

## Appendix C to:

EFSA BIOHAZ Panel (EFSA Panel on Biological Hazards), Koutsoumanis K, Allende A, Alvarez-Ordóñez A, Bolton D, Bover-Cid S, Chemaly M, Davies R, De Cesare A, Hilbert F, Lindqvist R, Nauta M, Peixe L, Ru G, Simmons M, Skandamis P, Suffredini E, Cocconcelli PS, Fernández Escámez PS, Maradona MP, Querol A, Suarez JE, Sundh I, Vlák JM, Barizzzone F, Correia S and Herman L, 2020. Statement on the update of the list of QPS-recommended biological agents intentionally added to food or feed as notified to EFSA 11: Suitability of taxonomic units notified to EFSA until September 2019. EFSA Journal 2020;18(2):5965, 57 pp. <https://doi.org/10.2903/j.efsa.2020.5965>

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## Appendix C – Search strategies for the maintenance and update of list of QPS-recommended biological agents (reply to ToR 2)

### Gram-Positive Non-Spore-forming Bacteria

#### *Bifidobacterium* spp.

String for species	
"Bifidobacterium adolescentis" OR "Bifidobacterium animalis" OR "Bifidobacterium bifidum" OR "Bifidobacterium breve" OR "Bifidobacterium longum" OR "B adolescentis" OR "B animalis" OR "B bifidum" OR "B breve" OR "B longum"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR bacteremia OR bacteraemia OR toxin*
3. Type of disease	endocarditis OR abscess OR meningitis
4. Mortality/Morbidity	clinical* OR death* OR morbidit* OR mortalit* OR disease* OR illness*
5. Disease Risk	opportunistic OR virulen*

#### *Carnobacterium divergens*

String for species	
"Carnobacterium divergens" OR "C divergens"	

OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

***Corynebacterium glutamicum***

String for species	
"Corynebacterium glutamicum" OR "C glutamicum" OR "Brevibacterium lactofermentum" OR "B lactofermentum"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* OR septic* OR bacteremia OR bacteraemia OR toxin* OR "pathogen*"
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	clinical* OR death* OR morbidit* OR mortalit* OR disease* OR illness*
5. Disease Risk	opportunistic OR virulen*

***Lactobacillus spp.***

String for species	
"Lactobacillus acidophilus" OR "Lactobacillus amylolyticus" OR "Lactobacillus amylovorus" OR "Lactobacillus alimentarius" OR "Lactobacillus animalis" OR "Lactobacillus aviaries" OR "Lactobacillus brevis" OR "Lactobacillus buchneri" OR "Lactobacillus casei" OR "Lactobacillus zeae" OR "Lactobacillus cellobiosus" OR "Lactobacillus coryniformis" OR "Lactobacillus crispatus" OR "Lactobacillus curvatus" OR "Lactobacillus delbrueckii" OR "Lactobacillus diolivorans" OR "Lactobacillus farciminis" OR "Lactobacillus fermentum" OR "Lactobacillus gallinarum" OR "Lactobacillus gasseri" OR "Lactobacillus helveticus" OR "Lactobacillus hilgardii" OR "Lactobacillus johnsonii" OR "Lactobacillus kefirifaciens" OR "Lactobacillus kefirii" OR "Lactobacillus mucosae" OR "Lactobacillus panis" OR "Lactobacillus collinoides" OR "Lactobacillus paracasei" OR "Lactobacillus paraplantarum" OR "Lactobacillus pentosus" OR "Lactobacillus plantarum"	

