COMITE SCIENTIFIQUE
DE L'AGENCE FEDERALE POUR LA SECURITE
DE LA CHAINE ALIMENTAIRE

AVIS 06-2013

Concerne : Facteurs de risque des maladies animales infectieuses (potentiellement) (ré-)émergentes (dossier Sci Com 2006/48 – auto-saisine).

Avis approuvé par le Comité scientifique le 22/02/2013.

Résumé

Le but de cet avis auto-saisine est d'identifier les facteurs de risque d'émergence des maladies animales infectieuses en Belgique afin de permettre aux gestionnaires de risque d'entreprendre des actions dans les temps.

Pour ce faire, 34 exemples de maladies animales infectieuses (ré-)émergentes ou à risque de (ré-)émergence, ainsi que 33 facteurs de risque ou de protection de l'émergence ont été sélectionnés de manière à assurer une représentativité la plus complète possible de ceux-ci. L'effet de ces facteurs sur le risque d'émergence des 34 maladies animales a été analysé par le biais d'une enquête Delphi réalisée auprès de 50 experts.

L'étude a permis de hiérarchiser les facteurs de risque par ordre d'importance de leur influence sur l'émergence de groupes de maladies animales infectieuses (par exemple, maladies exotiques, maladies zoonotiques, maladies transmissibles par l'alimentation), ainsi que de manière globale pour l'ensemble des maladies. Les six facteurs de risque qui ont le plus d'influence sur le risque d'émergence des maladies animales sont, en considérant l'ensemble des maladies, les suivants : la présence d'un réservoir animal, les problèmes de détection de l'émergence, les difficultés de contrôle de la maladie par la vaccination, l'extension géographique de la maladie, le portage asymptomatique et l'augmentation de l'incidence de la maladie dans d'autres pays.

Cette hiérarchisation des facteurs de risque a permis d'émettre des recommandations notamment en matière d' « early warning », de vigilance, de surveillance, de gestion et de lutte contre les maladies animales. En ce qui concerne l' « early warning », il est recommandé de réaliser un monitoring des facteurs de risque d'émergence mesurables. Une apparition ou une augmentation d'incidence de facteurs de risque peut alerter le gestionnaire de risque précocement de l'augmentation du risque d'émergence de maladies animales infectieuses.

Summary

Advice 06-2013 of the Scientific Committee of the FASFC on the risk factors of the (potentially) (re)-emerging infectious animal diseases

The objective of this advice is to identify the risk factors of emergence of infectious animal diseases in Belgium to allow the risk managers to undertake control measures in time.

For that purpose, 34 examples of (re)-emerging or at risk of (re)-emergence infectious animal diseases and 33 risk (or protection) factors of emergence were selected aiming for the most complete representativeness as possible. The effect of these factors on the risk of emergence of the 34 animal diseases was analysed via a Delphi survey by 50 experts.

The study allowed to rank the risk factors according to their relevance to the emergence of separate groups of infectious animal diseases (for example, exotic, zoonotic, foodborne diseases, etc.), as well as for all the diseases, taken together in one global group. The six most important risk factors, when considering (re)-emerging animal diseases as one global group, are the following: presence of an animal reservoir, detection problems of emergence of disease, difficulties to control the disease by vaccination, geographical extension of the disease, asymptomatic carriage and increase in the incidence of the disease in other countries.

This ranking of risk factors allowed to make recommendations, namely in regard to « early warning », vigilance, surveillance, and control of animal diseases. Concerning the “early warning”, it is recommended to monitor the measurable risk factors of emergence. The appearance of the increase in incidence of risk factors can alert the risk manager early of the increased risk of emergence of infectious animal diseases.

Mots clés

Maladies animales émergentes – facteurs de risque – hiérarchisation - recommandations

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1. Termes de référence

1.1. Objectif

Le but de cet avis auto-saisine est d'identifier les facteurs de risque d'émergence des maladies animales infectieuses en Belgique afin de permettre aux gestionnaires de risque d'entreprendre des actions dans les temps.

Le but n'est pas d'établir une liste exhaustive de maladies (ré-)émergentes ou à risque de (ré-)émergence. L'objectif est de développer une méthodologie qui permette d'identifier des facteurs de risque communs à plusieurs agents infectieux, en utilisant des exemples représentatifs de maladies.

L'enquête Delphi a été réalisée en considérant l'émergence des maladies animales infectieuses uniquement, sans considérer les maladies humaines en cas de maladies animales zoonotiques. La situation épidémiologique belge au moment de l'étude a été considérée (2007-2012).

L'étude a permis de hiérarchiser les facteurs de risque par ordre d'importance de leur influence sur le risque d'émergence de groupes de maladies, ainsi que de manière globale pour l'ensemble des maladies, en considérant la santé animale dans son ensemble. Cette étude a aussi permis d'émettre des recommandations.

1.2. Contexte législatif

L'arrêté royal du 20 novembre 2009 relatif à l'agrément des médecins vétérinaires oblige la déclaration obligatoire à l'AFSCA en cas de présence d'une augmentation soudaine de la morbidité ou de la mortalité causée par une des maladies de la liste[1] de l'Organisation Mondiale de la Santé Animale (OIE). Il vise donc à la déclaration obligatoire des maladies animales dans un contexte d'émergence.

1.3. Définitions (dans le cadre de cet avis)

Maladie animale (**Toma *et al*., 2001**): état de santé morbide due à un agent pathogène sévissant dans une population animale sensible. Une maladie animale peut être infectieuse (due à un agent pathogène qui se multiplie dans l'animal atteint), transmissible (dont l'agent peut être transmis et retransmis à d'autres animaux) et/ou contagieuse (transmise par contact direct ou indirect avec un animal infecté source de l'agent pathogène).

Zoonose : Maladie ou infection qui se transmet naturellement des animaux vertébrés à l'homme et vice-versa (**Toma *et al*., 1991**).

Maladie émergente :
- maladie présente en Belgique et dont l'incidence réelle (nombre de nouveaux cas d'animaux malades) augmente significativement dans une population animale donnée d'une région donnée et durant une période donnée, par rapport à la situation épidémiologique habituelle de cette maladie, ceci indépendamment des fluctuations saisonnières habituelles de la maladie ;
- nouvelle maladie causée par un agent pathogène non connu auparavant ;
- maladie causée par des agents pathogènes qui ont muté ;

[1] URL : http://www.oie.int/fr/sante-animale-dans-le-monde/maladies-de-la-liste-de-loie-2011/

- maladie qui existe déjà et qui se répand dans une nouvelle région où elle n'était pas présente auparavant.

Dans le cadre de cet avis, le terme « maladie animale émergente » est donc à considérer au sens large du terme : augmentation d'incidence ; introduction et établissement en Belgique si la maladie est exotique ; dispersion si la maladie est déjà présente, etc. Cette définition est détaillée dans la **brochure du Comité scientifique (2010).** Il est également à noter qu'une maladie animale, pour être émergente, est nécessairement une maladie transmissible.

Maladie potentiellement émergente ou à risque d'émergence : maladie qui n'est pas présente en Belgique mais qui est prévalente dans un autre pays (maladie exotique), et pour laquelle le risque d'introduction et de dissémination sur le territoire, à court ou à plus long terme, est réel.

Maladie ré-émergente ou à risque de ré-émergence : maladie qui a existé en Belgique, qui a été éradiquée, mais qui réapparaît ou qui risque de réapparaître.

Facteur de risque : facteur associé à l'augmentation de la probabilité d'apparition ou de développement d'une maladie.

Facteur de protection : facteur associé à la réduction de la probabilité d'apparition ou de développement d'une maladie.

Réservoir animal : espèce animale permettant la survie d'agents pathogènes et représentant une source importante d'agents pathogènes infectieux transmissibles à d'autres animaux.

Vu les discussions lors des réunions de groupe de travail des 17 novembre 2006, 13 février 2007, 2 mai 2007, 30 août 2012 et 4 janvier 2013, et les discussions durant la séance plénière du 22/02/2013,

le Comité scientifique émet l'avis suivant :

2. Méthodologie

<u>Etape 1. Etablissement d'une liste d'exemples de maladies animales (ré-) émergentes ou à risque de (ré-)émergence et classement selon leur situation épidémiologique</u>

Le Comité scientifique a choisi de ne pas travailler sur base d'une liste exhaustive de maladies animales infectieuses (ré-)émergentes ou à risque de (ré-)émergence, mais sur base d'une liste d'exemples de maladies animales. Ces exemples ont été sélectionnés de manière à être représentatifs de l'ensemble des maladies animales et de leurs propriétés biologiques (interactions hôte-agent pathogène), sur base :

- des différents types d'agents étiologiques (bactéries, virus, parasites, prions),
- de différentes situations épidémiologiques (maladies prévalentes, maladies exotiques, etc.),

- de différents types d'hôtes (animaux domestiques, faune sauvage, différentes espèces animales, etc.),
- de différentes voies de transmission (vectorielle, directe, alimentaire, indirecte, etc.),
- du caractère zoonotique ou non.

Les résultats de l'étude pourront ainsi être extrapolés à d'autres maladies présentant des caractéristiques similaires aux exemples choisis.

34 maladies animales infectieuses ont ainsi été sélectionnées et réparties en plusieurs groupes et sous-groupes selon leur situation épidémiologique :

(1) maladies prévalentes en Belgique, soit à l'état endémique, soit à l'état sporadique, et pour lesquelles un risque d'émergence (augmentation d'incidence) existe :
   - maladies endémiques : babésiose bovine, brucellose porcine chez le sanglier, maladie de Lyme, fièvre Q[2], hantavirose, cysticercose bovine, échinococcose (*Echinococcus multilocularis*), *E. coli* O157:H7[3],
   - maladies sporadiques: tuberculose bovine, tularémie, leishmaniose, rage chez la chauve-souris, anaplasmose[4],

(2) maladies présentes en Belgique et dont l'incidence augmente (émergence établie et constatée) : fièvre catarrhale ovine[1], échinococcose (*Echinococcus granulosus*), artérite virale équine, entérite nécrotique à *Clostridium perfringens* chez la volaille, encéphalopathie spongiforme transmissible (EST) atypique chez les petits ruminants, myopathie atypique des équidés,

(3) maladies non présentes en Belgique (exotiques) et à risque d'introduction et de dissémination en Belgique (maladies potentiellement (ré-) émergentes ou à risque de (ré-)émergence) : fièvre aphteuse, peste porcine africaine, peste porcine classique, fièvre du Nil occidental, fièvre de la vallée du Rift, maladie hémorragique épizootique, maladie du dépérissement chronique des cervidés, pleuropneumonie contagieuse bovine, influenza aviaire hautement pathogène, cysticercose porcine, rage classique des canidés, peste, encéphalites à tiques, encéphalopathie spongiforme bovine (ESB) atypique, dirofilariose.

Les principales caractéristiques de ces maladies (agent étiologique, caractère zoonotique, hôtes, voies de transmission) sont reprises à **l'annexe 1.**

Etape 2. Etablissement d'une liste de facteurs de risque (et/ou de protection) d'émergence des maladies animales infectieuses et classement en domaines sur base du modèle de convergence (King, 2004)

Le modèle de convergence[5] de **King (2004)** permet de classer des facteurs spécifiques d'émergence des maladies zoonotiques en grands domaines parmi

[2] L'étude a été réalisée entre 2006 et 2012. Le choix des maladies reflète leurs caractéristiques épidémiologiques au moment du début de l'étude. Ces choix n'ont pas été modifiés suite à l'évolution de la situation épidémiologique car l'objectif est d'étudier les facteurs de risque comme indicateurs, indépendamment de l'évolution épidémiologique, afin que le gestionnaire de risque puisse utiliser la matrice à moyen terme, indépendamment de la situation épidémiologique.

[3] E. coli O157:H7 provoque une infection et non une maladie chez les bovins.

[4] L'anaplasmose était sporadique en Belgique au début de l'étude. Cette maladie a évolué de manière endémique depuis lors.

[5] Différents modèles ont été proposés pour classer les facteurs de risque. Le modèle PERIAPT concerne les risques émergents dans la chaîne alimentaire, le modèle GENERALISE concerne les événements rares, et le modèle de CONVERGENCE concerne les zoonoses (ré-)émergentes. Ce modèle classe les facteurs de risque potentiels en grands domaines (par exemple, facteurs écologiques et environnementaux, facteurs socio-économiques, facteurs biologiques, etc.) au sein desquels les animaux domestiques et sauvages, les humains et l'environnement jouent un rôle. Des facteurs de risque spécifiques d'émergence sont contenus dans les domaines. Le terme « convergence » provient

lesquels des interfaces sont possibles. Les domaines et les facteurs de risque du modèle de convergence de King (2004) ont été modifiés dans le présent avis afin de les adapter aux buts de l'auto-saisine et de pouvoir considérer des maladies non zoonotiques. Les facteurs retenus dans le cadre de cette étude sont également inspirés de **Morse (2004) et Slingenbergh *et al*. (2004).** Quatre domaines ont été retenus :

- facteurs liés à l'agent infectieux,
- facteurs liés à l'activité humaine,
- facteurs liés aux animaux,
- facteurs liés aux changements environnementaux.

Chaque domaine comprend plusieurs facteurs de risque spécifiques. La terminologie utilisée pour définir les facteurs de risque a été choisie de manière à ce que ces facteurs soient adaptés aux différents exemples de maladies sélectionnés, et de manière à minimiser les problèmes d'interprétation et les biais de réponses aux questions par les experts (voir Etape 3. Enquête Delphi).

	Facteurs liés à l'agent infectieux	**Références**
1	Variabilité génétique (mutation, recombinaison, etc.)	**Webster and Hulse (2004)**
2	Manque de connaissance de la pathogénie	
3	Changement dans la pathogénie (= changement dans le développement de la maladie chez l'hôte, par exemple, augmentation de virulence, période d'incubation prolongée, variation dans l'interaction hôte-pathogène)	**Morse (2004), Angulo (2004)**
4	Difficultés de contrôler la maladie par la vaccination	
5	Possibilité de changement de spectre d'hôte d'une espèce animale vers une autre espèce animale (franchissement de la barrière d'espèce)	
6	Possibilité de changement de spectre d'hôte des animaux vers l'homme	
7	Extension de la distribution géographique de l'agent infectieux	
8	Augmentation de l'incidence (nouveaux cas) dans un (d') autre(s) pays	
9	Persistance de l'agent infectieux dans l'environnement	**Slingenbergh (2004)**
	Facteurs liés aux humains (activité humaine)	
10	Législation / police sanitaire	**Morse (2004)**
11	Changements dans les procédés technologiques et industriels	**Morse (2004), Slingenbergh (2004)**
12	Problèmes de détection de l'émergence (par exemple, difficultés de déclaration de la maladie par les éleveurs, faible performance des tests de diagnostic)	
13	Augmentation des interactions entre les compartiments (populations) animaux	**Webster and Hulse (2004)**
14	Augmentation des interactions entre les populations animales et humaines	
15	Croissance démographique humaine	**Brown (2004), Morse (2004), Slingenbergh (2004)**
16	Croissance de la population animale concernée par la maladie	
17	Globalisation : augmentation des voyages	**Slingenbergh (2004)**
18	Globalisation : augmentation du tourisme	**Slingenbergh (2004)**
19	Globalisation : augmentation du commerce	**Brown (2004), Morse**

du fait qu'il existe des rapports d'interdépendance entre les domaines, notamment entre la santé humaine, la santé animale et l'environnement, ce qui crée des interfaces et est à l'origine du concept « One Health ».

		(2004), Slingenbergh (2004)
20	Globalisation : augmentation du transport	**Brown (2004), Morse (2004), Slingenbergh (2004)**
21	Globalisation : augmentation du terrorisme	**Brown (2004)**
22	Systèmes de production intensifs	**Webster and Hulse (2004), Slingenbergh (2004)**
23	Systèmes de production extensifs	
	Facteurs liés aux animaux	
24	Porteurs asymptomatiques (sans signes cliniques)	
25	Réservoir animal	
26	Longue période d'incubation chez l'animal	
27	Contacts entre les animaux domestiques et la faune sauvage	**Bengis *et al*. (2004), Slingenbergh (2004)**
28	Rôle épidémiologique de la faune sauvage	**Bengis *et al*. (2004)**
29	Augmentation de la démographie et/ou de la distribution de la faune sauvage	**Bengis *et al*. (2004), Enria and Levis (2004)**
	Facteurs dus à des changements environnementaux	
30	Changements climatiques et météorologiques	**Brown (2004), de La Rocque *et al*. (2008), Gerdes (2004), Slingenbergh (2004)**
31	Changements dans les écosystèmes produits par l'homme	**Morse (2004), Slingenbergh (2004)**
32	Urbanisation	**Slingenbergh (2004)**
33	Présence de vecteur	**Chevalier *et al*. (2004), Slingenbergh (2004)**

Etape 3. Enquête Delphi

Une enquête a été réalisée auprès d'experts belges afin d'analyser l'influence des facteurs de risque (ou de protection) sélectionnés sur les différents exemples de maladie. La première phase de l'enquête visait à interroger les experts individuellement. La seconde phase avait pour objectif la validation, par ces mêmes experts, d'une proposition de consensus basé sur les réponses de la première phase.

- **Phase 1**

Les facteurs de risque et les exemples de maladies ont été encodés dans un tableau Excel à double entrée de manière à pouvoir confronter chaque facteur de risque (ou de protection) à chaque exemple de maladie (**annexe 2**).

78 experts ont été invités à participer à l'enquête sur base de leur expertise. Le taux de participation à la phase 1 (nombre d'experts ayant effectué la phase 1 / le nombre d'experts ayant été sollicités) est de 64 % (50/78). **L'annexe 3** reprend la liste des 50 experts ayant participé à la phase 1 de l'enquête Delphi ainsi que les maladies qu'ils ont évaluées. Chaque expert a analysé plusieurs maladies (minimum deux maladies par expert) et chaque maladie a été analysée par plusieurs experts (entre 2 et 15 experts par maladie), sauf concernant deux maladies (la pleuropneumonie contagieuse bovine et la peste) qui n'ont été anaysées que par un seul expert (**annexe 3**). Les experts devaient, par maladie, donner une évaluation de tous les

facteurs de risque de la liste. Un pré-test a été réalisé auprès de 5 experts du groupe de travail du Comité scientifique afin d'identifier de possibles problèmes d'interprétation et d'y remédier.

Le document Excel, assorti d'un mode d'emploi détaillé, a été envoyé par courrier électronique à chaque expert individuellement. Le mode d'emploi détaillé est présenté à **l'annexe 4**.
Les experts ont ensuite été invités à répondre dans le document Excel, via des menus déroulants, pour chaque facteur de risque / protection, et pour les maladies pour lesquelles ils ont été choisis, aux 3 questions présentées ci-dessous, avec possibilité de commenter/justifier leur choix.

Question 1 :
Le facteur énoncé existe-t-il/est-il présent actuellement en Belgique pour la maladie animale dont il est question ? Répondez « oui » (facteur présent) ou « non » (facteur absent). L'objectif de cette question découle du fait que la liste de facteurs de risque est identique pour toutes les maladies sélectionnées, et qu'il est nécessaire d'analyser la situation propre à chaque maladie. Il ne fallait pas encore répondre à la question « le facteur est-il un facteur de risque / protection de la maladie? » car cette question faisait l'objet de la seconde question.

Question 2 :
La réponse à cette question devait se faire indépendamment de la réponse à la première question, donc indépendamment de la présence/existence/absence actuelle en Belgique du facteur de risque. Même si le facteur n'était pas présent actuellement en Belgique, il fallait quand même répondre à la question, en raisonnant de manière théorique, c'est-à-dire en imaginant que le facteur existe:
Le facteur :
- diminue-t-il le risque d'émergence de la maladie en question ? Si oui, il s'agit d'un facteur de protection contre l'émergence de la maladie (encodage d'un « - »);
- augmente-t-il le risque d'émergence de la maladie en question ? Si oui, il s'agit d'un facteur de risque d'émergence de la maladie (encodage d'un « + »);
- dans certains cas, il peut ne pas avoir d'effet sur l'émergence de la maladie en question (encodage d'un « 0 »).
Pour répondre à cette question, il était nécessaire de considérer la définition d'émergence au sens large du terme. Par exemple, pour les maladies « exotiques » qui ne sont pas présentes à l'heure actuelle en Belgique, il fallait considérer l'influence du facteur sur le risque d'émergence (introduction et dissémination) de la maladie en Belgique.

Question 3 :
Quantifiez l'importance de l'influence de chacun de ces facteurs sur l'émergence des maladies selon le tableau de scores suivant :

Le facteur a une influence … sur l'émergence de la maladie animale	facteur de risque	facteur de protection
faible	+	-
moyenne	++	- -
grande	+++	- - -
très grande	++++	- - - -

(Si un « 0 » avait été encodé, cela signifiait que le facteur n'avait pas d'influence sur l'émergence de la maladie et il n'était pas nécessaire de quantifier).

Un schéma du questionnaire donné aux experts est présenté à **l'annexe 5**.

La première question (présence/absence) se rapportait à la Belgique. La deuxième question (facteur de risque ou non) était purement théorique. Les experts devaient répondre aux deux questions de manière indépendante l'une de l'autre, de manière à ce que ceux-ci évitent d'associer « présence » avec « facteur de risque » ou « absence » avec « facteur de protection ». Par exemple, un vecteur peut être absent de la Belgique à l'heure actuelle, mais représente tout de même un facteur de risque si la maladie considérée est une maladie vectorielle. L'analyse de la combinaison des réponses aux deux questions devait permettre d'extrapoler la notion théorique à la situation belge et de dégager des conclusions et recommandations propres à la Belgique. En d'autres mots, le fait de répondre indépendamment aux deux questions visait à permettre d'envisager toutes les possibilités par déduction et de tirer des conclusions.

Les réponses individuelles des experts ont été comparées. L'analyse des réponses à la première question s'est déroulée comme suit : le choix de la majorité des experts a été considéré par le groupe de travail, en tenant compte également d'arguments scientifiques provenant de la littérature scientifique si nécessaire (absence de majorité, réponses résultant clairement d'un problème d'interprétation, etc.).
L'analyse des réponses à la seconde question s'est déroulée comme suit :
Le choix de la majorité des experts a été considéré par le groupe de travail en tenant compte également d'arguments scientifiques provenant de la littérature scientifique si nécessaire (absence de majorité, réponses résultant clairement d'un problème d'interprétation, etc.).
Pour la quantification, des moyennes numériques des scores des experts majoritaires ont été calculées et reconverties en valeurs « signe » (« + », « ++ », …) pour la suite de l'enquête. De cette manière, pour chaque maladie, et pour chaque facteur de risque ou de protection, une proposition de consensus a été formulée sous forme d'une valeur « signe » qui représente la moyenne de la majorité des experts, par donnée.
Chaque proposition de consensus a été assortie d'une interprétation en anglais, elle-même appuyée par des justifications scientifiques issues de la littérature scientifique. Un exemple est proposé à **l'annexe 6**. Les interprétations ou justifications scientifiques avaient pour objectif d'exprimer les idées véhiculées par les propositions de consensus, afin de ne pas reproduire les erreurs d'interprétation de la phase 1 au cours de la phase 2.

Les justifications scientifiques ont été validées et/ou corrigées par des experts externes pour les maladies virales et bactériennes avant la phase 2 de l'enquête.

Cette proposition de consensus a servi de base à la seconde phase de l'enquête Delphi.

- **Phase 2**

Les 50 experts qui avaient participé à la première phase ont été à nouveau sollicités par une lettre explicative (**annexe 7**) leur demandant de participer à la seconde phase de l'enquête. Le taux de participation à la phase 2 (nombre d'experts ayant répondu à la phase 2 / le nombre d'experts ayant répondu à la phase 1) a été de 74% (voir **annexe 3**).

Le document Excel envoyé aux experts reprend, pour les maladies pour lesquelles ils avaient initialement été sélectionnés, et pour chaque facteur de risque ou de protection, les propositions de scores consensus assortis des justifications scientifiques (**annexe 6**) issues de l'analyse de la phase 1. Il leur a été demandé de

valider/corriger/commenter les propositions de consensus ainsi que les justifications scientifiques. Chaque maladie a été analysée par plusieurs experts, sauf quelques maladies (voir **annexe 3** et point 2.4.3). Les experts devaient, par maladie, valider/commenter la proposition de consensus pour l'ensemble des facteurs de risque de la liste.

A l'issue de la phase 2, des valeurs uniques consensus par facteur et par maladie, assorties de justifications scientifiques, ont ainsi été obtenues. Concernant les facteurs non liés spécifiquement à une maladie, dont la présence ou l'absence ne varie pas en fonction des maladies (par exemple, augmentation du tourisme, augmentation du terrorisme, bouleversements climatiques, etc.), une analyse horizontale a été effectuée pour harmoniser les réponses à la première question pour l'ensemble des maladies. Par exemple, la présence de changements climatiques et météorologiques ne varie pas en fonction des maladies animales. La réponse « oui (présence)» a donc été donnée pour l'ensemble des maladies. Pour ce faire, le choix de la majorité des experts a également été considéré.

Etape 4. Analyse des données

Les valeurs « signe » consensus ont été converties en valeurs numériques consensus (par exemple, « + » a été remplacé par « 1 » ; « ++ » par « 2 », « --- » par « -3 », etc.), et les statistiques descriptives (somme, moyenne, écart type, coefficient de variation, erreur standard, intervalle de confiance) ont été calculées :

- soit pour l'ensemble des maladies (santé animale globale),
- soit par groupes de maladies selon :
  - la situation épidémiologique (maladies endémiques, maladies sporadiques, maladies dont l'émergence est constatée, maladies exotiques à risque d'émergence),
  - le type d'agent pathogène (maladies bactériennes, maladies virales, maladies parasitaires, maladies à prions),
  - le mode de transmission (maladies vectorielles, maladies de transmission alimentaire, de transmission directe, indirecte, par inhalation, par l'environnement, etc.), et
  - le caractère zoonotique ou non.

Les facteurs de risque (ou de protection) ont été triés par ordre décroissant d'importance sur base de la moyenne des scores par groupes. Un ranking des facteurs de risque selon leur importance pour l'émergence des maladies animales a ainsi été obtenu, d'une part pour l'ensemble des maladies, d'autre part pour les différents groupes de maladies.

3. Résultats

3.1. Evaluation qualitative

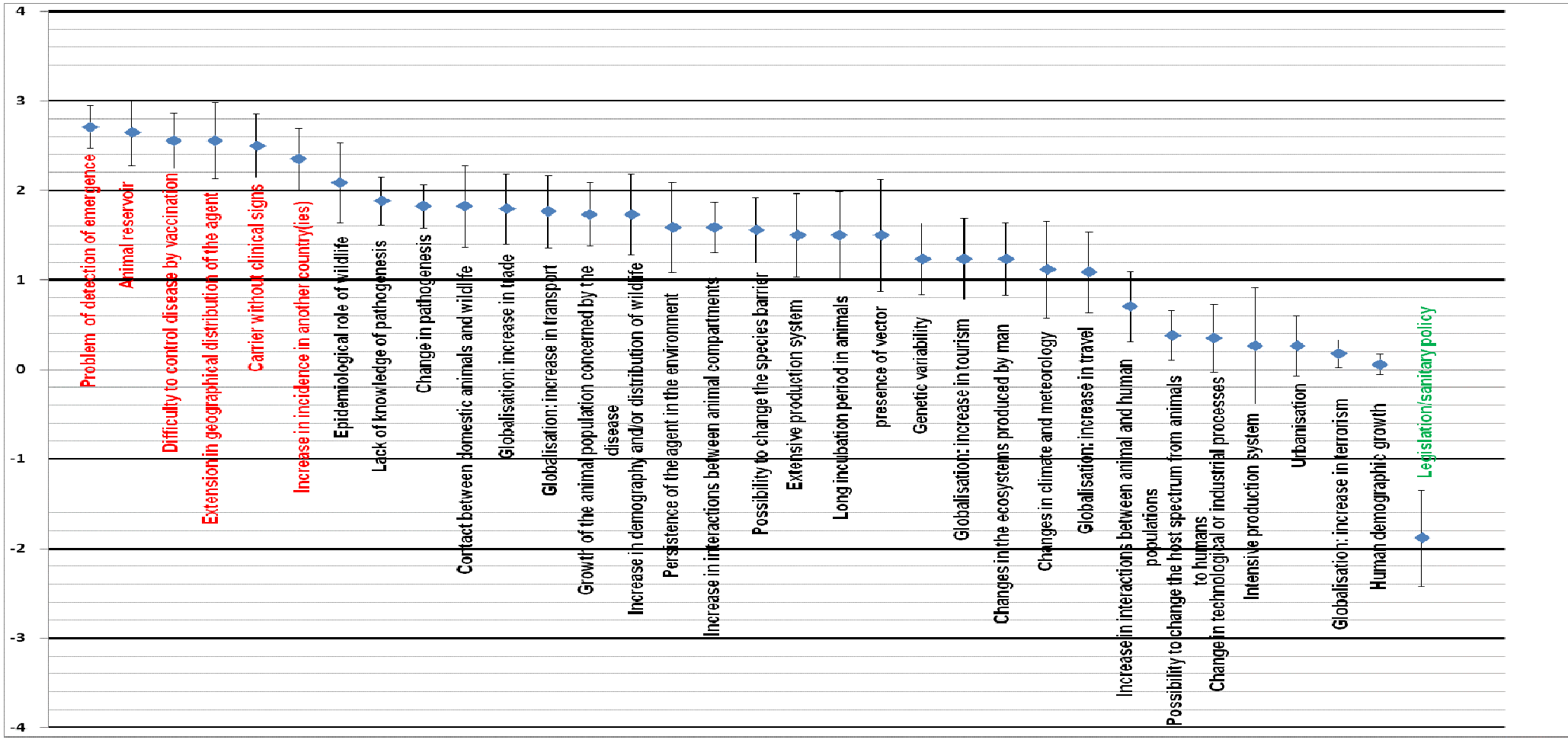
Les valeurs consensus, assorties des justifications scientifiques, de l'influence des facteurs de risque / protection sur les exemples de maladies animales se trouvent à l'**annexe 8**. Vu l'ampleur de ces résultats, ils ne sont pas résumés dans le texte de cet avis.

3.2. Evaluation quantitative de l'impact des facteurs de risque/protection sur l'émergence des maladies animales infectieuses

Ci-dessous est présenté le scénario de ranking des facteurs de risque d'émergence des maladies animales considérant la santé animale dans son ensemble (scénario 1):

Scenario 1. Ranking des facteurs de risque d'émergence des maladies animales considérant la santé animale dans son ensemble

Les 6 facteurs de risque indiqués en rouge représentent les facteurs de risque ayant l'occurrence la plus élevée pour l'ensemble des scénarios. Le facteur indiqué en vert est considéré comme un facteur de protection.



Les autres scénarios de ranking sont présentés à **l'annexe 9**:

- Scénario 2. Facteurs de risque d'émergence des maladies animales zoonotiques,
- Scénario 3. Facteurs de risque d'émergence des maladies animales transmises par les denrées alimentaires,
- Scénario 4. Facteurs de risque d'émergence des maladies animales vectorielles,
- Scénario 5. Facteurs de risque d'émergence des maladies animales endémiques,
- Scénario 6. Facteurs de risque d'émergence des maladies animales sporadiques,
- Scénario 7. Facteurs de risque d'émergence des maladies animales dont l'émergence a été constatée,
- Scénario 8. Facteurs de risque d'émergence des maladies animales exotiques à risque d'émergence.

4. Incertitudes

4.1. Problèmes d'interprétation

Lors de la phase 1 de l'enquête Delphi, certains experts ont eu des problèmes d'interprétation de la définition de certains facteurs de risque, ainsi que des problèmes de manque d'indépendance entre les réponses à la première et à la deuxième question. Par exemple, certains experts ont répondu à la première question comme si elle était intitulée « le facteur est-il un facteur de risque (encodez oui) ou un facteur de protection (encodez non) ?», et ont répondu à la deuxième question sous la forme d'une quantification de l'importance du facteur de risque / protection (+, ++, +++, etc.). Ceci a engendré une certaine hétérogénéité dans les réponses des experts, et des difficultés pour le traitement des données. Ce problème a été résolu suite à la proposition de consensus assorti d'interprétations et de justifications scientifiques finalement validées lors de la phase 2.

4.2. Hétérogénéité des groupes de maladies

Les groupes de maladies, formés selon la situation épidémiologique, le caractère zoonotique ou non, le type d'agent pathogène et le mode de transmission, sont hétérogènes c'est-à-dire que les maladies qui les composent ne présentent pas des caractéristiques similaires concernant le rôle des facteurs de risque. Par exemple, dans le groupe des maladies exotiques, il y a des bactéries, des virus, des parasites, des maladies à transmission vectorielle, alimentaire, etc. Le rôle de certains facteurs de risque sur l'émergence des virus n'est par exemple pas identique à leur rôle sur l'émergence des parasites.
Le scénario le plus complet est celui reprenant l'ensemble des 34 maladies. Les groupes des maladies endémiques, sporadiques, émergentes, exotiques, de transmission vectorielle, de transmission alimentaire et zoonotiques comprennent respectivement 7, 6, 6, 15, 13, 14 et 23 maladies. L'hétérogénéité dans les groupes comprenant moins de maladies est plus grande que dans les groupes contenant plus de maladies car les groupes avec moins de maladies contiennent moins de maladies comparables. **L'annexe 10** présente quelques exemples de l'influence de l'hétérogénéité des groupes sur les résultats. Plus il y a de maladies dans un groupe, plus les résultats du ranking sont stables.

4.3. Nombre d'experts ayant validé la seconde phase

L'impact des facteurs de risque sur certaines maladies n'a pu être validé que par un nombre restreint d'experts lors de la seconde phase de l'enquête Delphi, pour cause de manque de disponibilité des experts. *Echinococcus granulosus*, la maladie

hémorrhagique épizootique, la pleuropneumonie contagieuse bovine, la tuberculose bovine, la leishmaniose, la peste, l'encéphalite à tiques et la dirofilariose n'ont été validées que par respectivement un ou deux expert(s).

4.4. Interdépendance de certains facteurs de risque

Certains facteurs de risque ne sont pas totalement indépendants les uns des autres. Par exemple, le facteur de risque concernant la longue période d'incubation, durant laquelle un animal ne présente pas de signes cliniques malgré sa capacité à transmettre la maladie et provoquer une épidémie, ne peut pas être totalement dissociée du facteur de risque concernant le portage asymptomatique de la maladie. Un autre exemple concerne la présence de vecteurs, qui n'est pas totalement indépendante des bouleversements climatiques. Un dernier exemple concerne le rôle épidémiologique de la faune sauvage, qui comprend des aspects liés au facteur de risque relatif aux réservoirs animaux.

5. Conclusions et recommandations

Un inventaire de 33 facteurs de risque d'émergence des maladies animales infectieuses a été établi. Ces facteurs de risque ont été hiérarchisés selon plusieurs scénarios sur base de leur importance sur le risque d'émergence de ces maladies.
L'annexe 11 reprend, pour chaque scénario de ranking, les trois (choix arbitraire de ce nombre 3) facteurs de risque les plus importants. L'occurrence de ces facteurs de risque pour l'ensemble des scénarios a été comptée et les six (choix arbitraire de ce nombre 6) facteurs de risque ayant l'occurrence la plus élevée sont cités ci-dessous par ordre décroissant :
- la présence d'un réservoir animal,
- les problèmes de détections de l'émergence,
- les difficultés de contrôler les maladies par la vaccination,
- l'extension géographique de la maladie,
- la présence d'animaux porteurs asymptomatiques,
- l'augmentation d'incidence de la maladie dans d'autres pays.

Seuls ces 6 facteurs de risque ayant l'occurrence la plus élevée sont mis en évidence dans un souci de clarté, mais les autres facteurs de risque ont également leur importance.

La législation, la police sanitaire et les systèmes de production intensifs ont été identifiés comme facteurs de protection contre l'émergence des maladies animales infectieuses.

Cette étude a envisagé les facteurs de risque et de protection de façon monofactorielle, mais les raisons de l'émergence d'une maladie sont souvent multifactorielles et résultent de l'action combinée de plusieurs facteurs de risque d'émergence. Par exemple, l'augmentation du transport peut résulter en l'introduction d'une espèce de vecteur, dont le maintien dans nos écosystèmes est permis par un second facteur de risque tel que le réchauffement climatique.Parmi les facteurs de risque, certains sont complexes et peuvent englober plusieurs sous-catégories (voir Recommandations **annexe 12**).

L'intérêt principal de ce travail concerne l' « early warning » car une détection d'apparition ou d'augmentation d'incidence d'un facteur de risque peut alerter le gestionnaire de risque de l'émergence possible de pathogènes nouveaux. Si un facteur de risque important apparaissait ou augmentait, l'attention devrait être attirée sur les maladies concernées par ce facteur de risque. Par exemple, une augmentation très importante d'une population de tiques en Belgique peut annoncer

l'émergence de maladies exotiques ou même de maladies inconnues qui peuvent être révélées.
Le Comité scientifique a déjà hiérarchisé des zoonoses et des maladies animales à surveiller selon leur importance (avis 22-2008 concernant la surveillance des zoonoses alimentaires, et avis 26-2009 (+ addendum), 05-2010, 10-2010 et 20-2012 concernant la surveillance des maladies animales dans le cadre de la nouvelle potilique sanitaire). Cette approche-ci est complémentaire dans le sens où l'on propose une hiérarchisation de facteurs de risque.
Le message de cet avis est donc d'évoluer vers un concept complémentaire à la surveillance des maladies animales, qui consiste en un monitoring plus générique des facteurs de risque qui influencent la probabilité d'émergence des maladies animales.
Voici quelques facteurs de risque qui pourraient être mesurés (apparition ou augmentation) dans le cadre d'un monitoring:

- Extension de la distribution géographique des agents infectieux, via l'analyse de rapports internationaux ou via la participation à des réseaux internationaux (SCOFCAH, OIE, ADNS, …) ;
- Augmentation d'incidence des nouveaux cas de maladies dans les autres pays, via l'analyse de rapports internationaux (déjà en cours au niveau de la CE) ou via la participation à des réseaux internationaux (SCOFCAH, OIE, ADNS, …) ;
- Augmentation du taux d'importation d'animaux vivants et/ou de produits animaux à partir de pays tiers non indemnes, selon l'espèce animale ;
- Evolution de la démographie des espèces animales sauvages en Belgique. Par démographie, il est sous-entendu la densité des populations animales sauvages liée à la distribution géographique de ces populations. L'observation d'une augmentation de la démographie d'une espèce sauvage pourrait amener le gestionnaire de risque à surveiller plus particulièrement les maladies de cette espèce ;
- Monitoring entomologique des vecteurs de maladies (suivi des populations et surveillance de l'infection par des arbovirus) pour lesquels cela n'existe pas encore (ex. certaines espèces de moustiques, tiques).

Cette liste est donnée à titre d'exemple. Une étude de faisabilité de cette recommandation d'opérer un monitoring des facteurs mesurables pourra être réalisée ultérieurement en concertation avec les gestionnaires de risque dans le cadre d'une étude coût/bénéfice.

Le Comité scientifique propose des recommandations plus spécifiques qui sont soit des recommandations de type gestion, pour les facteurs de risque qui le permettent (ex. problèmes de détection de l'émergence), soit des recommandations de type surveillance, vigilance, et recherche scientifique.

L'annexe 12 reprend le détail des recommandations par facteur de risque. Ci-dessous figurent quelques exemples de recommandations classées en différentes thématiques mais non prioritisées. Une prioritisation pourra être réalisée ultérieurement en concertation avec les gestionnaires de risque dans le cadre d'une étude de faisabilité et d'une étude coût/bénéfice.

- Surveillance

- pour augmenter la détection des maladies:
  - stimuler la vigilance des acteurs de terrain pour la détection des maladies et des situations anormales, par exemple via la formation continue des vétérinaires, de l'information aux éleveurs, etc. ;

- instaurer un système officiel de vétérinaires praticiens sentinelles, comme en médecine humaine (Lobet *et al*., 1987; Stroobant *et al*., 1988) ;
- opérer une surveillance épidémiologique moléculaire de pathogènes isolés pour détecter des variations génétiques ;

o vecteurs :
- opérer un monitoring des populations de vecteurs pour détecter des augmentations de populations et des infections par des agents pathogènes ;
- surveiller les maladies vectorielles dont la population de vecteurs augmente ;

o constitution de sérothèques[6] pour différentes espèces animales en vue d'analyses sérologiques;

o surveillance de la situation internationale en matière de santé animale (alertes, littérature scientifique, réunions, symposiums, sources non officielles, etc.) ;

o Surveillance du secteur hobbyiste

- Recherche scientifique

o augmenter la performance des tests de diagnostic (sensibilité, délais, réactions aspécifiques) ;

o Recherche et développement de vaccins ;

o Développer des traitements alternatifs aux restrictions d'utilisation des antibiotiques et des vaccins

o réaliser des études scientifiques des réseaux de contact entre animaux (sauvages, domestiques) et augmenter la surveillance basée sur le risque dans les « hot spots » de ces réseaux de contact ;

o développer des tests de screening non spécifiques et multivalents pour détecter des maladies nouvelles inconnues ;

- Biosécurité

  o Au niveau des exploitations : optimaliser la compartimentalisation des espèces animales pour éviter la transmission de maladies entre espèces animales domestiques et également entre espèces domestiques et de la faune sauvage ;

  o Commerce et transports:
  - informations de biosécurité aux voyageurs (par exemple, interdiction d'importer des produits animaux ou des animaux vivants à partir de pays tiers);
  - utilisation de biocides dans les moyens de transport ;
  - continuer les contrôles du transport (frontières, PIFs, ports, aéroports), du commerce intracommunautaire et des importations ;

- Législation

[6] Les sérothèques sont des banques de sérum récoltées sur plusieures années à partir d'animaux de différentes espèces sur base d'un plan d'échantillonnage et archivées en vue d'une enquête épidémiologique rétroactive en cas d'émergence d'une maladie animale.

- pour favoriser la déclaration des maladies par les acteurs de terrain (éleveurs et vétérinaires):
  - donner des compensations financières et/ou des récompenses pour la détection des « index cases (premier cas d'une maladie émergente)» ;
  - en cas de suspicion de maladie, limiter les mesures temporaires de contrôle post-déclaration jusqu'à la confirmation du résultat de laboratoire, pour diminuer le seuil de déclaration des maladies (voir explications plus détaillées dans l'avis 12-2010 du Comité scientifique);
  - réaliser une analyse sociologique des relations entre les acteurs de terrain (vétérinaires et éleveurs) et l'Agence pour identifier des solutions au problème de sous-déclaration des maladies. De cette manière, l'Agence pourra développer des actions concrètes pour améliorer la confiance avec les opérateurs.

