United States Department of Agriculture
Agricultural Marketing Service | National Organic Program

Document Cover Sheet

Document Type:

☒ **National List Petition or Petition Update**

A petition is a request to amend the USDA National Organic Program's National List of Allowed and Prohibited Substances (National List).

www.ams.usda.gov/rules-regulations/organic/national-list

Any person may submit a petition to have a substance evaluated by the National Organic Standards Board (NOSB) [7 CFR 205.607(a)].

www.ams.usda.gov/rules-regulations/organic/nosb

National List Petition Guidelines for submitting a petition are available on the AMS website at How to File a Petition.

www.ams.usda.gov/rules-regulations/organic/national-list/filing-petition

AMS posts completed petitions online for public access on the NOP Petitioned Substances Index

www.ams.usda.gov/rules-regulations/organic/petitioned-substances

☐ **Technical Report**

A technical report is developed in response to a petition to amend the National List. Reports are also developed to assist in the review of substances that are already on the National List. Technical reports are completed by third-party contractors and AMS posts completed technical reports online for public access on the NOP Petitioned Substances Index. Contractor names and dates completed are available in the report.

www.ams.usda.gov/rules-regulations/organic/petitioned-substances

Read more about the technical report process in section **H. SUBSTANCE/MATERIALS REVIEW PROCESS** in the NOSB Policy & Procedures Manual posted on the AMS website.

www.ams.usda.gov/sites/default/files/media/NOSB-PolicyManual.pdf

www.ams.usda.gov/rules-regulations/organic/nosb

L-Lysine National List Petition Package

Petition to Add L-Lysine for Use in Organic Poultry and Swine Production at 7 CFR § 205.603(d)

September 10, 2026

Packet Organization

This unified packet assembles the petition cover letter, technical petition, consolidated supporting appendices, stakeholder templates, and compiled references into one Word document. Overlapping memoranda have been merged so that each appendix serves a distinct evidentiary or implementation function.

1. Transmittal Cover Letter
2. Technical Petition
3. Appendix A - Proposed Annotation and Compliance Framework
4. Appendix B - Essentiality, Necessity, and Development of the NOSB Record
5. Appendix C - Methionine Precedent Timeline and Lessons
6. Appendix D - Poultry Nutrition
7. Appendix E - Swine Nutrition
8. Appendix F - Alternatives, Environmental, and Farm Viability Analysis
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10. Appendix H - Manufacturer Feasibility and Market Development Consideration
11. Appendix I - Representative L-Lysine Feed Additive Source Document
12. Endnotes and Compiled References

Transmittal Cover Letter

September 10, 2026

National List Manager
USDA Agricultural Marketing Service
National Organic Program
1400 Independence Avenue SW
Washington, DC 20250

Submitted electronically via: nosb@usda.gov

Re: Petition to amend the National List at 7 CFR § 205.603(d) to allow L-lysine for use in organic poultry and swine feed

Dear National List Manager:

On behalf of The Methionine Task Force, please accept the enclosed petition package requesting that the National Organic Program amend the National List of Allowed and Prohibited Substances at 7 CFR § 205.603(d) to allow L-lysine for use as a feed additive in organic poultry and swine production.

This petition is submitted under the National List petition process described by USDA Agricultural Marketing Service for amendments to the National List at 7 CFR §§ 205.600-205.606. The petition requests review of a single generic substance, L-lysine, including feed-grade forms necessary for stable and effective use in poultry and swine feed, subject to the proposed annotation and supporting documentation provided in the petition package. [1]

Requested Action

The petitioner requests that 7 CFR § 205.603(d), Synthetic substances allowed for use in organic livestock production as feed additives, be amended to add L-lysine for use in organic poultry and swine production. The requested listing is limited to use as a feed additive to meet documented essential amino acid requirements when organic and nonsynthetic feed sources are insufficient to provide a nutritionally adequate ration without creating animal welfare, environmental, formulation, or economic tradeoffs inconsistent with sound organic management.

Proposed Annotation

The petitioner requests consideration of the following annotation:

L-Lysine, including L-lysine monohydrochloride, L-lysine sulfate, and liquid L-lysine forms - for use only in organic poultry and swine production as a feed additive to meet documented essential amino acid requirements when organic and nonsynthetic feed sources are insufficient to provide a nutritionally adequate ration without excessive crude protein supplementation. Use must be documented in the organic system plan and supported by ration formulation records. The substance and associated formulation components must not be produced using excluded methods.

Scope of the Petition

Species scope: Organic poultry and swine only. The petition does not request a listing for all livestock species.

