

## The 2019 updated list of QPS status recommended biological agents in support of EFSA risk assessments

The list of QPS status recommended biological agents (EFSA BIOHAZ Panel, 2020b) is being maintained in accordance with the mandate of the BIOHAZ Panel (2020-2022). Possible additions to this list are included around every 6 months, with the first Panel Statement to be adopted in June 2020 and the last Panel Statement planned for adoption in December 2022. These additions are published as updates to the Scientific Opinion (EFSA BIOHAZ Panel, 2020b) and as supporting information linked to every Panel Statement available on the EFSA Knowledge Junction community on Zenodo at <https://doi.org/10.5281/zenodo.1146566>.

**Table 1:** The 2019 updated list of QPS status recommended biological agents for safety risk assessments carried out by EFSA Scientific Panels and Units

<b>Bacteria</b>			
<b>Gram-positive non-spore forming bacteria</b>			
<b>Species</b>			<b>Qualifications<sup>(a)</sup></b>
<i>Bifidobacterium adolescentis</i>	<i>Bifidobacterium bifidum</i>	<i>Bifidobacterium longum</i>	
<i>Bifidobacterium animalis</i>	<i>Bifidobacterium breve</i>		
<i>Carnobacterium divergens</i> <sup>(f)</sup>			
<i>Corynebacterium ammoniagenes</i> <sup>(f)</sup>	<i>Corynebacterium glutamicum</i> <sup>(b)</sup>		QPS applies for production purposes only. <sup>(n),(o)</sup>
<i>Lactobacillus acidophilus</i>	<i>Lactobacillus delbrueckii</i>	<i>Lactobacillus panis</i>	
<i>Lactobacillus amylolyticus</i>	<i>Lactobacillus dextrinicus</i> <sup>(s)</sup>	<i>Lactobacillus paracasei</i>	
<i>Lactobacillus amylovorus</i>	<i>Lactobacillus diolivorans</i> <sup>(i)</sup>	<i>Lactobacillus parafarraginis</i> <sup>(t)</sup>	
<i>Lactobacillus animalis</i> <sup>(k),(t)</sup>	<i>Lactobacillus farciminis</i>	<i>Lactobacillus paraplantarum</i>	
<i>Lactobacillus alimentarius</i>	<i>Lactobacillus fermentum</i>	<i>Lactobacillus pentosus</i>	
<i>Lactobacillus aviaries</i>	<i>Lactobacillus gallinarum</i>	<i>Lactobacillus plantarum</i>	
<i>Lactobacillus brevis</i>	<i>Lactobacillus gasseri</i>	<i>Lactobacillus pontis</i>	
<i>Lactobacillus buchneri</i>	<i>Lactobacillus helveticus</i>	<i>Lactobacillus reuteri</i>	
<i>Lactobacillus casei</i> <sup>(c)</sup>	<i>Lactobacillus hilgardii</i>	<i>Lactobacillus rhamnosus</i>	
<i>Lactobacillus cellobiosus</i>	<i>Lactobacillus johnsonii</i>	<i>Lactobacillus sakei</i>	
<i>Lactobacillus collinoides</i>	<i>Lactobacillus kefir</i>	<i>Lactobacillus salivarius</i>	
<i>Lactobacillus coryniformis</i>	<i>Lactobacillus kefir</i>	<i>Lactobacillus sanfranciscensis</i>	
<i>Lactobacillus crispatus</i>	<i>Lactobacillus mucosae</i>		
<i>Lactobacillus curvatus</i>			
<i>Lactococcus lactis</i>			
<i>Leuconostoc citreum</i>	<i>Leuconostoc mesenteroides</i>	<i>Leuconostoc pseudomesenteroides</i>	
<i>Leuconostoc lactis</i>			
<i>Microbacterium imperiale</i> <sup>(f)</sup>			QPS only applies when the species is used for enzyme production.
<i>Oenococcus oeni</i>			
<i>Pasteuria nishizawae</i> <sup>(h)</sup>			
<i>Pediococcus acidilactici</i>	<i>Pediococcus parvulus</i> <sup>(i)</sup>	<i>Pediococcus pentosaceus</i>	
<i>Propionibacterium acidipropionici</i>	<i>Propionibacterium freudenreichii</i>		
<i>Streptococcus thermophilus</i>			