OR "Lactobacillus pontis" OR "Lactobacillus reuteri" OR "Lactobacillus rhamnosus" OR "Lactobacillus sakei" OR "Lactobacillus salivarius" OR "Lactobacillus sanfranciscensis" OR "L acidophilus" OR "L amylolyticus" OR "L amylovorus" OR "L alimentarius" OR "L animalis" OR "L aviaries" OR "L brevis" OR "L buchneri" OR "L casei" OR "L zeae" OR "L cellobiosus" OR "L coryniformis" OR "L crispatus" OR "L curvatus" OR "L delbrueckii" OR "L diolivorans" OR "L farciminis" OR "L fermentum" OR "L gallinarum" OR "L gasseri" OR "L helveticus" OR "L hilgardii" OR "L johnsonii" OR "L kefirifaciens" OR "L kefir" OR "L mucosae" OR "L panis" OR "L collinoides" OR "L paracasei" OR "L paraplantarum" OR "L pentosus" OR "L plantarum" OR "L pontis" OR "L reuteri" OR "L rhamnosus" OR "L sakei" OR "L salivarius" OR "L sanfranciscensis"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR bacteremia OR bacteraemia OR toxin*
3. Type of disease	endocarditis OR abscess OR meningitis
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	opportunistic OR virulen*

***Lactococcus lactis***

<b>String for species</b>	
"Lactococcus lactis" OR "L lactis"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR bacteremia OR bacteraemia OR toxin*
3. Type of disease	endocarditis OR abscess OR meningitis
4. Mortality/Morbidity	clinical* OR death* OR morbidit* OR mortalit* OR disease* OR illness*
5. Disease Risk	opportunistic OR virulen*

***Leuconostoc spp.***

<b>String for species</b>	
"Leuconostoc mesenteroides" OR "Leuconostoc lactis" OR "Leuconostoc pseudomesenteroides" OR "Leuconostoc citreum" OR "L mesenteroides" OR "L	

lactis" OR "L pseudomesenteroides" OR "L citreum"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR bacteremia OR bacteraemia OR toxin*
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	clinical* OR death* OR morbidit* OR mortalit* OR disease* OR illness*
5. Disease Risk	opportunistic OR virulen*

***Microbacterium imperiale***

<b>String for species</b>	
"Microbacterium imperiale" OR "M imperiale"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

***Oenococcus spp.***

<b>String for species</b>	
"Oenococcus oeni" OR "O oeni"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

***Pasteuria nishizawae***

<b>String for species</b>	
"Pasteuria nishizawae" OR "P nishizawae"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>

5. Disease Risk	<i>Not applied</i>
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***Pediococcus spp.***

<b>String for species</b>	
"Pediococcus pentosaceus" OR "Pediococcus dextrinicus" OR "Pediococcus acidilactici" OR "Pediococcus parvulus" OR "P pentosaceus" OR "P dextrinicus" OR "P acidilactici" OR "P parvulus"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

***Propionibacterium spp.***

<b>String for species</b>	
"Propionibacterium acidipropionici" OR "Propionibacterium freudenreichii" OR "P acidipropionici" OR "P freudenreichii"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

***Streptococcus thermophilus***

<b>String for species</b>	
"Streptococcus thermophilus" OR "S thermophilus" "Streptococcus thermophilus" OR "S thermophilus"	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR bacteremia OR bacteraemia OR toxin*
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	clinical* OR death* OR morbidit* OR mortalit* OR disease* OR illness*
5. Disease Risk	opportunistic OR virulen*

## Gram-positive spore-forming bacteria

### *Bacillus* spp.

String for species	
"Bacillus amyloliquefaciens" OR "Bacillus coagulans" OR "Bacillus clausii" OR "Bacillus atrophaeus" OR "Bacillus flexus" OR "Bacillus fusiformis" OR "Lysinibacillus fusiformis" OR "Bacillus licheniformis" OR "Bacillus lentus" OR "Bacillus mojavensis" OR "Bacillus megaterium" OR "Bacillus vallismortis" OR "Bacillus smithii" OR "Bacillus subtilis" OR "Bacillus pumilus" OR "Geobacillus stearothermophilus" OR "B. amyloliquefaciens" OR "B. coagulans" OR "B. clausii" OR "B. atrophaeus" OR "B. flexus" OR "B. fusiformis" OR "L. fusiformis" OR "B. licheniformis" OR "B. lentus" OR "B. mojavensis" OR "B. megaterium" OR "B. vallismortis" OR "B. smithii" OR "B. subtilis" OR "B. pumilus" OR "G. stearothermophilus"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR bacteremia OR bacteraemia OR toxin*
3. Type of disease	endocarditis OR abscess OR meningitis
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	opportunistic OR virulen*