- Concernant les importations :
  - réévaluer la législation européenne à l'issue d'évaluations de risque à l'importation ;

Pour le Comité scientifique,

Prof. Em. Dr. Pharm. C. Van Peteghem (Sé.)
Président

Bruxelles, le 07/03/2013

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Cadre juridique de l'avis

Loi du 4 février 2000 relative à la création de l'Agence fédérale pour la Sécurité de la Chaîne alimentaire, notamment l'article 8 ;

Arrêté royal du 19 mai 2000 relatif à la composition et au fonctionnement du Comité scientifique institué auprès de l'Agence fédérale pour la Sécurité de la Chaîne alimentaire;

Règlement d'ordre intérieur visé à l'article 3 de l'arrêté royal du 19 mai 2000 relatif à la composition et au fonctionnement du Comité scientifique institué auprès de l'Agence fédérale pour la Sécurité de la Chaîne alimentaire, approuvé par le Ministre le 09 juin 2011.

Disclaimer

Le Comité scientifique conserve à tout moment le droit de modifier cet avis si de nouvelles informations et données arrivent à sa disposition après la publication de cette version.

Annexe 1. Caractéristiques principales des exemples de maladies sélectionnées dans le cadre de cette étude

Maladie	Etiologie	Zoonose	Hôtes(s)	Voie(s) de transmission
Maladies prévalentes en Belgique, soit à l'état endémique, soit à l'état sporadique, et pour lesquelles un risque d'émergence (augmentation d'incidence) peut exister				
o **endémiques**				
1. Babésiose bovine	*Babesia divergens* (piroplasmose)	oui	bovins	Vecteur (tiques)
2. Brucellose porcine chez le sanglier	*Brucella suis* type 2	oui (type 2 << types 1 et 3)	Sangliers, porcs domestiques, (lièvres)	Contact direct (salive, matières fécales, urine, sécrétions nasales), contact indirect (transmission mécanique via les personnes ou le matériel infectés), vénérienne (sperme), aliments pour animaux et eau contaminés (abats de lièvres infectés, lait), aérosols
3. Maladie de Lyme	*Borrelia burgdorferi*	oui	Humains, chiens, chats = hôtes accidentels	Vecteur (tiques)
4. Fièvre Q	*Coxiella burnetii*	oui	Ruminants (bovins, moutons, chèvres) et autres espèces de mammifères	Aérosols, contact direct, ingestion
5. Hantavirose	Hantavirus	oui	Rongeurs domestiques et sauvages	Contact avec les urines, inhalation de poussières contaminées
6. Cysticercose bovine	*Cysticercus bovis*, *Taenia saginata*	oui	Hôtes intermédiaires: bovins; hôtes définitifs: humains	Bovins : ingestion via les pâtures ou l'eau de surface contaminées ; humains : consommation de viande bovine insuffisamment cuite
7. Echinococcose	*Echinococcus multilocularis*	oui	Hôtes définitifs: renards, chiens, (chats); hôtes intermédiaires: rongeurs sauvages,	Les canidés sauvages et domestiques (hôtes définitifs) sont infectés par carnivorisme de rongeurs infectés (hôtes intermédiaires). Les hôtes intermédiaires (rongeurs, humains) sont infectés par ingestion de parasites éliminés dans les matières fécales des renards/chiens/chats, ou présents sur le sol contaminé (rongeurs) et sur les fruits (humains).

			(chevaux, sangliers, humains)	
8. *E. Coli* O157:H7	*E. Coli* O157:H7 (pas les autres serotypes EHEC)	oui	Bovins (+ autres)	Humains : consommation de nourriture insuffisamment cuite, contact direct avec les animaux infectés ou les matières fécales provenant d'animaux infectés. Animaux : contact avec les matières fécales d'animaux infectés.
o **sporadiques**				
9. Tuberculose bovine	*Mycobacterium bovis*	oui	Bovins*	Inhalation d'aérosols, contact, consommation de nourriture contaminée (lait cru).
10. Tularémie	*Francisella tularensis*	oui	Rongeurs et lagomorphes **	Contact direct, vecteur (tiques), inhalation de contaminations environnementales, consommation de viande insuffisamment cuite ou d'eau contaminée.
11. Leishmaniose	*Leishmania infantum*	oui	Surtout les chiens***	Vecteur (phlébotomes)
12. Rage chez la chauve-souris	Lyssavirus 1 et 2 européens	oui	Chauves-souris (faune sauvage) + autres (chiens, chats, ovins, bovins, etc.)	Contact direct (salive, morsures)
13. Anaplasmose	*Anaplasma phagocytophillum*	Oui (les humains sont des hôtes accidentels	Nombreux mammifères (bovins, chevaux, moutons, chèvres, chiens, chats, etc.)	Vecteur (tiques)
Maladies présentes en Belgique et dont l'incidence augmente (émergence établie et constatée)				
14. Fièvre catarrhale ovine	Orbivirus sérotype 8 + autres sérotypes	non	Ruminants domestiques et sauvages (bovins, ovins)	Vecteur (Culicoïdes) mais aussi transmission verticale transplacentaire
15. Echinococcose / Hydatidose	*Echinococcus granulosus*	oui	Hôtes définitifs: canidés	Les canidés (hôtes définitifs) sont infectés par ingestion des abats des hôtes intermédiaires infectés (ex. abats de moutons). Les hôtes

			domestiques (chiens) et sauvages (renards); Hôtes intermédiaires: moutons, (bovins, chèvres, porcs, cervidés sauvages, sangliers, humains)	intermédiaires sont infectés par ingestion d'herbe ou de nourriture contaminées par les matières fécales des canidés infectés. Les hôtes définitifs et intermédiaires jouent un rôle dans la transmission du parasite. Les humains sont infectés accidentellement par contact avec des chiens infectés ou par ingestion de nourriture contaminée par les matières fécales de chiens infectés, mais ne jouent pas de rôle épidémiologique (pas de transmission du parasite).
16. Artérite virale équine	Arterivirus	non	équidés	aérosol et contact (voies respiratoires), sperme d'étalons infectés de manière chronique.
17. Entérite nécrotique chez la volaille	*Clostridium perfringens* (seuls certains toxinotypes A de *C. perfringens* spécifiques de la volaille sont considérés ici)	Non ****	volaille*****	*C. perfringens* toxinotype A est ubiquitaire et commensal du tractus intestinal de la volaille qui présente un portage asymptomatique. On ne sait pas comment les bactéries de la flore intestinale normale deviennent pathogènes. On suppose que le développement de la pathologie (entérotoxémie) est du à des facteurs nutritionnels.
18. EST atypique (petits ruminants)	prions	non	ruminants	Aliments, directe (faible), environnementale
19. Myopathie atypique des équidés	inconnue	non	équidés	Inconnue (pâtures) ; pas de preuve de transmission d'un agent infectieux
Maladies non présentes en Belgique (exotiques) et à risque d'introduction et de dissémination en Belgique (maladies potentiellement (ré-) émergentes ou à risque de (ré-) émergence)				
20. Fièvre aphteuse	Aphtovirus	non	Bovins, porcs, chèvres, moutons	Transmission aérienne (10 km, possible de la France vers le Royaume-Uni), contact direct (urine, sperme, matières fécales, salive), contact indirect (virus très résistant dans l'environnement extérieur, véhicules, personnes en contact avec les animaux, etc.)
21. Peste porcine africaine	Asfivirus	non	Porcs, sangliers domestiques et sauvages	Contact direct, aérosols, contact indirect, vecteur (tiques molles)
22. Peste porcine classique	Pestivirus	non	Porcs, sangliers domestiques et sauvages	Contact direct, aérosols, contact indirect

23. Fièvre du Nil occidental	Flavivirus	oui	Oiseaux, chevaux, bovins, nombreux mammifères domestiques et sauvages	Vecteur (moustiques, tiques)
24. Fièvre de la vallée du Rift	Bunyaviridae, Phlebovirus	oui	Ruminants domestiques et sauvages (bovins, ovins, caprins)	Vecteur (moustiques); contact direct avec des tissus infectés (éleveurs, vétérinaires)
25. Maladie hémorragique épizootique	Orbivirus	non	Bovins et ruminants sauvages (cervidés)	Vecteur (Culicoïdes)
26. Maladie du dépérissement chronique des cervidés (EST)	prions	non	Cervidés domestiques et sauvages	Alimentation, persistance dans les sols
27. Pleuropneumonie contagieuse bovine	*Mycoplasma mycoides* subsp. *mycoides* variant Small Colony	non	Bovins domestiques	Contact direct ou aérosol sur une courte distance
28. Influenza aviaire hautement pathogène	virus influenza sous-type H5N1	oui	Oiseaux domestiques et sauvages, porcs	Contact direct, aérosol
29. Cysticercose porcine	*Cysticercus cellulosae*, *Taenia solium*	oui	Hôtes intermédiaires: porcs domestiques et sangliers sauvages ; hôtes définitifs : humains	Porcs : ingestion de déchets de cuisine contaminés ou d'excréments humains; Humains : consommation de viande de porc insuffisamment cuite; Également possibilité de cycle inter-humain: ingestion par les humains d'eau, fruits ou légumes contaminés par des excréments humains
30. Rage classique (carnivores)	Lyssavirus génotype 1	oui	Carnivores domestiques et sauvages, bovins, autres mammifères	Contact direct (salive, morsure)
31. Peste	*Yersinia pestis*	oui	Rongeurs domestiques et	vecteur (puces) (rats → humains; humains → humains), inhalation (humain → humain), contact, morsures, griffes (chats → humains),

			sauvages (principalement les rats), chats, (lapins, lièvres)	ingestion (rongeurs → chats)
32. Encéphalites à tiques	Virus du groupe TBE (Flaviviridae)	oui	Principalement humains, et espèces sylvatiques, bovins	Vecteur (tiques), lait cru provenant de bovins infectés
33. ESB atypique	prions (type H et type L)	oui	bovins	alimentaire
34. Dirofilariose	*Dirofilaria*	Oui ******	Canidés domestiques et sauvages	Vecteur (moustiques)

* Mais aussi de nombreux animaux domestiques et sauvages (moutons, chèvres, chevaux, porcs, sangliers, chiens, chats, renards, blaireaux, rats, furrets, cerfs, etc.).

** Les rongeurs et les lagomorphes sont les plus sensibles et représentent le réservoir de la maladie. Toutes les espèces animales, ainsi que les oiseaux, les amphibiens et les invertébrés peuvent être sensibles.

*** Mais aussi un grand nombre d'espèces animales domestiques et sylvatiques.

**** Les humains sont seulement infectés par certaines souches de *C. perfringens* de toxinotype A productrices d'entérotoxines, qui sont différentes des souches induisant l'entérotoxémie chez la volaille. Chez les humains, ces souches du toxinotype A sont principalement responsables de gangrène gazeuse et de toxi-infections alimentaires collectives.

***** l'entérotoxémie chez la volaille, les bovins et les porcs est causée par différentes souches du toxinotype A de *C. perfringens* (spécificité d'hôte). Dans cet exercice, seules les souches affectant la volaille sont considérées.

****** occasionnellement dans des zones endémiques.

Annexe 2. Tableau Excel à double entrée (facteurs de risque et maladies)

Risk factors of animal disease emergence in Belgium

	Risk factors	A. Prevalent diseases (Belgium): endemic or sporadic									
		endemic									
		Bovine babesiosis (*Babesia divergens*)		Porcine brucellosis (boar) (*Brucella suis* type 2)		Lyme disease (*Borrelia burgdorferi*)		Q fever (*Coxiella burnetii*)		Hantavirosis (Hantavirus)	
	level of expertise (1, 2, 3 or 4)										
		Yes / No	"+", "-", "0"	Yes / No	"+", "-", "0"	Yes / No	"+", "-", "0"	Yes / No	"+", "-", "0"	Yes / No	"+", "-", "0"
	1. Factors related to the infectious agent										
1.1.	Genetic variability (mutation, recombination, etc.)										
1.2.	Lack of knowledge of pathogenesis										
1.3.	Change in pathogenesis (= change in development of the disease in the host) (e.g., increase in virulence, prolonged incubation period, variation in interaction host-pathogen)										
1.4.	Difficulty to control disease by vaccination										
1.5.	Possibility to change the host spectrum from one animal species to another animal species (species barrier)										
1.6.	Possibility to change the host spectrum from animals to humans										
1.7.	Extension in geographical distribution of the agent										
1.8.	Increase in incidence (new cases) in another country(ies)										
1.9.	Persistance of the agent in the environment										
	2. Factors related to human (activity)										
2.1.	Legislation/sanitary policy										
2.2.	Change in technological or industrial processes										
2.3.	Problem of detection of emergence (e.g. difficult declaration of the disease by farmers, weak performance of diagnostic tests)										
2.4.	Increase in interactions between animal compartments (populations)										
2.5.	Increase in interactions between animal and human populations										
2.6.	Human demographic growth										
2.7.	Growth of the animal population concerned by the disease										
2.8.	Globalisation: increase in travel										
2.9.	Globalisation: increase in tourism										
2.10.	Globalisation: increase in trade										
2.11.	Globalisation: increase in transport										
2.12.	Globalisation: increase in terrorism										

Annexe 3. Détail de la répartition des experts en fonction des exemples de maladies sélectionnées

Les experts mentionnés ont tous participé à la première phase de l'enquête Delphi. Les experts ayant également participé à la deuxième phase sont indiqués en gras. L'emplacement des croix dans le tableau indique les maladies traitées par les experts.

	Maladies																																	
Expert	**Babésiose bovine**	**Brucellose porcine**	**Maladie de Lyme**	**Fièvre Q**	**Hantavirose**	**Cysticercose bovine**	**E. multilocularis**	**Tuberculose bovine**	**Tularémie**	**Leishmaniose**	**Rage chez la chauve-souris**	**E. Coli O157:H7**	**Anaplasmose**	**Fièvre catarrhale ovine**	**Echinococcus granulosus**	**Artérite virale équine**	**Clostridium perfringens**	**TSE atypique (petits ruminants)**	**Myotathie atypique des équidés**	**Fièvre aphteuse**	**Peste porcine africaine**	**Peste porcine classique**	**Fièvre du Nil occidental**	**Fièvre de la vallée du Rift**	**Maladie hémorrhagique épizootique**	**Maladie du dépérissement chronique des cervidés**	**Pleuropneumonie contagieuse bovine**	**Influenza aviaire hautement pathogène**	**Cysticercose porcine**	**Rage classique (carnivores)**	**Peste**	**Encéphalites à tiques**	**ESB atypique**	**Dirofilariose**	**TOTAL**
Expert 1																			x				x											**2**
Expert 2			x			x				x										x	x	x		x			x		x					**9**
Expert 3					x						x												x							x				**4**
Expert 4	x													x																				**2**
Expert 5																x						x												**2**
Expert 6							x								x																			**2**
Expert 7	x						x								x														x				x	**5**
Expert 8												x																						**1**
Expert 9		x		x									x	x								x												**5**
Expert 10														x									x											**2**
Expert 11			x			x	x	x	x			x			x		x	x								x			x					**11**
Expert 12														x						x				x	x									**4**
Expert 13														x																				**1**
Expert 14	x																		x															**2**
Expert 15																				x		x						x						**3**
Expert 16						x	x					x																						**3**
Expert 17				x								x																						**2**
Expert 18						x	x								x														x					**4**
Expert 19	x	x	x														x																	**4**
Expert 20			x		x																													**2**
Expert 21		x		x					x																									**3**
Expert 22						x	x						x		x														x					**5**
Expert 23														x														x						**2**
Expert 24								x																										**1**
Expert 25	x												x	x																				**3**
Expert 26																	x																	**1**
Expert 27														x									x											**2**
Expert 28					x								x																					**2**
Expert 29												x					x																	**2**
Expert 30				x					x			x																						**3**

Expert 31																				x	x											**2**
Expert 32			x	x												x																**3**
Expert 33	x					x	x			x			x		x													x				x	**8**
Expert 34		x																			x											**2**
Expert 35														x													x		x				**3**
Expert 36														x					x														**2**
Expert 37																x			x	x	x												**4**
Expert 38			x									x																					**2**
Expert 39				x														x													x		**3**
Expert 40				x																	x												**2**
Expert 41																		x							x						x		**3**
Expert 42	x	x						x	x					x				x							x								**7**
Expert 43					x						x			x		x		x		x	x	x	x	x	x		x		x		x		**15**
Expert 44																						x					x						**2**
Expert 45							x				x																		x				**3**
Expert 46																		x							x						x		**3**
Expert 47						x	x																					x					**3**
Expert 48																			x			x											**2**
Expert 49		x																												x			**2**
Expert 50																						x	x										**2**
Total phase 1	**7**	**6**	**6**	**7**	**4**	**7**	**9**	**3**	**4**	**2**	**3**	**7**	**5**	**12**	**6**	**3**	**5**	**6**	**3**	**6**	**4**	**9**	**8**	**4**	**2**	**5**	**1**	**5**	**7**	**4**	**1**	**2**	**2**	**2**	
Total phase 2	**4**	**5**	**5**	**4**	**3**	**4**	**4**	**1**	**3**	**1**	**3**	**6**	**4**	**9**	**2**	**3**	**5**	**4**	**3**	**4**	**4**	**8**	**8**	**3**	**1**	**4**	**1**	**5**	**3**	**4**	**1**	**1**	**2**	**0**	

Annexe 4. Mode d'emploi de la phase 1 de l'enquête

Cher expert,

Vous avez accepté de participer à une étude du Comité scientifique de l'Agence Fédérale pour la Sécurité de la Chaîne Alimentaire (AFSCA) ayant pour but **l'identification de facteurs de risque d'émergence des maladies animales en Belgique**. Les membres du groupe de travail vous remercient d'avance de votre contribution scientifique.

Dans le cadre de cette étude, la définition de maladie émergente est la suivante : maladie dont l'incidence réelle (le nombre de nouveaux cas) augmente significativement dans une population donnée d'une région donnée et durant une période donnée, par rapport à la situation épidémiologique habituelle de cette maladie. Cette définition ne doit pas inclure les variations d'incidence saisonnières.

Le groupe de travail responsable de cette étude a décidé de travailler à partir d'une **liste d'exemples** de maladies animales.
32 **maladies animales** ont été sélectionnées et réparties en plusieurs groupes et sous-groupes (voir document Excel, feuille Risk factors) :
(1) maladies existant en Belgique, soit à l'état endémique, soit à l'état sporadique (et pour lesquelles un risque d'émergence peut exister);
(2) maladies dont l'émergence est établie en Belgique, et
(3) maladies non présentes en Belgique (exotiques) et à risque d'introduction et de dissémination en Belgique (maladies potentiellement émergentes).
Parallèlement à cela, le groupe de travail a sélectionné 33 **facteurs de risque** et les a répartis en 4 groupes (voir document Excel, feuille Risk factors) :
(1) facteurs liés à l'agent infectieux ;
(2) facteurs liés à l'homme (et à son activité) ;
(3) facteurs liés aux animaux, et
(4) facteurs liés aux changements dans l'environnement.
Dans le document Excel, des explications concernant certains facteurs de risque sont fournies sous forme de commentaires annexés aux cellules (triangle rouge). Pour lire les commentaires, se placer dans la cellule > clic droit > afficher le commentaire.

Le but de cet exercice est d'**identifier**, parmi les 33 facteurs proposés, lesquels sont des **facteurs de risque** d'émergence, lesquels sont des **facteurs de protection** de l'émergence, et/ou lesquels n'ont pas d'influence sur l'émergence des différentes maladies animales. Le but est aussi de quantifier l'importance de l'influence des facteurs de risque (ou de protection) sur l'émergence de ces maladies.

Il vous est vivement conseillé de d'abord lire entièrement ce mode d'emploi et les **instructions** dans le document Excel (feuille « Instructions ») avant de commencer l'exercice.

Dans un souci de traitement statistique ultérieur des données, il est nécessaire que chaque expert remplisse le tableau pour minimum deux maladies. Il vous est donc demandé de faire l'exercice pour la (les) maladie(s) qui vous est (sont) proposée(s) (en rouge dans le document Excel, feuille Risk factors), ainsi que pour toute autre maladie de votre choix.
Il vous est également demandé de qualifier votre niveau d'expertise pour chacune de ces maladies (1 : faible expertise ; 2 : expertise modérée ; 3 : grande expertise ; 4 : excellente expertise ; ligne 7 dans le document Excel, feuille Risk factors).

Afin que chaque expert interprète l'exercice de la même manière, il vous est demandé de répondre aux questions sur base des **connaissances actuelles**, de considérer l'émergence des maladies **animales** uniquement (et pas l'émergence des maladies chez l'homme en cas de zoonose), et uniquement en **Belgique** (pas en Europe, par exemple).

Pour une objectivité optimale, il vous est conseillé de travailler verticalement dans le tableau Excel, c'est à dire une maladie à la fois.

La **<u>première question</u>** est:
Le facteur est-il présent actuellement en Belgique pour la maladie dont il est question ? Dans la colonne jaune, répondre « oui » (facteur présent) ou « non » (facteur absent) à l'aide du menu déroulant.
La réponse à cette question doit se faire indépendamment de la présence ou de l'absence de la maladie actuellement en Belgique. En effet, un facteur de risque peut être présent en Belgique sans pour autant que la maladie n'y soit présente.

La **<u>deuxième question</u>** est i**ndépendante** de la réponse à la première question.
Le facteur :
- diminue-t-il le risque d'émergence de la maladie en question ? Si oui, il s'agit alors d'un **facteur de protection**, encodez « - » (à l'aide du menu déroulant) dans la colonne bleue du tableau Excel ;
- augmente-t-il le risque d'émergence de la maladie en question ? Si oui, il s'agit alors d'un **facteur de risque**, encodez « + » (à l'aide du menu déroulant) dans la colonne bleue du tableau Excel ;
- n'a pas d'effet sur l'émergence de la maladie en question ? Si c'est le cas, encodez « 0 ».

La réponse à la deuxième question doit se faire indépendamment de la réponse à la première question. En d'autres mots, même si le facteur n'est pas présent actuellement en Belgique, il faut quand même répondre à la deuxième question, en raisonnant de manière théorique, c'est à dire en imaginant que le facteur existe.

Il est nécessaire de répondre à la troisième question en même temps qu'à la deuxième question.

Pour les maladies « exotiques » qui ne sont pas présentes à l'heure actuelle en Belgique (C. Diseases at risk of introduction and dissemination in Belgium), il faut considérer l'influence du facteur sur le risque d'émergence de la maladie en Belgique.

<u>Troisièmement</u> (colonnes bleues, à remplir en même temps que la deuxième question), il vous est demandé de **quantifier l'importance de l'influence** de chacun de ces facteurs sur l'émergence de ces maladies, c'est à dire d'estimer la force de la relation entre le facteur et le risque d'émergence (ou la protection contre l'émergence) de la maladie animale, selon le tableau de scores suivant :

Le facteur a une influence … sur l'émergence de la maladie animale	facteur de risque	facteur de protection
faible	+	-
moyenne	++	- -
grande	+++	- - -
très grande	++++	- - - -

(Si vous aviez encodé un « 0 », cela signifie que le facteur n'a pas d'influence sur l'émergence de la maladie et il ne faut donc pas quantifier).

Points d'attention :
- la sélection des réponses se fait à l'aide des listes (menus déroulants);
- pour vous aider à interpréter les facteurs de la liste, de la littérature sur les facteurs de risque des maladies émergentes vous est fournie en annexe ;
- si nécessaire et/ou si applicable, vous pouvez justifier ou commenter votre choix par l'introduction d'un commentaire (placez le curseur dans la cellule, et via le menu Insertion, cliquez sur « Commentaire »). Vous pouvez également introduire des références bibliographiques via cette fonction Commentaire. Au bout de chaque ligne et en bas de chaque colonne du tableau, des espaces sont également prévus pour des commentaires et des suggestions ;
- évitez de laisser des cases vides. Si vous hésitez, répondez et insérez un commentaire.

Après une première analyse des résultats obtenus, un feed-back vous sera donné.

Les résultats de cette étude permettront au groupe de travail d'identifier des (groupes) de facteurs (de risque / de protection), par maladie, par groupe de maladies (par exemple, les maladies potentiellement émergentes) ou de manière globale pour l'ensemble des maladies. La quantification des facteurs permettra de les hiérarchiser par ordre d'importance. Ceci permettra au Comité scientifique de formuler un avis avec des recommandations en matière d' « early warning », de vigilance, de surveillance, de monitoring, de lutte, etc.

Cet exercice est destiné d'une part à servir de base pour l'émission d'un avis par le Comité scientifique et d'autre part, à une publication scientifique. Nous comptons donc également sur votre collaboration pour un traitement confidentiel de ce dossier. Si vous n'y voyez pas d'objection, votre nom sera mentionné dans l'avis du Comité scientifique auprès des experts qui y auront collaboré.

Si cela est possible pour vous, nous souhaiterions recevoir vos résultats pour **le 1er juin 2009**.

Si vous le désirez, une copie papier du document Excel peut vous être envoyée par voie postale afin de vous permettre de réaliser l'exercice plus facilement.

Si vous désirez des informations supplémentaires, n'hésitez pas à contacter soit Dr. Sabine Cardoen (sabine.cardoen@afsca.be - 02/211.87.01), soit Dr. Xavier Van Huffel (xavier.vanhuffel@favv.be - 02/211.87.20).

Les membres du groupe de travail vous remercient d'avance de votre disponibilité,

Prof. E. Thiry, Dr. K. Dierick, Prof. D. Berkvens, Dr. H. Imberechts, Prof. R. Ducatelle, Prof. C. Saegerman, Dr. J. Dewulf, Dr. T. van den berg, Dr. P. Heinen, Dr. X. Van Huffel et Dr. S. Cardoen.

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Annexe 5. Schéma des questions de la phase 1

Risk factors of emergence of animal diseases in Belgium

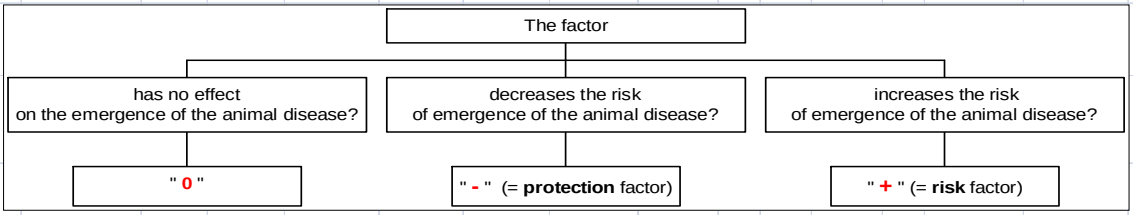
Scientific Committee of the Federal Agency for the Security of the Food Chain (FAFSC)

Working group: E. Thiry, D. Berkvens, H. Imberechts, K. Dierick, C. Saegerman, R. Ducatelle, T. van den Berg, J. Dewulf, X. Van Huffel, P. Heinen, S. Cardoen.

Instructions for page 2 (Risk factors):

1. Yellow columns: for each disease for which you make the exercise, answer the following question: Is the factor present (yes) or absent (no) for the concerned disease at the present time in Belgium ?

2. Blue columns: for each disease for which you make the exercise, answer the questions in the table below, based on the CURRENT knowledge, considering emergence of ANIMAL diseases IN BELGIUM, and theoretically (i.e. independently from the answer on question 1):



If necessary / if applicable, justify your choice by introducing a comment (Menu Insertion > Comment) at the cell : ++

3. Blue columns: for each positive ("+") (or negative ("-")) answer, weight the importance of the risk factor (+, ++, +++ or ++++) (or of the protection factor (-, --, --- or ----)) for the emergence of the disease:

		The relation/influence between/of the (risk or protection) factor and/on the emergence of the animal disease is:
"+"	"-"	low
"++"	"- -"	moderate
"+++"	"- - -"	high
"++++"	"- - - -"	very high

4. Line 7: estimate your own level of expertise for each disease for which you completed the exercise:

1	weak
2	moderate
3	high
4	excellent

Annexe 6. Exemple de proposition de consensus servant de base pour la phase 2 de l'enquête Delphi
Exemple. Fièvre du Nil occidental.

1. Factors related to the infectious agent			
Genetic variability (mutation, recombination, etc.)	**yes**	**"++"**	There exist more virulent strains. For example the severity of the expansion in the USA was due to (1) the immunologically naive status of the US population and (2) a particularly virulent strain. Genetic variability is a risk factor if the
Lack of knowledge of pathogenesis	**yes**	**"++"**	There is lack of knowledge of the pathogenesis which could explain some emergences: for example, the poorly known role of vectors in the cycle maintenance-dissemination of the virus, the molecular determinism of the
Change in pathogenesis (= change in development of the disease in the host) (e.g., increase in virulence, prolonged incubation period, variation in interaction host-pathogen)	**yes**	**"+++"**	There are changes in pathogenesis depending on the genetic variability. For example, the American strain is more virulent than the European one. The change of pathogenesis is a risk factor for emergence.
Difficulty to control disease by vaccination	**yes**	**"++"**	There is an available and authorized vaccine for horses in Belgium, but vaccination of the horses will not control emergence since horses are dead-end hosts. Vaccination of (wild) birds is impossible. Difficulty to vaccinate
Possibility to change the host spectrum from one animal species to another animal species (species barrier)	**yes**	**"+++"**	The virus can infect numerous receptive bird species which are capable to transmit the virus effectively. This is a risk factor for emergence. The virus can also infect other mammals, but these are dead-end hosts which do not contribute to the propagation of the disease and consequently have no
Possibility to change the host spectrum from animals to humans	**yes**	**"++++"**	The disease is transmissible to humans, and this is a risk factor for emergence of the disease in the human population. But since humans are dead-end hosts, this has no influence on the risk for emergence and
Extension in geographical distribution of the agent	**yes**	**"++++"**	There are more and more cases in the South of France, Italy, Hungary, Romania and recently in Austria. The emergence in the North of Europe is a
Increase in incidence (new cases) in another country(ies)	**yes**	**"+++"**	There is an increase in incidence in the South of France, Italy, Hungary, Romania, Austria. This is a risk factor for emergence in Belgium.
Persistence of the agent in the environment	**no**	**"0"**	The virus can not persist in the environment outside the vector. Even if it was able to persist in the environment, this should have no influence of the risk for

Annexe 7. Lettre explicative de la phase 2

Cher expert,

L'année passée, vous avez rempli un questionnaire sur les facteurs de risque d'émergence des maladies animales, dans le cadre d'une enquête Delphi proposée par le Comité scientifique de l'AFSCA, pour les maladies suivantes :

- Maladie 1
- Maladie 2
- Maladie 3
- Etc.

Plusieurs autres experts ont également rempli ce questionnaire pour ces mêmes maladies, et les réponses ont été analysées.

La seconde (et dernière) étape de cette enquête Delphi est de trouver un consensus dans les scores des différents experts.
Une proposition de consensus, tenant compte des réponses reçues des experts, se trouve dans le document Excel en annexe. Comme des problèmes d'interprétation lors de la première phase de l'enquête Delphi ont parfois été identifiés, la proposition de consensus est accompagnée d'une justification scientifique, pour exprimer l'idée véhiculée par les scores.

Pourriez-vous valider et/ou commenter les propositions de consensus des scores et les justifications scientifiques (au niveau des lignes jaunes)? Si vous acceptez, serait-il possible de renvoyer le document Excel pour le 31 mars 2011? Pourriez-vous également nous avertir si vous ne désirez plus participer à cette seconde phase de l'enquête ?

Pour vous rappeler le contenu et les principes de cette enquête Delphi, vous retrouverez également en annexe le mode d'emploi qui vous avait été donné lors de la première phase.

Le terme « maladie animale émergente » est à considérer au sens large du terme dans le cadre de cette enquête: augmentation d'incidence ; introduction et établissement en Belgique si la maladie est exotique ; dispersion si la maladie est déjà présente, etc.

En résumé, vous avez répondu, lors de la première phase de l'enquête, à deux questions, indépendamment l'une de l'autre :

- colonne jaune : le facteur énoncé dans la colonne B existe-t-il/est-il présent actuellement en Belgique pour la maladie animale dont il est question ? « Yes » ou « No ». Il ne faut pas encore répondre à la question « le facteur est-il un facteur de risque ? » car cette question fait l'objet de la colonne bleue.
- colonne bleue : (indépendamment de la réponse à la première question, donc indépendamment de la présence/existence actuelle ou de l'absence du facteur, en imaginent que le facteur existe/est présent) : le facteur représente-t-il un facteur de risque d'émergence de la maladie chez les animaux (avec quantification : +, ++, +++ ou ++++), ou au contraire est-il un facteur de protection contre l'émergence de la maladie chez les animaux (avec quantification : -, --, --- ou ----), ou encore n'a-t-il pas d'influence sur l'émergence de la maladie chez les animaux (« 0 ») ?

Le fait de répondre indépendamment aux deux questions nous permettra d'envisager toutes les possibilités par déduction et de tirer des conclusions.
Par exemple, si un facteur est présent actuellement en Belgique (« Yes ») et qu'il est un facteur de risque (« ++ »), nous devons être d'emblée vigilants concernant la possibilité d'émergence de la maladie.
Par exemple, si un facteur est absent actuellement (« No ») mais qu'il représenterait un facteur de risque s'il était présent (« +++ »), nous en déduiront que le jour où ce facteur apparait, il faudra être vigilant quant à la possibilité d'émergence de la maladie.
Par exemple, si un facteur est présent actuellement (« Yes ») et s'il s'agit d'un facteur de protection (« --- »), il faudra être vigilant s'il disparaissait.
Etc.

Les résultats de cette étude seront publiés dans un avis du Comité scientifique ainsi que dans une revue scientifique.

Un tout grand merci d'avance de votre collaboration, de la part du groupe de travail,
E. Thiry, K. Dierick, D. Berkvens, H. Imberechts, R. Ducatelle, C. Saegerman, J. Dewulf, T. van den Berg, X. Van Huffel et S. Cardoen.

Annexe 8. Détail qualitatif (justifications scientifiques) de l'influence des facteurs de risque ou de protection sur les maladies animales étudiées

Le numéro indiqué représente le numéro du facteur de risque tel que présenté dans le texte (point 2.2, étape 2).

Babésiose bovine (*Babesia divergens*)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	There are at this moment no indications for genetic variability of the causative agent. A genetic variability would have no influence on the risk for emergence of this disease.
2.	no	"++"	There is no lack of knowledge on the pathogenesis. Lack of knowledge on the pathogenesis is always a risk factor for emergence of the disease (for example, lack of detection of the disease).
3.	No	"++"	There are no changes in the pathogenesis, which represent a protection factor against the emergence of the disease. Changes in the pathogenesis would represent a risk factor for emergence of the disease.
4.	yes	"+++"	No vaccines available in Belgium. There are live vaccines which have provoked outbreaks with passage of the species barrier. Inactivated vaccines are harmless but are less efficient than live vaccines. These difficulties represent a risk factor for emergence of the disease.
5.	No	"+"	The parasite is able to infect several types of mammals, but these are resistant and are not considered as reservoirs and have no epidemiological role. So, there is no passage of the species barrier. The possibility to cross the species barrier and to infect a non resistant animal species would represent a risk factor for emergence.
6.	Yes	"0"	The parasite is zoonotic (especially dangerous for splenectomized persons). But this has no influence on the risk for emergence of the disease in animals because humans do not retransmit the parasite and do not play an epidemiological role.
7.	yes	"+++"	There is a geographical expansion of the disease: the disease is now enzootic in France and in the South of Belgium. The vector (Ixodes ricinus) can extend to more than 1500m of height in the Alps. This represents a risk factor for emergence of the disease.
8.	yes	"++"	There is an increase in incidence of the disease in other countries and this represent a risk factor for propagation and emergence of the disease in Belgium.
9.	no	"0"	The bacteria is not capable to persist in the environment (outside the vectors). If the bacteria was capable to persist in the environment outside the vectors, this would have no influence on the risk for emergence because the transmission of the bacteria needs the action of a vector bite.
10.	no	"0"	There is no legislation/ sanitary policy concerning this disease. Such measure would have no influence on the risk for emergence

			because the disease is tick-borne, and ticks are difficult to control.
11.	No	"0"	The disease is not concerned by the changes in the technological or industrial processes.
12.	Yes	"+++"	The lack of mandatory declaration might delay the detection of emergence. There can exist difficulties of diagnostic in non endemic regions (difficulties of detection). A lack of detection of the presence of the disease represent a risk factor for emergence of the disease.
13.	yes	"++"	There are increases in interactions between cattle and ticks, whose population increases and expand. This represents a risk factor for emergence of the disease.
14.	no	"0"	There are no increases in contacts between humans and cattle. An increase in contacts would have no influence of the risk for emergence because contacts are not necessary for the transmission of this tick-borne infection.
15.	no	"0"	There is no significant demographic growth in Belgium. The emergence of the disease is not influenced by a human demographic growth.
16.	no	"+"	There is no growth of the cattle population in Belgium. An increase would represent a little risk factor for emergence of the disease.
17.	yes	"0"	Human traveling is increasing, but this has no influence on the risk for emergence of the disease in the bovine population.
18.	yes	"0"	Human tourism is increasing, but this has no influence on the risk for emergence of the disease in the bovine population.
19.	Yes	"+"	There is an increase in trade. This increases the risk for emergence via the risk of introduction of infected animals in free cattle exploitations.
20.	Yes	"++"	There is an increase in transport. This increases the risk for emergence via the risk of introduction of infected animals in free cattle exploitations.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"- -"	There are intensive cattle production systems in Belgium. This represent a protection factor against emergence because there are less contacts between indoor kept cattle and ticks.
23.	yes	"++"	There are extensive cattle production systems in Belgium. This represent a risk factor for transmission and for emergence of the disease because of the increased possibilities of contact between outdoor kept cattle and ticks.
24.	yes	"++"	There are recovered cattle with a persistent asymptomatic parasitemia, which can serve as source of infection for ticks and other animals. This represents a risk factor for transmission and for emergence of the disease.
25.	yes	"++"	Babesia can infect numerous domestic and wild mammals but since they are resistant, they are not a reservoir of the disease. Recovered cattle with persistent parasitemia can serve as reservoir and source of parasite for infection of ticks. This is a risk factor for transmission and emergence of the disease. If ticks are considered as animals, then they represent the most important non-bovine animal reservoir. Actually, Babesia is able to survive several years (4 years) in ticks (trans-ovarian and trans-stadial transmission), even in absence of cattle. This represents also a risk factor for emergence of the disease.
26.	no	"+"	There is no long incubation period in cattle. A long incubation period would allow the transmission of the disease without detection and without taking appropriate measures, and would represent a risk factor for transmission, dispersion, and emergence of the disease.
27.	yes	"+++"	If ticks are considered as wild animals, then there is an increase in contacts between cattle and ticks, of which the population

			increases. This is a risk factor for transmission and for emergence of the disease.
28.	yes	"+++"	If ticks are considered as animals of the wild fauna, then the wildlife plays an important epidemiological role because Babesia is able to survive several years (4 years) in ticks (trans-ovarian and trans-stadial transmission), even in absence of cattle. Because the wild life is difficult to control, this represent a risk factor for emergence of the disease.
29.	yes	"++"	There is an increase in, an expansion of the geographical distribution of, and an increase in activity of the tick population. Because of the epidemiological role of the ticks, this represent a risk factor for emergence of the disease.
30.	yes	"+++"	There are climatic and meteorological changes. The global warming can be at the origin of an increase in the tick population and of a modification of the geographical distribution of the ticks (ticks coming from the South). The ticks are 2-fold more active when the weather is warm and dry. Because of the important epidemiological role of the ticks, this represent a risk factor for emergence of the disease.
31.	yes	"+++"	There are changes in the ecosystems (draining, forest fragmentation, etc.), increase in humidity, favoring the tick populations. This represents a risk factor for emergence of the disease.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. This can represent a protection factor against infection of humans, but it has no influence on the risk for emergence in cattle.
33.	yes	"++++"	The disease is tick-borne (Ixodes ricinus), whose population and activity increase. This represent an important risk factor for emergence of the disease.