Use scope: Feed additive use only, to meet documented essential amino acid requirements. The petition does not request use as a livestock drug, growth promotant, preservative, flavoring agent, colorant, or processing aid.

Substance scope: L-lysine and feed-grade forms necessary for stable and effective use in poultry and swine feed, with associated formulation components disclosed and limited to those necessary for stable feed-grade products.

Basis for Submission

L-lysine is nutritionally essential for poultry and swine. Synthetic L-lysine is not universally essential in every organic ration, but it may be necessary for organic poultry and swine production where compliant feed sources cannot meet digestible L-lysine requirements without creating animal welfare, environmental, formulation, or economic tradeoffs inconsistent with sound organic management.

The petition package explains that the requested listing should be evaluated as a narrow, documented-use feed additive allowance. It is not intended to substitute for appropriate organic feed sourcing, outdoor access, species-appropriate husbandry, breed selection, or other organic livestock management practices. Rather, the requested allowance is designed to help organic poultry and swine producers meet existing regulatory obligations to provide nutritionally adequate rations while avoiding crude protein overformulation, unnecessary nitrogen excretion, and other avoidable tradeoffs.

This request is also informed by the existing National List precedent for DL-methionine in poultry feed and by NOSB's 2024 recommendation to remove numerical limits from the methionine annotation. That recommendation recognized animal health, amino acid adequacy, lack of realistic natural alternatives, and the problem of crude protein overfeeding as relevant considerations. See [22].

Petitioner Contact Information

Petitioner Name:	Methionine Task Force
Petitioner Organization:	Methionine Task Force
Mailing Address:	516 Rheas Mill Rd, Farmington, AR 72730
Phone:	479-530-4469
Email:	ashley@hbfeggs.com
Authorized Representative:	Ashley Swaffar

The petitioner respectfully requests that NOP review the enclosed petition package for completeness and, if complete, forward the petition for NOSB review and consideration through the National List petition process.

Thank you for your consideration of this petition.

Sincerely,

Ashley Swaffar
Methionine Task Force

Technical Petition

Technical Petition to Amend the National List

Petition to Add L-Lysine for Use in Organic Poultry and Swine Production at 7 CFR § 205.603(d)

Executive Summary

This petition requests that the National Organic Program amend 7 CFR § 205.603(d) to allow L-lysine as a synthetic feed additive for use in organic poultry and swine production. The requested listing is limited to documented, nutritionally justified feed rations where organic and nonsynthetic feed sources are insufficient to meet essential amino acid requirements without excessive crude protein supplementation.

The requested action is not intended to expand the use of synthetic feed additives as a substitute for sound organic livestock management. Rather, the requested listing would provide a carefully limited tool to support nutritional adequacy, animal welfare, environmental stewardship, and compliance with the organic livestock requirement to provide feed rations sufficient to meet nutritional requirements, including proteins and amino acids.

L-lysine is an essential amino acid for monogastric livestock. In swine, L-lysine is commonly treated as the first limiting amino acid and the reference amino acid around which other amino acid ratios are formulated. In poultry, L-lysine is also an essential amino acid and is one of the principal amino acids used to formulate diets on a digestible amino acid basis. The petition is therefore limited to the two livestock categories for which the technical need and organic-system relevance are strongest: poultry and swine.

This petition references, but does not overstate, the precedent established by DL-methionine. The National List currently allows DL-methionine, DL-methionine hydroxy analog, and DL-methionine hydroxy analog calcium for organic poultry production. That precedent is important in two respects. First, it confirms that a synthetic amino acid can be compatible with organic livestock production when needed to meet nutritional requirements and avoid animal welfare or environmental harms from crude protein overfeeding. Second, it shows that the National List may identify not only the base amino acid but also closely related chemical forms or analogs needed for commercially stable and nutritionally functional feed use.

In October 2024, the NOSB recommended removing the numerical inclusion limits from the DL-methionine annotation, citing avian health, alignment with trading partners, and lack of realistic natural alternatives. The recommendation specifically recognized that limits on methionine may force producers either to provide inadequate amino acids or to overfeed protein to meet minimum amino acid requirements. [22]

The same logic applies to L-lysine when it is the limiting amino acid in organic poultry or swine diets. Without access to a verified non-excluded method source of L-lysine, producers may be forced to increase organic soybean meals or other protein sources to achieve L-lysine adequacy. This can result in excessive crude protein, increased nitrogen excretion, potential ammonia burden, ration imbalance, and unnecessary cost, while still not guaranteeing an optimal amino acid profile.