## Gram-negative bacteria

### *Gluconobacter oxydans*

String for species	
"Gluconobacter oxydans" OR "G. oxydans"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

***Xanthomonas campestris***

String for species	
"Xanthomonas campestris" OR "X campestris"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

**Yeasts*****TUs without keywords for OUTCOME***

String for species	
"Candida cylindracea" OR "Debaryomyces hansenii" OR "Candida famata" OR "Hanseniaspora uvarum" OR "Kloeckera apiculata" OR "Ogataea angusta" OR "Pichia angusta" OR "Saccharomyces bayanus" OR "Saccharomyces pastorianus" OR "Saccharomyces carlsbergensis" OR "Wickerhamomyces anomalus" OR "Hansenula anomala" OR "Pichia anomala" OR "Saccharomyces anomalus" OR "Candida pelliculosa" OR "Xanthophyllomyces dendrorhous" OR "Phaffia rhodozyma" OR "C cylindracea" OR "D hansenii" OR "C famata" OR "H uvarum" OR "K apiculata" OR "O angusta" OR "P angusta" OR "S bayanus" OR "S pastorianus" OR "S carlsbergensis" OR "W anomalus" OR "H anomala" OR "P anomala" OR "S anomalus" OR "C pelliculosa" OR "X dendrorhous" OR "P rhodozyma"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	<i>Not applied</i>

**TUs with keywords for OUTCOME except for type of disease and morbidity/mortality**

String for species	
"Kluyveromyces lactis" OR "Candida spherica" OR "Kluyveromyces marxianus" OR "Candida kefir" OR "Komagataella pastoris" OR "Pichia pastoris" OR "Lindnera jadinii" OR "Pichia jadinii" OR "Hansenula jadinii" OR "Torulopsis utilis" OR "Candida utilis" OR "Schizosaccharomyces pombe" OR "K lactis" OR "C spherica" OR "K marxianus" OR "C kefir" OR "K pastoris" OR "P pastoris" OR "L jadinii" OR "P jadinii" OR "H jadinii" OR "T utilis" OR "C utilis" OR "S pombe"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antimycotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR fungemia OR fungaemia OR mycos*
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	<i>Not applied</i>
5. Disease Risk	opportunistic OR virulen*

**TUs with keywords for OUTCOME except for type of disease**

String for species	
"saccharomyces cerevisiae" OR "saccharomyces boulardii" OR "s cerevisiae" OR "s boulardii"	
OUTCOME	String
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antimycotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	infection* OR abscess* OR sepsis* or septic* OR fungemia OR fungaemia OR mycos*
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	clinical* OR death* OR morbidit* OR mortalit* OR disease* OR illness*
5. Disease Risk	opportunistic OR virulen*



## Viruses used for plant protection

### *Alphaflexiviridae*

<b>String for species</b>	
<i>Alphaflexiviridae</i> OR <i>Potyviridae</i>	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	necros*
3. Type of disease	<i>Not applied</i>
4. Mortality/Morbidity	mortalit* OR "safety concern*" OR "health hazard"
5. Disease Risk	virulen*

### *Baculoviridae*

<b>String for species</b>	
"Nuclear polyhedrosis virus" OR granulovirus OR <i>baculoviridae</i>	
<b>OUTCOME</b>	<b>String</b>
1. Antimicrobial/Antibiotic/Antimycotic	<i>Not applied</i>
2. Infection/Bacteremia/Fungemia/Sepsis	<i>Not applied</i>
3. Type of disease	"nuclear polyhedrosis" OR granulosis
4. Mortality/Morbidity	mortalit* OR "safety concern*" OR "health hazard"
5. Disease Risk	<i>Not applied</i>