Brucellose porcine chez le sanglier (*Brucella suis* type 2)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	Swine brucellosis is caused by B. suis bv1 bv2 and bv3. Genetic studies tend to show that bv1 and bv3 are undistinguishable, while bv2 is different. Intra-biovar genetic variability is currently unknown. All bv2 strains isolated from boars seem to be very similar, but this has not been shown in detailed studies. So we consider that there is no genetic variability of the biovar type 2. A genetic variability would have no influence on the risk for emergence.
2.	no	"+"	There is sufficient knowledge of the pathogenesis. A lack of knowledge represents always a risk factor for emergence.
3.	no	"0"	There are no changes in the pathogenesis (due to the genetic stability). A change in the pathogenesis would have no influence on the risk for emergence of the disease.
4.	yes	"++"	There is no effective vaccine against porcine brucellosis, due to the fact that the bacteria grows optionally intracellular. This represents a risk factor for emergence of the disease.
5.	yes	"++"	There are 6 different species of Brucella which have each a main host. Each animal species can be (very rarely) infected by a

			"foreign" Brucella. For ex., the biovar type 2 infects mainly pigs and boars, and can infect humans to a lesser extent. Because the possibility exist, this represents a "theoretical" risk factor for emergence. However, because Brucella are genetically stable, the probability of a "change" of the host spectrum is weak. The possibility to change the host spectrum represents a risk factor for emergence of the disease
6.	yes	"0"	Brucella suis type 2 can be transmitted to humans, but is rarely pathogenic for humans (contrary to the 1 and 3 biovars which are very pathogenic for humans). Because humans do not retransmit the infection to the animals, the possibility of human infection has no influence on the risk for emergence in the animal population.
7.	yes	"++"	There is a geographical expansion of the agent which follows the expansion of the wild boar population. The biovar 2 is widespread in the boar (and hare) populations in whole Europe and is endemic in the Southern of Belgium. This constitutes a risk factor for emergence in the domestic pig population.
8.	yes	"++"	The last years, there is an increase in incidence of infected boars, namely in France, with outbreaks of porcine brucellosis in domestic pigs bred outside. There has also been a case in Belgium. Increases in incidence in neighbouring countries represent a risk factor for emergence of the disease in our country.
9.	yes	"++"	The bacteria can multiply inside or outside the host, and can survive several days or months in the external environment. This is a risk factor for emergence of the disease in the outside bred domestic pig population.
10.	yes	"-"	There are sanitary policy measures such as the control of the sperm production by testing the donors, the interdiction to feed pigs with offal, the compulsory declaration of the disease, but there is no official surveillance. But these measures provide only a weak protection factor against the emergence of the disease in the domestic pork populations because of the high number of possible transmission pathways and because of the implication of the wild fauna as source of infection.
11.	yes	"+++"	There have been changes in the industrial processes of pork production (surrender of inside breeding and replacement by outside breeding processes, mainly in the South of Belgium). This constitutes a risk factor for emergence in the domestic pig population because of the possibilities of contacts with wild boars.
12.	yes	"++"	There are problems of detection of the emergence (unapparent or discrete clinical signs, asymptomatic carriage, ...). Because the disease is transmissible, this represents a risk factor for emergence.
13.	yes	"++"	There are increases in interactions between the wild boars (and hares) and the domestic pigs bred outside (see point 2.2). Because of the possibility of transmission by direct contact, this represents a risk factor for emergence of the disease in the domestic pork populations in regions where outside breeding is practiced.
14.	yes	"0"	Due to the increase in the boar population, there are increases in interactions between boars and humans (hunters, forest warders, personnel of the slaughterhouses, butchers, veterinarians, etc.). But because humans do not play any role in the epidemiology of the disease (do not transmit the infection to animals), this has no influence of the risk for emergence of the disease in the animal population.
15.	no	"0"	There is no significant demographic growth in Belgium. Because humans do not play a role in the epidemiology of the disease, a human demographic growth would have no influence on the risk for emergence of the disease.
16.	yes	"++"	There is an increase in the wild boar population, which can be infected. This constitutes a risk factor for emergence of the disease. An increase in the domestic pig population (not currently the case) would also represent a risk factor, due to the problems of

			detection (see point 2.3).
17.	yes	"0"	Human traveling is increasing. This can increase the risk for infection of humans when traveling includes contact with asymptomatic infected animals. But because humans do not play an epidemiological role, this has no influence on the risk for emergence in the animal populations.
18.	yes	"0"	There is an increase in touristic activities (farm tourism, animal parks, etc.). This can increase the risk for infection of humans, but because humans do not play any epidemiological role, this has no influence on the risk for emergence in the animal populations.
19.	yes	"++"	The intra-EU exchanges of living pork's (including reproductive animals) and of sperm are intensive and increasing. This represent a risk factor for introduction of infected living pigs or sperm in pig exploitations and of emergence of the disease in the domestic pig population. The origin of the infection in wild boars in our regions could be importations of boars from Eastern Europe.
20.	yes	"++"	The intra-EU transports of living swine (including reproductive animals) and of sperm are intensive and increasing. This represents a risk factor for introduction of infected living pigs or sperm in pig exploitations and of emergence of the disease in the domestic pig population.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"- -"	There are many intensive (inside) production systems of swine in Belgium. This is one of the most important protection factor against the emergence because of the limitation of the most important risk factor: the contacts with the wild fauna (boars). The industrialization of swine production has resulted in the disappearance of brucellosis in swine in France since 1981. But because of the high diversity of possible transmission routes, this protection is not complete.
23.	yes	"+++"	There are extensive production systems of pigs in Belgium, with access to an outside course, mainly in the South of the country. This is an important risk factor for introduction of the disease in the domestic swine population, due to the possibility of infection by contact with wild boars which are the wild reservoir of the disease.
24.	yes	"++"	Wild boars and domestic pigs can be asymptomatic carriers. In boars, the disease is frequently unapparent. In domestic pigs, the clinical signs are more present, but can also be unapparent: in sows, the abortions occur only during the last third of the gestation. early abortions are most of the time not noticed; domestic male pigs are often asymptomatic chronic carriers. This represent a risk factor of marketing of undetected infected pork's in the EU, and a risk factor for emergence of the disease.
25.	yes	"+++"	Wild boars (and hares to a lesser extend) represent the animal reservoir of the biotype 2. They represent a potential source of infection for the domestic pigs. This is a risk factor for emergence of the disease in the domestic pigs.
26.	yes	"++"	Brucellosis is mostly characterized by a slow development. This represents a risk factor of non detection of contagious animals, and consequently a risk factor for emergence of the disease.
27.	yes	"++++"	There are contacts between domestic pigs (with an outside course) and wild boars. Direct contact is the most important transmission route in domestic pigs. This is a very important risk factor for emergence of the disease in the domestic pig population.
28.	yes	"++++"	Wild boars (and hares) are the reservoir of the bacteria (in France, there is a seroprevalence of 10% in boars). They represent the main source of infection of the domestic pigs. This is a very important risk factor for emergence of the disease in the domestic pig population.
29.	yes	"+++"	There is an increase in the wild boar population in Europe, and the infection by the biovar 2 follows this increase. This represents

			a risk factor for emergence of the disease in the wild and domestic populations of suidae.
30.	yes	"+"	There are climatic and meteorological changes. Since a decade, we observe an increase in wild boars populations due to enhanced fertility and better natural feeding (abundance of natural feed as acorns, rodents, …). Changes in climate constitute a risk factor of emergence of the disease.
31.	yes	"++"	For example, the interdiction to shoot wild boars, animal parks, development of crow culture change the ecosystem and give more chance to increase wild boars populations. This is a risk factor for emergence of the disease (see point 3.6).
32.	yes	"-"	There is an ongoing urbanisation in Belgium. This constitutes a protection factor because more cities represent less forests and less wild fauna.
33.	no	"0"	The disease is not vector-borne

Maladie de Lyme (*Borrelia burgdorferi*) (Bengis *et al*., 2004 ; Higgins, 2004)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+++"	There exist an antigenic variability of B. burgdorferi sensu lato, based on genetic modifications. New strains (and even new species) may develop. It is a major difficulty to follow the evolution of the disease because it is difficult to have efficient diagnostoc tools or prophylaxis as vaccine. This constitutes a risk factor for emergence.
2.	yes	"+"	The last years, the genome of the bacteria has been sequenced, animal models and vaccines have been developed, etc. However, despite a good knowledge of the bacteria, the pathogenesis in the several hosts is less known: true virulence factors, intervention of the immune response, links with histocompatibility factors, etc. The lack of knowledge represents always a risk factor for emergence.
3.	yes	"++"	The genetic variability can be responsible for changes in the pathogenesis (specially through changes in the surface antigens). This is a risk factor for emergence of the disease.
4.	yes	"+++"	There are difficulties to control the disease by vaccination. The human vaccine in the USA is not active against the European strains of the bacteria and the vaccine was redrawn from the market because of secondary effects. There is a vaccine for dogs available in France but vaccination is little practiced (contrary to Switzerland, Austria, Germany) and the vaccine is not active against all the Borrelia species. There is lack of knowledge concerning the role of the immune response in the pathogenesis. These difficulties concerning the vaccination represent risk factors of emergence of the disease.
5.	yes	"+++"	Borrelia can be transmitted to humans, dogs, cows, but also to a series of other animal species, including the wild fauna. Depending of the epidemiological role of these new target species (end-host or relay of the infection), the possibility of infection of other animal species and specially of the wild fauna (which is an animal reservoir) constitutes a risk factor for emergence of the disease.
6.	yes	"0"	The disease is transmissible to humans, in which the bacteria is pathogenic. But humans do not retransmit the infection. Therefore, humans do not play any epidemiological role in the maintenance of the disease, and human infections have no

			influence on the risk for emergence of the disease in the animal population.
7.	yes	"+++"	The disease is already present in France, Switzerland, Germany, Austria and is also endemic in Belgium. There has been an extension of the geographical distribution from Southern countries, and the disease is in full development in Europe. An extension of the geographical distribution of the disease is always a risk factor for emergence of the disease.
8.	yes	"++"	Each year, 60.000 human cases are diagnosed in Europe (155 cases/100.000 habitants in some countries); 5.000 to 10.000 human cases per year in France (the incidence has increased since the years 1980 in France); also cases in Belgium; the Lyme borreliose has become the most frequent tick-borne disease in the Northern hemisphere. The disease is in full development in Europe. The number of (infected) ticks has rapidly increased in Europe (30% of infected ticks in France, 60% in Austria). Because infected ticks can infect humans and animals, the increase in incidence in infected ticks is a risk factor for emergence of the disease.
9.	no	"0"	The bacteria is not capable to persist in the environment (outside the vectors). If the bacteria was capable to persist in the environment outside the vectors, this would have no influence on the risk for emergence because the transmission of the bacteria needs the action of a vector bite.
10.	no	"0"	There is no legislation and no official sanitary measures. There exist only recommendations to avoid human infections (avoid the endemic zones and the tick bites via protection clothes), which protects against infection in humans, but not against infection in the animal population. It is impossible to control the infection in the tick population. The existence of a legislation for animals would have no influence on the risk for emergence of the disease in the animal populations.
11.	no	"0"	The disease is not concerned by technological or industrial processes.
12.	yes	"++"	The disease is frequently under-diagnosed and is underestimated in humans (diagnostic tests are less sensitive, patients forget to declare the tick-bite during anamnesis, diagnostic is based on few specific or attenuated clinical signs and is difficult to establish, long incubation time of the disease after the tick bite) and in animals (90% of the dogs are asymptomatic, veterinarians and breeders are poorly informed). Problems of detection in humans and in domestic animals are risk factors for emergence because if better detection, better treatment or prevention for domestic animals and humans. Also, a lack of diagnosis could mask a change in virulence or clinical expression of the disease.
13.	yes	"++"	There are increases in interactions between the (infected) tick populations (increase in incidence of infected ticks, see factor 1.8; more ticks in our regions) and other animal populations (for ex. wild fauna). This is a risk factor for emergence of the disease in the animal population (wild fauna) because proximity increases the risk for tick bite.
14.	no	"0"	There is no increase in interaction between the animal/tick populations and the human population in Belgium. Increase in interaction between the human's and the tick's/animal's populations would increase the risk for infection in the human population, but this would have no influence on the risk for emergence in the animal population because humans do not retransmit the infection.
15.	no	"0"	There is no significant demographic growth in Belgium. A demographic growth would have no influence on the risk for emergence because humans are dead-end hosts.
16.	no	"++"	There is no growth of the dog/cattle population in Belgium. If intermediate hosts (wild or domestic animals) are increasing, there are more ticks and more contaminated ticks. Thus increase of the risk.

17.	yes	"++"	Human traveling is increasing. This could have an influence on the risk for infection of humans (infection in a country with a high prevalence). This is also a risk factor of emergence for the animal population via importation of ticks in luggages and via importation of new strains of *Borrelia*.
18.	yes	"++"	Human tourism is increasing. This is a risk factor for emergence in humans (activities in forests, infection in a country with a high prevalence) and in domestic animals (dogs) which accompany their master.
19.	yes	"++"	There is an increase in general trade. This is a risk factor via importation of ticks with other products in new countries, and via importation of new strains of *Borrelia*.
20.	yes	"++"	There is an increase in general transports. This is a risk factor via importation of ticks with other products in new countries, and via importation of new strains of Borrelia.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"- -"	There are intensive production systems of production animals (cows) and horses. Intensive production systems allow to reduce contacts with ticks, and therefore can protect these production animal against infection.
23.	yes	"++"	There are extensive production systems of production animals (bovines) and horses. Extensive production systems allow contact with ticks, and is a risk factor of infection of these production animal.
24.	yes	"++"	The infection can be asymptomatic in all the susceptible animal species. Because only the wild fauna plays an epidemiological role (the other animal species are dead-end hosts), the role of the asymptomatic carriage in the risk for emergence of the disease concern only the asymptomatic infected wild animals (and not the domestic animals). The infected asymptomatic wildlife can transmit the infection and this represent a risk factor for emergence of the disease.
25.	yes	"+++"	There is an animal reservoir in the wild fauna in Europe (sylvatic mammals, mice, voles) which can retransmit the bacteria to the ticks. Dogs and birds can disseminate infected ticks and enlarge the endemic zones. These are risk factors of emergence of the disease. Numerous domestic mammals (dogs, bovines, horses) are susceptible to the infection, but are not responsible for the maintenance of the disease in a region, because there are accidental hosts which are not capable to transmit the infection.
26.	no	"0"	There is no long incubation period in the animals. A long incubation in the animals would have no influence on the risk for emergence because ticks are capable to transmit the bacteria between two animals without needing the presence of clinical signs. Moreover, asymptomatic animals are capable to transmit the infection.
27.	yes	"++"	There are contacts between domestic animals and wildlife. Direct contacts between these two animal populations are not necessary for the transmission of the infection, because the transmission is tick-borne. However, indirect contacts between these two animal populations via their respective ecosystems containing ticks favor the transmission of the disease by infected ticks and represent a risk factor for emergence of the disease in the domestic animal population.
28.	yes	"+++"	The wild fauna (small sylvatic mammals, cervidae) has a fundamental epidemiological role because it is the reservoir of the bacteria and can re-infect the ticks. This is a risk factor for emergence of the disease because of the difficulties to control the wild fauna.
29.	no	"+++"	There is no increase in the demography / distribution of the wildlife (except wild cervidae). An increase in the wild fauna population is a risk factor for emergence of the disease because of the epidemiological role of the wildlife (see factors 3.2. and 3.5)
30.	yes	"++"	There are climatic and meteorological changes (more rains in the winter and more dryness in the summer, for example) which can

			induce changes in the distribution and activity of the ticks. Ixodes ricinus live in temperate regions (biotope: high humidity), and the ticks are twofold more active and mobile when the weather is warm and dry. Climatic changes could constitute a risk factor for emergence of the disease via a modification of the ecosystems which could become more favorable to the proliferations of the vector.
31.	yes	"+++"	For example, in the USA, the emergence of the Lyme disease resulted from the combined action of several factors: reforestation, which increased the density of the cervidae (preferred host of the ticks) and ticks populations, the temperature, and the movement of the humans in these zones (suburbs), which increases the risk for transmission to the humans. There are (similar?) changes in the ecosystems produced by man in Belgium. The increase in the density of the cervidae and ticks populations is a risk factor for emergence of the disease.
32.	yes	"+"	There is an ongoing urbanisation in Belgium. Urbanisation is associated to more frequent contact between men and wild fauna (as foxes in towns) because urbanisation destroy, encroach the habitat of wild fauna. Urbanization in the suburbs can increase the possibilities of contact with the ticks. Urbanisation is a risk factor. However, urbanization is also a protection factor against infection of humans and domestic animals (dogs) because of the less frequent possibilities of contact with the ticks.
33.	yes	"++++"	The vector (ticks Ixodes ricinus) is present in Belgium and this is the main risk factor for emergence of the disease.

Fièvre Q (*Coxiella burnetii*)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"++"	There are several strains of C. burnetii, with different geographical distributions, of which certain could be more virulent than others. However, the genetic variability of obligate intracellular bacterial species is weak. Moreover, the lack of knowledge of the biology of the bacteria impedes the measure of the consequences of the genetic variability in this bacterial species. A genetic variability represents always a risk factor for emergence.
2.	yes	"++"	There is a lack of knowledge of the pathogenesis of the disease (biology of the bacteria, changes of phase, formation of resistant pseudospores, etc.). This represents a risk factor for emergence of the disease.
3.	yes	"++"	There are changes in the pathogenesis of the disease (but the reasons of this are unknown) (for example, the circulation of a potential hyper-virulent strain in the Netherlands). Changes in pathogenesis are always risk factors for emergence of the disease.
4.	Yes	"+++"	In 2010 there was limited access to vaccins in Belgium. The efficacy of the vaccine is limited as it protects again clinical signs but do not prevent infection or excretion, so propagation of the infection, even if vaccination, is possible. Moreover, the efficiency of the vaccine has yet to be demonstrated against the different strains. The difficulties concerning the vaccination are risk factors for emergence of the disease.
5.	Yes	"++"	There are possibilities of passage of the species barrier, due to the fact that Coxiella may infect many mammal species, and to the possibilities of changes in pathogenesis (see factor 1.3.). This possibility represents a risk factor for emergence of the disease in a new animal species.

6.	Yes	"0"	The disease is zoonotic. However, because humans do not retransmit the disease to animals, this has no influence on the risk for emergence of the disease in the animal population.
7.	yes	"+++"	The bacteria are already present all over the world except in New Zealand. The bacteria are already spread worldwide. This is a risk factor for infection of new herds by new strains and a risk factor for emergence.
8.	yes	"+++"	There have been several outbreaks in the Netherlands (humans, goats), a neighbouring country. This represents a risk factor for emergence of this (potentially hyper-virulent) strain in our country.
9.	yes	"+++"	Coxiella burnetii, in the form of a pseudospore, is highly resistant in the environment and is particularly volatile. This is a risk factor of dispersion of the pathogenic agent and consequently a risk factor for emergence.
10.	yes	"-"	Instructions have been transmitted to reduce the risk for human infection and of dispersion of the bacteria; the surveillance (monitoring) is compulsory; the notification is compulsory; measures have to be taken in positive exploitations; etc. The legislation is only a weak protection factor against the expansion if the disease because the infection is already endemic.
11.	Yes	"0"	There are changes in technological and industrial processes. These can be risk factors or protection factors. The breeding of goats is a developing sector. If mores sheep/goats would be breeded, risk for those people may increase. If fecal material would be better processed or injected into the ground, exposure would be less. Some technics as pasterisation could destroy the bacteria in food.
12.	yes	"+++"	Before 2010 (at the time of this survey) , there was no official surveillance and notification was not compulsory. This is not the case currently. There has also be a sensibilisation of the sector since 2010, but there are always problems of declaration by the breeders. Problems of detection always represent a risk factor for emergence.
13.	yes	"++"	Almost all mammal species can be infected, although little develop the disease. There are increases in interactions between the different animal compartments, which increase the risk for transmission of the disease and the risk for emergence.
14.	yes	"0"	Educational farms are more and more widespread. This represent a risk factor of infection of humans. There exists an indirect carriage of humans: food or livestock dealers, vets which go form one fram to another. These are risk factors of dispersion of the disease.
15.	no	"0"	There is no significant human demographic growth in Belgium. Since humans do not retransmit the disease, this factor has no influence on the risk for emergence of the disease in the animal populations.
16.	yes	"++"	All the mammal species are concerned by the infection (more studies have to be done to identify which animal species are excretory and via which pathways), but the ruminants are currently the main host species. The breeding of goats is a developing sector. A high goat density is a risk factor for emergence of the disease.
17.	yes	"0"	Human traveling is increasing but because humans are terminal hosts (do not retransmit the infection to animals), this has no influence on the risk for emergence of the disease in the animal population.
18.	yes	"0"	There are increases in tourism but because humans are terminal hosts (do not retransmit the infection to animals), this has no influence on the risk for emergence of the disease in the animal population.
19.	yes	"++"	There is an increase in trade of ruminants. Because there is no European legislation imposing a control concerning Q fever, an increase in trade in (small) ruminants is a risk factor for emergence (risk for importation of infected animals, risk for importation of a hyper-virulent strain). Food or livestock dealers, vets which go form one fram to another, can dispers the disease and are also risk

			factors. Since the bacteria are already ubiquitous and spread worldwide, the quantification of the risk is difficult.
20.	yes	"++"	There is an increase in transport of (small) ruminants, which is a risk factor of infection of free herds
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"+++"	There are intensive productions systems for (small) ruminants. Intensive breeding is a risk factor for the transmission and circulation of the bacterium in closed spaces (indoor)
23.	yes	"++"	There are extensive production systems for (small) ruminants (outdoor breeding). This is a risk factor of dispersion of the disease in the environment via dry matters (dry abortion products, feaces, etc.)
24.	yes	"+++"	Out of the abortion periods, there are no clinical signs in (small) ruminants, which complicated the detection of the disease and the taking of measures. The asymptomatic infected animals can be transported and infect free herds. This is a risk factor of dispersion of the disease and of emergence.
25.	yes	"+++"	There is an animal reservoir (mostly small ruminants and cattle). The bacterium is maybe the most widespread bacterial species in the world. This is a risk factor for emergence of the disease.
26.	yes	"++"	There is a long incubation period before the abortion, which allows the dissemination of the undetected infection. This is a risk factor for emergence.
27.	yes	"++"	There are possibilities of contact between the domestic ruminants (bred outdoor) and the wild fauna. This represents a risk factor of infection because the disease is transmissible by direct contact.
28.	yes	"++"	The wild fauna could play an epidemiological role (transmission of the disease to domestic animals or to other wild animals). There is no described introduction of Q fever in herds from the wild fauna, but this should be studied. The infected wild fauna could represent a risk factor for emergence. The role of the wild fauna should have to be more studied.
29.	no	"+"	There is no demographic growth of the wild fauna (except wild cervids). A demographic growth of the wild fauna could be a risk factor for emergence of the disease because it is capable to transmit the disease to domestic animals.
30.	yes	"0"	There are climatic and meteorological changes. An increase in warm and dry periods represent a risk factor of dissemination of Q fever (dry matters from abortion products containing the bacterium can be dispersed by the wind) and consequently of emergence. On the contrary, heavy rainfall and floodings may decrease Q fever risk. The result is "0".
31.	yes	"++"	There are changes in the ecosystems. For example, a return to earlier production systems (outside breeding, etc.) or increases in domains for the wild fauna could represent a risk factor for emergence of the disease.
32.	yes	"- -"	There is an ongoing urbanisation in Belgium. This represents a protection factor against emergence in humans because it decreases the possibilities of aerogen transmission from animals. The urbanisation has no influence of the risk for emergence in the animal populations.
33.	yes	"+"	Ticks can transmit the disease, but this infection pathway seems to be less important. This is a potential risk factor for emergence because certain strains could adapt to the vectors (see point 1.3: possibility to change in pathogenesis)

Hantavirose (Hantavirus) (Bengis *et al*., 2004 ; Zeier *et al*., 2005; Enria and Levis, 2004)

Factor	Presence	Impact	Scientific justification

	(yes) / absence (no)	(risk / protection / no effect)	
1.	no	"0"	There is no genetic variability. A genetic variability should have no influence on the risk for emergence.
2.	yes	"++"	There is lack of knowledge of the pathogenesis. This is a risk factor for emergence.
3.	yes	"++"	According to Zeier *et al*. (2005), altough rodents are the main reservoir, there is a possibility of transmission of the disease to non natural hosts, such as dogs, cats, etc., and this can influence the virulence and the pathogenicity. This is a risk factor for emergence in new animal populations under a more pathogenic form. If the virus adapts to domestic animal populations, this represent a risk factor for infection of humans.
4.	yes	"++"	There are difficulties to vaccine wild rodents. This is a risk factor for emergence.
5.	yes	"++"	According to Zeier *et al*. (2005), altough rodents are the main reservoir, there is a possibility of transmission of the disease to non natural hosts, such as dogs, cats, pigs, cattle, etc. Altough this is at the present time not yet demonstrated, this represent a potential risk factor for adaptation of the virus in these unnatural hosts. This is a risk factor for emergence of the disease in new animal species. If the virus adapts to domestic animal populations, this is a risk factor for infection of humans.
6.	yes	"0"	The disease is zoonotic. Because humans have no epidemiological role, this has no influence on the risk for emergence in the animal populations.
7.	yes	"++"	The distribution of the virus is wide in Europe. This is a risk factor for emergence because transmission through wildlife has no boundaries.
8.	yes	"++"	There are increases in incidence in other countries (which countries?). This is a risk factor for emergence because transmission through wildlife has no boundaries.
9.	yes	"+++"	Hantaviruses are resistant in the environment (soils, litters, etc.). Because transmission occurs principally through inhalation of contaminated dust, this is a risk factor for transmission and of emergence both for animals and humans.
10.	no	"0"	There are no legislation nor sanitary policy measures against hantaviroses. These should have no influence of the risk for emergence because the virus is in wild rodents and there is no possible control.
11.	no	"0"	No influence of changes in technological or industrial processes for the risk for emergence of this disease.
12.	yes	"++"	Because the disease concerns the wild fauna, there are problems of detection of the emergence. Problems of detection of the emergence is a risk factor for emergence.
13.	no	"++"	There are no increases in interactions between wild rodents and other animal populations. Interactions between animal populations are a risk factor for transmission to domestic animal populations (cats, dogs, pigs, cattle) and of viral adaptation to these new hosts. This is a risk factor for emergence in new animal populations. If the virus adapts to these domestic animal populations, this is also a risk for transmission to humans.
14.	yes	"+++"	Diverse human activities are increasing, such as the capture of rodents, the breeding of rodents, fight against vermin, hunting, etc. These are risk factors of infection of humans and of emergence in the human population.
15.	no	"0"	There is no significant demographic growth in Belgium, and a demographic growth should have no influence on the risk for emergence of the disease.

16.	yes	"+++"	There is a growth of the rodent population in Belgium. A growth of the rodent population is a risk factor for emergence of the disease.
17.	yes	"+"	Human traveling is increasing. This increases the risk for importation of an infected animal (risk for emergence in the animal population) or the risk for infection of human travellers (risk for emergence in the human population).
18.	yes	"+"	Human tourism is increasing. This increases the risk for importation of an infected animal or the risk for infection of human travellers (risk for emergence in the animal population). Tourism (rural, walks) favours the contact with dejections of infected rodents and increases the risk for emergence in the human population.
19.	no	"0"	The increase in trade does not concern the wild rodents population.
20.	no	"0"	The increase in transport does not concern the wild rodents population.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"0"	Rodents are wild fauna, which is not concerned by the production systems. No influence of this factor on the risk for emergence.
23.	no	"0"	Rodents are wild fauna, which is not concerned by the production systems. No influence of this factor on the risk for emergence.
24.	yes	"+++"	The infection is chronic and asymptomatic in wild natural hosts (rodents). This is a risk factor for emergence (absence of clinical signs favours the transmission rate, absence of detection of asymptomatic animals)
25.	yes	"++"	The animal reservoir is constituted by the wild rodents (bank voles (campagnols roussâtres), brown rat (rat surmulot)). Because it concerns the wild fauna, difficult to control and to watch, this is a risk factor for emergence.
26.	no	"++"	There is no long incubation period. A long incubation period would represent a risk factor for emergence (possibility of viral transmission before being detained by clinical signs).
27.	yes	"0"	There are possibilities of contact between domestic and wild rodents, but the disease does not concern domestic animals. The contacts between domestic and wild animals have no influence on the risk for emergence.
28.	yes	"+++"	The wild rodents (bank voles (campagnols roussâtres), brownn rat (rat surmulot)) play an epidemiological role because they are the reservoir of the virus. This is a risk factor for emergence because the control of the wilf fauna is difficult.
29.	yes	"+++"	There is a growth of the rodent population in Belgium. A growth of the rodent population is a risk factor for emergence of the disease.
30.	yes	"++"	There are climatic and meteorological changes. A climatic change accompanied by an increase in precipitations leads to an increase in rodent population density, which is a risk factor for emergence of the disease.
31.	yes	"++"	There are changes in the ecosystems. This is a risk factor for emergence in humans because rural and wooded zones increase the risk for contact with infected wild rodents.
32.	yes	"++"	There is an ongoing urbanisation in Belgium. Urbanisation of previous rural areas favours the contact between humans and infected rodents.
33.	no	"0"	Hantavirosis is not a vectorial (insect) disease. Insects have no influence on the risk for emergence.

Cysticercose bovine (*Cysticercus bovis*, *Taenia saginata*)

Factor	Presence	Impact	Scientific justification

	(yes) / absence (no)	(risk / protection / no effect)	
1.	no	"0"	There is no genetic variability. A genetic variability would have no influence on the risk for emergence of this disease.
2.	no	"+"	There is no lack of knowledge on the pathogenesis of this disease. A lack of knowledge represents always a risk factor for emergence.
3.	no	"+"	There is no change in the pathogenesis of the disease. A change in pathogenesis could always represent a risk factor of emergence of the disease.
4.	yes	"+++"	There exists a vaccine offering a protection of 99.8%, but which is not commercially available. The lack of available vaccine is a risk factor for emergence of the disease (Lightowlers MW, Rolfe R, Gauci CG. Taenia saginata: vaccination against cysticercosis in cattle with recombinant oncosphere antigens. Exp Parasitol 1996; 84:330-338.)
5.	no	"0"	There is no possibility of passage of the species barrier and this has no influence on the risk for emergence of the disease
6.	yes	"+"	The disease is zoonotic (humans are host for the adult stages of taenia saginata). Because humans can occasionnally retransmit the infection, this is a risk factor for emergence of the disease.
7.	no	"0"	There is no geographical extension of the disease. A geographical extension would have no influence on the risk for emergence of the disease in Belgium because the transmission of the parasite by ingestion stays geographically localized.
8.	no	"0"	There is no increase in incidence in other countries or neighbouring countries. An increase in incidence in other countries would have no influence on the risk for emergence of the disease because the transmission of the parasite by ingestion stays geographically localized.
9.	yes	"+++"	The parasite can persist in the environment (pastures, surface waters: 2 months during the summer and 5 months during the winter) and this contributes to the transmission cycle by ingestion of infested grass. This represents a risk factor for emergence of the disease.
10.	yes	"- -"	The existing legislation (interdiction of spreading of human excrements on pastures, inspection and refusal of infected carcasses at the slaughterhouse) is a protection factor against emergence of the disease.The protection is weak because the current meat inspection detects only a small percentage (10-20%) of the infected carcasses.
11.	Yes	"- - -"	There are changes in the technological processes in bovine industry (serological detection in abattoirs)and this contributes to the protection against the emergence of the disease
12.	Yes	"+++"	There are detection problems of the disease (live animals are asymptomatic; weak sensitivity of the visual inspection at the slaughterhouse) and this can impede the detection of a possible increase in incidence. This represents a risk factor for emergence of the disease.
13.	No	"0"	There is no increase in interactions between the concerned animal populations (cattle populations). An increase in such interactions would have no influence on the risk for emergence of the disease because the transmission cycle of the parasite involves an indirect relation between humans and cattle and no direct relation between cattle.
14.	No	"+++"	There is no increase in interactions between cattle and human populations. Such an increase would represent a risk factor for emergence of the disease because the transmission cycle of the parasite involves (indirect) interactions between humans and

			cattle.
15.	no	"0"	There is no significant demographic growth in Belgium. The emergence of the disease is not influenced by a human demographic growth.
16.	no	"0"	There is no growth of the cattle population in Belgium. Such an increase would have no influence on the risk for emergence of the disease.
17.	Yes	"0"	Human traveling is increasing. This has no influence on the risk of emergence in the cattle population.
18.	Yes	"+"	Human tourism is increasing. Increased tourism by backpackers or wild campers defecating in pastures might have an influence on the risk of emergence
19.	yes	"+"	There is an increase in trade of cattle. This represents a risk factor of emergence of the disease because the more cattle have the possibility to graze different pastures, the more the probability of infection is higher.
20.	yes	"+"	There is an increase in transport of cattle. This represent a risk factor of emergence of the disease because the more the cattle have the possibility to grass different pastures, the more the probability of infection is higher.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"- -"	There are intensive cattle production systems in Belgium. This contributes to the protection against the emergence of the disease because cattle kept indoor receive feed less at risk than cattle kept on pastures.
23.	Yes	"+++"	There are extensive cattle production systems in Belgium. This represents a risk factor for emergence of the disease because of the cattle kept outdoor (pastures).
24.	yes	"+++"	Live cattle are asymptomatic and this represents a risk factor for emergence (lack of detection).
25.	yes	"+++"	There exists an animal reservoir (cattle) and this represents a risk factor for emergence of the disease.
26.	no	"0"	There is no long incubation period in cattle but the incubation period has no influence on the risk for emergence because only slaughtered animals (meat) are capable to transmit the disease to humans. During its live the animal is not infectious.
27.	yes	"0"	There are contacts between domestic cattle and wildlife but this has no influence on the risk for emergence because the transmission of the parasite (ingestion of infected grass) does not involve a direct contact between animals and because wildlife does not play an epidemiological role.
28.	No	"0"	The wild fauna does not play an epidemiological role. If the wildlife did play an epidemiological role, this would have no influence on the risk for emergence because infection of domestic cattle comes from humans.
29.	no	"0"	There is no demographic growth of the wild fauna concerned by the disease. Because the wild fauna does not play an epidemiological role in the transmission of the disease to domestic cattle, such an increase would have no influence on the risk for emergence of the disease.
30.	Yes	"0"	There are climatic and meteorological changes but this has no influence on the risk for emergence of the disease
31.	Yes	"0"	There are changes in the ecosystems produced by man but without effect on the risk of emergence of the disease.
32.	Yes	"+"	There is an ongoing urbanization in Belgium. Due to the urbanisation there are water floodings which can spread eggs of the parasite. This is a risk factor.
33.	no	"0"	Non vectorial disease

Echinococcose (*Echinococcus multilocularis*) (Mas-Coma *et al*., 2008)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	There is no genetic variability. A genetic variability would have no influence on the risk for emergence of this disease.
2.	yes	"+"	There are still important gaps in the factors that influence survival of the eggs in the environment and the way that intermediate hosts, especially an aberrant host such as humans, become infected with the eggs: is this by ingestion of contaminated berries, working in contaminated soil or by petting an infected pet dog,….? More knowledge on the transmission pathways and their risk factors are needed. A lack of knowledge represents always a risk factor for emergence.
3.	No	"+"	There is no change in the pathogenesis. A change in pathogenesis could always represent a risk factor of emergence of the disease.
4.	yes	"+++"	Vaccination against parasites is mostly problematic (efficiency, etc.). This is an important risk factor for emergence of the disease because in endemic zone, all canids have to be considered as infected and able to transmit the parasite.
5.	No	"++"	The parasite can already infect several animal species but, due to the absence of genetic variability, there is no possibility to infect additional animal species. A passage of the species barrier would represent a risk factor for emergence of the disease.
6.	Yes	"0"	The disease may be accidentally zoonotic. Since humans do not excrete the parasite in the feces (no definitive host) and consequently are not capable to retransmit the disease, there is no influence of the risk for emergence in the animal population.
7.	yes	"+++"	There is a geographical expansion of the disease (endemic from the South of the Meuse and in the Ardennes). This represents a risk factor for further expansion and for emergence of the disease in free regions.
8.	yes	"++"	There is an increase in incidence in neighboring countries and this represent a risk factor for emergence of the disease.
9.	yes	"+++"	The infectious parasite can persist in the environment in the feces of the definitive hosts and be ingested by the intermediate hosts (wild rodents or humans); this is a risk factor for emergence of the disease in the animal population.
10.	no	"0"	The parasite is on the list of zoonotic diseases to monitor in the EC zoonoses Directive. However, there is no official surveillance. There are no measures taken in definitive and intermediate hosts which could limit the expansion of the disease and decrease the risk for emergence. Because the parasitic cycle involves wild animals difficult to control, the absence of control measures has no influence on the risk for emergence of the disease.
11.	no	"0"	The disease is not concerned by changes in technological or industrial processes.
12.	yes	"++"	There are problems of detection of the emergence: no official surveillance programme (only prevalence studies in the frame of scientific research) which could help to detect an increase in incidence, the parasitic cycle concern wild animals difficult to monitor, the disease is asymptomatic in the definitive hosts, etc. These difficulties of detection are risk factors for emergence of the disease.
13.	yes	"++"	There is an increase in interaction between the animal compartments concerned by the disease (ex. increase in the foxes population). This represents a risk factor for emergence of the disease.

14.	no	"0"	There is no increase in interaction between foxes and humans. An increase would have no influence on the risk for emergence in the animal population because humans do not retransmit the parasite.
15.	no	"0"	There is no significant demographic growth in Belgium. The emergence of the disease is not influenced by a human demographic growth, because humans are not capable to retransmit the parasite.
16.	Yes	"+++"	There is an increase in the fox population. Because foxes are important definitive hosts of the disease, this represent a risk factor for emergence of the disease
17.	Yes	"0"	Human traveling is increasing. This has no influence on the risk for emergence of the disease
18.	Yes	"0"	Human tourism is increasing. This has an influence on the risk for emergence in the human population (fruit picking), but not in the animal population.
19.	No	"0"	There is no increase in trade of foxes or rodents. No influence on the risk for emergence of the disease.
20.	No	"0"	There is no increase in transport of foxes or rodents. No influence on the risk for emergence of the disease.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"0"	There are no intensive foxes production systems in Belgium. No influence on the risk for emergence of the disease.
23.	no	"0"	There are no extensive foxes production systems in Belgium. No influence on the risk for emergence of the disease.
24.	Yes	"+++"	The infection is asymptomatic in carnivores (definitive hosts). This allows the dissemination of the parasite in the environment and infection of the intermediate hosts. This is an important risk factor for emergence of the disease.
25.	Yes	"+++"	Foxes and domestic canids are the reservoir of the parasite. Because of their epidemiological role in the transmission of the disease and the possibility of asymptomatic carriage, this represent a risk factor for emergence of the disease
26.	no	"0"	There is no long incubation period. Because the excretion of the parasite and transmission of the disease does not depend on the presence of clinical signs, a long incubation period would have no influence on the risk for emergence of the disease.
27.	yes	"++"	There are contacts between domestic and wild animals concerned by the disease. The wild (foxes) or domestic (dogs and cats) definitive hosts get infected by eating infested wild rodents. There is also a possibility for foxes to eat some died infected small ruminants. Wild rodents get infected by ingesting parasite eggs via feces of infected definitive hosts. This has an influence on the continuation of the parasitic cycle and represents a risk factor for emergence of the disease.
28.	Yes	"+++"	Because foxes are the reservoir and the main definitive hosts responsible for the transmission of the parasite, the wildlife plays an important epidemiological role. This is a risk factor for emergence of the disease.
29.	yes	"+++"	The last ten years, the population of foxes has increased, and their distribution has extended (have established in Flanders, and in peri-urban zones). This represent a risk factor for dissemination and for emergence of the disease in free regions.
30.	Yes	"- -"	There are climatic and meteorological changes. The global warming could have a protective effect against the risk of emergence because the survival of the parasite is increased under cold climates (Northern hemisphere).
31.	yes	"0"	There are changes in the ecosystems produced by humans, with a higher risk of emergence of the disease. Control of rodents, such as musk rats, can on the other hand decrease the infection rate of foxes. The result is "no influence".
32.	yes	"0"	There is an ongoing urbanisation in Belgium, and foxes move from the country side to the city. This increases the risk of infection for the human urban population, but not for the animal population.
33.	no	"0"	Non vectorial disease.