Accordingly, this petition requests a narrow, enforceable, and species-specific listing. It is not a request for all livestock. It is not a request for unrestricted use. It is not a request to use L-lysine to promote faster growth, substitute for outdoor access, or compensate for poor organic management. It is a request to permit L-lysine for organic poultry and swine only when its use is documented in the organic system plan and supported by ration formulation records showing nutritional need.

Proposed National List Annotation

The petitioner requests that § 205.603(d) be amended by adding a new paragraph as follows:

L-Lysine, including L-lysine monohydrochloride, L-lysine sulfate, and liquid L-lysine forms - for use only in organic poultry and swine production as a feed additive to meet documented essential amino acid requirements when organic and nonsynthetic feed sources are insufficient to provide a nutritionally adequate ration without excessive crude protein supplementation. Use must be documented in the organic system plan and supported by ration formulation records. The substance and any formulation components necessary to produce a stable feed-grade L-lysine product must not be produced using excluded methods.

The requested annotation follows the successful methionine model by identifying the base amino acid and commercially relevant stable forms. It also adds enforceable guardrails appropriate to the NOSB's historical concerns about synthetic amino acids: species limitation, documented nutritional need, ration-formulation records, organic system plan oversight, and exclusion of products produced using excluded methods.

A. Petition Category Information

A.1 Section of the National List

This petition seeks inclusion of L-lysine at 7 CFR § 205.603(d), "Synthetic substances allowed for use in organic livestock production - As feed additives." The current § 205.603(d) includes DL-methionine, DL-methionine hydroxy analog, and DL-methionine hydroxy analog calcium for use only in organic poultry production, as well as trace minerals and vitamins used for enrichment or fortification when FDA approved. [16]

A.2 Petition Type and OFPA Category

This is a petition to add a synthetic substance to the National List for use in organic livestock production. The relevant OFPA category is production aid/feed additive, with functional overlap with nutritional enrichment or fortification. L-lysine is petitioned as a nutritional feed additive used to meet essential amino acid requirements in poultry and swine rations.

A.3 Inert Ingredients

This petition does not seek approval of L-lysine as a pesticide inert ingredient. This item is not applicable.

A.4 Generic Substance

This petition is submitted for the generic substance L-lysine and specified feed-grade L-lysine forms, not for a brand-name formulated product. The petition is intended to cover only forms and formulation components disclosed in the petition and verified by certifiers as compliant with the final annotation, including excluded method restrictions.

B. Substance Information

B.1 Substance Name and Chemical Identity

Item	Information
Common name	L-Lysine
Feed-grade forms covered by petition	L-lysine, L-lysine monohydrochloride, L-lysine sulfate, liquid L-lysine, and stable feed-grade forms consistent with the final annotation.
Chemical class	Essential amino acid.
Function	Feed additive used to meet essential amino acid requirements in poultry and swine rations.
CAS number, L-lysine	56-87-1.
CAS number, L-lysine monohydrochloride	657-27-2.
Additional identifiers	Product-specific identifiers for L-lysine sulfate and liquid L-lysine should be supplied with manufacturer documentation.

FDA recognizes lysine, including L- and DL-forms, as generally recognized as safe when used in accordance with good manufacturing or feeding practice at 21 CFR § 582.5411. [18]

Regulatory source:

B.2 Petitioner and Manufacturer Information

This petition is for the generic substance L-lysine rather than any proprietary brand. Representative manufacturer literature identifies feed-grade L-lysine products including L-lysine HCl, L-lysine sulfate, and liquid L-lysine. CJ Bio describes L-lysine as a fermentation-based product available in powder and liquid forms. Evonik describes Biolys as a concentrated source of L-lysine for feed use in poultry and swine and identifies the product as produced through fermentation. [70, 72, 73]

B.3 Intended or Current Use

L-lysine is intended for use as an animal feed additive in certified organic poultry and swine rations. Its function is to provide the essential amino acid L-lysine where ration formulation based solely on organic and nonsynthetic feedstuffs cannot reliably meet L-lysine requirements without excessive crude protein supplementation.

The intended use is nutritional. It is not petitioned as a livestock drug, growth promotant, preservative, flavoring agent, colorant, pesticide, sanitizer, or processing aid. FDA's regulation at 21 CFR § 582.5411 recognizes L-lysine as GRAS when used in accordance with good manufacturing or feeding practice. [18]

B.4 Intended Activities and Application Rate

The substance would be used in organic poultry and swine feed formulation. Application rates would be determined by species, age, production stage, feed intake, ingredient amino acid profile, amino acid digestibility, and the target lysine-to-energy or lysine-to-calorie ratio. The petition does not request a fixed maximum inclusion rate because L-lysine need varies by species and life stage. Instead, use should be limited by the annotation to document essential amino acid requirements, good feeding practice, and certifier review through the organic system plan.

