

Fermentation-derived / single-cell protein ingredients (precision-fermented, cultured, yeast-biomass proteins): HMTc Standard

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CITE AS

Pendergrass K. "Fermentation-derived / single-cell protein ingredients (precision-fermented, cultured, yeast-biomass proteins): HMTc Standard". Heavy Metal Certified, 2026. <https://heavymetalcertified.com/standards/pet-food-fermentation-derived-protein>. CC BY 4.0.

KEYWORDS

heavy metals, food safety, dietary exposure

PUBLICATION HISTORY

This revision 2026-08.

CORRESPONDENCE

Corrections are logged publicly on the article page, each with its date, the affected value, and the source that resolved it.

Abstract

The Heavy Metal Tested & Certified human-grade standard for precision-fermented, cultured, and single-cell / yeast-biomass protein ingredients used in pet food, stated as sold on a dry powder basis. Pet food is legally feed; HMTc voluntarily certifies each analyte to the strictest human-food sovereign maximum for the nearest analog, with the laxer feed-law floor disclosed for contrast.

1 | How every number on this standard is set

This subcategory covers a precision-fermented / single-cell / cultured PROTEIN INGREDIENT (spray-dried, heat-inactivated microbial biomass, e.g. *Saccharomyces cerevisiae* expressing an animal-identical protein) sold as a constituent of pet food. It is legally FEED (FDA CVM review, AAFCO, EU Directive 2002/32). Two read-across facts set the number honestly. First, a single-cell-protein biomass is not contamination-free by construction: anionic cell-wall groups biosorb Pb/Cd/Ni/Cr, arsenate is actively imported through the yeast phosphate transporters, and the metal load tracks the fermentation feedstock (plant sugars/molasses) and the mineral/trace-element premix — so Cd, Pb, and inorganic arsenic are real, load-bearing risks and are never marked not-material. Second, the strictest applicable HUMAN-FOOD analog on a dry as-sold basis is the plant-protein fraction (cereals, pulses, legumes), the same strict analog set the finished pet food already reads across; adopting it (rather than the looser same-class spec) keeps the ingredient limit at least as strict as any finished food it enters (Method v2.0 strictest-applicable rule, and the anti-circumvention guardrail against a looser ingredient tier laundering into a stricter finished food). The resulting toxic ceilings (Pb 20, Cd 40, tAs 100, iAs 100, tHg 20 ug/kg) are stricter on every toxic than the only governed same-class human-food spec, the EU novel-food *Yarrowia lipolytica* yeast-biomass Union-list contaminant limits (Pb 100, Cd 100, As 150, Hg 100 ug/kg; Reg (EU) 2019/760 amending 2017/2470), which is disclosed as the corroborating over-compliance

floor and never selects the number. The applicable feed floor is disclosed on every row and never selects the number.

2 | Master limit table

All values in ppb (µg/kg), as sold basis. A brand meeting every value qualifies for the mark.

ANALYTE	TIER	HMTC LIMIT	BASIS
Lead (Pb)	Tier 1	20	human-grade read-across (Hong Kong)
Cadmium (Cd)	Tier 1	40	human-grade read-across (European Union)
Total arsenic (tAs)	Tier 2	100	human-grade read-across (Paraguay)
Inorganic arsenic (iAs)	Tier 1	100	human-grade read-across (Israel)
Mercury, total (tHg)	Tier 1	20	human-grade read-across (Hong Kong)
Methylmercury (MeHg)	Tier 1	≤ tHg	bounded by tHg (reflex speciation)
Nickel (Ni)	Tier 2	800	human-grade read-across (European Union)
Tin (Sn)	Tier 2	250,000	human-grade read-across (Singapore)
Aluminium (Al)	Tier 2	100,000	human-grade read-across (China)
Total chromium (Cr)	Tier 2	500	human-grade read-across (Hong Kong)
Hexavalent chromium (Cr-VI)	Tier 2	≤ Cr	bounded by Cr (reflex speciation)

3 | Derivation – where each number comes from

Every cell traces to one named sovereign maximum level (the strictest for the nearest analog), or to an explicit control, not-material, or species-bounded determination. No occurrence statistic selects a certification value.

ANALYTE	HMTC	SOVEREIGN ANALOG / DETERMINATION
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Lead (Pb)	20	Hong Kong — Cereal-based food intended to be consumed principally by persons under the age of 36 months
Cadmium (Cd)	40	European Union — pulses, general
Total arsenic (tAs)	100	Paraguay — pulses, dried legume seeds, except soybean
Inorganic arsenic (iAs)	100	Israel — Dried legumes, including peanuts and soybeans
Mercury, total (tHg)	20	Hong Kong — Rice, husked rice, polished rice, maize, maize flour, wheat, wheat flour
Methylmercury (MeHg)	≤ tHg	MeHg carries no product-specific sovereign cell; it is a component of and bounded by its parent total tHg (MeHg ≤ tHg), an enforceable ceiling via reflex speciation rather than an empty cell.
Nickel (Ni)	800	European Union — cereals except durum/rice/husked-rice/-pseudocereal/oat rows
Tin (Sn)	250,000	Singapore — human-food analog
Aluminium (Al)	100,000	China — human-food analog
Total chromium (Cr)	500	Hong Kong — Vegetables, other than pulses
Hexavalent chromium (Cr-VI)	≤ Cr	Cr-VI carries no product-specific sovereign cell; it is a component of and bounded by its parent total Cr (Cr-VI ≤ Cr), an enforceable ceiling via reflex speciation rather than an empty cell.

4 | Cite this standard

Pendergrass, K. "Fermentation-derived / single-cell protein ingredients (precision-fermented, cultured, yeast-biomass proteins)." In Heavy Metal Tested & Certified (HMTc) Pet Foods standard, version 1.0 (2026-08-31). Institute of Contaminant Standards (ICS), 2026.

References

- [1] China — human-food maximum levels
 Binds Al. Strictest applicable human-food sovereign maximum for the nearest analog.
 MAXIMUM LEVEL

- [2] European Union — human-food maximum levels
Binds Cd, Ni. Strictest applicable human-food sovereign maximum for the nearest analog.
MAXIMUM LEVEL
- [3] Hong Kong — human-food maximum levels
Binds Pb, tHg, Cr. Strictest applicable human-food sovereign maximum for the nearest analog.
MAXIMUM LEVEL
- [4] Israel — human-food maximum levels
Binds iAs. Strictest applicable human-food sovereign maximum for the nearest analog.
MAXIMUM LEVEL
- [5] Paraguay — human-food maximum levels
Binds tAs. Strictest applicable human-food sovereign maximum for the nearest analog.
MAXIMUM LEVEL
- [6] Singapore — human-food maximum levels
Binds Sn. Strictest applicable human-food sovereign maximum for the nearest analog.
MAXIMUM LEVEL
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STATUS AND LICENCE

Editorially reviewed in-house; no external peer review has been completed on this reference. Published as a preprint with its review state tracked on the article page. Released under CC BY 4.0.

DATA AVAILABILITY

The works this reference draws on are listed in full in the references above and on the briefing page at <https://heavymetalcertified.com/standards/pet--food-fermentation-derived-protein>. Primary legal instruments and expert-body assessments are named with their public identifiers; the underlying occurrence and toxicology corpus is maintained on the Heavy Metal Index.

COMPETING INTERESTS

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PUBLICATION HISTORY

This revision 2026-08. The full dated record is maintained at <https://heavymetalcertified.com/standards/-pet-food-fermentation-derived-protein>.