***E. Coli* O157:H7 (Schlundt *et al*., 2004)**

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+"	There are several strains of EHEC O157:H7 showing differences, but the true variability sensu stricto as consequence of genetic modifications has not been studied. However, it is considered that there are variabilities concerning the presence of different virulence factors; the presence of different serotypes; of different strains which differ in their ability to induce a disease in humans or to survive in the environment. This represents a risk factor for emergence. On the other hand, the absence/presence of pathogenicity is due to absence/presence of the receptor expression for the toxin in ruminants, and genetic variability will not change this.
2.	yes	"+"	There is lack of knowledge of the pathogenesis (for example, concerning the colonization, namely of cattle, but particularly of other ruminants), the host specificity of the different identified clones, etc. This lack of knowledge can be a risk factor mainly for the healthy carriers.
3.	No	"++"	Currently there are no changes in the pathogenesis of the disease. A change in pathogenesis in ruminants could only occur if receptors for the toxin would suddenly appear in endothelial cell in ruminants. Such a change in pathogenesis would represent a risk factor for the emergence of the disese in ruminants.
4.	yes	"+++"	Concerning the vaccination, the human aspects have to be differentiated from the animal aspects. In humans, the disease is mainly caused by a toxin. Despite the principles of the vaccination against these toxins are clear, its practical application is not yet evident. In animals in which the toxins do not play any role because they are mostly healthy carriers, the targets of vaccine are represented by colonization factors. However, many characteristics remain to be discovered about these colonization factors and about the immune response of these "healthy carriers", and consequently, the principles of the vaccination in animals remains unclear. These uncertainties about the effect of the vaccination in animals and the lack of vaccines represent risk factors for emergence of the disease.
5.	Yes	"++"	The possibility of passage of the species barrier (from cattle to sheep, goats, pigs, turkeys, or to a lesser extend: to dogs, cats, birds, etc.) could exists, but assuming that the genetic variability truly exists in our timescale. Such strains could acquire virulence factors allowing them to colonize non primate and non ruminant hosts and induce diarrhea or more if endothelial cells of these "new" hosts own receptors specific to the toxins of these EHEC strains. Adaptation to new animal hosts could increase the risk
6.	Yes	"++"	The disease is zoonotic. This is a risk factor for emergence of the disease in humans. Transmission from humans to humans has been described, and to animals is a possibility which will rarely occur. This is a risk factor for emergence.
7.	No	"0"	There is no geographical extension of the bacterium because it is already widespread worldwide. A geographical extension has no effect on the risk of emergence because the bacteria are already widespread.
8.	no	"+"	There is no really increase in incidence of new cases in neighbouring countries. In recent years, there seems to be an incraese in

			Belgium. An increase in incidence of new cases in neighbouring countries would represent a risk factor for emergence because it would mean an increase in the number of carrier animals and, because of the trade, it would mean an increasing prevalence in our cattle and an increased risk for contamination of humans.
9.	yes	"++++"	The bacterium can survive for a long time (several months) in the environment, principally in organic matters (soils, feces in which it can multiply, water, plants) independently of the presence of carrier animals. This is a risk factor of dispersion and of emergence of the disease namely when animals are placed on pastures on which manure has been expanded during the 6 previous weeks. Persistence in the environment is an important risk factor since reinfection of cattle occurs via this route and since human infection via vegetables, drinking water etc.. is going via that route.
10.	Yes	"- -"	There is a legislation (for ex. Directive zoonoses). This is a protection factor against emergence, to be reinforced in case of emergence in animals.
11.	yes	"++"	Some strains of E. coli contaminate the meat or meat products during the processes of food production. For example, accidental contaminations can be amplified by the process and spread in numerous batches of minced meat or hamburgers. So this factor is a risk factor. Some modifications of breeding practices or of alimentary habits could also lead to the emergence of the disease. Otherwise, some changes in the technological or industrial processes could also have protective effects (for example, some technologies, better hygienic conditions in the slaughterhouse)
12.	yes	"+++"	There exist some problems of detection of emergence. For example, in animals, the prevalence is probably underestimated, due to the fact that animals are asymptomatic healthy carriers, that the number of bacteria per gram of sample is sometimes below the detection limit of the test, and because of the intermittent shedding. In humans, there is still no reimbursment of diagnosis for O157:H7 by INAMI and these analyses are not included in the RIZIV nomenclature. As a consequence, only a few specialists ask an analysis for EHEC O157:H7 even in presence of blood diarrhea and only a few laboratories detect this pathogen. In case of large food-borne outbreak, the lack of a rapid diagnostic will impede rapid reactions and control measures. Otherwise, the diagnostic tests are very efficient for the diagnosis of O157:H7. The problems of detection of emergence are risk factors of emergence of the disease.
13.	No	"+"	There are no increases in interactions/contacts between the ruminant populations (cattle). Increases in interactions (for example, via animal purchases of healthy carriers, which increase the risk for infection of the cattle herds) would represent a risk factor, but minor because the bacteria is prevalent in the environment and (re)infections can occur from the environment. This type of reinfection is as important as reinfection due to contact with other animals. Walking around on a farm is enough to spread the infection and the dose needed to infect/reinfect an animal is low. It is much more important to prevent shedding in the environment than to prevent contact between animal compartments.
14.	yes	"+"	There are increases in interactions between (small) ruminants and humans, for example in ecological farms and educational farms for children. In Denmark it has been shown that infections occur around areas with concentrations of cattle farm. So when human and cattle regions come closer in contact, this is a risk factor. These increases in interactions represent a risk factor for emergence. It is a weak risk factor because the most important way of transmission to humans remains the food-borne infection, and not the direct contact.
15.	No	"0"	There is no significant demographic growth in Belgium and the emergence of the disease is not concerned by a human

			demographic growth, except if such a growth does modify certain breeding practices or alimentary habits (see factor 2.2.)
16.	no	"++"	There is no growth of the cattle population in Belgium. Such a growth would represent a risk factor for emergence of the disease (increase in the infection pressure)
17.	yes	"++"	Human traveling is increasing. This is probably the cause of worldwide distribution of the bacteria between 1982 and 1995. The bacteria are spread in the environment and can infect cattle. This represent a risk factor of emergence of the disease in the animal population.
18.	yes	"++"	Human tourism is increasing. Humans can get infected for example in touristic farms through consumption of farm raw products (vegetables, fruit, milk) contaminated by feces from carrier animals or through narrow contacts with healthy carrier animals (mostly children, who do not wash their hands). The human tourism is probably the cause of worldwide distribution of the bacteria between 1982 and 1995.The bacteria are spread in the environment and can infect cattle. This represent a risk factor of emergence of the disease in the animal population.
19.	yes	"++"	There is an increase in trade of ruminants. This increases the risk for importation of healthy carrier animals, and represents a risk factor for emergence.
20.	yes	"+"	There is an increase in transport and of movements of ruminants. This increases the risk for introduction of healthy carrier animals in free herds and represents a risk factor for emergence of the disease.
21.	yes	"+"	There is an increase in terrorism worldwide. The bacteria could be used and increase the risk.
22.	yes	"+"	There are intensive production systems concerning the ruminants. They represent a risk factor of expansion and of emergence of the disease, because the bacteria present in small quantities can spread easily in high dense herds or when cattle from different origins is gathered in big production units.
23.	yes	"0"	There are extensive production systems for ruminants in Belgium, but these have no influence on the risk for emergence of the disease in the animal populations.
24.	yes	"+++"	Bovine are asymptomatic healthy carriers and can excrete the bacteria for a long time without being detected. This is an important risk factor for emergence of the disease.
25.	yes	"+++"	The most important animal reservoir is cattle, but pigs, wild ruminants, turkeys, goats, sheep, boars can also be rarely carriers of virulent germs, and domestic animals, birds, rodents can also be sporadically carriers. There are "hypershedder" carrier animals harboring high amounts of bacteria in their intestines during long periods. The animal reservoir represent an important risk factor for emergence of the disease.
26.	no	"0"	The incubation period does not have any influence of the risk for emergence because the animals are healthy asymptomatic carriers capable to excrete the bacteria without the presence of clinical signs.
27.	yes	"++"	There are contacts between domestic and wild animals, with possibilities of reciprocal transmission of the germs by direct contact, since the wild fauna is also reservoir. There are several recent studies showing the important prevalence of the bacteria in wild animals. This represents a risk factor of transmission of the disease and so of emergence
28.	yes	"+"	The wild fauna can play an epidemiological role because it is a reservoir and it can transmit the infection to domestic animals. O157 has been isolated from deer, wild pigs, birds, rats etc. There are several recent studies showing the important prevalence of the bacteria in wild animals even for birds such as sparrows the bacterium could be isoltated from their excreta and they could be

			followed flying from one farm to another. This represents a risk factor for emergence of the disease. The quantification of the risk is difficult in absence of real studies concerning the role of the wild fauna in the epidemiology of the disease.
29.	no	"+"	There is no increase in the demography or distribution of the wild fauna concerned by the disease. Such an increase would represent a light risk factor for emergence because of the possibility of epidemiological role in the transmission of the disease. More studies are needed concerning the epidemiological role of the wild fauna.
30.	yes	"0"	There are climatic and meteorological changes, but the disease is not concerned by climatic changes
31.	no	"0"	The disease is not concerned by ecological changes.
32.	yes	"+"	There is an ongoing urbanisation in Belgium. If this urbanisation is accompagnied with closer contact between farms and housing of people as demonstrated in Denmark, this consitites a risk factor.
33.	no	"0"	Non vectorial disease.

Tuberculose bovine (*Mycobacterium bovis*) (Bengis *et al*., 2004 ; Abalos and Retamal, 2004)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"++"	Mycobacteria are relatively genetically stable. A genetic variability would represent a risk factor for emergence of new strains.
2.	no	"+"	Much is known about the pathogenesis of the disease, except concerning some molecular aspects of the bacteria. Lack of knowledge on the pathogenesis is always risk factors for emergence of the disease.
3.	no	"+++"	Currently, there are no known changes in the pathogenesis of the disease. Changes in the pathogenesis of the disease such as an increase in the virulence for humans, or for a domestic animal species (dog, cat, horse, ...), which is a theoretical possibility, would represent a risk factor for emergence of the disease in these animal species.
4.	yes	"+++"	Vaccination is practiced in human medicine but is not practiced preventively in animals because the efficiency of the existing veterinary vaccines is variable and because the vaccination impedes the attempts of eradication of the disease. These difficulties represent risk factors for re-emergence of the disease.
5.	no	"++"	There are many target animal species but because of the weak genetic variability, the probability of a "change" in the host spectrum is weak. An increase in virulence for an already existing target animal species is more probable. A passage of the species barrier would represent a risk factor for emergence of the disease in a new animal species.
6.	yes	"0"	The disease is zoonotic, but the probability of retransmission of the disease from humans to animals is quasi inexistent. The zoonotic character has no influence on the risk for emergence of the disease in the animal population.
7.	no	"+++"	The disease is already present worldwide, so there is no geographical extension anymore. A geographical extension is always a risk factor of (re)emergence of the disease.

8.	yes	"++"	There are increases in incidence in neighbouring countries (France, United Kingdom, Ireland) and this represent a risk factor of re-emergence in Belgium.
9.	yes	"+++"	The bacterium is very resistant everywhere in the environment. This is a risk factor of re-emergence of the disease.
10.	yes	"- - -"	The legislation/sanitary policy/surveillance (detection, slaughtering, post-mortem inspection with tracing back in the herd of origin, compulsory notification, control of the animal movements, etc.) are protective factors against re-emergence. A decrease in the surveillance or of the measures could favor a re-emergence, particularly since the disease is yet sporadically present.
11.	yes	"0"	There are changes in the technological and industrial processes, but these have no influence on the risk for re-emergence in cattle. The pasteurisation/sterilisation of the milk is has a protective effect for humans.
12.	yes	"++"	There are problems of detection of the emergence (weak clinical signs; the interpretations of the tuberculinations are not always homogenous; problems of notification; no test on the wild fauna, the tests are efficient in cattle but not in other sensitive animal species such as dogs and cats for example, ...). A lack of detection represents always a risk factor for (re)emergence of infectious diseases.
13.	yes	"++"	There is an increase in interaction between the different sensitive animal species. Because M. tuberculosis is not strictly host-specific, increases in contacts between different animal populations represent a risk factor for emergence of the disease.
14.	no	"0"	There is no increase in interaction between domestic (and wild) host animal populations and humans. Because the probability that humans retransmit the infection to animals is very low, an increase would have no influence on the risk for emergence in the animal population.
15.	no	"0"	There is no significant demographic growth in Belgium. A demographic growth has no influence on the risk for emergence of the disease in the animal population.
16.	no	"+"	There is no growth of the cattle population. An increase in the domestic animal population concerned by the disease would represent a risk factor of emergence.
17.	yes	"0"	Human traveling is increasing. Human traveling increase the risk for human infection in endemic countries, but because the reverse zoonosis is very rare, this has no influence on the risk for emergence in the animal populations.
18.	yes	"0"	Human tourism is increasing. Tourism increases the risk for human infection in endemic countries, but because the reverse zoonosis is very rare, this has no influence on the risk for emergence in the animal populations.
19.	yes	"++"	There is an increase in trade of the concerned animal species (cattle) in Belgium. Because of the risk for importation of infected animal from endemic countries if the animals are not tested at importation (note that the test is obligatory), this represent a risk factor of introduction of the disease in the country and a risk for emergence.
20.	yes	"+++"	There is an increase in animal (cattle) transports in Belgium. Because the disease can spread via movements of undetected infected animals, and because there are several cases in Belgium each year, this represents a risk factor for emergence of the disease.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"+"	There are intensive cattle production systems in Belgium. Although the introduction of the bacteria in such intensive (mostly closed) systems can be easily controlled, the promiscuity of the cattle in closed spaces can favor the transmission of the bacteria once introduced. Intensive production systems are a weak risk factor for emergence of the disease.

23.	yes	"+++"	There are extensive cattle production systems in Belgium. Because of the possibilities of contact with the wild fauna, this represents a risk factor of introduction of the infection in the herd, and a risk factor for emergence.
24.	yes	"++"	Although there can be intern lesions due to M. tuberculosis (detection on the carcass at the slaughterhouse), most of cattle are asymptomatic, which allows the transmission of the infection without being detected. This is a risk factor for dispersion and for emergence of the disease.
25.	yes	"+++"	There is an animal reservoir in the wild fauna (badgers) (in cattle, the domestic animal reservoir, the disease is mostly eradicated). This is a risk factor for emergence of the disease.
26.	yes	"+++"	There can be a long period between infection and appearance of clinical signs (months or years) and the animals can transmit the infection to many animals before being detected. This is a risk factor for emergence of the disease.
27.	yes	"++++"	There are contacts between cattle and the wild fauna. This represent a risk factor of infection of cattle (from the wild fauna) and of the wild fauna (from cattle), and a risk factor for emergence.
28.	yes	"+++"	The wild fauna (infected badgers), being a wild reservoir of the disease, plays an epidemiological role in the maintenance of the bovine tuberculosis and in complicating the complete eradication of the disease. This is a risk factor for emergence.
29.	yes	"+++"	There is an increase in the number of badgers and, because of its epidemiological role, this is a risk factor for emergence of the disease.
30.	yes	"0"	There are climatic and meteorological changes but this has no influence on the risk for emergence of the disease.
31.	yes	"++"	There are changes in the ecosystems produced by man. In relation to their implication with the wild fauna, this can be a risk factor for emergence of the disease.
32.	yes	"+"	There is an ongoing urbanisation in Belgium and this is a risk factor for emergence (mechanism?)
33.	no	"0"	Bovine tuberculosis is not a vectorial disease.

Tularémie (*Francisella tularensis*) (Bengis *et al*., 2004)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"+"	There are several strains with different virulence levels (for example, the most virulent biovar is the A type in the USA, the European type B biovar being less virulent), but there is no genetic variability leading to the appearance of new strains, which is a protection factor against emergence. Because of its high growth exigencies, this bacterium is genetically stable. A genetic variability would represent a risk factor for emergence of new strains.
2.	yes	"++"	There is lack of knowledge of the pathogenesis (because only dead animals are found in the wild fauna, lack of knowledge of the interactions with the hosts, of the molecular pathogenesis, etc.), and it is a risk factor for emergence of the disease.
3.	no	"+"	Considering the lack of knowledge of the pathogenesis, it is difficult to answer this question, but it is assumed that there is currently no change in the pathogenesis. A change in the pathogenesis would represent a risk factor for emergence of the disease.

4.	yes	"+++"	As for each facultative intracellular bacteria, the classical vaccination is not very efficient. It is difficult to vaccine wild fauna. There is no authorized vaccine commercially available for animals. These difficulties concerning the vaccination represent a risk factor for emergence of the disease.
5.	yes	"+"	The disease concern mainly rodents and lagomorphs, but theoretically, all the mammal species are sensitive to the bacteria. This possibility of passage of the species barrier increases the risk for establishment of the disease in an uncommon animal species and is a risk factor for emergence of the disease in a new animal species.
6.	yes	"0"	The disease is zoonotic, but humans do not retransmit the disease to the animal populations. The zoonotic character of the disease has no influence of the risk for emergence of the disease in the animal populations.
7.	no	"++"	Because the disease is already present in Belgium, in France, etc., there is no true geographical expansion. A geographical expansion is always a risk factor for emergence. The sporadic presence of the disease is a risk factor for emergence.
8.	yes	"++"	There have been several outbreaks in humans the last years in neighbouring countries. For example, there has been an outbreak with more than 500 human cases in Sweden in 2003; there is a general increase in outbreaks in Europe (undetermined cause); there are 20 to 70 human cases per year in France, etc. If they correspond to a change in the pathogenesis or to an increased presence of the bacteria, these increases in incidence in neighbouring countries could represent a risk factor for emergence of the disease in Belgium.
9.	yes	"++"	The environment is contaminated essentially by dejections of rodents and the bacteria can persist several months at temperatures below 0°C in water, sludge or on plants and a few days at temperatures above 5°C. Because of the possibility of infection by inhalation, this persistence in the environment is a risk factor for emergence of the disease.
10.	no	"- -"	There is no legislation/sanitary policy for tularemia. Measures such as the screening/detection of epizooties in hare and wild rodents, the regulation of importations of rodents and lagomorphs, the protection of the exploitations against intrusion of wild rodents, the compulsory declaration of all the suspicions of tularemia in man and in animals, etc. should protect against the risk for emergence.
11.	no	"0"	The disease is not concerned by changes in industrial or technological processes.
12.	yes	"+++"	There are problems of detection of emergence (wild fauna, lack of knowledge by breeders, by the veterinary and medical world, no compulsory declaration). These problems of detection represent a risk factor for emergence of the disease.
13.	yes	"++"	There are increases in interactions between the animal compartments (mainly the wild fauna, during the hunting period for example). Because the disease is transmissible by direct contact, inhalation, ingestion, etc., this represent a risk factor for emergence of the disease.
14.	no	"+"	There is no real increase in interactions between humans and lagomorphs (except during the hunting period), but because the disease is zoonotic, an increase in interaction (for example, manipulation of the carcasses during the hunting) could represent a risk factor of seasonal transmission to man. Because humans only rarely retransmit the disease, the risk factor for emergence of the disease in the animal population is weak.
15.	no	"0"	There is no significant demographic growth in Belgium. The disease is not concerned by a demographic growth.
16.	yes	"++"	There is a growth of the animal populations concerned by the disease (wild fauna: lagomorphs, rodents, ticks) in Belgium. This is a risk factor for emergence of the disease.

17.	yes	"+"	Human traveling is increasing but this has no influence on the risk for emergence of the disease in the animal population (only weak risk for emergence in the human population)
18.	yes	"+"	Human tourism is increasing. This has no influence on the risk for emergence in the animal population, but represents a little risk for infection of humans (via increased risk for contact with ticks, ecological and bucolic tourism, increase of hunting restaurants and game meals.
19.	yes	"++"	There is an increase in trade of lagomorphs (see point 2.9: increase in game meals during the hunting period, etc.). This is a risk factor for emergence of the disease in the human population, but not in the animal population.
20.	yes	"++"	There is an increase in transport of lagomorphs (during the hunting period). This is a risk factor for emergence of the disease in the animal population.
21.	yes	"+"	Tularemia is concerned by the bio-terrorist threats because the bacteria are transmissible to humans through healthy skin or by inhalation and because the infectious dose is very weak. This represents a risk factor for emergence for humans, but not for animals. Note that the bacterium is very difficult to cultivate and that the risk is weak.
22.	yes	"- - -"	There are intensive production systems of rabbits, because there is no contact with the wild fauna, which is the reservoir of the germ, this constitutes a protection factor against emergence.
23.	yes	"++"	There are extensive production systems of rabbits. The possibility of contacts with the wild fauna and its dejections is a risk factor for emergence
24.	yes	"+"	Most of domestic (cats) and many wild animals (foxes, boars, mustelidae) are frequently asymptomatic carriers of the bacteria. Cats can transmit the bacteria to humans. Because the weak epidemiological role of these species, it represents a weak risk factor for the emergence of the disease.
25.	yes	"+++"	Hares and rodents represent the wild reservoir of the disease. Prairie dogs, sporadically present in Belgium since 1980, also. There is a possible trans-ovarian transmission in ticks, which are also considered as reservoir. Because the wild fauna is difficult to control, the wild animal reservoir is an important risk factor for emergence of the disease.
26.	no	"+"	There is no long incubation period in the most sensitive animal species: rodents and lagomorphs die after 1 to 2 weeks (short period). The length of the incubation period has no influence on the risk for emergence of the disease.
27.	yes	"+++"	Wild rodents can enter stables of domestic animals, which is a risk factor of infection of domestic mammals and a risk factor for emergence of the disease.
28.	yes	"+++"	The animal reservoir is a wild reservoir (hares, rodents). Because the wild fauna is difficult to control, this represent an important risk factor for emergence of the disease.
29.	yes	"+++"	There is a growth in the demography of the lagomorphs and of the wild rodents. A growth in demography of the wild fauna is a risk factor for emergence of the disease because the wild fauna is difficult to control.
30.	yes	"0"	There are climatic and meteorological changes, but they can have protective and/or risk effects on the emergence. For example, a softening of the climatic conditions with more rain (soft winters) will favor the survival of the bacteria and also the possibilities of transmission, because of the multiplication of the bacteria and of the target or intermediary animal species (mammals and arthropods) = risk factor. On the other hand, colder conditions (hard winters) represent a protection factor because animal and bacterial populations do not multiply (or to a lesser extend), and consequently the infectious and epidemiological pressures do not

			increase.
31.	no	"+"	Changes in the eco-landscaped structure of the forests (ex. North of America) favor the ticks pullulation. This would represent a risk factor for emergence, but such changes in ecosystems do not exist in Belgium.
32.	yes	"--"	There is an ongoing urbanisation in Belgium. Urbanisation has protective effects against emergence (decrease contacts between humans and wild fauna, decrease of the forest areas and of the wild fauna population).
33.	yes	"++"	There exist a vectorial transmission of the disease via ticks, but the quantification of their role in the transmission of the disease is difficult to estimate. Tick transmission is a risk factor for emergence of the disease.

Leishmaniose (*Leishmania infantum*) (Gallego, 2004 ; Dujardin, 2006)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	Very little is known at present about genetic variability because (i) there is little agreement on the exact taxonomy of *L. infantum* sl. and (ii) there is little precise information about the importance of the 'sexual' part (genetic recombination) in the lifecycle (as is the case for all trypanosomatids). A genetic variability would have no influence on the risk for emergence of this disease.
2.	Yes	"++"	There exists considerable confusion on the division between cutaneous leishmaniosis (CL) and visceral leishmaniosis (VL). E.g. there is a so-far unpublished thesis from Rabat University that shows that *L. tropica*, traditionally considered cause of TL, also causes VL in Morocco. A lack of knowledge represents always a risk factor for emergence.
3.	No	"+++"	There is no change in the pathogenesis. Changes in the pathogenesis would represent a risk factor for the emergence of the disease. For example, selection of parasites resistant to the drugs would increase the risk of emergence of resistant Protozoa. Dogs can constitute an important reservoir for the emergence of resistant strains because their teatment is difficult.
4.	Yes	"++++"	There are treatment difficulties and absence of available vaccine. These are risk factors for emergence.
5.	Yes	"+++"	Leishmania can infect different domectic and sylvatic animals, which become infectious. This is a risk factor for emergence and expansion of the disease.
6.	yes	"0"	The disease is zoonotic but humans are dead-end hosts and can not infect the vector, except in the case of immunocompromised persons where the parasite is dermotrope. In case of co-infection with the VIH (immunosuppression), there is a possibility of selection of drug-resitstant organisms, which can constitute a risk factor for emergence of potentially first line drug resistant leishmaniosis.
7.	Yes	"+++"	There is a geographical extension of the disease around the Mediterranean. There are sporadic human cases in Belgium (10 human cases per year, of which one Belgian case in 2007, with the other cases originating from all the continents, Europe included (Italy, Spain, Turkey). Recent expansion in the North of Italy. Ectopic outbreaks in France due to the frequent movements of dogs (in the Loire, etc.), which could stabilise in the future. Climatic evolution models indicate the possibility of outbreaks in the South of the United-Kingdom in 2030. The geographical extension of the agent represents a risk factor of emergence of the disease in Belgium.

8.	Yes	"++"	There are increases in incidence of the disease in other countries. This represents a risk factor of emergence of the disease in Belgium.
9.	No	"0"	The Protozoan does not persist in the environment (only persistence in the vector). A persistence in the environment would have no influence on the risk for emergence.
10.	Yes	"- - -"	There is a surveillance system in Belgium for humans (Tropical Medicine Institute) but not for animals. The existence of surveillance systems are protection factors against emergence.
11.	No	"0"	Disease not concerned by changes in technological or industrial processes.
12.	Yes	"+++"	There are problems of detection of the emergence (examples?). This represents a risk factor for emergence.
13.	Yes	"++"	The peri-urbanisation and the more frequent contacts of the citizen / dogs with the nature increase the proximity between dogs and larval forms of phlebotomes. This represents a risk factor for emergence of the disease.
14.	Yes	"++"	There is a proximity between domestic dogs and humans. The role of dogs as infection source for humans has been established, but this occurs via a vectorial bite, without needing a direct interaction. There are more frequent contact of the citizen with the nature. This increases the risk of bite by phlebotomes and the risk for human infection. These are risk factors for emergence of the disease in humans, but not in animals, because humans can not retransmit the disease to animals
15.	No	"0"	There is no significant demographic growth in Belgium. A human demographic growth would have no influence on the risk for emergence of the disease in the animal population.
16.	no	"+++"	There is no true increase in the dog population in Belgium. An increase in the reservoir animal population would represent a risk factor for emergence of the disease.
17.	yes	"++"	Human traveling is increasing. The mobility allows the colonisation by new species of Leishmania. This represent a risk factor of emergence of the disease.
18.	yes	"++++"	Human tourism is increasing. There are imported human cases of leishmaniasis in Belgium due to touristic activities (trips). This is a risk factor of emergence of the disease in humans, but not in the animal populations.
19.	Yes	"++"	There is an increase in trade of dogs. This represents a risk factor of emergence of new species of Leishmania.
20.	Yes	"++"	There is an increase in transport of dogs. This represents a risk factor of emergence of new species of Leishmania.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	No	"0"	The disease is not concerned by the production systems
23.	No	"0"	The disease is not concerned by the production systems
24.	Yes	"++++"	The dogs do not present clinical signs. As a consequence, they are not treated and can retransmit the disease. This represents a risk factor for emergence of the disease.
25.	yes	"++++"	Dogs are the main animal reservoirs, but there is also a high number of implicated sylvatic and domectic animal species (62 different mammals, foxes, wolves, renards, loups, jackals, ...), but not in Belgium. Cats (exceptionally). This represents a risk factor of emergence of the disease.
26.	Yes	"++++"	The long incubation period without clinical signs allows the transmission of the disease via the phlebotomes. This constitutes a risk factor of emergence of the disease.
27.	yes	"+++"	There are numerous susceptible sylvatic mammals. The possibility of contacts between domestic dogs and cats and these sylvatic

			mammals favours the transmission of the disease. This represents a risk factor of emergence of the disease in the animal population.
28.	yes	"+++"	There are numerous susceptible wild mammals able to transmit the infection to the domestic animals and humans via the phlebotomes. This represents a risk factor of emergence of the disease.
29.	no	"+++"	There is no increase in the wild fauna population in Belgium. Because wild animal can retransmit the disease, an increase would represent a risk factor for emergence of the disease.
30.	Yes	"++++"	There are climatic and meteorological changes. The climatic changes (warming) constitute an important risk factor for geographical extension of the disease towards temperated regions via modifications in the distribution of the vectors (extension towards the North), via an increase in the density of vectors (lenghtening of the activity period with the increase in temperature), and via an increase in the number of infected vectors. Thanks to the increase in temperature, the phlebotomes can overwinter at larvae stadia. This represents a risk factor for emergence of the disease.
31.	no	"++"	Natural and human-induced changes in the ecosystems (for ex. deforestation) can lead to modifications in the range and density of the vectors and the reservoirs and represent a risk factor for emergence of the disease. But such changes in ecosystems do not occur at present in Belgium.
32.	Yes	"++"	There is an ongoing urbanisation in Belgium (peri-urbanisation). This is a risk factor for emergence of the disease in dogs because it increases the contacts between dogs and vectors.
33.	Yes	"++++"	The implicated phlebotomes are present in Belgium. Once infected, the phlebotome remains infected all the life (during months). The vectorial activity is concentrated in the summer perio. The vectors move below 1 km from the larvae form, situated mainly near the herbivore farms. The presence of the vector is an important risk factor of emergence of the disease.

Rage chez la chauve-souris (Lyssavirus 1 et 2 européens) (Bengis *et al*., 2004 ; Cliquet and Picard-Meyer, 2004)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+++"	Lyssaviruses are RNA viruses which typically have a high mutation rate. 4 new genotypes have been recently isolated in bats in Asia and in East Europe. A mutation that changes the disease characteristics in bats toward more agression, might facilitate transmission the transmission to humans or to other anial species. Genetic variability is a risk factor for emergence.
2.	yes	"+++"	There is lack of knowledge of the pathogenesis. Bats are protected species and especially the insectivorous European species are difficult to keep in captivity. For these reasons, there are almost no experimental infection studies in bats and there is limited knowledge on the behaviour of these lyssaviruses in their reservoir host, the bat. Studies are necessary to study the ecology of bats and and the viral transmission between bats. The lack of knowledge in pathogenesis is a risk factor for emergence of the disease.
3.	no	"++"	Currently, there is no observed change in the pathogenesis. Transmission to ther species, such as men, is rare although the viruses are relatively prevalent in certain European bat species. This is probably due to the fact that the typical rabid aggressive

			behaviour is seldomly seen in European bats. Probably this is because the pathogenesis of European bat lyssaviruses is different from the classic rabies virus. A mutation might change the pathogenesis, what should represent a risk factor, because it might change the behaviour of these lyssaviruses towards the phenotype of the classic rabies virus, with an increased appearance of rabid behaviour (agressivity) in bats and transmission to humans (as is the case in the USA) = variation in the interaction host-pathogen.
4.	yes	"++"	It is difficult to vaccine wild species (bats). This is a risk factor for emergence.
5.	yes	"+++"	Several cases of transmission to other species have been described in Europe (1 marten in Germany, 2 house cats in France, 2 sheep in Denmark). The possibility to pass the species barrier is a risk factor for emergence in new animal populations.
6.	yes	"0"	The bats can transmit the infection to humans. But since humans do not retransmit the virus, they are dead-end hosts. The zoonotic character of the disease is not a risk factor for emergence (no influence).
7.	yes	"++"	The disease is present in all Europe. This is a risk factor for emergence.
8.	yes	"++"	There are increases in incidence in other countries than Belgium. These increases have a direct influence on the risk for emergence in Belgium because bats (wild life) are capable to move from one country to another independently of the borders. The increase in incidence in the other countries is a risk factor for emergence.
9.	no	"0"	The virus is not able to persist in the environment. The possibility of viral persistence in the environment should have no influence on the risk for emergence because transmission requires a contact between animals.
10.	yes	"++"	Bats are protected by law. This implies that epidemiological research or other types of research are only allowed after specific derogation by the competent authorities. In this case, the legislation represents a risk factor for emergence. In 1999, an infected bat transited through Belgium from Africa towards France. The legislation about importation should be reinforced and the controls should be more rigourous.
11.	no	"0"	No influence of changes in technological or industrial processes for the risk for emergence of this disease.
12.	yes	"+++"	It is dificult to obtain samples for analysis and surveillance. Bat conservationist groups in Belgium are rather protective and it is difficult to gain their confidence and cooperation with regard to obtaining samples of diseased or dead specimens for analysis. Bats are wildlife species. This can lead to a problem of detection of emergence and is a risk factor for emergence.
13.	no	"++"	There is no specially increase in interactions between bats populations and other animal populations, but favourising contacts between bats and other animal species increases the risk for transmission and of emergence in other species.
14.	yes	"0"	Bat conservationists are at highest risk for being contaminated by bats. Several groups are active in Belgium with growing numbers of members. Disappearance of natural biotopes (abandonned buildings, forrests,...) may force bat colonies to move nearer to human dwellings. Since men do not retransmit the infection (dead-end host), the increase in interactions between humans and animals has no influence on the risk for emergence in the animal population.
15.	no	"0"	There is no significant demographic growth in Belgium. The emergence of the disease is not concerned by a demographic growth, because humans are dead-end hosts.
16.	no	"++"	There is no growth of the bat species population which is the most concerned (Eptesicus serotinus). A growth should represent a risk factor for emergence of the disease in this animal population.
17.	yes	"0"	Human traveling is increasing, but bats are not concerned by human travels. No influence of this factor on the risk for emergence

			of the disease in this animal population.
18.	yes	"0"	Human tourism is increasing, but bats are not concerned by human tourism. No influence of this factor on the risk for emergence of the disease in this animal population.
19.	no	"0"	Bats are not concerned by trade. This factor has no influence on the risk for emergence. Note that in 1999, an infected bat transited through Belgium from Africa towards France.
20.	no	"0"	Bats are not concerned by transport. This factor has no influence on the risk for emergence. Note that in 1999, an infected bat transited through Belgium from Africa towards France.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"0"	Bats are wild fauna, which is not concerned by the production systems. No influence of this factor on the risk for emergence.
23.	no	"0"	Bats are wild fauna, which is not concerned by the production systems. No influence of this factor on the risk for emergence.
24.	yes	"+++"	There are asymptomatic infected bats. This is a risk factor for emergence because asymptomatic animals can transmit the disease without being detected.
25.	yes	"+++"	The animal reservoir is the wild bats population. Since wild life is difficult to control/watch, this is a risk factor for emergence.
26.	yes	"+++"	Infections by Lyssaviruses are characterised by a long incubation period. A long incubation period allows the viral transmission without being detected, which increases the risk for emergence of the disease.
27.	yes	"+++"	There are contacts between bats and sensible animal species. Since the passage of the species barrier is possible, this constitutes a risk factor for emergence of the disease in these other animal species.
28.	yes	"+++"	The wildlife has an epidemiological role since wild bats are the reservoir. Wildlife is dificult to control. This is a risk factor for emergence of the disease.
29.	no	"+++"	There is no growth of the bat species population which is the most concerned (Eptesicus serotinus). Since bats are the main host of the disease, a grouwth would represent a risk factor for emergence of the disease.
30.	yes	"+"	There are climatic and meteorological changes. Bats can be migratory. Changes in climate may change their natural territory. Soft winters and abundance of insects are ideal to increase bat populations. The changes in climate and meteorology are risk factor for emergence of the disease.
31.	yes	"++"	There are changes in biotopes produces by man. Reduction of natural biotopes may force bats to live nearer to human dwellings or other animal populations. It can have an influence on the risk for infection of humans or other animal populations, but not on the risk for emrgence in the bat population.
32.	yes	"++"	There is an ongoing urbanisation in Belgium. Some bat species are good adapted to the urban environment. That can increase the risk.
33.	no	"0"	Non vectorial disease. No influence on the risk for emergence.

Anaplasmose (*Anaplasma phagocytophillum*)

Factor	Presence	Impact	Scientific justification

	(yes) / absence (no)	(risk / protection / no effect)	
1.	No	"+"	There is no genetic variability of the bacteria. A genetic variability of the bacteria should represent a risk factor for emergence of the disease.
2.	yes	"++"	There is a general lack of knowledge of the pathogenesis of the obligate intracellular bacteria. A lack of knowledge of pathogenesis represents a risk factor for emergence of the disease.
3.	No	"++"	There is no known change in the pathogenesis of anaplasmosis. A change in the pathogenesis should represent a risk factor for emergence of the disease.
4.	yes	"+++"	There are questions concerning the efficacy of vaccination (due to the lack of knowledge on pathogenesis, and to the fact that the bacteria grow intracellularly). The difficulty to control the disease by vaccination represents a risk factor for emergence.
5.	Yes	"++"	The bacteria are capable to infect numerous mammal species, which can all re-infect the ticks. This represents a risk factor for emergence.
6.	Yes	"0"	The bacteria can be transmitted to humans. Because humans are accidental hosts (dead-end hosts not capable to retransmit the infection to the ticks), this has no influence on the risk for emergence.
7.	Yes	"+++"	There is a geographical extension of the pathogenic agent which is largely distributed in North of America, in Europe and in Asia. This is a risk factor for emergence.
8.	No	"++"	There is no significant increase of incidence in neighboring countries. An increase in incidence would represent a risk factor.
9.	No	"0"	The bacteria grow strictly intracellularly and are not capable to survive in the environment outside the vector (the ticks are not considered as "environment"). The persistance in the environment would have no effect on the risk of emergence because the transmission necessitates a vector bite.
10.	No	"0"	There is no legislation and there are no official sanitary measures. Knowing the epidemiology of the disease (the transmission is obligatory vectorial and ticks are difficult to control by legislation; impossibility to control the infection of the animal population by ticks), the existence of a legislation for animals would have no influence on the risk for emergence of the disease in animals.
11.	No	"0"	The disease is not influenced by changes in technological or industrial processes.
12.	Yes	"+++"	There are problems of detection of the emergence (lack of knowledge by the breeders, veterinarians and by the medical world, resulting in a lack of diagnosis and an underestimation of the disease. Mammals remain asymptomatic carriers for life). The lack of detection of the disease is a risk factor for emergence of the disease.
13.	Yes	"++"	There are increased interactions between the animal compartments concerned by the disease. The proximity between the several animal hosts increases the probability of bites by infected ticks. This is a risk factor for emergence of the disease.
14.	No	"0"	There is no increase in the interaction between the concerned animal populations and humans. Such an increase would incease the risk for bite of humans by infected ticks, and sould be a risk factor for infection in humans. But because humans do not retransmit the infection (accidental host), this would not represent a risk factor for emergence of the disease in the animal population.
15.	No	"0"	There is no significant demographic growth in Belgium. Human demographic growth should have no influence on the risk for

			emergence because humans are accidental hosts and do not retransmit the infection.
16.	No	"++"	There is no growth of the animal populations concerned by the disease. Due to the increase of the infection pressure, an increase in animal populations would represent a risk factor of emergence for the disease.
17.	Yes	"0"	Human traveling is increasing. This increases the risk for human infection, but this has no influence on the risk for emergence in the animal populations in Belgium because humans are accidental hosts.
18.	Yes	"+"	Human tourism is increasing. There are certain touristic activities (in forest), increasing the risk for infection in humans and in their companion animals.
19.	Yes	"0"	There is a general increase in trade, but this has no influence on the epidemiology of the disease nor on the risk for emergence. Since the disease is already prevalent in Belgium, the risk for importation of infected animals has no influence on the risk for emergence of the disease.
20.	yes	"0"	There is a general increase in transport, but this has no influence on the epidemiology of the disease nor on the risk for emergence. Since the disease is already prevalent in Belgium, the risk for transport of infected animals has no influence on the risk for emergence.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"- -"	There are intensive production systems (cattle, etc.). Intensive productrion system avoids contact with the vector in natural biotopes and acts as protector factor.
23.	yes	"++"	There are extensive production systems (cattle, etc.). Extensive production system allows and enhances contact with the vector environment and then constitutes an effective risk factor.
24.	Yes	"++"	Many mammal hosts remain, once infected, asymptomatic carriers for life, ensuring a reservoir role capable to retransmit the infection to the ticks. This is a risk factor for emergence of the disease.
25.	yes	"++"	Many mammal hosts remain, once infected, asymptomatic carriers for life, ensuring a reservoir role capable to retransmit the infection to the ticks. This is a risk factor for emergence of the disease.
26.	yes	"++"	The incubation period can be long in animals. This is a risk factor for emergence because these animals are not detected and have more chances to retransmit the disease before becoming diseased.
27.	yes	"++"	There are contacts between domestic animals and wildlife. This is a risk factor for emergence because proximity favors the vectorial transmission by the ticks, especially when the wildlife is asymptomatic.
28.	Yes	"++"	Numerous wild mammal species (cervidae, foxes, rodents, maybe birds) constitute the natural reservoir of the bacteria in Europe. This is a risk factor for emergence of the disease.
29.	No	"++"	There is no increase in the demography of the wild fauna concerned by the disease. Since the wild fauna plays a role of natural reservoir of the disease, an increase in demography of the wild life would constitute a risk factor for emergence of the disease.
30.	Yes	"++"	There are climatic and meteorological changes,(more rains in the winter and more dry periods in the summer, for example) which can induce changes in the distribution and activity of the ticks. Ixodes ricinus live in temperate regions (biotope: high humidity), and the ticks are twice more active and mobile when the weather is warm and dry. Climatic changes could constitute a risk factor for emergence of the disease via a modification of the ecosystems which could become more favorable to the proliferations of the vector.

31.	Yes	"+++"	There are changes in the ecosystems produced by man. Modifications of the soils state or occupation (drainage, forest fragmentation, short cut, etc.) and the humidity favor the populations of ticks. These are risk factors for emergence.
32.	Yes	"0"	There is an ongoing urbanisation in Belgium.The urbanization is a protection factor against infection of humans and domestic animals (dogs) because of the less frequent possibilities of contact with the ticks. Attention, urbanization in the suburbs can increase the possibilities of contact with the ticks. Urbanization has no influence on the risk for emergence of the disease because humans are accidental hosts
33.	Yes	"++++"	The vector (ticks Ixodes ricinus) is present in Belgium and this is the main risk factor for emergence of the disease.

Fièvre catarrhale ovine (Orbivirus sérotype 8 + autres sérotypes)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+"	There exists a genetic variability in the RNA viruses, associated with a risk for reassortment. Other serotypes than serotype 8 are currently absent in Belgium, but are prevalent in neighbouring countries (France for ex.). Genetic drift and shift may increase (but also decrease) the virulence of the disease. Serotype alone does not determine the virulence of individual field strains of BTV.
2.	yes	"++"	There is lack of knowledge of the pathogenesis of the disease (for the several serotypes). This lack of knowledge is a risk factor for emergence (lack of detection, for example)
3.	yes	"++"	There have been changes in pathogenesis, namely concerning serotype 8. Changes in pathogenesis can affect the intensity of clinical signs in some sensitive animal species (namely cattle) or induce new features on transplacental infections. This is also possible for other serotypes. Changes in pathogenesis are a risk factor for emergence.
4.	yes	"++"	In Belgium vaccination against BTV8 came too late, and most susceptible animals were already infected by the natural way. Duration of protection after vaccination is not exactly known but limited in time. Natural infection however would give lifelong immunity. Concerning other emergent serotypes, the unavailability of specific vaccines is a risk factor. Moreover, we cannot anticipate the emergent serovar and we cannot prevently vaccine the animals again all serotypes. Difficulties related to the vaccination represent a risk factor for emergence of viral diseases.
5.	yes	"0"	Not only ruminants may be infected: many carnivores and some rodents may also be infected. But since their role in the epidemiology of the disease seems to be insignificant, the change of the host spectrum has no influence on the risk of emergence of the disease.
6.	no	"0"	The disease is not zoonotic. There is no influence of this factor on the risk for emergence.
7.	yes	"++++"	The several serotypes of Bluetongue viruses (can) spread geographically. This is a risk factor for emergence of new strains in Belgium.
8.	yes	"+++"	In other countries (neighbouring countries and other), there are increases in incidence of serotypes absent in Belgium (for example, serotype 1). This is a risk factor for emergence due, for example, to an increase in the risk for importation of an animal infected by a serotype absent in Belgium.

9.	no	"0"	The virus can not persist in the environment outside the vector. Even if it was able to persist in the environment, this should have no influence of the risk for emergence since transmission involves the action of a vector.
10.	yes	"- -"	There are sanitory policy measures (mandatory vaccination, restrictions of movements, mandatory notification, screenings, etc.). These are protection factors against emergence.
11.	no	"0"	Bluetongue is not concerned by changes in technological or industrial processes.
12.	yes	"+++"	There have been problems of detection of the serotype 8 in 2005-2006 (difficulties to recognise and diagnose unusual clinical signs, difficulties of declaration by farmers and veterinarians, etc.). Problems of detection of infectious disease are risk factors of emergence because it results in a spread of the disease without control measures.
13.	yes	"++"	There are increasing interactions between animal compartments, for example through and transport. Moving infected animals in free areas is a risk factor for emergence of the disease in the uninfected animal populations.
14.	no	"0"	There are increasing interactions between the ruminant populations and the humans. Since the disease is not zoonotic, an increase in such interactions will not influence the risk for emergence.
15.	no	"0"	There is no significant demographic growth in Belgium. This should have no influence on the risk for emergence since the disease is not zoonotic.
16.	no	"++"	There is no increase in the ruminant population in Belgium. An increase in the animal population concerned by the disease should represent a risk for emergence of the disease (higher transmission rates).
17.	yes	"0"	Human traveling is increasing, but humans are not involved in the risk of spread of the disease (only risk of transport of infected vectors)
18.	yes	"0"	Human tourism is increasing, but humans are not involved in the risk of spread of the disease (only risk of transport of infected vectors).
19.	yes	"+++"	Animal trade is increasing. This is a risk factor for emergence, through the risk for importation of animals infected by serotypes against which the animal population is not immunised.
20.	yes	"+++"	Animal transport is increasing. This is a risk factor for emergence through the risk for transport of animals infected by serotypes against which the animal populations are immunologically naive.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"++"	There are intensive production systems for ruminants in Belgium. The high density of the animal population increases the risk for infection (higher transmission rates) and of emergence. Moreover, in Belgium usually more C.obsoletus/scoticus were captured inside than outside the stables.
23.	yes	"++"	There are extensive production systems for ruminants in Belgium. The presence of animals on pasture increases the risk for contact with the vectors and the risk for emergence
24.	yes	"+++"	There are asymptomatic carriers, which can disseminate the infection without being detected, confined or treated. This is a risk factor for emergence.
25.	yes	"++"	The animal reservoirs are the domestic and wild ruminants, but wildlife has no important reservoir function, since seroprevalence decreased in Belgian deer in 2008 (mostly in juveniles) (Linden *et al*. Emerging Inf dis 16, 833-836, 2010). A wild reservoir is a risk factor for spread of the disease because it is difficult to control. A domestic animal reservoir is also a risk factor for spread of the

			disease.
26.	no	"0"	The incubation period of Bluetongue disease is not especially long. The length of the incubation period has no influence on the risk for emergence because the vectors do not need the presence of clinical signs to bite animals and transmit the viruses.
27.	yes	"++"	There are possibilities of (proximity) contacts between domestic and wild ruminants. Proximity between the two animal populations favours the viral transmission through culicoïdes. This is a risk factor for dispersion of the disease.
28.	yes	"++"	The wild fauna (ruminants) has an epidemiological role in the transmission of the disease because it is a (not very important) reservoir. It is a risk factor because wild fauna is difficult to control and vaccine.
29.	yes	"+"	There is an increase in the wild cervids population. Since wildlife plays a (not important) epidemiological role, this is a risk factor for emergence.
30.	yes	"++"	There are climatic and meteorological changes. Global warming is a risk factor for emergence because higher temperatures increase the vectorial capacity and competence for BT virus, increase the survival and activity of the vectors, change the geographical distribution areas of these vectors (Northern hemisphere). In Belgium, these changes are not so important, and Culicoides was already there since a long time.
31.	yes	"+"	There are (few) changes in the ecosystems favouring the presence of culicoides. This is a (weak) risk factor for viral propagation.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. Urbanisation has no influence on the risk of emergence of the disease. Culicoides have been seen in farms and barns. Consequently, urbanisation does not decrease nor increase the presence of culicoides.
33.	yes	"++++"	The vectors responsible for the transmission of the disease are present in Belgium (Culicoides). This is an important risk factor for establishment and expansion of new viral serotypes in Belgium if such new serotypes are introduced.