A conservative compliance framework would require the producer or feed manufacturer to maintain records demonstrating:

- The ration is formulated to meet, not exceed, essential amino acid requirements;

- Organic and nonsynthetic feed sources alone are insufficient or would require excessive crude protein supplementation;
- Use is limited to poultry or swine;
- The L-lysine source and necessary formulation components are not produced using excluded methods;
- The material is reviewed by the certifier through the organic system plan or feed-mill input approval process; and
- The use is consistent with good manufacturing or feeding practices.

Kansas State University materials emphasize that feed-grade amino acids must be used within balanced formulation. In swine, once the L-lysine requirement is determined, other amino acid ratios relative to L-lysine must also be considered. Amino acid imbalances can occur when an amino acid is supplied at levels lower or higher than needed, potentially reducing feed intake or growth performance. This supports a documented, nutritionist-formulated use pattern rather than open-ended inclusion. [40, 41]

B.5 Manufacturing Process

Commercial L-lysine is generally produced by fermentation. Representative manufacturer literature describes fermentation-based production using agricultural carbohydrate substrates such as corn, sugar cane, beet molasses, or other carbohydrate sources. A representative manufacturing process for feed-grade L-lysine may include the following steps:

1. Preparation of a carbohydrate substrate;
2. Fermentation using selected production microorganisms;
3. Separation, concentration, purification, or conversion of the fermentation broth into the intended feed-grade L-lysine form;
4. Formation of a stable salt or liquid product, such as L-lysine monohydrochloride, L-lysine sulfate, or liquid L-lysine;
5. Drying, granulation, liquid stabilization, or other final-form processing;
6. Standardization to feed-grade specifications; and
7. Packaging and distribution for feed manufacture.

For L-lysine monohydrochloride, hydrochloric acid may be used to form hydrochloride salt. For L-lysine sulfate, sulfuric acid or sulfate chemistry may be part of the final salt form or product matrix. For liquid L-lysine, water and pH adjustment may be necessary to maintain feed-grade stability. Fermentation-broth products may contain L-lysine in salt form together with coproducts from the fermentation process. The final petition must disclose whether the petition seeks approval for purified L-lysine salts only or also for fermentation-broth products containing biomass or coproducts.

Excluded methods are a central review issue. Many modern amino acid fermentation systems may involve genetically modified production strains or substrates derived from genetically engineered crops. This petition therefore requests approval only for L-lysine and necessary formulation components that are not produced using excluded methods. The final petition should include manufacturer affidavits and supply-chain controls sufficient to demonstrate compliance with NOP excluded method restrictions, including statements on production organisms, genetic modification history, fermentation substrates, downstream processing aids, carriers, and stabilizers. [13, 14, 28]

B.6 Formulation Components and Stable Feed-Grade Forms

This petition intentionally uses the methionine precedent to address commercially stable chemical forms and associated formulation needs. The current methionine listing does not merely say "methionine." It lists DL-methionine, DL-methionine hydroxy analog, and DL-methionine hydroxy analog calcium, with CAS numbers, for use only in organic poultry production. That structure recognizes that feed-grade amino acids may be supplied in different stable and functional forms, including salt or analog forms necessary for feed manufacture, storage, handling, and nutritional delivery.

Following that precedent, the petitioner requests that the lysine listing includes L-lysine, L-lysine monohydrochloride, L-lysine sulfate, and liquid L-lysine forms. The purpose is not to approve undisclosed proprietary formulas. The purpose is to ensure that the listing covers the stable feed-grade forms in which L-lysine is realistically manufactured and used, provided that all components are disclosed, are consistent with the final annotation, and are not produced using excluded methods.

The petition distinguishes three categories of formulation-related substances:

Substance forms: L-lysine, L-lysine monohydrochloride, L-lysine sulfate, and liquid L-lysine. These should be included in the annotation if the NOSB accepts the methionine-style approach.

Necessary formulation components: water, acid/base components, salts, fermentation coproducts, and anticaking or flow agents that may be necessary for stable feed-grade forms. These should be fully disclosed and reviewed as part of the petition record or certifier input review.

Unrelated carriers, coatings, or proprietary additives: These should not be automatically allowed by the L-lysine listing unless separately allowed, disclosed, and found compliant. Rumen-protection technologies are outside the immediate poultry/swine scope and should not be swept into this petition.