Gram-positive spore-forming bacteria			
<b>Bacillus</b>			
Species			Qualifications <sup>(a)</sup>
<i>Bacillus amyloliquefaciens</i>	<i>Bacillus fusiformis</i>	<i>Bacillus pumilus</i>	Absence of toxigenic activity. In the case of <i>Bacillus velezensis</i> , absence of toxigenic potential and absence of aminoglycoside production <del>including the genes encoding it.</del>
<i>Bacillus atrophaeus</i>	<i>Bacillus lentus</i>	<i>Bacillus smithii</i> <sup>(i)</sup>	
<i>Bacillus clausii</i>	<i>Bacillus licheniformis</i>	<i>Bacillus subtilis</i>	
<i>Bacillus coagulans</i>	<i>Bacillus megaterium</i>	<i>Bacillus vallismortis</i>	
<i>Bacillus flexus</i> <sup>(i)</sup>	<i>Bacillus mojavensis</i>	<i>Bacillus velezensis</i> <sup>(t)</sup>	
<i>Geobacillus stearothermophilus</i>			Absence of toxigenic activity.
<i>Paenibacillus illinoisensis</i> <sup>(t)</sup>			QPS applies for production purposes only <sup>(n)</sup> and absence of toxigenic potential.
<i>Parageobacillus thermoglucosidasius</i> <sup>(t)</sup>			QPS applies for production purposes only <sup>(n)</sup> and absence of toxigenic potential.
Gram-negative bacteria			
Species			Qualifications <sup>(a)</sup>
<i>Cupriavidus necator</i> <sup>(t)</sup>			QPS applies for production purposes only. <sup>(n)</sup>
<i>Gluconobacter oxydans</i>			QPS only applies when the species is used for vitamin production.
<i>Komagataeibacter sucrofermentans</i> <sup>(p),(q)</sup>			QPS applies for production purposes only. <sup>(n)</sup>
<i>Xanthomonas campestris</i> <sup>(g)</sup>			QPS only applies when the species is used for the production of xanthan gum.
Yeasts <sup>(e)</sup>			
Species			Qualifications <sup>(u)</sup>
<i>Candida cylindracea</i> <sup>(f)</sup>			QPS only applies when the species is used for enzyme production.
<i>Debaryomyces hansenii</i>			
<i>Hanseniaspora uvarum</i>			
<i>Kluyveromyces lactis</i>	<i>Kluyveromyces marxianus</i>		
<i>Komagataella pastoris</i>	<i>Komagataella phaffii</i> <sup>(l)</sup>		QPS only applies when the species is used for enzyme production.
<i>Lindnera jadinii</i>			QPS only applies when the species is used for enzyme production.
<i>Ogataea angusta</i>			QPS only applies when the species is used for enzyme production.
<i>Saccharomyces bayanus</i>	<i>Saccharomyces cerevisiae</i> <sup>(d)</sup>	<i>Saccharomyces pastorianus</i>	In the case of <i>Saccharomyces cerevisiae</i> the general qualification <sup>(u)</sup> applies for yeast strains able to grow above 37°C.
<i>Schizosaccharomyces pombe</i>			
<i>Wickerhamomyces anomalus</i>			QPS only applies when the species is used for enzyme production.
<i>Xanthophyllomyces dendrorhous</i>			
<i>Yarrowia lipolytica</i> <sup>(m)</sup>			QPS applies for production purposes only. <sup>(n)</sup>

<i>Zygosaccharomyces rouxii</i> <sup>(t)</sup>			
<b>Viruses</b>			
<b>Plant viruses</b>			
<b>Family</b>			
Alphaflexiviridae	Potyviridae		
<b>Insect viruses</b>			
<b>Family</b>			
Baculoviridae			
<b>Protists / Algae</b>			
<i>Aurantiochytrium limacinum</i> <sup>(t)</sup>			QPS applies for production purposes only. <sup>(n)</sup>
<i>Euglena gracilis</i> <sup>(r)</sup>			
<i>Tetraselmis chuii</i> <sup>(t)</sup>			

QPS: Qualified Presumption of Safety.