Echinococcose (*Echinococcus granulosus*)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	There is no genetic variability. A genetic variability would have no influence on the risk for emergence of this disease.
2.	no	"+"	There is no lack of knowledge on the pathogenesis. A lack of knowledge represents always a risk factor for emergence.
3.	No	"+"	There is no change in the pathogenesis. A change in pathogenesis could always represent a risk factor of emergence of the disease.
4.	yes	"+++"	Vaccination against parasites is mostly problematic (efficiency, etc.). This is a risk factor of emergence of the disease.
5.	No	"++"	The parasite can already infect several animal species but, due to the absence of genetic variability, there is no possibility to infect additional animal species. A passage of the species barrier would represent a risk factor for emergence of the disease.
6.	yes	"0"	The disease may be accidentally zoonotic. Since humans do not excrete the parasite in the feces (no definitive host) and consequently are not capable to retransmit the disease, there is no influence of the risk for emergence in the animal population.
7.	No	"++"	There is currently no geographical extension of the disease. A geographical extension would increase the risk for dispersion and

			for emergence of the disease.
8.	No	"++"	There is no increase in incidence in other countries. An increase in incidence in other countries would represent a risk factor of emergence of the disease in our country.
9.	yes	"++"	The infectious parasite can persist in the environment in the feces of the definitive hosts (for ex. in pastures) and be ingested by the intermediate hosts; this is a risk factor for emergence of the disease in the animal population.
10.	yes	"- -"	There are legislations and measures: the parasite is on the list of zoonotic diseases to be monitored (zoonoses Directive); post mortem inspection of ruminant carcasses at the slaughterhouse; destruction of offal at the slaughterhouse to avoid infection of dogs; but there is no official surveillance in the definitive hosts and no measures in wild and domestic canids. The legislation and the sanitary policy measures are always protection factors against emergence.
11.	no	"0"	The disease is not concerned by changes in technological or industrial processes.
12.	yes	"++"	There are problems of detection of emergence (no true surveillance programme aiming at detecting an increase in incidence but only punctual prevalence studies for research activities; the disease is asymptomatic in the definitive hosts). These problems are risk factors for emergence.
13.	yes	"++"	There is an increase in interaction between the animal compartments concerned by the disease (dogs and sheep). This represent a risk factor for transmission of the disease and for emergence.
14.	yes	"0"	There is an increase in interactions between canids and humans. This has no influence on the risk for emergence in the animal population because humans do not retransmit the parasite.
15.	no	"0"	There is no significant demographic growth in Belgium. The emergence of the disease is not influenced by a human demographic growth.
16.	no	"+++"	There is no growth of the animal populations concerned by the disease. Such a growth would represent a risk factor for emergence of the disease.
17.	Yes	"0"	Human traveling is increasing. This has no influence on the risk for emergence of the disease in the animal population since humans do not retransmit the parasite to animals.
18.	Yes	"++"	There is an increase in touristic activities. This is a risk factor for emergence of the disease in dogs (increased probability of eating offal of intermediate hosts such as sheep carcasses).
19.	Yes	"+"	There is an increase in trade of dogs. This can be a risk factor for importation of infected dogs and a weak risk factor for emergence ("weak" because the disease is already endemic in Belgium)
20.	Yes	"+"	There is an increase in transport of dogs. This can be a risk factor for dispersion of infected dogs and a weak risk factor for emergence ("weak" because the disease is already endemic in Belgium)
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"- -"	There are no intensive sheep production systems in Belgium. Intensive production systems can protect against emergence by decreasing the possibilities of interaction of these domestic intermediate hosts with pastures potentially contaminated by feces of infected definitive hosts (dogs or foxes)
23.	Yes	"+++"	There are extensive sheep production systems in Belgium. This is a risk factor for emergence of the disease because it allows sheep to graze on pastures potentially contaminated by feces of infected dogs.

24.	Yes	"++"	The dogs (and foxes) are asymptomatic carriers. This allows the dissemination of the parasite in the environment and infection of the intermediate hosts. This is a risk factor for emergence of the disease.
25.	Yes	"+++"	The canids are the reservoir of the disease. Because of their epidemiological role in the transmission of the disease and the possibility of asymptomatic carriage, this represents a risk factor for emergence of the disease
26.	Yes	"0"	There is a long incubation period in animals, linked to the asymptomatic carriage. Because the excretion of the parasite and transmission of the disease does not depend on the presence of clinical signs, this has no influence on the risk for emergence of the disease.
27.	Yes	"0"	There are possibilities of direct contact between the intermediate domestic hosts (for example sheep kept outside) and definitive wild hosts (foxes). However, direct contacts are not necessary to keep going the parasitic cycle because infection of canids occurs via ingestion of offal of infected sheep and infection of domestic intermediate hosts (sheep) occurs via grazing or ingesting feed contaminated by feces of infected canids. Moreover, foxes play only a minor role as definitive host in comparison with dogs. Consequently, it is considered that the contacts between domestic animals (sheep) and wildlife (foxes) has no influence on the risk of emergence.
28.	no	"++"	Wild foxes (definitive hosts) play only a minor epidemiological role in the transmission cycle of the parasite in comparison with domestic dogs. Wild cervids (intermediate hosts) can be a source of infection for the dogs. Nevertheless, the epidemiological role of the wild fauna is minor in comparison with the role of dogs and sheep in the transmission cycle of the disease. If they had a more important epidemiological role, the wild definitive and intermediate hosts, because they are able to transmit the parasite, would represent a risk factor for emergence of the disease.
29.	Yes	"0"	The last ten years, populations of foxes have increased and extended (in Flanders and in peri-urban zones). There is also an increase in the populations of wild cervids. Because wildlife does not play an important epidemiological role, this has no influence on the risk for emergence of the disease.
30.	Yes	"0"	There are climatic and meteorological changes, but the emergence of the disease is not concerned by such changes.
31.	no	"0"	There are no changes in ecosystems allowing the emergence of the disease
32.	Yes	"++"	There is an ongoing urbanisation in Belgium. Foxes in cities could increase the risk of emergence of th disease
33.	no	"0"	Non vectorial disease.

Artérite virale équine (Arterivirus)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+++"	There exists a genetic variability. This is a risk factor for emergence.
2.	yes	"++"	There is lack of knowledge of the pathogenesis. This is a risk factor for emergence
3.	yes	"++"	There are changes in pathogenesis with emergence of more virulent variants, namely in France in 2007. There are differences between Europe and USA, where there have been abortion "storms". These changes in pathogenesis are risk factors of

			emergence.
4.	yes	"+++"	There are few vaccines, which are few tested (but which seem to have an effect of reduction of the viral excretion). These difficulties to control disease by vaccination are risk factor for emergence of the disease.
5.	no	"+++"	There is no passage of the species barrier, and this is a protection factor against emergence. A passage of the species barrier (infection via the respiratory way) would represent a risk factor for emergence.
6.	no	"0"	The disease is not transmissible to humans.
7.	yes	"+++"	There is an extension of geographical distribution. This is a risk factor for emergence.
8.	yes	"+++"	An increase in incidence is observed since several years, associated with an increase in animal movements and transport of sperm. This is a risk factor for emergence because it increases the risk for infection.
9.	no	"0"	There is no persistence of the virus in the environment. According to the transmission pathways, a persistence in the environment should not be a risk factor for emergence.
10.	yes	"- - - -"	There is a control at importation of stallions (certificates). This is a protection factor against emergence.
11.	no	"0"	This disease is not concerned by this factor
12.	yes	"+++"	Due to the chronic asymptomatic carriage, there are difficulties of detection of the disease, which represents a risk factor for viral dissemination. The difficulty of detection is a risk factor for emergence.
13.	yes	"++"	There is an increase in interactions between horse populations because horses travel more and more internationally (races, jumpings, etc.). An increase in interactions between horses population represent a a risk factor for emergence.
14.	no	"0"	There is no increase in interactions between horses and humans populations. This would have no influence on the risk for emergence of the disease.
15.	no	"0"	There is no significant demographic growth in Belgium. This disease is not concerned by a human demographic growth.
16.	no	"0"	There is no growth of the horse population. According to the transmission pathways, a growth of the horses population would not influence the risk for emergence.
17.	yes	"0"	Human traveling is increasing. According to the transmission pathways and to the fact that the disease is not zoonotic, such an increase would have no influence on the risk for emergence.
18.	yes	"0"	Human tourism is increasing. According to the transmission pathways and to the fact that the disease is not zoonotic, such an increase would have no influence on the risk for emergence.
19.	yes	"+++"	There is an increase in trade of horses and of sperm. This represents a risk factor for emergence of the disease.
20.	yes	"+++"	There is an increase in transport of horses and of sperm. This represents a risk factor for emergence of the disease.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"0"	Horses are not concerned by production systems
23.	yes	"0"	There are extensive production systems for horses in Belgium (pasture). This has no influence on the risk of emergence of the disease.
24.	yes	"++++"	There is a life asymptomatic carriage by chronic infected stallions. Because these stallions are not systematically detected, this is a risk factor for emergence.
25.	no	"0"	There is no animal reservoir; an animal reservoir should not represent a risk factor for emergence.

26.	no	"++"	The incubation period is not especially long for this disease. A long incubation period would represent a risk factor for emergence of the disease because is should allow the diffusion of the virus without detection of the infection. However, the legislation (certificates) would limit this risk.
27.	no	"0"	Disease not concerned by the wildlife
28.	no	"0"	Disease not concerned by the wildlife
29.	no	"0"	Disease not concerned by the wildlife
30.	yes	"0"	There are climatic and meteorological changes. Disease not concerned by climatic changes
31.	no	"0"	Disease not concerned by changes in ecosystems
32.	yes	"0"	There is an ongoing urbanisation in Belgium. Disease not concerned by urbanisation
33.	no	"0"	Non vectorial disease

Entérite nécrotique chez la volaille (*Clostridium perfringens*)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"++"	There are variants (toxinotypes) depending on the strains. In a same toxinotype, varaition of pathogenicity could be observed, especially linked to the ability of toxin expression and level of expression. Moreover, some genes coding for toxins are situated on mobile elements (plasmids) capable to be transferred, but this possibility is not studied. The genetic variability represents a risk factor for emergence of new variants.
2.	yes	"+++"	There is a lack of knowledge of the pathogenesis of the disease. During years, the pathogenesis was thought to be understood at the bacteriologic level (toxin alpha), but today, contradictory results concerning the implicated toxins are published. The circumstances of the apparition of the enterotoxaemia in the animals are not well understood. The most difficult is to determine with precision the management and feeding conditions allowing the start of pathology. These lacks of knowledge of the pathogenesis constitute risk factors of emergence of the disease (for example by impeding to take adequate prevention measures).
3.	no	"++"	There are no changes in the pathogenesis (see point 1.1: there is no genetic variability), which represent a protection factor against the emergence of the disease. Changes in the pathogenesis would represent a risk factor for emergence of the disease.
4.	yes	"++"	There are practical difficulties to control the disease by vaccination. Moreover, new research results are published, calling previous theories into question. These difficulties concerning the vaccination represent a risk factor for emergence of the disease.
5.	no	"0"	The possibility of passage of the species barrier is unknown (the basis of a potential host specificity is unknown), but it is considered that the pathogenic strains of C. perfringens are host-specific. The origin of the pathology is the own intestinal flora of the animal, in a specific flock. So, there is no influence of a possible passage of the species barrier on the risk of emergence.

6.	yes	"0"	The disease is not considered to be zoonotic (the strains are host specific; the pathogenesis of the disease in humans is totally different from the one in poultry), but the possibility exists. If the possibility existed (in theory), this would have no influence on the emergence in the animal population.
7.	no	"0"	Clostridium perfringens are commensal bacteria which are already present everywhere in the intestines of the animals and in the environment. So, there is no geographical extension of the agent possible. However, there is a geographical extension of the "disease". Because the bacteria is already ubiquitous, a geographical extension of the disease has no influence on the risk for emergence.
8.	yes	"0"	There is an increase in incidence of the disease in other countries, but this has no influence on the emergence of the disease in Belgium, because the bacteria are already ubiquitous in the intestines of the animals and in the environment.
9.	yes	"0"	The type A is ubiquitous and can survive in soil and dust, and also in the intestine of animals. The persistence in the environment has no influence on the risk for emergence of the disease because the bacteria is already commensal and ubiquitous in the intestine of the animals.
10.	yes	"++"	There is no specific legislation about necrotic enteritis in poultry, but the re-emergence of the disease is associated to the interdiction of using some antibiotics as additive in poultry feed (this decision is founded on human health protection, inter alia to limit extension of antibiotics resistance). Interdiction of using antibiotics as additive represents a risk factor of emergence of the disease.
11.	yes	"+++"	There are changes in the technological and industrial processes related to poultry production, for example, in relation with their nutrition (prohibition of use of antibiotic growth promoters) The best known predisposing factor is mucosal damage, caused by coccidiosis. Diets with high levels of indigestible, water-soluble non-starch polysaccharides, known to increase the viscosity of the intestinal contents, also predispose to necrotic enteritis). This represents a risk factor for enterotoxaemia in the animals, and consequently a risk for emergence of the disease.
12.	yes	"++"	There are problems of detection of the emergence (the disease is under-diagnosed in animals because the clinical signs are unspecific). However, anatomopathologic lesions and bacteriological count are known. Problems to detect the disease represent a risk factor for emergence of the disease, because under-detection delays the taking of preventive measures.
13.	no	"0"	There is no increase in interactions between the animal compartments concerned by the disease (poultry, cows, pigs). Such an increase would have no influence of the risk for emergence because the pathogenic strains of C. perfringens are host-specific and an increase in interaction should not result in a passage of the species barrier. Increases in interactions between different poultry populations would have no influence of the risk for emergence of the disease in the poultry populations because the bacteria are already ubiquitous.
14.	no	"0"	There is no increase in interactions between poultry and humans. Such an increase would have no influence of the risk for emergence because the pathogenic strains of C. perfringens are host-specific and an increase in interaction should not result in a passage of the species barrier.
15.	no	"0"	There is no significant demographic growth in Belgium. The disease is not concerned by a human demographic growth.
16.	no	"0"	There is no growth of the poultry population in Belgium. Such an increase would have no influence on the risk of emergence because the origin of the pathology is the own intestinal flora of the animal.

17.	Yes	"0"	Human traveling is increasing. The disease is not concerned by an increase in human traveling.
18.	Yes	"0"	Human tourism is increasing. The disease is not concerned by the increase in tourism.
19.	Yes	"0"	There is an increase in trade of poultry, but because the bacteria is ubiquitous, this has no influence on the risk for emergence of the disease. However, because the pathogenesis is no entirely known, the importation of more sensitive poultry for example cannot be excluded.
20.	Yes	"0"	There is an increase in transport of poultry, but because the bacteria is ubiquitous, this has no influence on the risk for emergence of the disease.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	Yes	"+++"	There are intensive poultry production systems, which constitute risk factors for emergence of the disease linked to the changes in nutrition processes (exact mechanism unknown).
23.	Yes	"- -"	There are extensive poultry production systems, which are protective against emergence of the disease (mechanism?).
24.	yes	"++"	The strains of the toxinotype A are usual commensal germs of the intestine of the animals. Potentially all poultry is a carrier as typa A is a normal inhabitant of intestinal flora. This is a risk factor for emergence of the disease because the strains of the toxinotype A which are responsible for the enterotoxaemia are particular (other toxins? other factors?) and are not present in all the exploitations.
25.	yes	"+"	The intestines of the poultry are a natural reservoir of the host specific toxinotype A of C. perfringens, in addition to soils and environment. This is a risk factor for emergence because if additional factors are added (nutrition?), the disease can occur.
26.	no	"0"	In the case of C. perfringens, there is no incubation period, but rather a normal asymptomatic carriage. The development of the pathology is due to additional (nutritional) circumstances.
27.	yes	"0"	There can be contacts between domestic poultry and wildlife, but this has no influence on the risk for emergence because wildlife does not play any epidemiological role.
28.	no	"0"	The wildlife does not play any epidemiological role, and this has no influence on the risk for emergence of the disease.
29.	no	"0"	The disease is not concerned by the wild life demography
30.	yes	"0"	There are climatic and meteorological changes, but this does not have any influence on the emergence of the disease.
31.	yes	"0"	There are changes in the ecosystems produced by man, but this does not have any influence on the emergence of the disease.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. No influence of the urbanisation on the risk of emergence
33.	no	"0"	Non vectorial disease.

TSE atypique chez les petits ruminants (prions)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+++"	Strains of different profiles exist. The breeding for genetic resistance could lead to the selection of hypervirulent atypical strains.

			This can represent a risk factor for emergence.
2.	yes	"+++"	There is lack of knowledge of the pathogenesis (due to the weak number of observed cases, to the difficulty to realise experiments). The lack of knowledge of pathogenesis is a risk factor for emergence.
3.	yes	"++"	The atypical TSE present different characteristics than the classical TSE. A modification in their pathogenicity could modify the epidemiology of the disease and favor emergence.
4.	yes	"++"	There is no vaccine. If no vaccination, no protection and higher risk of emergence.
5.	yes	"++"	There is a possibility of transmission between the ruminant species. It is a risk factor for emergence.
6.	no	"0"	Atypical scrapie is considered as being not zoonotic. Even if the disease was transmissible to humans, this should not have any influence on the risk for emergence because humans should be dead-end hosts and should not retransmit the disease.
7.	yes	"++"	There is an extention in the geographical distribution of the agent. Since a geographical extension reveals an extension of the contamination via the animal of via contaminated matters from the animal, this represents a risk factor for emergence.
8.	yes	"++"	There is an increase in incidence of the disease in other countries. An increase in incidence in other countries increases the risk for emergence in Belgium, due to the risk for transport of infected animals or animal products.
9.	yes	"++++"	The prion can persist in the environment. This favours the transmission between animals and is a risk factor for emergence.
10.	yes	"- - -"	The existing legislation is an important protection factor against the emergence of the disease.
11.	yes	"+++"	There are changes in the technological or industrial processes. BSE appeared namely because of the changes in the industrial processes of production of meat and bone meals. This is a risk factor for emergence of prion diseases. Technological changes could also lower the risk.
12.	yes	"++"	There is a problem of declaration of the clinical signs by farmers and a lack of sensibility of the diagnostic test. These are risk factors of emergence.
13.	no	"++"	There are no increases in interactions between animal populations concerned by the disease. Since scrapie and other TSE, as well as CWD are transmissible, increases in interactions would represent a risk factor for emergence of the disease.
14.	no	"0"	There is no increase in interactions between ruminants and humans. Since the disease is not known to be zoonotic, increases in interactions should not have any influence on the risk for emergence.
15.	no	"0"	There is no significant demographic growth in Belgium. Since the disease is not zoonotic, a human demographic growth should not have any influence on the risk for emergence.
16.	yes	"+"	There is currently an increase in the goat population (sector in expansion) in Belgium. An increase constitutes a (weak) risk factor for emergence.
17.	yes	"0"	Human traveling is increasing, but this has no influence on the risk for emergence in the cattle population.
18.	yes	"0"	Human tourism is increasing, but this has no influence on the risk for emergence in the cattle population.
19.	yes	"++"	There is an increase in animal trade. This is a risk factor through the risk for importation of infected animals.
20.	yes	"+++"	There is an increase in animal transports. This increases the risk for transport of infected animals or infected animal products, and the risk for emergence.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"++"	There are intensive production systems for ruminants in Belgium. This constitutes a risk factor for emergence, due to the use of

			industrial feed (see origin of BSE) and to the transmission via contaminated soil.
23.	yes	"+"	There are extensive production systems for ruminants in Belgium. Extensive production, with grazing and contacts between animals, favour certain TSE, such as scrapie, for example. This is a weak risk factor for emergence.
24.	yes	"+++"	Ruminants infected by an atypical TSE do never develop the typical symptomatology. This increases the risk for non detection and the risk for emergence of the disease.
25.	yes	"++"	There could be an animal reservoir in small ruminants but data are lacking on pathogenesis and epidemiology to estimate a transmission risk from this reservoir. The distribution of PrPd in atypical TSE is rather limited (e.g. no lymphoid involvement) compared to classical TSE (scrapie). This is a risk factor for emergence of the disease as the sensitivity of the present tests is unknown and most cases are without clear clinical signs.
26.	yes	"+++"	The incubation period is long for the TSE, specially the atypical TSE. This increases the risk for transmission of the non detected disease and the risk for emergence of the disease.
27.	yes	"+"	There are contacts between small ruminants and wildlife. Since the disease is transmissible, this can favour the transmission and is a risk factor for emergence.
28.	no	"+"	The wild fauna does not play any epidemiological role. Since the disease is transmissible, an epidemiological role of wildlife would increase the risk of emergence of the disease.
29.	no	"+"	There is no increase in demography of the wildlife concerned by the disease. Since the disease is transmissible, an increase in demography of the wildlife would represent a risk factor of emergence of the disease.
30.	yes	"0"	There are climatic and meteorological changes. No influence on the risk of emergence.
31.	no	"0"	No influence of possible changes in ecosystems.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. No influence of urbanisation on the risk for emergence.
33.	no	"0"	Non vectorial disease.

Myotathie atypique des équidés

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	Impossible to answer this question because up till now, the causative agent is unknown.
2.	yes	"++++"	There is lack of knowledge of the pathogenesis. The etiology of the disease is unknown. This is an important risk factor for emergence because this lack of knowledge makes the prevention and the etiological treatment difficult.
3.	yes	"+"	Changes in the pathogenesis are observed: these last years the disease affect populations of different age - old horses have been affected during the last clinical series; the recent cases we have seen showed clinical signs a little bit different as the cases we have seen before; the mortlity rate seems to decrease with time. A change in pathogenesis could always represent a risk factor of emergence of the disease.

4.	yes	"0"	There is no vaccine. Several horses that have survived from atypical myopathy have died from the condition after a second outbreak of the disease (several months later). These cases question about the efficacy of vaccination. It is, at the present time, impossible to answer the question as the pathogenesis of the disease and the etiology are unknown.
5.	no	"0"	Currently, there are no indications that the species barrier can be passed. The syndrome only affects horses. No influence on the risk for emergence.
6.	no	"0"	No possibility of transmission to humans. No influence on the risk for emergence.
7.	yes	"++++"	There is a geographical extension of the disease: the disease is present since 2000 in Belgium and is present in most of the European countries. This expansion may be due to a modification in the environment rather than to any effect of an "infectious" agent. This extension is a risk factor, particularly since the pathogenesis is unknown.
8.	yes	"++"	Since about ten years, an increase in incidence (emergence) is observed. This is a risk factor of emergence of the disease.
9.	no	"++++"	Pastures at risk have been identified, but this may be due to topographical specific environmental conditions rather than to the presence (persistence) of an "infectious" agent. The disease is especially observed in horses on pastures, in the spring or the fall. If the agent persisted in the environment, that would represent a risk factor for emergence of the disease.
10.	no	"0"	There is no legislation. This has no impact on the risk for emergence because the etiological agent is unknown.
11.	yes	"++"	Most of horses affected by atypical myopathy belong to persons poorly informed about how to manage a pasture. Lack of technological knowledge is more often the reason of the poor quality of the pasture. Poor quality of pastures appears to be a risk factor for the disease.
12.	no	"++"	The disease is clinically very easy to diagnose. Because alerting for the emergence of (seasonal) clinical series may enable to take temporarily preventive measures, the easy diagnosis prevents the emergence. Problems of detection of the disease would represent a risk factor for emergence of the disease.
13.	yes	"0"	There is in general an increase in interactions between horses (competitions, …), but it is unknown if this is a risk factor for emergence because it is unknown if the disease is transmissible. It is assumed that interactions have no influence on the risk for emergence. Horses affecetd by atypical myopathy are not in competition. Most of them are non working horses kept at pasture. The use for work is a protective factor for the condition.
14.	no	"+"	There are no increases in interactions between horses and humans. An increases would represent a risk factor because horses might be more often kept in badly managed pastures, which is a risk factor for developing the disease.
15.	no	"0"	There is no significant demographic growth in Belgium. Non-zoonotic diseases are not concerned by human demographic growth.
16.	no	"0"	There is no growth of the equine population. A growth in the population would have no effect on the risk for emergence.
17.	yes	"0"	Human traveling is increasing. Disease not concerned by an increase in human traveling.
18.	yes	"0"	Human tourism is increasing. Disease not concerned by an increase in tourism.
19.	yes	"0"	No influence of an increase in horses trade
20.	yes	"0"	No influence of an increase in number of horse transports
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"+++"	There are no intensive horse production systems in Belgium. Intensive production systems (overgrazing; more animals on small pastures) can increase the risk for emergence.

23.	yes	"+++"	There are extensive production systems for horses in Belgium (pasture). Because atypical myopathy is a pasture-associated disease (stabling decreases the risk), extensive production systems (animals on pasture) can increase the risk for emergence of the disease.
24.	no	"0"	Asymptomatic horses (i.e. subclinically affected horses) exist but they should not be considered as potential carriers but rather as horses temporarily affected. These horses are not susceptible to transmit the atypical myopathy, because the disease is rather associated to grazing than to an infectious agent. The subclinical infection has no influence on the risk for emergence.
25.	no	"0"	There are no known animal reservoirs susceptible to transmit the disease. No influence on the risk for emergence.
26.	no	"0"	The incubation period is not long (although one week of grazing is necessary before the appearence of the clinical signs). Since the disease is not contagious, a long period of incubation would have no influence on the risk for emergence of the disease.
27.	yes	"0"	There can be contacts between horses and wild fauna, but since the wild fauna is not concerned by the disease, this has no influence on the risk for emergence.
28.	no	"0"	The wild fauna is not concerned by the disease (not infected, no epidemiological role).
29.	no	"0"	The wild fauna is not concerned by the disease
30.	yes	"++++"	There are climatic and meteorological changes. The risk is linked to the environmental conditions on pastures (poor quality), and to the season (spring and fall). The climate and environmental changes are risk factors of emergence of the disease.
31.	no	"0"	There are no changes in ecosystems. Changes in the environmental characteristics of the pastures have no influence on the risk for emergence.
32.	yes	"0"	There is an ongoing urbanisation in Belgium, but which has no influence on the risk for emergence
33.	no	"0"	Non vectorial disease. No influence.

Fièvre aphteuse (Aphtovirus)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"+++"	There is a genetic variability, but currently no genetic variability capable to contribute to the risk for emergence. A genetic variability capable to contribute to the risk for emergence (ex. change in host spectrum towards new animal species) should represent a risk factor for emergence of the disease.
2.	no	"+"	FMD was studied very completely and there is no lack of knowledge of the pathogenesis. A lack of knowledge represents always a risk factor for emergence.
3.	no	"++"	There is no change in the pathogenesis. A change in the pathogeny should be a risk factor for emergence (for ex. prolonged incubation period)
4.	yes	"++++"	A vaccine is available and is efficient in an epidemiological point of view, but preventive vaccination is not authorized in Belgium,

			which represent a difficulty to control the disease by vaccination. Moreover, differentiation between vacinated animals and infected ones is not perfect. These difficulties are a risk factor of emergence of the disease.
5.	no	"+++"	Currently, there are no indications of a possibility of passage of the species barrier, except the known susceptible species. Such a possibility would represent a risk factor for emergence of the disease in new animal species.
6.	no	"0"	Non zoonotic disease (or very very rarely and/or theoretically).
7.	no	"++++"	Currently, there is no extension of the geographical distribution of the agent (but could change rapidly). Since the virus is high contagious and can even cross the Channel under favourable climatic conditions (cf England in 2001 and 2007), a geographical extension would represent a very important risk factor for emergence.
8.	yes	"++++"	There have been recent cases in Bulgaria. Since the virus is highly contagious, an increase in incidence in a neighbouring country should represent an important risk factor for emergence in Belgium (dispersion by air, risk at importation).
9.	no	"+++"	Even if the virus can be relatively resistant in the outer environment, it is not considered that it can persist in the environment. According to the transmission pathways, the viral persistance in the environment should represent a risk factor for transmission and of emergence.
10.	yes	"- - - -"	There is a legislation concerning preventive (ex. control of importations) and control measures (ex. slaughtering). These are protection factors against emergence of the disease.
11.	no	"0"	The disease is not concerned by this factor
12.	yes	"+++"	There are difficulties of detection of the disease based on the passive surveillance (for ex. sheep express almost no clinical signs) and difficulties of notification. These are risk factors of emergence of this high contagious disease
13.	no	"+++"	There are currently no increases in interactions between the animal host populations. Such increases should increase the risk for viral diffusion and would represent a risk factor for emergence.
14.	no	"+++"	Currently, there are no increases in interactions between the concerned animal populations and humans. According to the possibility of indirect transmission of the virus between exploitations via human activities, such increases in interactions would represent a risk factor for emergence.
15.	no	"0"	There is no significant demographic growth in Belgium. Non zoonotic disease and no influence of a demographic growth.
16.	no	"++"	Currently, there are no growths of the susceptible animal populations. Because the animal density has an influence on the transmission rate, such a growth would be a risk factor for emergence.
17.	yes	"++"	Human traveling is increasing. This is a risk factor for emergence (risk for transport of materials infected by the resistant virus).
18.	yes	"++"	Human tourism is increasing. This is a risk factor for emergence (risk for transport of materials infected by the resistant virus).
19.	yes	"+++"	There is an increase in trade. Due to the high risk at importation (living animals and freezed meat), this is a risk factor for emergence of the disease.
20.	yes	"+++"	There is an increase in transport. Due to the high risk at importation (living animals and freezed meat), this is a risk factor for emergence of the disease.
21.	yes	"++"	There is an increase in terrorism worldwide. Currently, the disease not concerned by bioterrorism. If it was the case (cf second World war), this would be a risk factor for emergence.
22.	yes	"+++"	There are intensive production systems concerning the susceptible animal populations. This is a risk factor for emergence

			because a high animal density favours viral transmission.
23.	yes	"+++"	There are extensive production systems concerning the susceptible animal populations. This is a risk factor for emergence because it favours the aerogen transmission of the virus between herds.
24.	no	"+++"	There can be animals without clinical signs (during the 2001 FMD outbreak in the UK infected sheep did almost show no clinical symptoms). Asymptomatic carriage is a risk factor for spread of this highly contagious disease.
25.	no	"++++"	There is no animal reservoir (rather in Africa). An animal reservoir should be an important risk factor for emergence
26.	no	"++"	There is no specially long incubation period. A long incubation period would represent a risk factor for emergence, due to the speed of the transmission. The low incubation period is protective against emergence.
27.	yes	"+++"	There are possibilities of contacts between domestic ruminants and the wild fauna. It is an important risk factor for transmission and of emergence (in case the wild fauna is infected, cf in Africa).
28.	no	"+++"	The wild fauna has currently no epidemiological role. If the wild fauna (cervids and other ruminants) had an epidemiological role (cf in Africa), it should represent a risk factor for emergence (see transmission pathways).
29.	yes	"0"	There is an increase in the demography of wild cervids in Belgium. Since the Belgian wild fauna does not play currently an epidemiological role (see higher), an increase in its demography should have no influence on the risk for emergence.
30.	yes	"0"	There are climatic and meteorological changes, but which have no influence on the risk for emergence.
31.	no	"0"	No influence of this factor
32.	yes	"0"	There is an ongoing urbanisation in Belgium. No influence of this factor
33.	no	"0"	Non vectorial disease. No influence of this factor.

Peste porcine africaine (Asfivirus)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"+++"	There is no genetic variability. A genetic variability should be a risk factor for emergence of new subtypes. The absence of genetic vriability is a protection factor against the emergence of new subtypes.
2.	yes	"+++"	There is lack of knowledge of the pathogenesis of this disease, for example concerning the immunopathogenesis of the infection. The lack of knowledge on pathogenesis is a risk factor for emergence.
3.	yes	"+++"	Changes in pathogenesis are sometimes reported in the Russian Federation, and EFSA recommends more research. A change in the pathogenesis (for example, longer incubation period, new host, etc.) would represent a risk factor for emergence.
4.	yes	"++++"	There are difficulties concerning the vaccination, due to the insufficient understanding of the immunity against the disease. The absence of vaccination is a risk factor for emergence of the disease.
5.	no	"0"	This disease concerns only domestic and wild suidae. A crossing of the species barrier is improbable.

6.	no	"0"	Non zoonotic disease and no influence on the risk for emergence
7.	yes	"++++"	The disease is present in Africa and in Sardinia. Since more recently, there is a worrying geographical extension of the disease and a threat for Europe from Russia and Caucasus. This is a risk factor for emergence in our countries.
8.	yes	"++++"	The disease is at risk for introduction in the Iberian peninsula where it has already previously been identified. It is also present in Africa, Sardinia and Russia. This is a risk factor for emergence in our countries.
9.	no	"+++"	The virus is not very resistant in the environment but could persist a few weeks (?). EFSA recommands more research about this. The persistance in the environment should represent a risk factor for emergence.
10.	yes	"- - - -"	The sanitary measures taken in case of an outbreak (for example, slaughtering) are protective factors against expansion of the disease.
11.	no	"0"	This disease is not concerned by changes in technological or industrial processes.
12.	yes	"++++"	Since the last outbreaks date from several years, there is a lack in practice experience of some farmers/veterinarians, leading to a risk for absence of early detection of this high contagious disease. Detection in wild boars is also difficult. These are risk factors of emergence of this high contagious disease. The performance of the tests is not a problem.
13.	yes	"++"	There are increasing contacts between domestic pigs (outdoor) and wild boars. This increases the risk for transmission of the disease to domestic pigs (from the wild fauna). This is a risk factor for emergence.
14.	no	"0"	There are no increasing interactions between humans and pigs/boars populations in Belgium. Since the disease is not zoonotic, such an increase should not have any influence on the risk for emergence.
15.	no	"0"	There is no significant demographic growth in Belgium. No influence of a human demographic growth.
16.	yes	"+++"	There is no increasing pigs population currently in Belgium but Flanders is a region with a high density pig population. An increase should represent a risk factor for emergence because a high density of the swine population should favor the spread of the disease.
17.	yes	"+++"	Human traveling is increasing. This is a risk factor for emergence, associated with the risk for importation of contaminated meat or meat products.
18.	yes	"++"	Human tourism is increasing. This is a risk factor for emergence, associated with the risk for importation of contaminated meat or meat products.
19.	yes	"++++"	There is an increase in trade. Importation of risk products (meat from infected animals and from prevalent countries), in which the virus can resist for a very long time, is an important risk factor for introduction and emergence of the disease.
20.	yes	"++++"	There is an increase in transports. Transport of risk products (meat or delicatessen from infected animals and from prevalent countries), in which the virus can resist for a very long time, is an important risk factor for introduction and emergence of the disease.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"+++"	There are intensive production systems of pigs in Belgium. The high swine density increases the possibility of spread of the disease, which is a risk factor for emergence.
23.	yes	"++++"	There are extensive production systems of pigs in Belgium. This is a risk factor for emergence in the domestic pigs population through possibilities of contact with wild boars. Another reason is the possibility to introduce the virus by swillfeeding animals

			containing infected pork meat.
24.	yes	"+++"	There are no true asymptomatic carriers, but depending on the age of the animals, there can be animals without clinical signs. EFSA recommends more research. The presence of asymptomatic carriers represents a risk factor for spread of this high contagious disease.
25.	no	"++++"	Wild suidae are an animal reservoir, but mainly in Africa, and not in Belgium or in neighbouring countries. The presence of an animal reservoir in Belgium should represent a risk factor for emergence of the disease in the domestic pigs populations.
26.	no	"++++"	There is no long incubation period, which is a protection factor against the emergence. The presence of a long incubation period would represent a risk factor, due to the possibility of spread of the disease by asymptomatic undetected animals.
27.	yes	"++++"	There are contacts between domestic pigs and wild boars (for example, in extensive production systems). If the virus was present in the Belgian wild boar population, or in a neighbouring country, it should be a risk factor for emergence because of the possibility of transmission through direct contact. But currently, there is no presence of the virus in wild boars of Belgium or of neighbouring countries.
28.	no	"++++"	Since Belgian wild boars are not infected (are only infected in Africa), the Belgian wildlife does not currently play an epidemiological role. If there were infected wild boars in Belgium, this would represent an important risk factor for emergence in the domestic pigs population.
29.	yes	"+++"	Since a decade, we observe an increase in wild boars populations due to enhanced fertility and better natural feeding (abundance of natural feed as acorns, rodents, …). This represents a risk factor for emergence if this population was infected.
30.	yes	"0"	There are climatic and meteorological changes. Current virological, entomological and epidemiological data do not suggest that the disease, which is transmitted by suidae, can be influenced by the climatic changes. An EFSA working group is going to evaluate the possibility of influence of this factor on African swine fever.
31.	no	"+++"	There are no changes in the ecosystems in Belgium. If there were changes in the ecosystems which could modify the boars distribution and allow the presence of soft ticks, this would contribute to the risk for emergence.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. No influence of the urbanisation on the risk for emergence.
33.	no	"++++"	Soft ticks are not present in Belgium currently, which is a protection factor against emergence, although the disease can be also transmitted directly without the action of a tick. If these ticks were present in Belgium, this should represent an important risk factor for emergence of the disease. Here also EFSA suggest more research.

Peste porcine classique (Pestivirus)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"++"	Despite the existence of several CSF strains, the virus is stable. The presence of a genetic variability should represent a risk factor for emergence.
2.	yes	"++"	In agreement with the Discontools Gap analysis, there is a lack of knowledge: host factor determinating clinical outcome; viral

			factors that determine the virulence of the CSF isolate; immunopathogenisis. These lacks of pathogenesis are risk factors for emergence of the disease.
3.	no	"++"	There are viral factors which determine the virulence of the CSF viruses. This is a risk factor for emergence of more virulent strains.
4.	yes	"++"	A good vaccine exists, but preventive vaccination of domestic pigs is not authorized in Belgium, which represent a difficulty to control the disease by vaccination. Vaccination of wild boars is effective (EFSA), despite some difficulties due to the oral route of vaccination. Vaccination is protective against emergence. Difficulties concerning the vaccination are a risk factor for emergence of the disease.
5.	no	"0"	This disease concerns only domestic and wild suidae. A crossing of the species barrier is improbable.
6.	no	"0"	Non zoonotic disease and no influence on the risk for emergence
7.	yes	"+++"	There is currently no real geographical extension of the disease towards Belgium. However, the disease is present in wild boar in Germany, but seems to be under control through the vaccination; the situation in Romania and Bulgaria is unclear; the situation in the Russian Federation is also unclear. If there was a geographical extension towards Belgium, this should represent a risk factor for emergence.
8.	yes	"+++"	There are increases in incidence of the disease in other countries (for example, in Germany). Considering the intracommunity transports of pigs, the increase in incidence in one country represents a risk for introduction of the disease in Belgium.
9.	no	"+++"	The virus is not very resistant in the environment (maybe a few weeks after secretion/excretion). The reemergence in earlier vaccinated boar populations is sometimes difficult to understand, and the possibility of persistence in the environment will be searched for in a research project on classical swine fever. If the virus was capable to persist in the environment, it should represent an important risk factor for emergence. (Here, meat and frozen meat are not considered as "environment").
10.	yes	"- - -"	The sanitary measures taken in case of an outbreak (for example, slaughtering) are protective factors against expansion of the disease if the sanitary measures are well applied. Feeding with kitchen waste is now absolutely prohibited. These measures are protection factors against emergence.
11.	no	"0"	This disease is not concerned by changes in technological or industrial processes.
12.	yes	"+++"	Since the last outbreaks date from several years, there is a lack in practice experience of some farmers/veterinarians, leading to a risk for absence of early detection of the clinical signs of this high contagious disease. There are pigs with subclinical infection, leading to difficulties of detection. Detection in wild boars is also difficult. Contraints induced by the sanitary measures constitute un important risk factor of under-notification These are risk factors of emergence. The performance of the tests is not a problem.
13.	yes	"++"	There are increasing contacts between domestic pigs (outdoor) and wild boars. This increases the risk for transmission of the disease to domestic pigs (from the wild fauna). This is a risk factor for emergence.
14.	no	"0"	There are no increasing interactions between humans and pigs/boars populations in Belgium. Since the disease is not zoonotic, such an increase should not have any influence on the risk for emergence.
15.	no	"0"	There is no significant demographic growth in Belgium. No influence of a human demographic growth.
16.	yes	"+++"	There is no increasing pigs population currently in Belgium but Flanders is a region with a high density pig population. An increase should represent a risk factor for emergence because a high density of the swine population should favor the spread of the

			disease.
17.	yes	"++++"	Human traveling is increasing. This is a risk factor for emergence, associated with the risk for importation of contaminated meat or meat products.
18.	yes	"++++"	Human tourism is increasing. This is a risk factor for emergence, associated with the risk for importation of contaminated meat or meat products.
19.	yes	"++++"	There is an increase in trade. Importation of risk products (meat or delicatessen from infected animals and from prevalent countries), in which the virus can resist for a very long time, is an important risk factor for introduction and emergence of the disease.
20.	yes	"++++"	There is an increase in transports. Transport of risk products (meat or delicatessen from infected animals and from prevalent countries), in which the virus can resist for a very long time, is an important risk factor for introduction and emergence of the disease.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"+++"	There are intensive production systems of pigs in Belgium. The high swine density increases the possibility of spread of the disease and is a risk factor for emergence.
23.	yes	"++"	There are extensive production systems of pigs in Belgium. This is a risk factor for emergence in the domestic pigs population through possibilities of contact with wild boars. Another reason is the possibility to introduce the virus by feeding animals with scraps of meat (cuisine waste) containing infected pork meat.
24.	yes	"+++"	There are no true asymptomatic carriers, but depending on the age of the animals, there can be animals without clinical signs. Wild boars can be asymptomatic carriers. Asymptomatic carriage is a risk factor for spread of this highly contagious disease.
25.	yes	"+++"	Wild boars are animal reservoirs. There is no infected wild boar in Belgium, but wel in Germany, a neighbouring country. The presence of an animal reservoir in Germany represents a risk factor for introduction of the disease in Belgium.
26.	yes	"+++"	Depending of the age of the animals, there can be a longer incubation period of the disease. A long incubation period is a risk factor, due to the possibility of spread of the disease by asymptomatic undetected animals.
27.	yes	"++++"	There are contacts between domestic pigs and wild boars (for example, in extensive production systems). Because of the possibility of transmission of the disease through direct contact, this is a risk factor for emergence. There are no infected wild boars in Belgium, but the presence of the disease in wild boars in Germany could have an influence.
28.	yes	"+++"	Since wild boars are an animal reservoir of the disease, the wild fauna plays an epidemiological role. Because wild life is difficult to control, the presence of infected wild boars in a neighbouring country (Germany) is a risk factor for emergence in Belgium.
29.	yes	"+++"	Since a decade, we observe an increase in wild boars populations due to enhanced fertility and better natural feeding (abundance of natural feed as acorns, rodents, …). This represents a risk factor for emergence if this population was infected.
30.	yes	"0"	There are climatic and meteorological changes. But current virological, entomological and epidemiological data do not suggest that the disease, which is transmitted by suidae, can be influenced by the climatic changes.
31.	yes	"+"	Development of crow culture changes the ecosystem and gives more chance to increase wild boars populations. This is a risk factor for emergence of the disease.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. No influence of the urbanisation on the risk for emergence.