B.7 Previous Reviews and NOSB History

The NOSB has previously reviewed amino acids and synthetic amino acid use in livestock production. The NOSB has accepted, through the methionine listing, that a synthetic amino acid can be compatible with organic livestock production where needed to meet nutritional requirements and avoid animal welfare or environmental harms. [16, 22]

The petition record shows that generic amino acids were reviewed in the early NOSB record and were not recommended for rulemaking as a whole class and that the 2013 pet food amino acid recommendation did not support most petitioned amino acids, including L-lysine, where the Subcommittee concluded that amino acid requirements could be met through feedstuffs.

There is of course a precedent for amino acids in poultry with methionine. In 2001, NOSB approved methionine for interim use in organic poultry production, despite cautioning that it was not fully consistent with organic agriculture. In 2005, NOSB extended methionine based on need, animal welfare, economics, and lack of alternatives. In 2008 and 2010, NOSB continued to apply pressure toward natural alternatives and resisted open-ended use. In 2015, NOSB accepted practical welfare problems associated with inadequate methionine, including poor feathering, feather pecking, cannibalism, and overfeeding protein. In 2024, the NOSB recommended removing the numerical limits, recognizing that the restrictions could impair amino acid adequacy and force overfeeding of protein. [6, 20, 22, 24, 25, 26, 27]

B.8 Regulatory Authority

FDA recognizes lysine, including L- and DL-forms, as generally recognized as safe when used in accordance with good manufacturing or feeding practice under 21 CFR § 582.5411. No EPA pesticide registration or tolerance is required because the petitioned use is not pesticidal. [18]

L-Lysine, including L-lysine monohydrochloride, liquid L-lysine, and dried or liquid L-lysine fermentation products, including sulfate-containing fermentation-product forms, provided the product conforms to applicable AAFCO feed ingredient definitions and the substance and necessary formulation components are not produced using excluded methods.

B.9 Physical and Chemical Properties

L-lysine is an essential amino acid used in protein synthesis and animal nutrition. In feed use, L-lysine is commonly supplied as L-lysine monohydrochloride, L-lysine sulfate, or liquid lysine. The material functions as a nutrient, not as a pesticide, sanitizer, livestock drug, or preservative.

Chemical interactions

L-lysine is expected to interact nutritionally with other amino acids because ration formulation depends on amino acid balance. In swine, L-lysine is often used as the reference amino acid for establishing ratios of other amino acids. Poorly balanced use can create amino acid imbalances, which supports the proposed requirement for ration formulation records.

Toxicity and environmental persistence

At feed-use levels and under good feeding practice, L-lysine is regulated as GRAS by FDA. It is metabolized as a nutrient by livestock and is not expected to persist in the environment in the manner of a pesticide, parasiticide, or sanitizer. [18]

Environmental impacts from use

The principal environmental benefit of L-lysine supplementation is the ability to formulate diets closer to essential amino acid requirements rather than overfeeding crude protein. Overfeeding crude protein can increase nitrogen excretion and manure nutrient burden. Amino-acid-balanced formulation can reduce excess nitrogen intake and excretion while maintaining nutritional adequacy.

Environmental impacts from manufacture

Commercial L-lysine manufacture is fermentation-based and relies on agricultural carbohydrate substrates. Manufacturer-specific review is necessary because environmental and organic-compliance implications depend on production organism, substrate sourcing, processing aids, coproduct management, waste streams, and excluded method status.

B.10 Safety Information

The safety and quality documentation available for representative L-lysine feed additive products supports the conclusion that L-lysine is a recognized feed ingredient used to supply an essential amino acid in livestock and poultry rations, but the currently available documents are not yet sufficient by themselves to establish organic compliance for any specific commercial source. The available SDSs, product sheets, brochures, and specification-bearing materials generally identify the products as feed-grade sources of L-lysine, including L-lysine monohydrochloride, liquid L-lysine, and fermentation-derived lysine products; describe their intended use in animal feed; provide guaranteed L-lysine content or minimum assay information; and include standard safety, handling, storage, transport, and hazard information. These materials are useful for demonstrating the

identity, feed function, commercial availability, and general safety profile of L-lysine products when used according to good manufacturing and feeding practices.

However, for National Organic Standards Board review, the more important remaining quality and compliance documents are current supplier-issued SDSs, labels, specification sheets, certificates of analysis, contaminant limits, manufacturing summaries, component disclosures, and excluded method affidavits. Those documents are important to verify not only that the products are suitable feed-grade L-lysine sources, but also that the production organism, fermentation substrate, processing aids, carriers, stabilizers, salts, coproducts, and other necessary formulation components are not produced using excluded methods and are consistent with the petition's proposed annotation. Please see Appendix I for more details.