A specific representative of a QPS proposed taxonomic unit, does not need to undergo a further safety assessment other than to satisfy the specified qualifications, if applicable. On the other hand, representatives of taxonomic units that fail to satisfy a qualification would be considered unfit for the QPS list and would remain subject to a full safety assessment, in the frame of a notification by the responsible EFSA Scientific Panel.

- (a): Generic qualification for all QPS bacterial taxonomic units: the strains should not harbour any acquired antimicrobial resistance genes to clinically relevant antimicrobials.
- (b): *Brevibacterium lactofermentum* is a synonym of *Corynebacterium glutamicum*.
- (c): The previously described species '*Lactobacillus zeae*' has been included in the species *Lactobacillus casei*.
- (d): *Saccharomyces cerevisiae*, subtype *boulardii* is contraindicated for persons with fragile health, as well as for patients with a central venous catheter in place.
- (e): Yeast synonyms commonly used in the feed/food industry:
- *Debaryomyces hansenii*- anamorph *Candida famata*;
  - *Hanseniaspora uvarum*- anamorph *Kloeckera apiculata*;
  - *Kluyveromyces lactis*- anamorph *Candida spherica*;
  - *Kluyveromyces marxianus*- anamorph *Candida kefyr*;
  - *Komagataella pastoris*- synonym *Pichia pastoris*;
  - *Lindnera jadinii*- synonyms *Pichia jadinii*, *Hansenula jadinii*, *Torulopsis utilis*, anamorph *Candida utilis*;
  - *Ogataea angusta*- synonym *Pichia angusta*;
  - *Saccharomyces cerevisiae*- synonym *Saccharomyces boulardii*;
  - *Saccharomyces pastorianus*- synonym *Saccharomyces carlsbergensis*;
  - *Wickerhamomyces anomalus*- synonyms *Hansenula anomala*, *Pichia anomala*, *Saccharomyces anomalus*, anamorph *Candida pelliculosa*;
  - *Xanthophyllomyces dendrorhous*- anamorph *Phaffia rhodozyma*.
- (f): Microorganisms recommended in the Panel Statement published in December 2014 (EFSA BIOHAZ Panel, 2014).
- (g): Microorganisms recommended in the Panel Statement published in June 2015 (EFSA BIOHAZ Panel, 2015a).
- (h): Microorganisms recommended in the Panel Statement published in December 2015 (EFSA BIOHAZ Panel, 2015b).
- (i): Microorganisms recommended in the Panel Statement published in July 2016 (EFSA BIOHAZ Panel, 2016).
- (j): Microorganisms recommended in the Panel Statement published in March 2017 (EFSA BIOHAZ Panel et al., 2017a).
- (k): Microorganisms recommended in the Panel Statement published in July 2017 (EFSA BIOHAZ Panel, 2017b).
- (l): Microorganisms recommended in the Panel Statement published in January 2018 (EFSA BIOHAZ Panel, 2018a).
- (m): Microorganisms recommended in the Panel Statement published in July 2018 (EFSA BIOHAZ Panel, 2018b).
- (n): The qualification 'for production purpose only' implies the absence of viable cells of the production organism in the final product and can also be applied for food and feed products based on microbial biomass.
- (o): In relation to *Corynebacterium glutamicum*, the qualification that QPS only applies when the species is used for amino acid production was extended to other production purposes in the Panel Statements published in January and July 2019 (EFSA BIOHAZ Panel, 2019a, b).
- (p): Basonym *Acetobacter xylinus* subsp. *sucrofermentans*.
- (q): Microorganisms recommended in the Panel Statement published in January 2019 (EFSA BIOHAZ Panel, 2019a).
- (r): Microorganisms recommended in the Panel Statement published in July 2019 (EFSA BIOHAZ Panel, 2019b).
- (s): *Lactobacillus dextrinicus* (Coster and White 1964) Haakensen et al. 2009, comb. nov., previously *Pediococcus dextrinicus* (Coster and White 1964) Back 1978. Name change indicated in the Panel Statement published in July 2019 (EFSA BIOHAZ Panel, 2019b).
- (t): Microorganisms recommended in the Panel Statement published in January 2020 (EFSA BIOHAZ Panel, 2020).
- (u): Absence of antimycotic resistance should be proved if the yeasts are to be used as viable organisms in the food and feed chains.

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