33.	no	"0"	No vectorial disease, no influence of this factor.

Fièvre du Nil occidental (Flavivirus) (Bengis *et al*., 2004 ; Chevalier *et al*., 2004 ; Glaser, 2004)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"++"	There exist more virulent strains. For example the severity of the expansion in the USA was due to (1) the immunologically naive status of the US population and (2) a particularly virulent strain. The same happened recently in Europe. Genetic variability is a risk factor if the strain is more virulent.
2.	yes	"++"	There is lack of knowledge of the pathogenesis which could explain some emergences: for example, the poorly known role of vectors in the cycle maintenance-dissemination of the virus, the molecular determinism of the virulence variations, the possible bird to bird transmission. The lack of knowledge is a risk factor
3.	yes	"+++"	There are changes in pathogenesis depending on the genetic variability. For example, the American strain is more virulent than the European one. The change of pathogenesis is a risk factor for emergence.
4.	yes	"++"	There is an available and authorized vaccine for horses in Belgium, but vaccination of the horses will not control emergence since horses are dead-end hosts. Vaccination of (wild) birds is impossible. Difficulty to vaccinate birds is a risk factor for emergence
5.	yes	"+++"	The virus can infect numerous receptive bird species which are capable to transmit the virus effectively. This is a risk factor for emergence. The virus can also infect other mammals, but these are dead-end hosts which do not contribute to the propagation of the disease and consequently have no influence on the risk for emergence/expansion.
6.	yes	"0"	The disease is transmissible to humans, and this is a risk factor for emergence of the disease in the human population. But since humans are dead-end hosts, this has no influence on the risk for emergence and propagation in the animal population.
7.	yes	"++++"	There are more and more cases in the South of France, Italy, Hungary, Romania and recently in Austria. The emergence in the North of Europe is a risk factor for emergence in Belgium.
8.	yes	"++++"	There is an increase in incidence in the South of France, Italy, Hungary, Romania, Austria. This is a risk factor for emergence in Belgium.
9.	no	"0"	The virus can not persist in the environment outside the vector. Even if it was able to persist in the environment, this should have no influence of the risk for emergence since transmission involves the action of a vector.
10.	yes	"- -"	The current legislation and sanitary policies are protection factors against emergence: mandatory notification of disease, Ministerial decree of 29th september 1992, recent Royal decree, contingency plan, efficient diagnostic tests.
11.	no	"0"	There are no changes in technological or industrial processes concerning domestic birds or horses. No influence on the risk for emergence.
12.	yes	"++++"	There are many asymptomatic infections by humans and horses, detection of high mortality rates by birds is difficult. Detection of emergence can only be late. Problems of detection of emergence are risk factors of emergence since the disease can disseminate without being detected.

13.	no	"++"	There is no increase in interactions between the concerned animal populations (horses, wild birds, domestic birds). If infected migratory birds transport the virus to Belgium, this should be a risk factor of introduction and dissemination of the disease in horses and birds in Belgium. This risk for introduction is possible because the viruses can persist several days in birds, allowing a viral transport from South of France or from Austria. The risk for dissemination of the disease also exists since the vectors are present in Belgium.
14.	no	"0"	There is no increase in (vectorial) interactions between humans and horses/birds. Since humans are dead-end hosts, an increase in interactions between human and bird/horse populations could increase the risk for emergence in humans (immunologically naive human population), but not in the animal populations capable to spread the infection. No influence on the risk for emergence in the animal populations.
15.	no	"0"	There is no significant demographic growth in Belgium. A human demographic change should have no influence on the risk for emergence of the disease in Belgium because humans are dead-end hosts.
16.	no	"+++"	There is no growth in the equine and bird populations in Belgium. If there was such a growth, it could increase the risk for emergence (birds are capable to transmit infection).
17.	yes	"0"	Human traveling is increasing, but this has no influence on the risk of introduction of the disease in Belgium because humans will not introduce the virus (dead-end hosts).
18.	yes	"0"	Human tourism is increasing but this has no influence on the risk of introduction of the disease in Belgium because humans will not introduce the virus (dead-end hosts).
19.	yes	"+++"	There is an increase in trade. Trade of birds or of goods (which can contain infected mosquitoes) is a risk factor (cf outbreak in the USA). Importation of horses (for example, from Romania) increases the risk for introduction but not the risk for propagation of the disease in Belgium, because horses are dead-end hosts.
20.	yes	"+++"	There is an increase in transport. International transport is a risk factor for introduction of the disease because it allows movements of infected mosquitoes, (illegal) importation of infected birds and importation of goods which can contain infected mosquitoes (cf outbreak in the USA). Transport of horses is not a risk factor for emergence since horses are dead-end hosts.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"0"	Wild birds, which are responsible for the propagation and dissemination of the disease, are not production species, and are not concerned by production systems. No influence of production systems on the emergence of West Nile disease.
23.	no	"0"	Wild birds, which are responsible for the propagation and dissemination of the disease, are not production species, and are not concerned by production systems. No influence of production systems on the emergence of West Nile disease.
24.	yes	"++++"	Migratory birds can transport the viruses asymptomatically over long distances. This is an important risk factor for emergence.
25.	yes	"++++"	The animal reservoirs of the disease are the (wild) birds which are difficult to control. This is an important risk factor for emergence.
26.	no	"0"	The incubation period of West Nile disease is not particularly long. The length of the incubation period has no influence on the risk for emergence because the vectors do not need the presence of clinical signs to bite animals and transmit the viruses.
27.	yes	"+++"	Via the vectors, there are possibilities of contact between on one hand horses/domestic birds and on the other hand wild birds. This is a risk factor for emergence in the (immunologically naive) horse and domestic bird populations (infection from wild birds).

			Domestic birds will be capable to spread the disease.
28.	yes	"++++"	Wild birds play an epidemiological role: they transmit the disease, amplify the viruses and transport it on long distances. It is an important risk factor for emergence because of the difficulties to control wild fauna.
29.	no	"+++"	There is no increase in demography and/or distribution of wild birds in belgium. Such changes would represent risk factors for emergence (introduction) of the disease in Belgium.
30.	yes	"++++"	There are climatic and meteorological changes. These changes can possibly generate changes in the migratory routes and increases in the length of life of migratory birds, or settling of exotic vectors. For example, larvae of mosquitoes develop better in organic matters in stagnant waters which are concentrated by warm and dry climatic conditions. These are important risk factors for emergence of the disease in Belgium. However, this is speculation: WNV has always been in Europe and there is no evidence that changing climate may affect it in either way.
31.	yes	"+++"	There are changes in the ecosystems produced by man. The ecological effects on the wild bird populations have yet to be studied. Ecosystems favouring installation of mosquito populations (for example, swimming pools) and wild birds populations are risk factors of emergence. Changes in ecosystems which can change the classical migratory routes of wild birds (question of availability in nidification areas) are also risk factors for emergence. However, this is speculation: WNV has always been in Europe and there is no evidence that changing climate may affect it in either way.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. Since the vectorial mosquitoes are present in urbanized areas such as in humid natural areas and in countryside, urbanisation has no influence on the risk for emergence.
33.	yes	"++++"	Culex (mosquito), the vector of the disease, is present in large number in Belgium. This is an important risk factor of viral dispersion in case of introduction of the virus in Belgium, of infection of humans and horses, and also a risk factor for the amplification cycle between birds and mosquitoes.

Fièvre de la vallée du Rift (Bunyaviridae, Phlebovirus) (Bengis *et al*., 2004 ; Chevalier *et al*., 2004 ; Gerdes, 2004 ; Martin *et al*., 2008)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	There is no genetic variability. A genetic variability of this virus should have no influence on the risk for emergence.
2.	yes	"+++"	There is lack of knowledge of the pathogenesis. (potential vectors, geographical distribution). This lack of knowledge represents a risk factor for emergence.
3.	no	"++"	There is no change in pathogenesis concerning this disease. A change in pathogenesis (for example, increase in virulence) should represent a risk factor for emergence.
4.	yes	"+++"	Live and inactivated vaccines exist but are not commercially available in Belgium. In case of introduction of the disease in Belgium, this should constitute a risk factor for dispersion and emergence.
5.	yes	"++"	Numerous animal species have been identified as receptive to the virus. This represents a risk factor for emergence.
6.	yes	"+++"	The disease is zoonotic. In case of sufficient viraemia, humans are able to retransmit the virus to the vector, which then can

			retransmit the virus to animals or humans (the humans are not dead-end hosts). This is a risk factor for expansion (and emergence) of the disease in case of introduction.
7.	no	"+++"	The disease, confined to Africa until 2000, invaded the arabic peninsula but has never been reported in Europe. If the disease emerged in Europe, this should represent a risk factor for emergence in Belgium. The ability of RVF to extend in free areas is due to the high variety of vectors able to transmit the infection, and to a sufficient vireamia in ruminants and humans to infect the mosquitoes. There also exists a possibility for the wind to transport infected vectors from neighbouring areas (Egypt).
8.	yes	"++"	There is an increased incidence in Africa, but not in Europe. If there would be an increased incidence in Europe, this would represent a risk factor for Belgium, because of the possibility of transboundary expansion on large distances, via for example animal transport.
9.	no	"0"	The virus can not persist in the environment outside the vector. Even if it was able to persist in the environment, this would have no influence of the risk for emergence since transmission involves the action of a vector.
10.	yes	"- - -"	There is a legislation (mandatory notification disease) and precautionary measures (for example, trade and transport controls, differential diagnose in case of abortion). These are protections factors against the emergence of the disease. Recommendations to (1) establish a warning system to detect any abnormal increase in abortion/neo- and perinatal mortality associated to necrotic hepatitis in ruminants, during the season of mosquitoes (spring, summer, autumn) and (2) define an emergency contingency plan.
11.	no	"0"	RVF is not concerned by changes in technological or industrial processes.
12.	yes	"+++"	In case of introduction of the disease, there may be detection problems of the emergence, due to the lack of specificity of the symptomatology, the neccessity of a sufficient number of contemporary cases to detect the emergence, the lack of experience despite the availability of diagnostic tests in Belgium. These are risk factors of emergence.
13.	yes	"++"	There are increasing interactions between animal compartments, for example through trade and transport. There are few transmissions by direct contact between ruminants despite the presence of the virus in the saliva and in nasal excretions, but the proximity between animals increases the risk because it favours the action of the vector. The increase in interactions between animal compartments is a risk factor for viral transmission and emergence.
14.	no	"+++"	There is no increase in interactions between ruminant and human populations.in the urban cycle, humans are infected by mosquitoes pricks. The disease is also transmissible via direct contact with infected animal tissues (sylvatic cycle, vets, farmers). An increase in interactions (vectorial proximity, direct contact) between ruminant and human populations should represent a risk factor for emergence of the disease because humans are capable to reinfect the vectors and retransmit the disease (are not dead-end hosts).
15.	no	"0"	There is no significant demographic growth in Belgium. RVF is not concerned by an eventual human demographic growth.
16.	no	"++"	There is currently no increase in the Belgian ruminant population. High densities of sensitive animals could maintain durably the infection cycles, if the vectors are present. A growth of the ruminant population should be a risk factor for emergence.
17.	yes	"++"	Human traveling is increasing. This is a risk factor because of the possibility of introduction of the disease via infected persons who have travelled in an endemic area, and because the human viraemia is sufficient to reinfect indigenous mosquitoes. However, this risk factor is relative because of the necessity, for the establishment of an outbreak, of ecological conditions favourable to the emergence of a lot of mosquitoes.

18.	yes	"++"	Human tourism is increasing. This is a risk factor because of the possibility of introduction of the disease via infected persons who have travelled in an endemic area, and because the human viraemia is sufficient to reinfect native mosquitoes. However, this risk factor is of relative importance because of the necessity, for the establishment of an outbreak, of ecological conditions favourable to the emergence of a lot of mosquitoes.
19.	yes	"+++"	Animal trade is increasing. This is an important risk factor for emergence because of the risk for importation of infected viraemic animals capable to transmit the infection.
20.	yes	"+++"	Animal transport is increasing. This is an important risk factor because movements of infected animals can be responsible for the dissemination of the disease in new areas (cf outbreak in Egypt).
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"++"	There are intensive production systems for ruminants in Belgium. The high density of the animal population increases the risk for infection (higher transmission rates) and of emergence.
23.	yes	"++"	There are extensive production systems for ruminants in Belgium. The presence of animals on the pasture increases the risk for contact with the vectors and the risk for emergence.
24.	no	"++"	There are no asymptomatic infected animals (but the infection can sometimes pass inapparently). Asymptomatic animals can disseminate the infection without being detected, confined or treated. This is a risk factor for emergence.
25.	no	"+++"	There is no animal reservoir for RVF (? à valider). If an animal reservoir existed, it would represent a risk factor for emergence.
26.	no	"0"	The incubation period of RVF is not especially long. The length of the incubation period has no influence on the risk for emergence because the vectors do not need the presence of clinical signs to prick animal and transmit the viruses.
27.	yes	"++"	There are possibilities of (proximity) contacts between domestic and wild ruminants. Proximity between the two animal populations favours the viral transmission through the vectors. This is a risk factor for dispersion of the disease.
28.	no	"+"	The epidemiological role of the wild ruminant population has yet to be studied. If the wild fauna played an epidemiological role, this would represent a risk factor.
29.	yes	"0"	There is an increase in the demography of wild cervids. Since wildlife does not play any epidemiological role, this has no influence on the risk for emergence.
30.	yes	"++++"	There are climatic and meteorological changes (longer periods of heat and more intensive rainfall). This is a risk factor for emergence because heat and rain have an influence on the geographical distribution of mosquitoes populations (reproduction sites depends on the presence of water: rains, floods, etc.). Localized rains have no influence, but strong persistent rain periods occuring after a drought, accompanied by durable floods, allow hatching of eggs and the establishment of large populations of mosquitoes. The virus could persist during months in the mosquitoe's eggs and could replicate again during the development to the larvae stadium during the strong rains.
31.	no	"+++"	Currently, there are no ecological changes in Belgium which could favour the emergence of the disease (for example, dams and irrigation zones favouring the development of mosquito populations). Belgium is a densely populated region with intensive use of the soils, decreasing the available water surfaces. Changes in the ecosystems such as for example the construction of dams and large irrigation zones should represent a risk factor for emergence, through favouring the development of the mosquitoes

			population.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. Since the vectorial mosquitoes are present in urbanized areas such as in humid natural areas and in countryside, urbanisation has no influence on the risk for emergence.
33.	yes	"++++"	The vector of the disease (mosquitoes Aedes and Culex) is present in Belgium. This represents an important risk factor for dissemination of the disease if it is introduced in Belgium via for example trade of infected animals. There is a possibility of viral overwintering (vertical transovarian transmission of the virus) in some vector species (Aedes), and of simultaneous hatching of one generation of infected mosquitoes, which can favour the primary installation of the disease, followed by the action of secondary vectors leading to the installation of an endemicity (cf Egypt). The ability of RVF to extend in free areas is due to the high variety of vectors capable to transmit the infection and to a viraemia level in ruminants and humans sufficient to infect mosquitoes. There is also a possibility of mechanical transmission via culicoides and ticks.

Maladie hémorragique épizootique (Orbivirus) (EFSA, 2009)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"++"	There is no genetic variability. A genetic avriability would represent a risk factor for emergence.
2.	yes	"+++"	There is lack of knowledge of the pathogenesis. This infection is few studied in cervids and not known in cattle. This lack of knowledge in pathogenesis is a risk factor for emergence of the disease.
3.	no	"++"	There is no observed change in the pathogenesis. A change in the pathogeneisis should be a risk factor for emergence.
4.	yes	"++++"	No vaccine available on the market. Important risk factor for emergence.
5.	no	"+++"	There is no observed passage of the species barrier. A passage of the species barrier would represent a risk factor for emergence.
6.	no	"0"	The disease is not zoonotic. This has no influence on the risk for emergence
7.	yes	"++++"	There have been 4 epidemics in the Mediterranean countries. This is an important risk factor for emergence in Belgium, via vectorial dispersion if the disease is present in a neighbouring region, or via the importations.
8.	yes	"++++"	There have been 4 epidemics in the Mediterranean countries. This is an important risk factor for emergence in Belgium, via vectorial dispersion if the disease is present in a neighbouring region, or via the importations.
9.	no	"0"	The virus can not persist in the environment. Persistence of the virus in the environment should have no influence on the risk for emergence because the vectorial transmission pathway.
10.	yes	"- - -"	There are quarantine and detection systems; the notification of the disease is mandatory. These are protection factors of emergence of the disease.
11.	no	"0"	This disease is not concerned by this factor
12.	yes	"++++"	There are several problems of detection of the disease: concerning the passive surveillance, the clinical signs are similar to these

			of the Bluetongue; there is no active surveillance programme; the wild fauna is difficult to survey; lack of serological diagnostic methods on the market. These difficulties represent a risk factor for emergence of the disease (dissemination before being detected).
13.	no	"++"	Currently, there are no increases in interactions between domestic and wild cattle in Belgium. An increase in such interactions could be a risk factor for emergence (through a favoured vectorial transmission).
14.	no	"0"	No increase in interactions between animal and human populations. Non zoonotic disease, no influence of an interaction with humans.
15.	no	"0"	There is no significant demographic growth in Belgium. Non zoonotic disease and no influence of a demographic growth.
16.	no	"++"	There is no growth of the domestic ruminant population. If there was an increase, it would represent a risk factor for emergence (vectorial transmission favoured).
17.	yes	"0"	Human traveling is increasing. No influence of an increase in human travels
18.	yes	"0"	Human tourism is increasing. No influence of an increase in human tourism
19.	yes	"+++"	There is an increase in trade of cattle. Because of the risk at importation, this is a risk factor for emergence.
20.	yes	"+++"	There is an increase in transport of cattle. Because of the risk at importation, this is a risk factor for emergence.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"- -"	There are intensive production systems in Belgium for cattle. Stabling is a protection factor against infection (and emergence) in the domestic cattle population because the risk for contact with the culicoides is reduced (except that culicoides can enter the stabels). Wild cervids are not concerned by production systems.
23.	yes	"+++"	There are extensive production systems in Belgium for cattle. This leads to an increased risk for contact with the culicoides and is a risk factor for emergence in the domestic cattle population. Wild cervids are not concerned by production systems
24.	no	"0"	There is no asymptomatic carriage. An asymptomatic carriage would have no influence on the risk for emergence because the vectorial transmission (culicoides) does not depend on the presence of clinical signs.
25.	no	"++++"	The host animals are the wild cervids, but there is no animal reservoir (the lenght of the viraemia is variable). An animal reservoir should represent a risk factor for emergence of the disease.
26.	no	"0"	There is no specially long incubation period for the disease. A long incubation period would have no influence on the risk for emergence because tick bites do not depend on the presence of clinical signs.
27.	yes	"++"	There are contacts between wild and domestic (in extensive systems) ruminants, which could, via the proximity, favour the action of the vectors and the transmission of the disease to the domestic cattle population. This is a risk factor for emergence in the domestic cattle population.
28.	yes	"+++"	There is an epidemiological role of the wildlife because wils ruminants can be infected and retransmit the infection. This is a risk factor for emergence because of the difficulties to control the wildlife.
29.	yes	"++"	There is an increase in the wild cervids population in Belgium. This represents a risk factor for emergence, because this facilitates the vectorial transmission of the virus.
30.	yes	"++++"	There are climatic and meteorological changes, which modify the repartition of the vectors in the North hemisphere. This is a risk factor for emergence (presence of culicoides)

31.	no	"+"	Currently, there are no changes in ecosystems in Belgium. Changes in ecosystems could contribute to an interaction between domestic cattle and wild cervids which should favour the transmission by the culicoides. This would represent a risk factor for emergence of the disease in the domestic cattle population.
32.	yes	"0"	There is an ongoing urbanisation in Belgium, but the disease is not concerned by the urbanisation.
33.	yes	"++++"	The transmission is vectorial (culicoïdes (C. imicola, obsoletus, pulicaris)). This is an important risk factor for emergence through the possibility of dispersion from a neighbouring country.

Maladie du dépérissement chronique des cervidés (EST) (prions)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"+"	There is no evidence of genetic variability. A genetic variability should represent a risk factor for emergence.
2.	yes	"++"	There is lack of knowledge of the pathogenesis. There are few studies on the subject of chronic wasting disease. The lack of knowledge of pathogenesis is a risk factor for emergence.
3.	yes	"++"	There are changes in pathogenesis (for example: some polymorphisms like the G96S polymorphism in white tail deer and S225F in mule deer seem to provide a reduced susceptibility; the potential for genetic influences on susceptibility relating to the CWD strains identified in North America, as well as to other TSE, remains under investigation). Theses changes in pathogenesis are risk factors of emergence.
4.	yes	"+"	There is no immunization against the TSEs. Consequently, there is no vaccination possible. If no vaccination, no protection and higher risk for emergence.
5.	no	"++"	Currently, there is no evidence for passage of the species barrier. But the possibility of passage of the barrier species exists, and represents a potential risk factor for emergence in other ruminant species.
6.	no	"0"	In principle, the disease is not transmissible to humans. However, in vitro conversion experiments indicate that CWD prions can convert human as well as bovine and sheep prion proteins into its abnormal conformer (PrPres), albeit at a very low rate. A transmission to humans should not represent a risk for emergence in the animal populations because humans do not retransmit infection.
7.	no	"+++"	Currently, there is no geographical extension of the disease, which is restricted to North America. However, considering the knowledge collected in North America with regard to the epidemiology of CWD (spreading of the disease from geographical clusters) and the demographical and geographical bias in the Belgian and EU CWD survey, the presence of CWD in EU cervids cannot be excluded. Since the assumption of a random sampling in the Belgian and EU CWD survey is not fulfilled, a quantitative estimate of the true prevalence with confidence intervals is not possible, since it might underestimate the true prevalence if the epidemiological situation with regards to CWD in cervids was different in blank areas. Since the disease is transmissible, a geographical extension would represent a risk for emergence of the disease in Belgium.
8.	yes	"++"	There is an increase in incidence in other countries (which countries?). This represents a risk factor for emergence of the disease

			in Belgium (mechanism?)
9.	yes	"+++"	The prion can persist in the environment, what is responsible for the horizontal transmission. The persistence in the environment is a risk factor for emergence of the disease.
10.	no	"- -"	The disease is poorly covered by the legislation, because of the absence of cases in Belgium and in Europe. A legislation should be a protection factor against the emergence of the disease.
11.	yes	"+"	There are changes in the technological and industrial processes. By analogy with the mechanism partly responsible of the emergence of BSE, changes in processes are risk factors of emergence of the chronic wasting disease. Technological changes could also lower the risk.
12.	yes	"+++"	The detection of the disease is difficult in wild cervids, and also in domestic cervids, due to the lenght of the incubation period. These problems of detection of emergence are risk factors of emergence.
13.	yes	"++"	There are increases in interactions between the cervidae populations. Since CWD is transmissible, the interactions between these animal populations favour the transmission of the prions responsible for the disease. These are risk factors of emergence.
14.	no	"0"	There are no increases in interactions between the cervid and human populations. Since the disease is not transmissible to humans by contact, there is no influence of an eventual increase in interactions between the animal and human populations on the risk for emergence.
15.	no	"0"	There is no significant demographic growth in Belgium. The disease is not concerned by a human demographic growth.
16.	yes	"++"	The cervid population is increasing in Belgium. This growth represents a risk factor for emergence because the disease is transmissible.
17.	yes	"+++"	Human traveling is increasing. This is a risk factor of emergence of the disease (import via international hunters).
18.	yes	"+++"	Human tourism is increasing. This is a risk factor of emergence of the disease (import via international hunters).
19.	yes	"++"	There is an increase in trade of cervids (?). This is a risk factor for emergence, through the risk for importation of infected animals.
20.	yes	"++"	There is an increase in transport of cervids (?). This is a risk factor for emergence, through the risk for transport of infected animals in our country
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"++"	There are intensive production systems of cervids in Belgium (?). This favours the transmission of the disease amongst cervids. Industrial feeding of the animals plays also a role. These are risk factors of emergence.
23.	yes	"++"	There are extensive production systems of cervids in Belgium. These are risk factors of emergence because this favours the transmission between cervids, such as evidenced in USA in parks for cervids.
24.	yes	"++"	The cervids can sometimes be asymptomatic during all their lifespan. This is a risk factor for transmission and of emergence, due to the non detection and to the absence of sanitary meausres
25.	yes	"+++"	There is an animal reservoir. Since the disease is transmissible, and that the animal reservoir plays an epidemiological role, this is a risk factor for emergence.
26.	yes	"+++"	The incubation period is long. Preclinical carriers can excrete the PrPd before the disease occurs (birth, milk, …). This increases the risk for transmission of the non detected disease and the risk for emergence of the disease.
27.	yes	"+"	There are contacts between domestic and wild cervids. Since the disease is transmissible, this can favour the transmission and is

			a risk factor for emergence.
28.	yes	"+++"	Since it is a cervid disease, the wildlife has an epidemiological role. This is a risk factor for emergence, due to the difficulty of controlling wild fauna.
29.	yes	"+++"	There is an increase in the demography of wild cervids, which can increase the risk for emergence.
30.	yes	"0"	There are climatic and meteorological changes. No influence on the risk of emergence.
31.	no	"0"	No influence of possible changes in ecosystems.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. No influence of urbanisation on the risk for emergence.
33.	no	"+"	Non vectorial disease. However, CWD can apparently be transmitted by fomites.

Pleuropneumonie contagieuse bovine (*Mycoplasma mycoides* subsp. *mycoides* variant Small Colony)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"++"	Several mycoplasms, of which Mycoplasma mycoides subsp mycoides variant Small Colony, show modifications of the surface antigens (antigenic variation, variation in diverse surface proteins) due to genetic modifications. This genetic variability is a risk factor for emergence of new types.
2.	yes	"++"	The pathogenesis of the mycoplasms has been intensively studied the last 20 years but there are still numerous remaining knowledge gaps. This is a risk factor for emergence of the disease.
3.	no	"++"	Currently, there are no changes in the pathogenesis of the disease. If there were changes in the pathogenesis, these would represent a risk factor for emergence of the disease.
4.	yes	"+++"	There are problems associated with the vaccination: there is an attenuated live vaccine in Africa available, but the efficiency of these vaccines against the European strains is doubtful; the vaccination protects only a few months and has to be repeated; the vaccination is forbidden in Europe. These difficulties constitute a risk factor for emergence.
5.	no	"+"	The bacteria is highly host specific and the probability to change the host spectrum is very low. If there was a possibility to pass the species barrier, this would represent a risk factor for emergence of the disease in a new animal species.
6.	no	"0"	The disease is not zoonotic and this possibility would have no influence on the risk for emergence because humans should not retransmit the disease.
7.	no	"++"	The disease is widespread in Africa, Asia and some European countries, but there is no geographical extension of concern to Belgium. A further geographical extension would represent a risk factor. For example, the regular episodes in the Southern of Europe (namely in France) represent a risk factor for emergence in Belgium.
8.	yes	"++++"	There have been re-emergences in Europe since the eradication in the XIXth century: in Portugal in 1951, in Spain in 1957, in France in 1984, in Italy in 1990-1993, in Portugal in 1999. These re-emergences represent an important risk factor for emergence in Belgium via the trade (risk for importation of infected animals)

9.	no	"+"	Mycoplasms are not considered to be resistant in the environment, which is a protection factor against emergence. The persistance in the environment would represent a risk factor of emergence.
10.	yes	"- - - -"	There are legislations and sanitary policy measures: disease of the list of OIE, existence of recommended norms for the surveillance, slaughtering of the herd in case of outbreak, control of the trade of the bovines, control of the meet at the slaughterhouses, etc. These measures are protection factors against the emergence of the disease.
11.	no	"0"	The disease is not concerned by changes in technological or industrial processes. No influence on the risk for emergence of the disease.
12.	yes	"++++"	There are several problems of detection of emergence, which represent risk factors for emergence of the disease: (1) there are chronic infected asymptomatic animals, difficult to diagnose, and which are responsible for the silently persistence and propagation of the disease; (2) the veterinarians and the breeders will have difficulties to recognize the first cases in case of outbreak; (3) there are less pathogenic strains causing untypical problems.
13.	no	"++"	There are no increases in interactions between the bovine populations at national level. Increases in interactions should represent a risk factor for emergence because interactions increase the possibilities of transmission of the disease.
14.	no	"0"	The disease is not concerned by the human population.
15.	no	"0"	There is no significant demographic growth in Belgium. The disease is not concerned by the human demography.
16.	no	"++"	There is no growth of the bovine population in Belgium. An increase in this population would represent a risk factor because it would increase the risk for transmission of this contagious disease.
17.	yes	"0"	Human traveling is increasing, but which has no influence of the risk for emergence of the disease.
18.	yes	"0"	Human tourism is increasing, but which has no influence of the risk for emergence of the disease.
19.	yes	"++"	There is an increase in trade of animals, which create opportunities of contacts between infected and non infected animals via movements and via importations. Movements of animals play an important role in the propagation of the disease. The increase in trade is a risk factor for emergence of the disease.
20.	yes	"++"	There is an increase in transport of animals, which create opportunities of contacts between infected and non infected animals. Movements of animals play an important role in the propagation of the disease. The increase in transport a risk factor for emergence of the disease.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"0"	There are intensive production systems for bovines. The intensification does not play any role in the emergence of the disease.
23.	yes	"0"	There are extensive production systems for bovines. These extensive production systems do not play any role in the risk for emergence of the disease.
24.	no	"++++"	There are currently no asymptomatic infected animals in Belgium. Undetected asymptomatic animals or animals which recover rapidly and remain carrier during a long period (until 2 years) are capable to retransmit the infection. These animals represent a major source of infection. In Europe, the clinically unapparent chronic form of the disease is most frequent. If the disease was introduced in Belgium, these asymptomatic carriers would be a very important risk factor for dissemination of the disease between herds and of emergence.
25.	no	"++++"	There are currently no animal reservoirs in Belgium. In the world endemic zones, the chronic carriers are responsible for the

			insidious maintenance of the disease in the populations, and these reservoir animals represent an important risk factor for emergence of the disease.
26.	yes	"++++"	The incubation period, during which the animal is already infectious, can be very long (between 1and 3 months, sometimes more, until 7 months). Because these animals are not detected, this is a risk factor for emergence of the disease.
27.	yes	"0"	There are contacts between the domestic bovines and the wild fauna but, because the wildlife does not play any epidemiological role (host specificity of the mycoplasm, which does not infect other animal species), this has no influence on the risk for emergence of the disease.
28.	no	"0"	The wild fauna is not sensitive to the mycoplasm and has no influence of the risk for emergence.
29.	no	"0"	There is no increase in the demography of the wildlife in Belgium. Because the wildlife does not play any epidemiological role, this has no influence on the risk for emergence of the disease.
30.	yes	"0"	There are climatic and meteorological changes, but these have no influence on the risk for emergence of the disease.
31.	no	"0"	The disease is not concerned by changes in the ecosystems produced by man.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. The disease is not concerned by the urbanisation.
33.	no	"0"	Non vectorial disease.

Influenza aviaire hautement pathogène (virus influenza A sous-type H5N1) (Webster and Hulse, 2004 ; Bengis *et al*., 2004 ; Gilbert *et al*., 2008)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+++"	There is a high genetic variability in RNA viruses. A reassortment provoked the emergence of this highly pathogenic strain H5N1. The genetic variability of the influenza viruses is a risk factor for emergence of new strains.
2.	yes	"+"	There is lack of knowledge of the pathogenesis. For example, the study of the molecular markers of virulence is yet necessary. A lack of knowledge represents always a risk factor for emergence.
3.	yes	"+++"	There have been changes in pathogenesis. Namely, the passage to the "highly virulent" status of this avian influenza virus is an essential element. This viral ability to change its pathogenesis pattern is a risk factor for emergence.
4.	yes	"++"	Vaccination is forbidden in Belgium (except in zoos). Vaccination can prevent clinical signs but does not fully prevents the viral excretion, making the viral transmission yet possible. Vaccination can hide a residual infection. Vaccination affects the trade. These difficulties represent a risk factor for emergence of the disease in case of introduction.
5.	yes	"++"	The virus can be transmitted from poultry to pigs and to other mammals (for example, carnivores), and also between different bird species. This represent a risk factor for emergence of new subtypes in case of concomitant infection of a pig (for example) by a porcine and a human strain.

6.	yes	"+++"	The virus is zoonotic. This is a risk factor for emergence of the disease in humans and also in the animal population because humans are capable of retransmitting the disease (humans are not dead-end hosts).
7.	yes	"+++"	A geographical expansion of the disease has been observed the last years (not in 2011 anymore) observed. This increases the risk for emergence in Belgium.
8.	yes	"+++"	New cases are regularly reported in foreign countries. This increases the risk for emergence in Belgium.
9.	yes	"++"	The virus can persist in the environment under specific conditions (water). The possibility of viral persistence in the environment increases the risk for transmission and of emergence.
10.	yes	"- - -"	There are currently legislation and sanitary policy measures (mandatory notifiable disease, biosecurity, confinement of poultry, etc.). These measures are protection factors against emergence.
11.	no	"0"	This disease is not concerned by changes in technological or industrial processes.
12.	yes	"++"	If the disease is introduced in Belgium, it will probably occur via the wild avifauna. The surveillance of this wild avifauna is a passive surveillance. Since the wild fauna, present in a natural environment, is difficult to monitor, there will be a problem of early detection of the presence of the disease on the territory. This is a risk factor for emergence because an absence or a delay in detection will allow the virus to expand without control measures.
13.	no	"++"	There is no increase in interactions between the animal populations concerned by the disease. If the disease is introduced in Belgium, it will probably happen via the wild avifauna. An increase in interactions between the animal populations concerned by the disease should be a risk factor for emergence, (1) through the increase in risk for viral transmission to domestic poultry and (2) in case of increase in interactions between poultry and pigs (for example, farms associating poultry and pork production), through the increase in risk for viral transmission to pigs, which can be a center of viral recombination leading to the emergence of new subtypes.
14.	no	"+++"	There is no increase in interactions between the avian/porcine and the human popuation in Belgium. If there was such an increase, this should be a risk factor for transmission to humans and emergence in the human population (the human cases of H5N1 followed a narrow contact between poultry and humans). However, despite the theoretical risk for human adaptation with subsequent inter-human transmission, there will probably be no subsequent inter-human transmission.
15.	no	"0"	There is no significant demographic growth in Belgium. Human demographic growth would have no influence on the risk for emergence.
16.	no	"++"	There is currently no growth of the domestic/wild avian and porcine populations in Belgium. A growth of these animal populations should represent a risk factor for emergence of the disease, because an increase in animal density favours the transmission rate of the disease.
17.	yes	"++"	Human traveling is increasing. This is a risk factor for viral introduction in Belgium, namely through the authorized or illicit transport of birds.
18.	yes	"++"	Human tourism is increasing. This is a risk factor for viral introduction in Belgium, namely through the authorized or illicit transport of birds.
19.	yes	"+++"	Birds/animal trade is increasing. This is a risk factor for introduction and emergence of the disease in the country, through the risk for (illegal) importation of infected animals.

20.	yes	"++"	Bird/animal transport is increasing. This is a risk factor for introduction and emergence of the disease in the country, through the risk for (illegal) transport of infected animals
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"++"	There are intensive poultry production systems in Belgium. If the disease was introduced in Belgium, this would be a risk factor for emergence, through the high contagiousness and transmission rate of the infection in high density populations. The high density of the pork production systems would also be a risk factor for recombination and emergence of new sybtypes, in case of introduction of the disease in Belgium.
23.	yes	"+++"	There are extensive poultry/pork production systems in Belgium. This is a risk factor for emergence through the possibility of contact with infected wild avifauna.
24.	yes	"+++"	There are (wild) avian species which show no clinical signs if infected. These species can move and disseminate the disease. This is a risk factor for introduction of the disease in our country.
25.	yes	"+++"	Wild birds (mainly water birds) are the animal reservoir for the domestic poultry. Their presence is a risk factor for emergence of the disease in domestic poultry.
26.	no	"++"	The incubation period is not specially long in animals. But a long incubation period could favour the viral disperion on long distances via migrations of undiseased infected birds, and should represent a risk factor for introduction of the disease in our country.
27.	yes	"+++"	There are possibilities of contact between domestic poultry and wild avifauna. This is a risk factor for emergence of the disease.
28.	yes	"+++"	If infected, the wild avifauna can be a viral reservoir and play an epidemiological role by transmitting the infection to domestic poultry. This is a risk factor for emergence because wild faune is difficult to control.
29.	no	"++"	There is no increase in demography and/or distribution of wild birds in belgium. Such changes would represent risk factors for introduction and expansion of the disease in Belgium because of the important epidemiological role of this animal population.
30.	yes	"0"	There are climatic and meteorological changes, but they atr not capable of influencing the risk for emergence of the disease (no influence on the migratory routes). It is to be noted that higher humidity and temperatures favour the persistence of the virus in water.
31.	no	"+++"	There are currently no changes in the ecosystems in Belgium. But changes in ecosystems (for example, establishment of water features favourable to the wild waterbirds) would represent risk factors for introduction of the disease via the wild fauna.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. Urbanisation has no influence on the risk for emergence of the disease.
33.	no	"0"	The transmission is not vectorial. No influence of the insects on the risk for emergence of the disease.