B.11 Research Information

The scientific and technical record supports the following points:

- L-lysine is an essential amino acid and is commonly the first limiting amino acid in swine diets.
- After determining L-lysine requirements in swine, other amino acid ratios relative to L-lysine must be considered to avoid amino acid imbalance.
- In poultry, essential amino acids cannot be synthesized by the bird and must be supplied in the diet; when an essential amino acid is limiting, protein synthesis and utilization of other amino acids are impaired.
- Amino-acid-based formulation can reduce excessive crude protein feeding and can reduce nitrogen excretion or manure nitrogen burden.
- L-lysine supplementation is not a stand-alone solution. It must be used within balanced ration formulation and should be limited to documented nutritional needs.
- The NOSB has already recognized, in the methionine context, that organic poultry producers must be able to meet amino acid requirements, and that restrictions on amino acid use can force inadequate nutrition or overfeeding of protein. [22]
- Commercial L-lysine products are available from multiple manufacturers in powder, liquid, and fermentation-derived forms, but manufacturer-specific excluded method documentation is essential.

Contrasting evidence and concerns: Synthetic amino acids have been scrutinized by NOSB because they may be perceived as supporting conventionalized ration design rather than organic system development. This petition addresses that concern by proposing a documented-use annotation, species limitation, excluded method restriction, and certifier oversight. The petition should also acknowledge that excessive or poorly balanced use of L-lysine can create amino acid imbalance, which is why ration formulation records are necessary.

C. Petition Justification Statement

C.1 Necessity for Organic Poultry and Swine Production

L-lysine is nutritionally essential. Synthetic L-lysine is not universally essential in every organic ration, but it may be necessary for organic poultry and swine production where compliant feed sources cannot meet digestible L-lysine requirements without creating animal welfare, environmental, formulation, or economic tradeoffs inconsistent with sound organic management.

The petitioned substance is necessary because organic poultry and swine producers are required to provide rations sufficient to meet nutritional requirements, including proteins and amino acids. Where L-lysine is

limiting, producers may need to overfeed organic protein sources to meet L-lysine requirements. That approach can increase crude protein, nitrogen excretion, ammonia burden, feed cost, and ration imbalance while still failing to provide the most efficient amino acid profile.

Kansas State University's swine nutrition guide explains that after determining the L-lysine requirement, other amino acid ratios relative to L-lysine can be determined. University of Nebraska materials similarly describe pig diets as being formulated to meet L-lysine requirements and note that reducing excess amino acids reduces nitrogen excretion. [38, 41]

Methionine is typically the first limiting amino acid in common poultry diets, which explains the existing methionine listing. However, L-lysine remains an essential amino acid, and common ingredients can be deficient in L-lysine relative to bird requirements. Poultry diets are increasingly formulated on a digestible amino acid basis, and L-lysine is one of the principal amino acids used in such formulation. The poultry request is therefore not that L-lysine replaces methionine, but that L-lysine be available as a documented feed-formulation tool where needed to achieve balanced amino acid nutrition without excessive crude protein.

C.2 Alternatives to the Petitioned Substance

Potential alternatives include:

- Organic soybean meal;
- Organic peas and other pulses;
- Organic fish meal where available, appropriate, and compliant;
- Organic dairy-derived proteins where appropriate;
- Insect meals, if organic standards and certified organic supply become available;
- Pasture and forage, depending on species and production system;
- Breed selection and slower-growth genetics;
- Ration reformulation using multiple organic protein sources;
- Improved feedstuff testing for amino acid content and digestibility.

These alternatives are important and should remain first-line tools in organic livestock management. However, they are not always sufficient, commercially available in organic form, nutritionally balanced, or environmentally preferable. Protein-source selection depends on digestibility, amino acid profile, energy content, anti-nutritional factors, variability, consistent sourcing, cost, and production goals. In practice, the alternative to targeted L-lysine may be additional organic soybean meal or other high-protein ingredients, resulting in unnecessary crude protein and nitrogen burden.

This petition therefore does not argue that organic protein sources are unimportant. It argues that organic protein sources alone may be an imprecise and environmentally burdensome way to correct a specific limiting amino acid, especially in swine and, in particular circumstances, poultry.

C.3 Environmental, Human Health, and Farm Ecosystem Benefits

A limited allowance for L-lysine can support lower crude protein rations while maintaining essential amino acid adequacy. This has potential environmental benefits because excess dietary nitrogen is excreted in manure. Reducing crude protein overfeeding can reduce manure nitrogen, ammonia burden, and associated bedding, housing, and nutrient-management challenges.