Cysticercose porcine (*Cysticercus cellulosae*, *Taenia solium*)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification

1.	no	"0"	There is no genetic variability. A genetic variability would have no influence on the risk for emergence of this disease.
2.	no	"+"	There is no lack of knowledge on the pathogenesis of this disease. A lack of knowledge represents always a risk factor for emergence.
3.	no	"+"	There is no change in the pathogenesis of the disease. A change in pathogenesis could always represent a risk factor of emergence of the disease.
4.	yes	"++"	There exist an efficient vaccine but which is not commercially available. The lack of available vaccine is a risk factor for emergence of the disease.
5.	no	"0"	There is no possibility of passage of the species barrier and this has no influence on the risk for emergence of the disease
6.	yes	"+"	The disease is zoonotic (humans are host for the adult stages of taenia saginata). Because humans can occasionnally retransmit the infection, this is a risk factor for emergence of the disease.
7.	no	"0"	There is no current geographical extension of the disease (stays in central America, Africa, Asia). If there was a geographical extention, this would have no influence on the risk for emergence because the transmission of the parasite by ingestion stays geographically localized. The risk is rather linked to importation of infected pigs.
8.	no	"++"	Even in developing coutries (Peru, mexico) the incidence decreases (Flisser *et al*, 2010. Plos NTD 4 (12)e831). An increase in incidence represents a risk factor for emergence of the disease in Belgium because of the increased risk of importation of infected pigs. De decreased incidence is a protection factor against emergence.
9.	yes	"+++"	The parasite can persist in the environment (pastures, surface waters: 2 months during the summer and 5 months during the winter). This can increase the risk for infection of the igs via ingestion of eggs in the environment and represent a risk factor for emergence of the disease.
10.	yes	"- -"	There are controls at importation, which represent a protection factor against the introduction of the disease in the country. These repersent protection factors against the emergence of the disease.
11.	no	"0"	Raw pork minced meat consumption is frequent in Belgium. Use frozen meat fo that use could reduce the risk but only for humans. There are no changes in the technological or industrial processes concerning the pork industry which could have an influence on the risk of emergence of the disease.
12.	yes	"+++"	There are problems of detection of the disease (live animals are asymptomatic; weak sensitivity of the visual inspection at the slaughterhouse) and this can impede the detection of a possible increase in incidence. This represents a risk factor for emergence of the disease.
13.	no	"0"	There is no increase in interactions between the concerned animal populations (swine populations). An increase in such interactions would have no influence on the risk for emergence of the disease because the transmission cycle of the parasite involves an indirect relation between humans and swine and no direct relation between swine.
14.	no	"+++"	There is currently no increase in interactions between pork and human populations in Belgium. Increases in interactions would represent a risk factor of transmission of the parasite in swine (increase in exposition to human feces)
15.	no	"0"	There is no significant demographic growth in Belgium. The emergence of the disease is not influenced by a human demographic growth.
16.	no	"0"	There is no growth of the porcine population in Belgium. Such an increase would have no influence on the risk for emergence of

			the disease.
17.	yes	"++"	Human traveling is increasing. This increases the risk of human infection abroad and the risk of introduction of the parasite in the Belgian swine population (emergence).
18.	yes	"++"	Human tourism is increasing. This increases the risk of human infection abroad and the risk of introduction of the parasite in the Belgian swine population (emergence).
19.	yes	"++"	There is an increase in trade of pork. This represents a risk factor of importation of infected swine in Belgium (introduction and emergence)
20.	yes	"+"	There is an increase in transport of pork. This represents a risk factor of introduction of infected swine in Belgium (emergence)
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	Yes	"- - -"	There are intensive swine production systems in Belgium. This is a protection factor against infection of porks because their receive industrial feed and have no access to an environment contaminated by human dejections.
23.	Yes	"++"	There are extensive swine production systems in Belgium (ex kept outside, BIO porks). This represents a risk factor of infection of swine via ingestion of matters infected by human excrements present in the environment.
24.	yes	"+++"	Live pigs are asymptomatic and this represents a risk factor for emergence (lack of detection).
25.	yes	"+++"	There exists an animal reservoir (pork) and this represents a risk factor for emergence of the disease.
26.	no	"0"	There is no long incubation period in swine but the incubation period has no influence on the risk for emergence because only dead animals (meat) are capable to transmit the disease to humans. The live animal is not infectious.
27.	yes	"0"	There are contacts between domestic pigs and wildlife but this has no influence on the risk for emergence because the transmission of the parasite (ingestion of infected matters from humans) does not involves a direct contact between animals, and because wildlife does not play an epidemiological role.
28.	no	"0"	The wild fauna does not play an epidemiological role. If the wildlife did play an epidemiological role, this would have no influence on the risk for emergence because infection of swine comes from humans.
29.	yes	"0"	There is a demographic growth of the wild boars population in Belgium. Because the wild fauna does not play an epidemiological role in the transmission of the disease to domestic cattle, such an increase would have no influence on the risk for emergence of the disease.
30.	yes	"0"	There are climatic and meteorological changes but this has no influence on the risk for emergence of the disease
31.	yes	"0"	There are changes in the ecosystems produced by man but these have no influence on the risk of emergence of the disease.
32.	yes	"0"	There is an ongoing urbanization in Belgium but which has no influence on the risk for emergence of the disease.
33.	no	"0"	Non vectorial disease

Rage classique (carnivores) (Lyssavirus génotype 1) (Bengis *et al*., 2004 ; Cliquet and Picard-Meyer, 2004)

Factor	Presence (yes) /	Impact (risk /	Scientific justification

	absence (no)	protection / no effect)	
1.	no	"0"	Lyssaviruses are RNA viruses which typically have a high mutation rate. But currently, we do not observe a genetic variability in this Lyssavirus genotype 1. If there was a genetic variability this should not increase the risk for emergence because classical rabies is already asssociated with an agressive behaviour (contrary to the bat rabies).
2.	no	"+"	There is no lack of knowledge of the pathogenesis of rabies in carnivores. A lack of knowledge represents always a risk factor for emergence.
3.	no	"+"	Currently, there is no change in the pathogenesis of the disease. A change in the pathogenesis represents always a risk factor for emergence. In this case, the influence is weak because the virus is already associated with an agressive behaviour of the animals, allowing the transmission of the disease.
4.	no	"++++"	There are no difficulties to control the disease by vaccination, which is a high protection factor against the emergence of the disease. Difficulties to control the disease by vaccination should represent a high risk factor for emergence of the disease.
5.	no	"+"	The virus can already infect naturally all the mammal species. The host spectrum is already very large. There are no relevant possibilities to increase the host spectrum compared to the current situation. The faculty of the virus to infect additional species should even so represent a little risk factor for emergence.
6.	yes	"0"	Animals can transmit the infection to humans. But since humans do not retransmit the virus, they are dead-end hosts. The zoonotic character of the disease is not a risk factor for emergence (no influence).
7.	yes	"+++"	The disease is present in Europe (not in Belgium), for example in Northern Italy (other neighbouring countries?). The geographical extension of the disease is a risk factor for emergence of sylvatic rabies in Belgium.
8.	yes	"+++"	There is an increase in incidence in other european countries (neighbouring countries, for example?). This is a risk factor for emergence of the disease in Belgium, through the risk for illegal transport of infected animals.
9.	no	"0"	The virus is not able to persist in the environment. The possibility of viral persistance in the environment should have no influence on the risk for emergence because transmission requires a contact between animals.
10.	yes	"- - -"	The presence of a legislation/sanitory policy measures (vaccination dogs/foxes), forbidden movements of unvaccinated dogs) is a protection factor against the emergence of the disease.
11.	no	"0"	No influence of changes in technological or industrial processes for the risk for emergence of this disease.
12.	yes	"+++"	Illegal importation of susceptible animals poses a continuous risk for reintroduction. Some travellers and animal rescue organisations adopt sick and abandonned animals in southern countries and circumvent deliberately or out of ignorance the existing legislation. Veterinarians not always declare these illegal imports if they are presented, because of the conflict of interest (client binding!). Veterinarians who do declare illegal imports, resulting in euthanasia of the animal, are bashed on internet fora.This is an important risk factor for emergence of the disease.
13.	yes	"++"	There are increases in interactions between animal compartments. This can favour interspecies transmissions, and is a risk factor for emergence.
14.	yes	"0"	There are increases in intercations between humans and dogs/foxes. This increases the risk for infection of humans, but since humans are dead-end hosts, this has no influence on the risk for emergence of the disease.

15.	no	"0"	There is no significant demographic growth in Belgium.The emergence of the disease is not concerned by a demographic growth, because humans are dead-end hosts.
16.	no	"++"	There is no increase in the dog population in belgium. An increase would represent a risk factor for emergence.
17.	yes	"+++"	Human traveling is increasing. Some travellers and animal rescue organisations adopt sick and abandonned animals in southern countries and circumvent deliberately or out of ignorance the existing legislation. This is a risk factor for re-emergence of the disease in Belgium.
18.	yes	"+++"	Human tourism is increasing. Some travellers and animal rescue organisations adopt sick and abandonned animals in southern countries and circumvent deliberately or out of ignorance the existing legislation. This is a risk factor for re-emergence of the disease in Belgium.
19.	yes	"++"	There is an increase in trade of dogs, for example: importation of puppies from endemic regions with false vaccination certificates. There are also illegal importations. These are risk factors of re-introduction of the disease in Belgium.
20.	yes	"++"	There is an increase in transport of dogs, for example: transport of puppies from endemic regions with false vaccination certificates. These are risk factors of re-introduction of the disease in Belgium (linked with the increase in trade).
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"-"	Dogs, cats, foxes are not concerned by production systems. Intensive production systems of cattle, however, decrease the risk for contact of cattle with infected (wild) animals and constitute a protection factor against infection of cattle.
23.	yes	"++"	Dogs, cats, foxes are not concerned by production systems. Extensive production systems of cattle, however, increase the risk for contact of cattle with infected (wild) animals and constitute a risk factor for infection of cattle.
24.	no	"+++"	There are no asymptomatic carriers. The presence of asymptomatic carriers (related to the length of the incubation period) should represent a risk factor for emergence of the disease, because these animals in incubation are capable to transmit the disease via direct contact, without showing any clinical sign.
25.	no	"+++"	Since rabies is currently eradicated in Belgium, there are no animal reservoirs. The animal reservoir should be dogs and foxes. If infected foxes or dogs were present in Belgium, thus if there was an animal reservoir, it should represent a risk factor for emergence of the disease.
26.	yes	"++++"	There is a long incubation period in animals. Since animals in incubation are capable to transmit the virus by direct contact without showing clinical signs, the long incubation period is a risk factor for emergence of the disease.
27.	yes	"++"	There are contacts between wild foxes or wild animal species, and domestic cattle or dogs. This is a risk factor for emergence of the disease in the domestic animal population.
28.	yes	"++"	The wild fauna (foxes and raccoons with uncertain origin) plays an epidemiological role (reservoir) concerning rabies. This is a risk factor for emergence.
29.	yes	"+++"	There is an increase in the foxes population in Belgium. Foxes and raccoon dogs in Eastern Europe are still reservoirs of the virus. Illegal import of these species (especially raccoon dogs) may pose a risk for reintroduction. Raccoon dogs have been spotted in Belgian fauna, but their origin is uncertain. They are almost never submitted for rabies surveillance. This is a risk factor for emergence of the disease.
30.	yes	"0"	There are climatic and meteorological changes. No influence of climatic changes on the risk for emergence of classical rabies of

			carnivores.
31.	no	"0"	No influence of changes in ecosystems on the risk for emergence of classical rabies of carnivores.
32.	yes	"-"	There is an ongoing urbanisation in Belgium. Urbanisation is a protection factor against emergence since dogs kept in an urban environment are less likely to come into contact with wildlife (in contrast to farm dogs or hunting dogs).
33.	no	"0"	Non vectorial disease. No influence on the risk for emergence.

Peste (*Yersinia pestis*) (Bengis *et al*., 2004 ; Higgins, 2004)

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	yes	"+"	There is enormous genetic variability - including virulence plasmid content - between strains belonging to different biovars and geographical origin. This is a risk factor for emergence of new "strains".
2.	no	"++"	Yersinia are well known bacteria. This knowledge allows a good prophylaxis and is a protection factor against emergence. Lacks of knowledge are always risk factors for emergence.
3.	no	"+"	There are no changes in pathogenesis. Some strains are more virulent than others, some tend to cause a disease often evolving towards the pneumonic form which can be transmitted to other individuals by air (vector no longer required), others do not. But globally, the disease is the same. Changes in pathogenesis would represent a risk factor for emergence.
4.	yes	"++"	There is a human vaccine, which is not commercially available however for the public (only for some exposed persons such as the military or for research workers); the protection is short-term (6 months); it is impossible to vaccine the rats. The absence of vaccination is a risk factor for emergence of the disease.
5.	no	"+"	The bacteria can already infect rats, cats, dogs, rabbits, etc. Because the bacteria are genetically stable, there is no possibility to change this host spectrum. The possibility to change the host spectrum is always a risk factor for emergence of the disease in this new host.
6.	yes	"+"	The disease is zoonotic. Because humans are capable to retransmit the infection to animals or to other humans, this factor represents a risk factor for emergence of the disease.
7.	yes	"++++"	There is an extension of the geographical distribution of the agent: the disease is currently endemic in several parts of the world in the XXth century (Africa, Asia, North and South of America) but not in Europe. This is an important risk factor for emergence in Europe and in our country.
8.	yes	"+++"	Recently, there has been an outbreak in North Africa and reappearance in several countries worldwide (currently not in Europe). The disease is considered by the WHO as a re-emergent disease on world scale. Because fleas and rats do not recognize the political borders, this increase in incidence represent a risk factor for emergence in Europe and in our country.
9.	yes	"+"	The bacteria can stay virulent for several days in putrefying organisms. The persistence in the environment would represent a risk factor for emergence of the disease, but the mechanism is unknown. Re-emergence is conditionned by many environmental factors, including the presence of suitable vectors and (intermediate) hosts.

10.	yes	"- - -"	There are some sanitary policies: biosecurity (fight against rodents and vermin), control programs against fleas in endemic regions, tests at importation, etc.). These elements are important protection factors against emergence.
11.	yes	"0"	The disease is not concerned by the changes in technological or industrial processes.
12.	yes	"+"	There could be problems of recognition of the warning symptoms of the disease in human patients by first line doctors in case of re-emergence. The non detection of the disease would be a risk factor for emergence of the disease.
13.	yes	"+"	There can be increases in interactions between the different concerned animal compartments (between wild and domestic rodents via flea bites, between cats and rodents via ingestion of rats, etc.). This could represent a risk factor for emergence of the disease if infected animals would be present in the region.
14.	yes	"+"	There are increases in interactions between humans and animal populations concerned by the disease, due to the proximity between the reservoir rodent populations and the human activities (extension of the peri-urban zones) or due to contacts with cats. Because humans are capable to retransmit the disease to animals or other humans, this could be a risk factor for emergence if the disease was prevalent in Europe.
15.	no	"++"	There is no significant demographic growth in Belgium. A human demographic growth could create conditions for an increase in the transmission of the disease (from animals to humans and between humans), if such a growth was accompanied by a decrease in general hygiene (for example, waste discharges in big cities).
16.	yes	"+++"	There is a growth of the rodent population in Belgium. This represents a risk factor for emergence of the disease.
17.	yes	"+"	Human traveling is increasing. The bacteria can spread via rodents/vectors accompanying international human movements. International air traveling represent a risk factor for emergence of the disease.
18.	yes	"+"	Human tourism is increasing. The bacteria can spread via rodents/vectors accompanying international human movements. The eco-tourists are a risk population if they travel in endemic regions. International air traveling represents a risk factor for emergence of the disease.
19.	yes	"+"	The rodents are not directly concerned by the trade but, such as for traveling and tourism, international trade from endemic regions can represent a risk factor of accidental importation of infected rodents/vectors in a free region (historical example: rats in the commercial ships). So, the global increase in trade is a risk factor for emergence of the disease.
20.	yes	"+"	The rodents are not directly concerned by the transports but, such as for traveling, tourism and trade, international transport from endemic regions can represent a risk factor of accidental importation of infected rodents/vectors in a free region (historical example: rats in the commercial ships). So, the global increase in trade is a risk factor for emergence of the disease.
21.	yes	"+"	There is an increase in terrorism. Yersinia pestis could be used as bacteriological weapon. This is a risk factor for emergence of the disease.
22.	no	"0"	The disease is not concerned by the production systems of domestic animals.
23.	no	"0"	The disease is not concerned by the production systems of domestic animals.
24.	yes	"+++"	Some rodent species are resistant, do not die when infected, and transmit the disease. These resistant host species infect the fleas which in their turn infect sensitive animals, which can create an outbreak. In case of presence of such rodents in our regions, this asymptomatic carriage would represent a risk factor for emergence of the disease.
25.	yes	"++"	The wild rodents are the natural reservoir of the disease. The fleas are also considered as natural reservoir because they can stay

			infected during 396 days. In the natural outbreaks, the forest plague survive by a continuous cycle of the etiological agent, transmitted between rodents via the fleas (arthropod-vertebrate complex). cats and dogs could also represent an animal reservoir if the incidence of the infection increases in these species. The animal reservoirs represent a risk factor for emergence of the disease.
26.	no	"+"	In sensitive animals, the incubation period is short and the animals die rapidly, which is a protection factor. A long incubation period should represent a risk factor for emergence because it favors the transmission by infected and non diseased animals.
27.	yes	"++"	There are contacts between domestic and wild rodents. For example, wild rats (forest plague) can infect ubiquitous rats via a flea bite, which in their turn can infect domestic rats, which in their turn can infect humans (urban plague). These contacts are risk factors of emergence of the disease.
28.	yes	"+++"	The wild rodents (rats) play an important epidemiological role because they are the natural reservoir of the bacteria. Because the wild fauna is difficult to control, this represent a risk factor for emergence of the disease.
29.	no	"+++"	There is an increase in the rodent/rat population in our country. If the disease was present in the region, an increase in the rat population would represent a risk factor for emergence of the disease.
30.	yes	"++"	There are climatic and meteorological changes. If sensitive animal are sufficiently numerous and if the climatic conditions are favorable (warm and dry weather), a plague outbreak can occur in rodents. The fleas would also better survive and would be more abundant in case of soft winter. Floods favor the moving of the rodents (rats) can also favor an emergence. These are risk factors of emergence. However hard winters (if the gulf stream disappeared) should be protective factors against emergence.
31.	yes	"+"	There are changes in ecosystems produced by man, and this represents a risk factor for emergence of the disease.
32.	yes	"+"	There is an ongoing urbanisation in Belgium. The urbanisation creates opportunities of contacts between wild and domestic rats (infected wild rodents can infect rodents living at proximity of the habitations which in their turn can infect humans). If there are problems concerning the waste and dumping management, the increase in urbanisation could, in case of presence of the bacteria, be a risk factor for emergence.
33.	yes	"+++"	Fleas (mostly the rat fleas) and body lice (EID 16 n°5 p.892-893, 2010) are responsible for the transmission of the disease between all the host species. The presence of this vector in Belgium constitutes an important risk factor for emergence of the disease.

Encéphalites à tiques (Virus du groupe TBE (Flaviviridae))

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"0"	There is no genetic variability. A genetic variability should have no influence on the risk for emergence.
2.	yes	"++"	There is lack of knowledge of the pathogenesis. The lack of knowledge in pathogenesis is a risk factor for emergence.
3.	no	"+"	The infection profile remains stable. A change of pathogenesis could represent a risk factor for emergence of the disease.
4.	yes	"++"	The vaccination is efficient for the prevention of the disease in humans, but has no epidemiological significance on the risk for

			emergence of the disease because the transmission is vectorial. This is a risk factor for emergence of the disease.
5.	no	"0"	There are no known possibilities to pass the species barrier, except the known susceptible species (wild small mammals, cattle). The passage of the species barrier would have no influence on the risk for emergence.
6.	yes	"0"	The disease can be transmitted to humans, but this has no influence on the risk for emergence.
7.	yes	"+++"	The disease is present in Europe and goes up to the North of Europe following the increase in ticks populations. This is a risk factor for emergence in Belgium.
8.	yes	"+++"	The last years, the number of (human) cases increases in most countries (France, Germany, Austria, etc.). This is a risk factor for emergence.
9.	no	"0"	The virus does not persist in the environment. Since the transmission needs a vectorial action, a persistence in the environments would have no influence on the risk for emergence.
10.	no	"- -"	There are no measures capable to limit the extension of the disease, because of the impossibility to take measures against ticks and wild small mammals. The pasteurization of the milk of infected cows is a protection factor of the human population.
11.	no	"0"	This disease is not concerned by this factor
12.	yes	"++"	There are difficulties to detect the disease in ticks and wild small mammals, and also probably difficulties of field detection of this etiology in diseased cattle. Problems of detection are risk factors of emergence of the disease.
13.	no	"0"	There is no increase in interactions between animals compartments concerned by the disease (small mammals, cattle) (for ticks, see last point). Such an increase would have no influence on the risk for emergence, because the transmission needs the action of a tick.
14.	no	"0"	There is no increase in interactions between animals concerned by the disease (small mammals, cattle) and humans (for ticks, see last point). Such an increase would have no influence on the risk for emergence, because the transmission needs the action of a tick.
15.	no	"0"	There is no significant demographic growth in Belgium. The disease is not concerned by a human demographic growth.
16.	no	"0"	There is no growth of the domestic animal populations concerned by the disease. Such an increase would have no influence on the risk for emergence of the disease.
17.	yes	"++++"	Human traveling is increasing. This is a risk factor for infection of humans and of emergence in the human population. This implies also a risk for importation of infected ticks via planes;
18.	yes	"++++"	Human tourism is increasing (forest tourism, campers, picking, hunting, naturalists). This is a risk factor for emergence in humans, but not in animal populations.
19.	no	"0"	The increase in trade does not concern ticks nor wild small mammals.
20.	no	"0"	The increase in transports does not concern ticks nor wild small mammals.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	yes	"-"	There are intensive production systems concerning cattle, decreasing the risk for being infected by ticks. This is a protection factor against emergence in the cattle population.
23.	yes	"+"	There are extensive production systems concerning cattle, increasing the risk for being infected by ticks. This is a risk factor for emergence in the cattle population.

24.	no	"0"	There is no asymptomatic carriage. An asymptomatic carriage would have no influence on the risk for emergence because tick bites do not depend on the presence of clinical signs.
25.	yes	"+++"	The animal reservoirs are forest rodents and small mammals. Because this reservoir is wildlife, the animal reservoir is a risk factor for emergence of the disease.
26.	no	"0"	There is no especially long incubation period for the disease. A long incubation period would have no influence on the risk for emergence because tick bites do not depend on the presence of clinical signs.
27.	yes	"++"	There are possibilities of contacts between cattle and wildlife (small mammals of the wild fauna). This is a risk factor for transmission of the disease and of emergence
28.	yes	"+++"	Wildlife (ticks and wild small ruminants) has an important epidemiological role because they are the animal reservoir. This is a risk factor for emergence because control of wildlife is difficult.
29.	yes	"++++"	The abundance of forest big vertebrates (roe deer) and of the small mammals reservoir (xild rodents) favours the ticks pullulation. This is a risk factor for emergence of the disease.
30.	yes	"++"	There are climatic and meteorological changes. Climatic changes (warming) increase the tick populations and their geographical repartition. This is a risk factor for emergence.
31.	no	"++"	Changes in the eco-landscaped structure of the forests (ex. North of America) favours the ticks pullulation. This would represent a risk factor for emergence, but such changes in ecosystems do not exist in Belgium.
32.	yes	"++"	There is an ongoing urbanisation in Belgium. Urbanisation is a risk factor because it increases the interactions between humans and ticks/wild fauna. This is a risk factor for emergence on the disease.
33.	yes	"++++"	Ticks (Ixodes ricinus et ixodes persulcatus) are present in Europe and in Belgium. This is an important factor of emergence of the disease in Belgium.

ESB atypique (prions (type H et type L))

Factor	Presence (yes) / absence (no)	Impact (risk / protection / no effect)	Scientific justification
1.	no	"+"	A certain diversity exists concerning the prions, but we can not speak about a true variability. A genetic variability should represent a risk factor for emergence.
2.	yes	"++"	There is lack of knowledge of the pathogenesis. The origin of atypical BSE is unknown (spontaneous and sporadic arrival? Meat and bone meal?). Little is known on the pathogenicity of atypical BSE. There are no data on the distribution of the infectivity in peripheral tissues, what impede any evaluation of risk reduction by the different prevention measures in force, such as SRM. The lack of knowledge of pathogenesis is a risk factor for emergence.
3.	yes	"++"	The L-type seems more virulent for humans than the classical type. In case of L-type, the majority of the PrPd is not situated in the brainstem, and the brain should not be the optimal target for the detection of prion particles, which can lead to a lack of detection of cases. A non detection of cases can lead to the emergence of the disease.

4.	yes	"+"	There is no vaccine. If no vaccination, no protection and higher risk of emergence.
5.	yes	"++"	There is a possibility of transmission to other species, but this is only proven under experimental conditions for the L-type (humanized mice, monkeys). There is a possibility, after interspecific passage, to generate classical BSE --> possibility of re-emergence of classical BSE. The possibility to change the host spectrum is a risk factor for emergence.
6.	yes	"+"	There are indications that the L-type could be potentially transmissible to humans and be more virulent that the classical type. Humans do not transmit infection (dead end host), but there is the theory about recycling of human cadavers from the Ganges into MBM as possible vector, and recently theoretical airborn transmission is shown to be very efficacious. So the possibility of passage to humans is a risk factor for emergence in animals.
7.	no	"0"	There are cases in different European countries, but we can not speak about a real geographical expansion. Since the transmission of the disease is food-borne, it has no influence on the risk for emergence. The risk concerns the importations (see below).
8.	yes	"+"	There are cases in several European countries, and also in non-European countries (Japan, USA). This is only a risk factor in case of importation of infected animals or infected animal products (meat and bone meal).
9.	yes	"++"	The persistence in the environment is not proven for Atypical BSE, but by analogy with other prions (scrapie and classical BSE), it has to be considered that there is a survival in the environment. This is a risk factor for emergence.
10.	yes	"- - -"	There is a legislation (EC Regulation 999/2001). This is an important protection factor against emergence. However, the reduction of the surveillance can be a risk factor for underestimation of the prevalence or of undetection of a potential emergence.
11.	yes	"+"	There are changes in the technological or industrial processes. The origin of atypical BSE is sporadic or spontaneous (i.e. not due to changes in industrial processes), but the recycling of infectious materials could be at the origin of the transmission of the disease, such as for classical BSE. Consequently, the changes in the industrial processes are risk factors of emergence.
12.	yes	"+++"	Different current tests (see validation of current tests by EFSA) available offer sufficient sensitivity. However, due to the fact that in atypical cases the majority of the PrPd is not present in the brainstem (brainstem is used in all these tests), the current testing methods do not allow reliable detection of the Atypical cases, so no reliable data on the occurence and possible other transmission mechanisms than for classical BSE are available. This represents a risk factor of non detection of a re-emergence of the disease, and a risk factor for emergence in case of recycling of products from infected incubating animals.
13.	no	"+"	There are no increases in interactions between cattle populations. Pathogenesis and transmission of Atypical BSE is largely unknown. If lymphoreticular system would be more involved like in Classical scrapie or CWD, then direct and indirect contact could be a risk factor.
14.	no	"0"	There are no increases in interactions between human and cattle populations. Since the transmission is foodborne and that humans are dead end hosts, interactions have no influence on the risk for emergence of atypical BSE.
15.	no	"0"	There is no significant demographic growth in Belgium. There is no influence of a demographic growth on the risk for emergence, for the same reasons mentioned above.
16.	no	"0"	There is no growth of the cattle population in Belgium. A growth of the cattle population should have no influence on the risk for emergence since the transmission route of the disease is food-borne.
17.	yes	"0"	Human traveling is increasing, but this has no influence on the risk for emergence in the cattle population.

18.	yes	"0"	Human tourism is increasing, but this has no influence on the risk for emergence in the cattle population.
19.	yes	"++"	There is an increase in trade of cattle. This is a risk factor, through the risk for importation of infected animals or meat and bone meal.
20.	yes	"+"	There is an increase in transport of cattle and animal products. There is no influence of the transport of animals on the risk for emergence, but the transport, deriving from less controlled countries, of meat and bone meal (illegal ?!) could be a risk.
21.	yes	"+"	As BSE is considered as a potential bioterrostic agent for animals (economic) as for humans (nv CJD link), atypical BSE can also considered as such (one cannot exclude it)
22.	yes	"+"	Intensive production systems exist for cattle in Belgium. These are a risk factor only if recycled material is used (which is forbidden).
23.	yes	"+"	Extensive production systems exist for cattle in Belgium. These can be a risk factor only if the mean age of the population increases.
24.	yes	"++"	The animals are asymptomatic during a very long period (no H-BSE and L-BSE were observed in the passive epidemio-surveillance network although, during retrospective interviews, the farmers and veterinarians for six of these animals reported clinical signs with TSE in three fallen stock), rendering the early detection of the disease impossible. This can be a risk factor for emergence in case of recycling of products from infected incubating animals.
25.	no	"0"	There is no animal reservoir. The existence of an animal reservoir should not represent a risk factor because the transmission of the disease is most probably food-borne (but other transmission ways cannot be excluded as pathogenesis studies are lacking at present).
26.	yes	"++"	The incubation period is very long (> 8 years), rendering the early detection of the disease impossible. This can be a risk factor for emergence in case of recycling of products from infected incubating animals.
27.	yes	"+"	There are possibilities of contacts between domestic cattle and wildlife. Pathogenesis and transmission of Atypical BSE is largely unknown. If lymphoreticular system would be more involved like in Classical scrapie or CWD, then direct and indirect contact could be a risk factor and also the (carnivorous !) feeding of contaminated MBM.
28.	no	"0"	The wildlife has no known epidemiological role in the risk for emergence.
29.	no	"0"	No influence of a possibly increase in demography or distribution of the wildlife.
30.	yes	"0"	There are climatic and meteorological changes. No influence on the risk of emergence.
31.	no	"0"	No influence of possible changes in ecosystems.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. No influence of urbanisation on the risk for emergence.
33.	no	"0"	Non vectorial disease.

Dirofilariose (*Dirofilaria*) (Mas-Coma *et al*., 2008)

Factor	Presence	Impact	Scientific justification

	(yes) / absence (no)	(risk / protection / no effect)	
1.	no	"0"	There is no genetic variability. A genetic variability would have no influence on the risk for emergence of this disease.
2.	no	"+"	There is no lack of knowledge of pathogenesis. A lack of knowledge represents always a risk factor for emergence.
3.	no	"++"	There is no change in the pathogenesis. A change in pathogenesis can increase the risk for emergence.
4.	yes	"++"	There exist difficulties to control the disease by vaccination. This represents a risk factor for emergence.
5.	yes	"+"	There exist possibilities of changing the host spectrum. Such possibilities represent a risk factor for emergence.
6.	yes	"+"	The possibility to change the host spectrum from animals to humans exists, but only in highly endemic regions. The number of human infections is increasing in Europe. The contribution of humans in transmission is negligible.
7.	yes	"+++"	There is a progressive recovery of the disease in France (first in the Mediterranean Basin, then towards the center till the Paris Basin) (maybe false expansion due to an increased detection). 'This represents a risk factor of emergence in Belgium.
8.	yes	"++"	Increase in prevalence in the South (Spain, Italia, Sardinia) and in the East of Europe (Serbia, Croatia, Turkey, Romania) + increase in the number of cases in the North of Europe (Switzerland, Austria, Netherland, Germany, United-Kingdom, Sweden, Hungaria) in imported dogs or in dogs which stayed in the South of France, but also in dogs which have not left their home (cases in Switzerland). This represent a risk factor of emergence of the disease in Belgium.
9.	no	"0"	There is no persistance of the parasite in the environment. Because the transmission is vectorial, a persistence in the environment should have no influence on the risk for emergence.
10.	no	"- -"	There is no legislation nor sanitary polici. Some measures, such as compulsory prophylactic treatment of dogs travelling to endemic areas, could protect against the emergence of the disease.
11.	no	"0"	The disease is not concerned by this factor
12.	yes	"++"	There exists a problem of detection of the disease. This represent a risk factor of emergence.
13.	no	"0"	There is no increase in interactions between the animal compartments concerned by the disease. An increase would have no influence on the risk of emergence because the transmission pathway involves mosquitos and does not need some interactions between animals.
14.	no	"0"	There is no increase in interactions between the animal and the human populations. An increase would have no influence on the risk of emergence because the transmission pathway involves mosquitos and does not need some interactions between animals and humans.
15.	no	"0"	There is no significant demographic growth in Belgium. The emergence of the disease is not influenced by a human demographic growth.
16.	no	"++"	There is no increase in the dog population in Belgium. Such an increase would represent a risk for an increased transmission of the disease and for an increased incidence of the disease.
17.	yes	"+++"	Human traveling is increasing. Movements of infected dogs via travels, tourism, transport and trade increase the risk of introduction of the disease in the country.
18.	yes	"+++"	Human tourism is increasing. Movements of infected dogs via travels, tourism, transport and trade increase the risk of introduction

			of the disease in the country.
19.	yes	"++"	There is an increase in trade of dogs. Movements of infected dogs via travels, tourism, transport and trade increase the risk of introduction of the disease in the country.
20.	yes	"++"	There is an increase in transport of dogs. Movements of infected dogs via travels, tourism, transport and trade increase the risk of introduction of the disease in the country.
21.	yes	"0"	There is an increase in terrorism worldwide, but which does not concern this disease.
22.	no	"0"	Carnivores are not concerned by the production systems for food animals.
23.	no	"0"	Carnivores are not concerned by the production systems for food animals.
24.	yes	"+++"	The infection can be asypmtomatic. If not detected and not treated, the risk of retransmission of the disease is increased. This represents a risk factor for emergence.
25.	yes	"++"	domestic and wild canids, (cats)
26.	yes	"+"	There is a long incubation period, during which the animals can be infected without being detected; this is a risk factor for emergence
27.	yes	"0"	There can be contacts between the domestic animals and the wild fauna, but this has no influence on the risk of emergence because the (vectorial) transmission does not need contacts
28.	yes	"+"	Because wild canids are reservoir of the disease and that they can transmit the infection, the wild fauna has an epidemiological role. This represent a risk factor for emergence because it is difficult to control the wild fauna.
29.	yes	"+"	There is an increase of the foxes demograpgy/distribution in Belgium. An increase in the wild carnivore population represent a risk factor for emergence.
30.	yes	"+++"	There are climatic and meteorological changes. A warm and humid climate, favourable for the reproduction of the vector populations, can favour the expansion of the disease. This represent a risk factor.
31.	no	"++"	There are no true changes in the ecosystems in Belgium. Changes in ecosystems, if they favour the multiplication of the moquitoes, can be risk factors for emergence.
32.	yes	"0"	There is an ongoing urbanisation in Belgium. Since the vectorial mosquitoes are present in urbanized areas such as in humid natural areas and in countryside, urbanisation has no influence on the risk for emergence.
33.	yes	"++++"	The vectorial moquitoes (anophèles, culex, aedes) are present in belgium. This represent a risk factor for emergence.

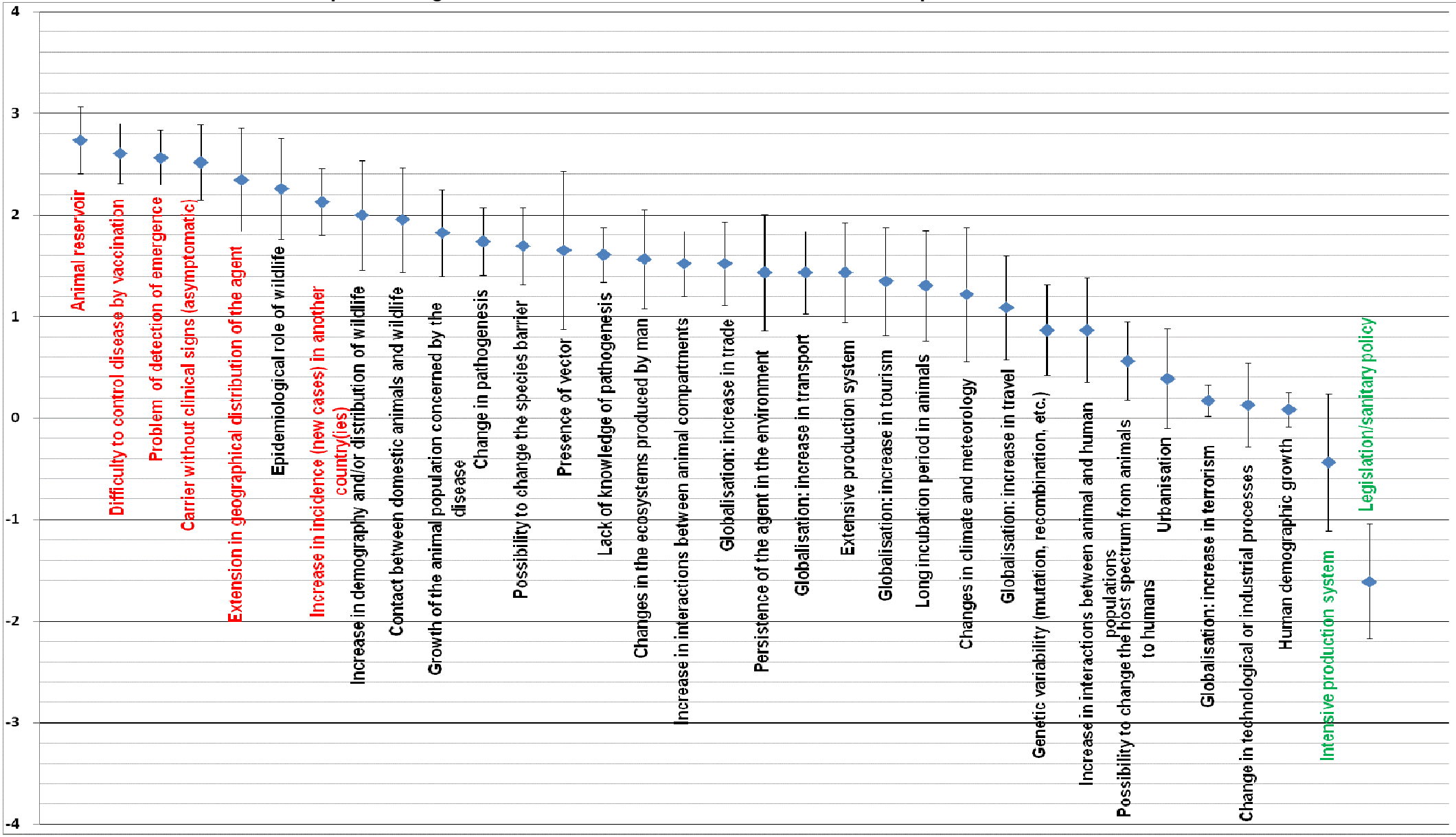
Annexe 9. Scénarios de ranking pour les différents groupes de maladies

Les intervalles de confiance à 95% sont calculés sur base d'une distribution normale. L'axe des abcisses représente la force de l'influence des facteurs sur le risque d'émergence des maladies, selon les scores données par les experts (voir explications à l'annexe 4). Les valeurs positives indiquent les facteurs de risque. La valeur « 0 » indique une absence d'influence du facteur. Les valeurs négatives indiquent les facteurs de protection. Les 6 facteurs de risque indiqués en rouge représentent les facteurs de risque ayant l'occurrence la plus élevée pour l'ensemble des scénarios, selon l'annexe 11. Les facteurs indiqués en vert sont considérés comme des facteurs de protection.

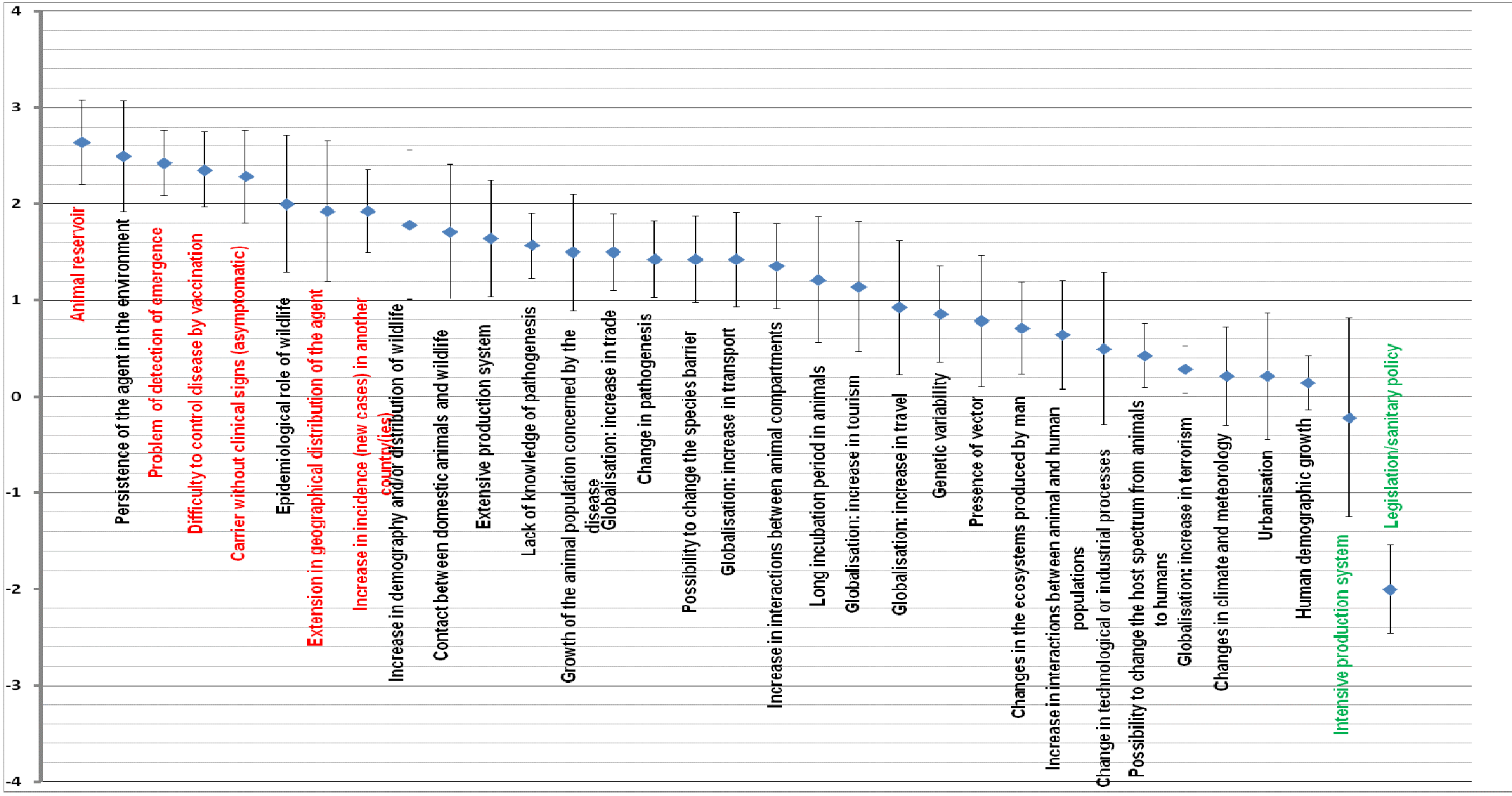
Scénario 1. Facteurs de risque d'émergence des maladies animales considérant la santé animale dans son ensemble

Ce scénario est présenté dans le texte de l'avis dans le chapitre relatif aux résultats (point 2.3.2).