The benefit is not merely economic. In organic systems, manure nitrogen, ammonia, bedding quality, animal comfort, nutrient cycling, and farm ecosystem management are integral organic concerns. A ration that

supplies essential amino acids more precisely may be more compatible with organic livestock health and environmental stewardship than a ration that overuses crude protein to compensate for a single limiting amino acid.

No adverse human health effect is known or expected from use of feed-grade L-lysine in accordance with good manufacturing or feeding practices and organic certification controls. FDA recognizes L-lysine as GRAS when used in accordance with good manufacturing or feeding practices. [18]

C.4 Animal Welfare and Livestock Health

This petition does not claim that L-lysine is a cure-all or that every organic poultry or swine ration requires synthetic L-lysine. Rather, the petitioner asserts that essential amino acid adequacy is a meaningful part of livestock health and welfare. Where L-lysine is limiting, overreliance on crude protein sources may produce imbalanced rations, unnecessary nitrogen burden, or inadequate amino acid nutrition.

C.5 Compatibility with Organic Agriculture

This petition is compatible with organic livestock production since the petitioned listing is narrowly annotated and enforced through organic system plan review. The proposed annotation is designed to ensure that L-lysine is used as a nutritional correction tool, not as a substitute for organic management, outdoor access, appropriate genetics, high-quality organic feedstuffs, or species-appropriate husbandry.

The requested listing parallels the current methionine reasoning. In 2024, NOSB recognized that amino acid restrictions can create animal health impacts, prevent adequate nutrition, and encourage overfeeding of protein. A similarly disciplined approach to L-lysine would advance the same regulatory purpose: nutritionally adequate organic poultry and swine production within a system of organic management. [22]

C.6 OFPA Evaluation Criteria

Potential for detrimental chemical interactions

No detrimental chemical interactions are expected when L-lysine is used as a feed nutrient in accordance with good feeding practices. Nutritional interactions with other amino acids are expected and beneficial when managed through ration formulation. Poorly balanced use could cause other amino acids to become limiting, which is why this petition proposes documentation and ration-formulation controls.

Toxicity, mode of action, breakdown products, and environmental persistence

L-lysine functions nutritionally as an essential amino acid. FDA recognizes L-lysine as GRAS for use in accordance with good manufacturing or feeding practices. It is metabolized by livestock and is not expected to persist as an environmental contaminant. [18]

Probability of environmental contamination during manufacture, use, misuse, or disposal

Use in feed presents low environmental contamination concern. Manufacturing impacts require manufacturer-specific review, especially with respect to fermentation substrates, fermentation organisms, processing aids, waste streams, and excluded methods. Final petition materials should include manufacturer environmental documentation and excluded method affidavits.

Effects on human health

No adverse human health effect is expected from use of L-lysine in livestock feed under good feeding practice. FDA's GRAS listing supports this conclusion. [18]

Effects on biological and chemical interactions in the agroecosystem

The primary agroecosystem effect is expected to be beneficial where L-lysine allows reduced crude protein overfeeding and corresponding reductions in nitrogen excretion. The effect is mediated through ration formulation and manure nutrient management, not direct soil or crop application.

Alternatives

Alternatives exist but are not uniformly adequate, available, or environmentally preferable in all organic poultry and swine systems. Organic soybean meal and other protein sources remain essential ration ingredients, but protein-source selection is constrained by digestibility, anti-nutritional factors, variability, sourcing, cost, amino acid profile, and environmental consequences of overfeeding crude protein.

Compatibility with sustainable agriculture

A narrowly annotated listing for L-lysine is compatible with sustainable agriculture because it supports precise nutrition, reduces crude protein overfeeding, may reduce nitrogen loading in manure, and helps producers meet the organic livestock requirement for nutritionally adequate rations.

D. Proposed Organic System Plan Documentation

To address NOSB concerns about synthetic amino acids and to make the listing certifiable, the petitioner proposes that use be documented through the organic system plan or feed-mill input review. The following documentation should be sufficient for certifier review:

- Identification of the poultry or swine class receiving the ration;
- Ration formulation records showing target amino acid requirements and ingredient contributions;
- Documentation of why organic and nonsynthetic feed sources alone would be insufficient or would require excessive crude protein supplementation;
- Product label, SDS, certificate of analysis, and manufacturer specification sheet for the L-lysine product;
- Manufacturer statement that the L-lysine and necessary formulation components are not produced using excluded methods;
- Disclosure of production organism, fermentation substrate categories, processing aids, salts, carriers, stabilizers, anticaking agents, and coproducts to the extent necessary for organic review;
- Annual or batch-based verification, as appropriate, that the approved source remains compliant; and
- Certifier approval before use.