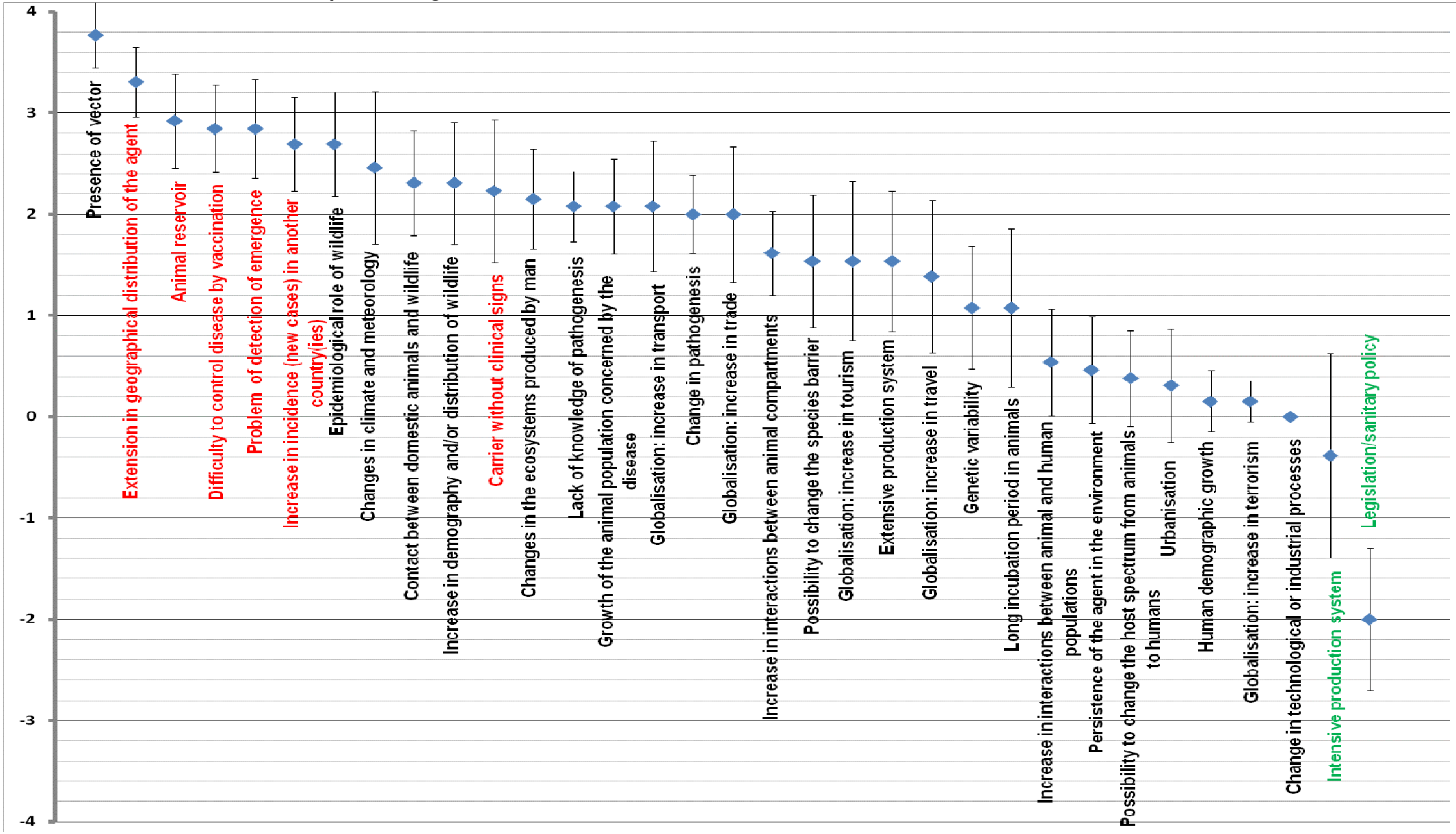
Scénario 2. Facteurs de risque d'émergence des maladies animales infectieuses zoonotiques



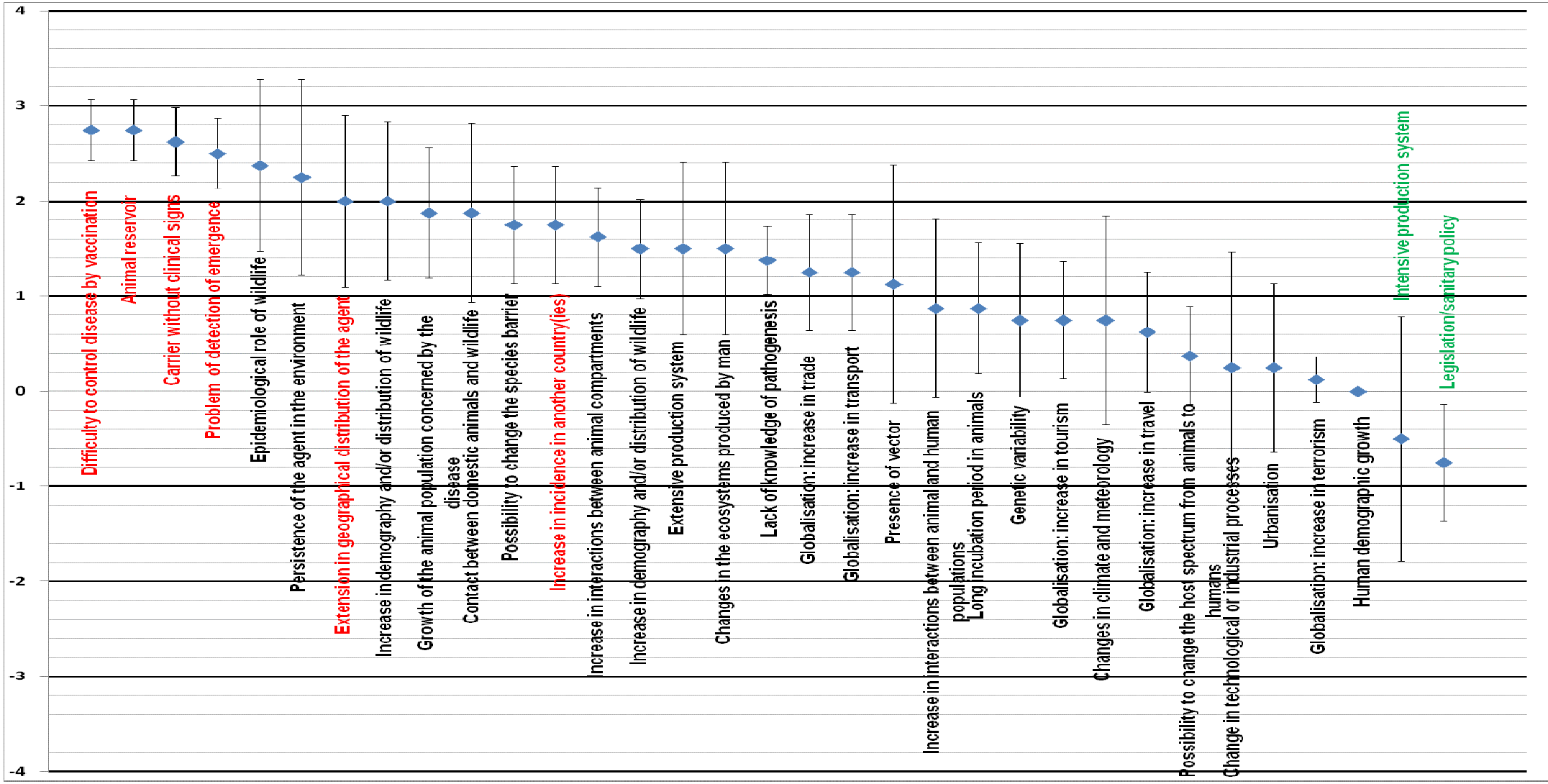
Scénario 3. Facteurs de risque d'émergence des maladies animales infectieuses transmises par les denrées alimentaires



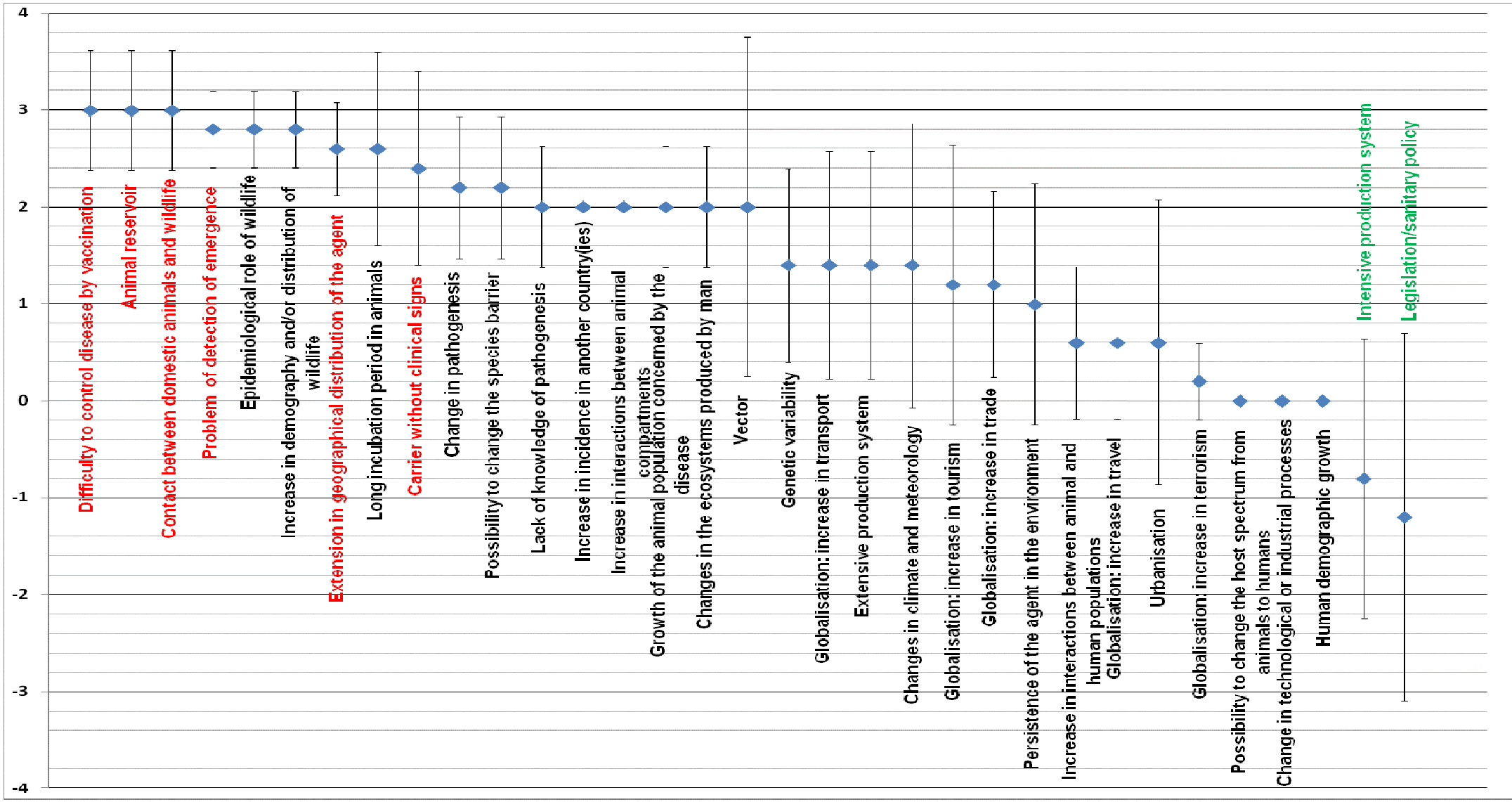
Scénario 4. Facteurs de risque d'émergence des maladies animales infectieuses vectorielles



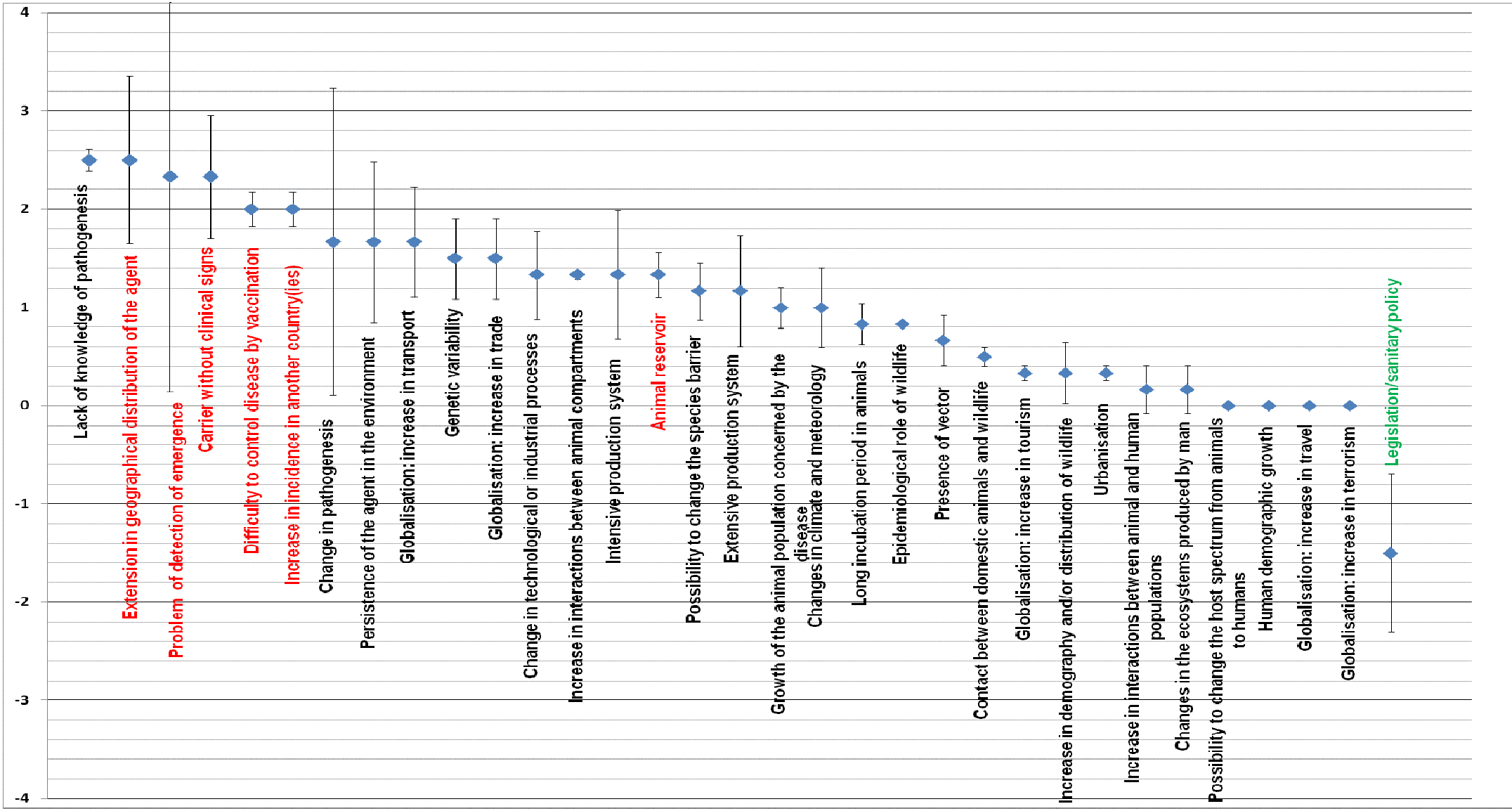
Scénario 5. Facteurs de risque d'émergence des maladies animales infectieuses endémiques



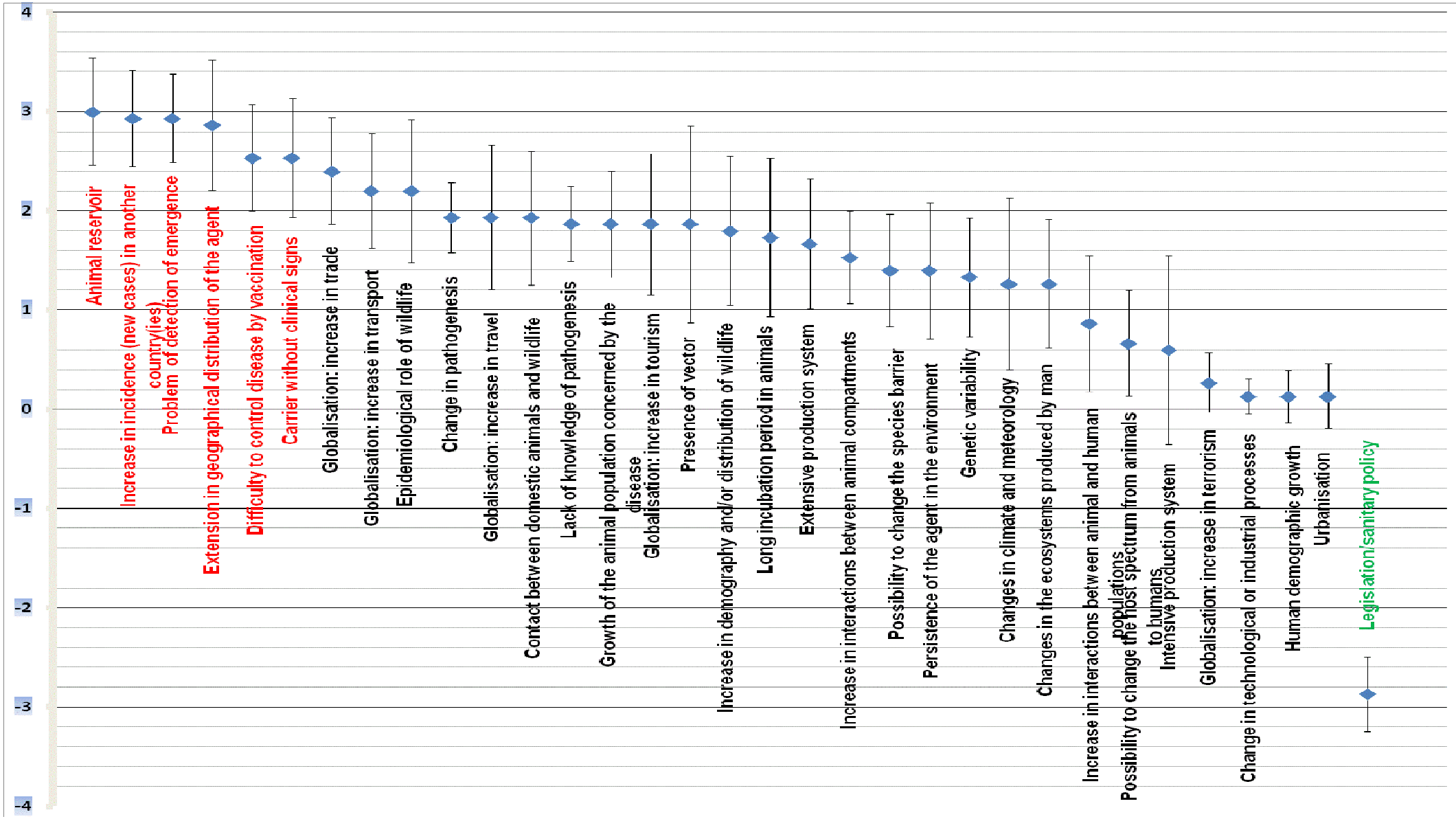
Scénario 6. Facteurs de risque d'émergence des maladies animales infectieuses sporadiques



Scénario 7. Facteurs de risque d'émergence des maladies animales infectieuses dont l'émergence est constatée



Scénario 8. Facteurs de risque d'émergence des maladies animales infectieuses exotiques et à risque d'émergence

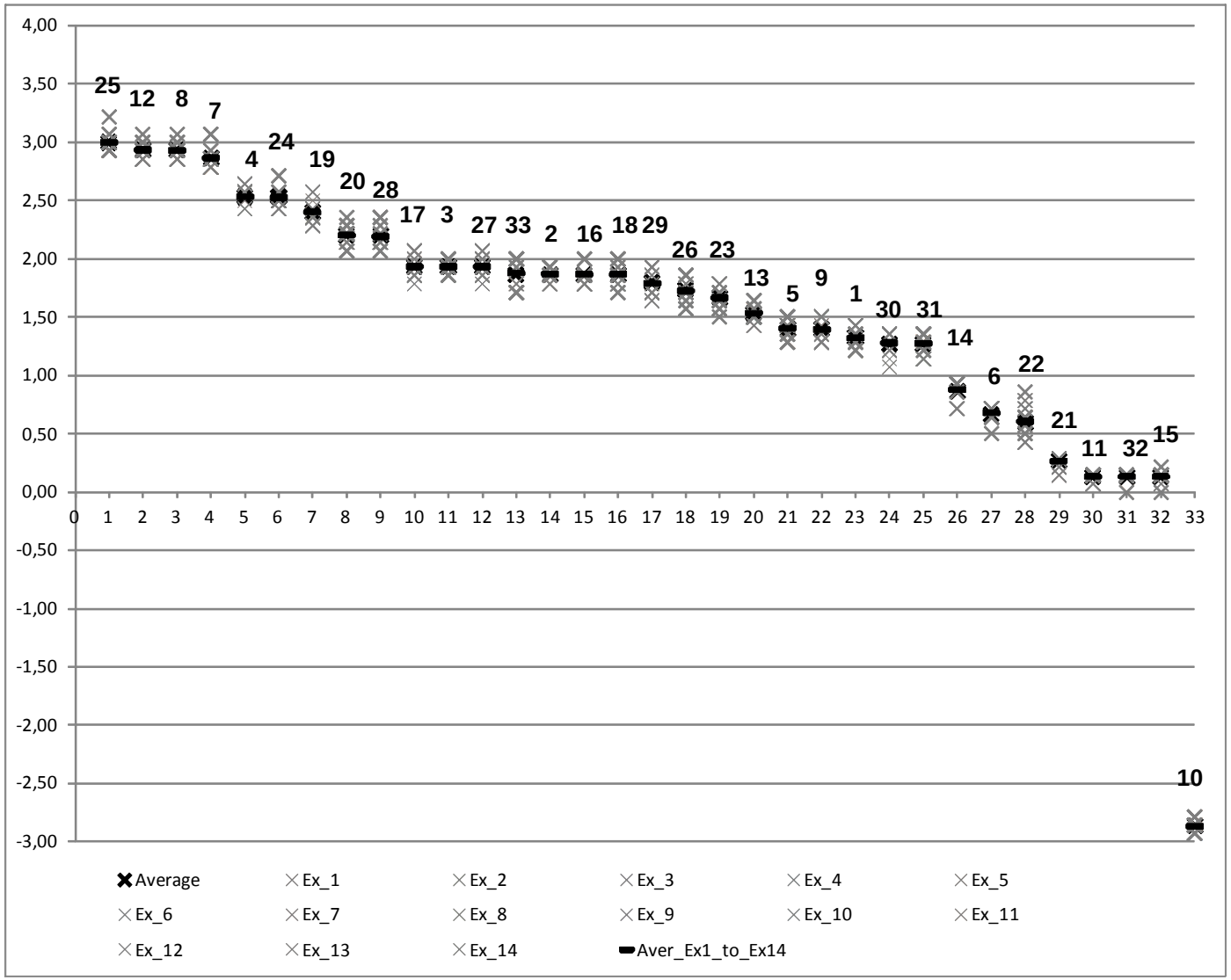


Annexe 10. Influence de l'hétérogénéité des groupes sur les résultats des rankings

L'hétérogénéité inhérente aux groupes et le nombre de maladies dans les groupes ont une influence sur les résultats des rankings. Les graphes ci-dessous montrent l'influence de l'enlèvement d'une maladie à la fois sur les résultats des rankings.

Scénario 1. Facteurs de risque influencant l'émergence des maladies exotiques (groupe de 15 maladies)

La croix noire centrale représente la moyenne des scores par facteur de risque, considérant les 15 maladies du groupe. Les croix grises représentent la moyenne des scores après retrait, à chaque fois, d'une maladie du groupe. Le numéro indiqué au dessus des croix représente le numéro du facteur de risque tel que présenté dans le texte (point 2.2, étape 2).
Dans ce scénario, l'influence de l'enlèvement d'une maladie sur les résultats du ranking est faible (l'ordre du ranking ne change pas beaucoup) car il y a beaucoup de maladies. Les résultats concernant les grands groupes sont plus stables.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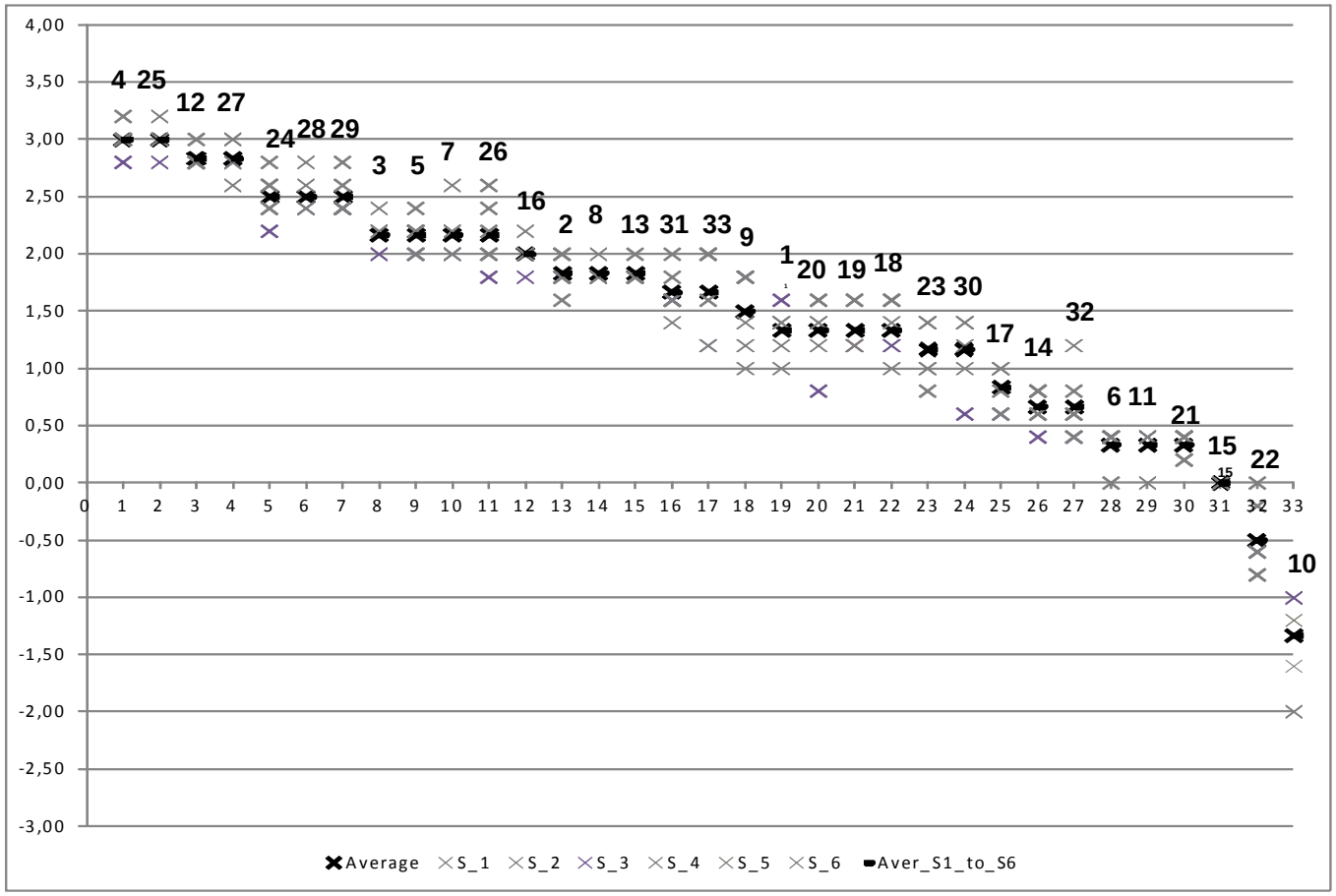
Aver_Ex1_to_Ex14

Scénario 2. Facteurs de risque influençant l’émergence des maladies sporadiques (groupe de 6 maladies)

Dans ce scénario, l’influence de l’enlèvement d’une maladie sur les résultats du ranking est plus importante (l’ordre du ranking change) car il y a moins de maladies. Les résultats concernant les petits groupes sont donc moins stables.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Aver_S1_to_S6

Annexe 11. Résumé des trios de tête des facteurs de risque pour les différents scénarios

Pour chaque scénario de ranking, les trois facteurs de risque les plus importants sont cités. L'occurrence de ces facteurs de risque dans l'ensemble des scénarios a été comptée et les facteurs de risque ayant l'occurrence la plus élevée ont été mis en évidence (voir point 3. Conclusions).

Scope	**Groupe de maladies**	**Facteurs de risque les plus importants (top 3 de chacun des scénarios)**		
Santé animale dans son ensemble	**toutes les maladies**	Problem of detection of emergence	Animal reservoir	Difficulty to control disease by vaccination
Situation épidémiologique des maladies	**endémiques**	Difficulty to control disease by vaccination	Animal reservoir	Carrier without clinical signs (asymptomatic)
	sporadiques	Difficulty to control disease by vaccination	Animal reservoir	Contact between domestic animals and wildlife
	émergence constatée	Lack of knowledge of pathogenesis	Extension in geographical distribution of the agent	Problem of detection of emergence
	exotiques	Animal reservoir	Increase in incidence (new cases) in another country(ies)	Problem of detection of emergence
Agent pathogène	**bactéries**	Difficulty to control disease by vaccination	Animal reservoir	Problem of detection of emergence
	virus	Extension in geographical distribution of the agent	Increase in incidence (new cases) in another country(ies)	Problem of detection of emergence
	parasites	Difficulty to control disease by	Carrier without clinical signs	Animal reservoir

		vaccination	(asymptomatic)	
	prions	Persistence of the agent in the environment	Problem of detection of emergence	Long incubation period in animals
Mode de transmission	**vectorielle**	Presence of vector	Extension in geographical distribution of the agent	Animal reservoir
	alimentaire	Animal reservoir	Persistence of the agent in the environment	Problem of detection of emergence
	directe	Animal reservoir	Difficulty to control disease by vaccination	Carrier without clinical signs (asymptomatic)
	indirecte	Contact between domestic animals and wildlife	Animal reservoir	Epidemiological role of wildlife
	inhalation	Extension in geographical distribution of the agent	Increase in incidence (new cases) in another country(ies)	Carrier without clinical signs (asymptomatic)
	environnement	Persistence of the agent in the environment	Long incubation period in animals	Lack of knowledge of pathogenesis
Caractère zoonotique	**oui**	Animal reservoir	Difficulty to control disease by vaccination	Problem of detection of emergence
	non	Extension in geographical distribution of the agent	Problem of detection of emergence	Increase in incidence (new cases) in another country(ies)

Annexe 12. Recommandations spécifiques

Les tableaux ci-dessous reprennent des recommandations spécifiques pour les différents facteurs de risque. Ces recommandations sont des données brutes et ne sont pas prioritisées. Une prioritistion ainsi qu'une étude de faisabilité pourront être réalisées ultérieurement en concertation avec les gestionnaires de risque.

Problèmes de détection de l'émergence :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Problèmes de détection clinique (passive) sur le terrain, dus par exemple à un manque de vigilance et de connaissance, à une variation des manifestations cliniques, à l'existence de plusieurs sérotypes, ou à un portage asymptomatique.	o formations o sensibilisation régulière et stimulation de la vigilance des acteurs de terrain (éleveurs et vétérinaires) o instauration d'un système de vétérinaires praticiens sentinelles (cf. médecine humaine)	o surveillance active o surveillance syndromique
Maladie nouvelle non identifiée	o formations répétées des acteurs de terrain à la détection de situations anormales	Développement de tests de screening non spécifiques (par exemple, bio-chips, métagénomique)
Manque de déclaration à l'AFSCA (manque de confiance, de motivation)	o dialogue et communication o compensations financières o récompense pour la détection de l' « index case (premier cas d'une maladie émergente)» o en cas de suspicion de maladie, limiter les mesures temporaires de contrôle post-déclaration jusqu'à la confirmation du résultat de laboratoire, pour diminuer le seuil de déclaration des maladies (voir explications plus détaillées dans l'avis 12-2010 du Comité scientifique)	Analyse sociologique des relations entre les acteurs de terrain (vétérinaires et éleveurs) et l'Agence pour identifier des solutions au problème de sous-déclaration des maladies. De cette manière, l'Agence pourra développer des actions concrètes pour améliorer la confiance avec les opérateurs.
Manque de coordination entre les maillons de la chaine, mauvaise transmission des données	o guide pratique type brochure o information o liste de personnes de contact	Analyse sociologique des relations entre les acteurs de terrain (vétérinaires et éleveurs) et l'Agence pour identifier des solutions au problème de sous-déclaration des maladies. De cette manière, l'Agence pourra développer des actions

		concrètes pour améliorer la confiance avec les opérateurs.
Echantillons de mauvaise qualité, refroidissement insuffisant lors du transport vers le laboratoire	o formations o méthodes/procédures d'échantillonnage simples	
Tests de diagnostic: délais d'obtention des résultats, réactions aspécifiques, faible performance (sensibilité)	o communication entre l'AFSCA et les acteurs de terrain o management de laboratoire	Recherche scientifique sur les techniques de diagnostic

Réservoir animal :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Faune sauvage (ex. rongeurs)	/	Prélèvements chez des espèces animales cibles et conservation à long terme (sérothèque, par exemple)
Animaux domestiques	/	Prélèvements chez les animaux de production et de compagnie et conservation à long terme (sérothèque, par exemple)
Tiques, insectes	/	Mise au point d'un système de capture et d'identification systématiques des insectes et tiques susceptibles d'être vecteurs
Porteurs sains	/	identification des porteurs sains par des activités de surveillance

Difficultés de contrôler la maladie par la vaccination :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Problèmes de disponibilité:		
-vaccin inexistant, ou difficile à produire car antigènes difficiles à préparer ou pathogène difficile à isoler et cultiver in vitro	accords avec des compagnies privées	- recherche scientifique - développement de vaccins
- vaccin non disponible	- maintien des stocks de vaccins - accord avec compagnies privées	
- vaccin non autorisé	- demande d'autorisation si pertinent - analyse par l'AFMPS - éventuellement autorisation temporaire d'utilisation	

Problèmes de performance:		
- faible efficacité de protection (ex. parasite, variabilité génétique)	/	recherche scientifique
- vaccin plus adapté aux souches qui circulent sur le terrain	/	
- Pas de DIVA	/	
Administration difficile du vaccin, manque de participation des stakeholders		Firmes pharmaceutiques : améliorer la formulation du vaccin et modifier le mode d'injection

Extension de la distribution géographique de l'agent infectieux :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Extension causée par des facteurs connus et gérables	éviter ces facteurs	surveillance
Extension causée par des facteurs inconnus et non gérables	o Vigilance accrue de la situation internationale par l'autorité compétente o Monitoring de sources non officielles (google, …) o Consultation des alertes, de la littérature	surveillance
Extension dans le pays	mesures de contrôle	surveillance
Extension dans un pays voisin	contrôle du commerce intracommunautaire et des mouvements	surveillance
Extension en Europe	contrôle du commerce intracommunautaire et des mouvements	surveillance
Extension dans une autre région du monde	Contrôle des importations	surveillance

Porteurs asymptomatiques (sans signes cliniques) :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Introduction ou importation d'animaux infectieux	o quarantaine o tests sérologiques à l'achat, à l'importation	
Excrétion persistante	Détection des animaux excréteurs	Développement de tests rapides
Excrétion intermittente	détection par des méthodes de diagnostic indirectes (sérologie)	

Augmentation de l'incidence (nouveaux cas) dans un (d') autre(s) pays:

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
	o Vigilance accrue de la situation internationale par l'autorité compétente o Monitoring de sources non officielles (google, …) o Consultation des alertes, de la littérature	
Pays voisin	collaboration structurée en épidémiosurveillance avec les pays voisins	surveillance aux frontières (ex. faune sauvage)
Pays de l'UE	contrôle du commerce intracommunautaire et des mouvements	surveillance
Pays tiers	Contrôle des importations	surveillance

Rôle épidémiologique de la faune sauvage :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
	biosécurité	surveillance de la faune sauvage; cibler des espèces animales d'intérêt

Manque de connaissance de la pathogénie :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Pathogène complètement nouveau dont la pathogénie est inconnue	o Pas de mesure de gestion possible o Possibilité de quarantaine	o Surveillance (si des méthodes existent) o Recherche scientifique
Un pathogène similaire est connu et la pathogenèse peut être déduite	o Quarantaine o Mesures prises sur base d'éléments supposés	o Surveillance (si des méthodes existent) o Recherche scientifique
Gaps dans la connaissance de la pathogénie d'un agent connu	o Mesures basées sur les éléments connus	o Surveillance o Recherche scientifique
Maladie connue mais mauvaise connaissance des acteurs de terrain, des experts	Formation continue	

Changement dans la pathogénie :

Sous-catégories	Recommandations

du facteur de risque	Mesure concrète de gestion	Surveillance/vigilance/étude scientifique
Augmentation de virulence	Essayer d'éviter des conditions qui favorisent une augmentation de la pathogénie	o Surveillance o Recherche scientifique
Allongement de la période d'incubation		
Variation de l'interaction hôte-pathogène		
Changement du spectre d'hôte	Compartimentalisation des espèces au niveau de l'exploitation pour éviter la transmission interespèces	

Contacts entre les animaux domestiques et la faune sauvage :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
	biosécurité	Surveillance de la faune sauvage

Globalisation : augmentation du commerce :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
intracommunautaire		Liste de pays à risque
extracommunautaire	contrôle aux frontières, PIFs, ports, aéroports	Réévaluer la législation européenne à l'issue d'évaluations de risque à l'importation

Globalisation : augmentation du transport :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
intracommunautaire		
Extracommunautaire	o contrôle aux frontières, PIFs, ports, aéroports o certificats	

Croissance de la population animale concernée par la maladie :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Faune sauvage	Gestion des populations	
Animaux domestiques	biosécurité	Surveillance des maladies de ces populations

Augmentation de la démographie et/ou de la distribution de la faune sauvage :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Démographie	Gestion des populations	
distribution		

Persistance de l'agent infectieux dans l'environnement :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Poussières, sol	Gestion des déchets	échantillonnage pour la surveillance
Air		échantillonnage pour la surveillance
Matières fécales	Hygiène	échantillonnage pour la surveillance
eau	éviter les contacts avec les matrices contaminées	échantillonnage pour la surveillance

Augmentation des interactions entre les compartiments (populations) animaux :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
		étude scientifique des réseaux de contacts entre animaux et augmenter la surveillance basée sur le risque dans les hot spots de ces réseaux de contacts
Animaux domestiques – animaux domestiques	Biosécurité	
Animaux domestiques – faune sauvage	biosécurité	
Faune sauvage – faune sauvage		surveillance épidémiologique des maladies majeures dans différentes espèces animales
Animaux domestiques - nuisibles	Lutte contre les nuisibles	
Elevage outdoor	Biosécurité (barrières)	
absence de quarantaine des nouveaux animaux	formation des éleveurs et vétérinaires	
introduction d'animaux à partir de zones non sures	formation des éleveurs et vétérinaires	
hébergement inaproprié des animaux	formation des éleveurs et vétérinaires	
mélange d'animaux d'âges différents	formation des éleveurs et vétérinaires	

Possibilité de changement de spectre d'hôte d'une espèce animale vers une autre espèce animale (franchissement de la barrière d'espèce) :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
	o Eviter les contacts avec les espèces animales susceptibles o biosécurité	Surveillance Recherche scientifique

Systèmes de production extensifs :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Contacts avec animaux sources	biosécurité	

Longue période d'incubation chez l'animal :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
	quarantaine	

Vecteur :

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
De manière globale (moustiques, tiques, Culicoides, etc.)		o Surveillance des populations de vecteurs pour détecter d'éventuelles augmentations de populations o surveillance de l'apparition d'une nouvelle espèce o étude de la dynamique des populations (ex; overwintering, etc.) o Surveillance de l'infection des vecteurs par les agents pathogènes
Augmentation d'incidence d'une espèce de vecteur		Surveillance des maladies transmises par ce vecteur

Variabilité génétique (mutation, recombinaison):

Sous-catégories du facteur de risque	Recommandations	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Variabilité innée (drift, shift)	o Action directe impossible	o Surveillance épidémiologique

	o limiter la transmission via l'hygiène et la biosécurité	moléculaire de pathogènes isolés
Variabilité induite par des facteurs externes	Eviter les circonstances qui induisent la mutagénèse	

Globalisation : augmentation du tourisme :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Intra-EC	o contrôles aux frontières, aux aéroports, ports o informations de biosécurité aux voyageurs	
Extra-EC		
Expansion des vecteurs	biocides dans les moyens de transport (avion, bateau)	

Changements dans les écosystèmes produits par l'homme :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
déforestation / reforestation		surveillance des maladies concernées par ces changements (voir **annexe 8**)
barrages/digues		
canals		

Changements climatiques et météorologiques :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
réchauffement	Éviter les facteurs qui contribuent au réchauffement	surveillance des populations de vecteurs et des maladies vectorielles
humidité/précipitations	réduire le nombre de points d'eau stagnante	surveillance des populations de vecteurs et des maladies dont la propagation est favorisée par l'humidité (voir **annexe 8**)

Globalisation : augmentation des voyages :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Intra-EC	o contrôles aux	

Extra-EC	frontières, aux aéroports, ports o informations de biosécurité aux voyageurs	
Expansion des vecteurs	biocides dans les moyens de transport (avion, bateau)	

Augmentation des interactions entre les populations animales et humaines :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
interactions avec le personnel de la ferme	formation du personnel	étudier les agents (zoonotiques) potentiellment transmis par ces interactions
interactions avec des personnes étrangères (ex. fermes pédagogiques)	hygiène, formation	

Possibilité de changement de spectre d'hôte des animaux vers l'homme :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
	Eviter contacts directs avec les animaux	
Pour mieux détecter chez les animaux	Meilleure interface entre les autorités de santé publique et les autorités de santé animale	surveillance
Pour mieux détecter chez les humains	o Formation des médecins o Élargissement du spectre de tests en médecine humaine	

Changements dans les procédés technologiques et industriels :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Nouveaux procédés technologiques		Évaluation de risque des changements
Changements dans les procédés existant		
Procédés (zootechniques) d'hébergement des animaux : densité, alimentation,	o Nettoyage régulier o Alimentation « safe » o Gestion des déchets	

évacuation des déchets, all in – all out, etc.		
Durant l'abattage	o Good Slaughterhouse Management	
Durant le processing du lait, de la viande, des oeufs	HACCP	

Systèmes de production intensifs :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
Haute densité des animaux	o Biosécurité o formation	

Urbanisation :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
expansion vers les campagnes	identification et inventaire des animaux domestiques détenus de manière non professionnelle	surveillance des maladies transmises par les tiques
augmentation de densité urbaine	information du public pour une réduction du risque d'émergence et de propagation d'agents pathogènes (par exemple gestion des plans d'eau privés)	

Globalisation : augmentation du terrorisme :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
bioterrorisme		
Agroterrorisme (expansion délibérée de pathogènes des animaux/plantes pour déstabiliser l'économie d'un pays)	Collaboration structurée entre Afsca et les services de sécurité fédérale pour définir des seuils d'alerte	Systèmes d'alerte

Croissance démographique humaine :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**

en Belgique	formation du public à l'hygiène et aux préventions des maladies animales au niveau belge	
en Europe	formation du public à l'hygiène et aux préventions des maladies animales au niveau européen	
dans le monde: plus de consommateurs signifie plus de nourriture et par conséquent importation à partir d'une variété plus grande d'origines (inconnues)	Donner des informations à l'industrie alimentaire et la distribution alimentaire sur les dangers et les risques d'émergence pour leur permettre d'en tenir compte dans leur plan HACCP afin d'éviter que des pathogènes ne soient présents dans les aliments	
augmentation de l'élevage hobbyiste et de basse-cour	informations aux éleveurs hobbyistes	

Législation / police sanitaire :

Sous-catégories du facteur de risque	**Recommandations**	
	Mesure concrète de gestion	**Surveillance/vigilance/étude scientifique**
manque de législation sur la déclaration	Adapter la liste des maladies à déclaration obligatoire	
manque de contrôle aux frontières	augmenter le contrôle aux frontières	
manque de contrôle de la biosécurité	augmenter l'importance de la biosécurité	
Manque de mesures de contrôle obligatoires	faire une législation	
restrictions sur l'utilisation de traitements (ex.antibiotiques)	évaluation des alternatives à ces traitements par des comités d'experts consultatifs	
restrictions sur l'utilisation de la vaccination		
législation ne permettant pas à l'autorité de prendre des actions	adapter la législation	