This documentation framework is intended to make the listing narrow in practice, not merely in wording.

E. Strategic Treatment of Excluded Methods

The petition notes that excluded method concerns will be among the most important issues raised by NOSB, NOP, certifiers, and public commenters.

The petitioner does not request approval for any L-lysine product produced using excluded methods. The requested listing is limited to L-lysine and necessary stable feed-grade forms for which the producer, feed manufacturer, and certifier can verify that the production organism, fermentation substrate, processing aids, carriers, stabilizers, and other formulation components are not produced using excluded methods. We note that the methods currently employed for verification of methionine inputs should be sufficient for L-lysine inputs.

F. Responses to Likely Concerns of NOSB and Public Comment

1: Amino acids conventionalize organic livestock production

Response: The petition is limited to poultry and swine, requires documented nutritional need, and ties use to organic system plan review. It does not permit L-lysine as a productivity enhancer or management substitute. It is designed to avoid the welfare and environmental consequences of crude-protein overfeeding while supporting nutritional adequacy.

2: Producers meet amino acid needs through organic feedstuffs

Response: Organic feedstuffs remain the foundation of the ration. The petition applies only when organic and nonsynthetic feed sources are insufficient to provide a nutritionally adequate ration without excessive crude protein supplementation. The petition supports organic feed development but recognizes, as NOSB did with methionine, that natural alternatives may not be commercially realistic in all circumstances.

3: L-lysine may be produced using genetic engineering

Response: 7 CFR 205.105 expressly excludes L-lysine and feed formulation components produced using excluded methods. [14]

4: Multiple L-lysine forms approve undisclosed proprietary formulations

Response: The requested annotation follows the methionine precedent by identifying stable chemical forms needed for feed use but does not approve undisclosed proprietary products. Necessary formulation components must be disclosed and reviewed, and unrelated carriers or coatings are not included unless separately allowed and compliant.

5: Be species-specific.

Response: The petition is species-specific. It requests use only for organic poultry and swine, not all livestock.

G. Requested NOSB Action

The petitioner requests that the NOSB recommend rulemaking to add L-lysine to § 205.603(d) as a feed additive for organic poultry and swine production, with the following annotation:

L-Lysine, including L-lysine monohydrochloride, L-lysine sulfate, and liquid L-lysine forms - for use only in organic poultry and swine production as a feed additive to meet documented essential amino acid requirements when organic and nonsynthetic feed sources are insufficient to provide a nutritionally adequate ration without excessive crude protein supplementation. Use must be documented in the organic system plan and supported by ration formulation records. The substance and any formulation components necessary to produce a stable feed-grade L-lysine product must not be produced using excluded methods.

If the NOSB prefers a more conservative initial listing, the petitioner would support an annotation limited to L-lysine monohydrochloride and L-lysine sulfate, with liquid L-lysine addressed only where formulation components are fully disclosed and verified compliant.

Technical Petition Attachment - Key References and Citation Links

[1] NOP Petition Guidance: https://www.ams.usda.gov/rules-regulations/organic/national-list/filing-petition

[12] 7 CFR Part 205: https://www.ecfr.gov/current/title-7/subtitle-B/chapter-I/subchapter-M/part-205

[17] 7 CFR 205.607: https://www.ecfr.gov/current/title-7/subtitle-B/chapter-I/subchapter-M/part-205/subpart-G/section-205.607

[18] 21 CFR 582.5411 Lysine: https://www.ecfr.gov/current/title-21/chapter-I/subchapter-E/part-582/subpart-F/section-582.5411

[22] NOSB DL-Methionine Annotation Change, Oct. 24, 2024: https://www.ams.usda.gov/sites/default/files/media/LS_DLMethionineAnnotChangeFinalRec.pdf

[5] USDA Petitioned Substances Index: https://www.ams.usda.gov/rules-regulations/organic/petitioned-substances

[8] USDA Livestock Proposals Archive: https://www.ams.usda.gov/rules-regulations/organic/nosb/subcommittees/livestock-proposals

[38] University of Nebraska Swine Nutrition Guide: https://animalscience.unl.edu/sites/unl.edu.ianr.casnr.animal-science/files/media/file/swinenutrition.pdf

[46] Kansas State University, Amino Acids, Swine Nutrition Guide: https://www.asi.k-state.edu/extension/swine/swinenutritionguide/growfinish/useGF5_AminoAcids_Final.pdf

[48] Kansas State University, Protein Sources for Swine Diets: Kansas State University, Protein Sources for Swine Diets

[49] Kansas State University, Effects of Increasing L-Lysine HCl: https://www.asi.k-state.edu/extension/swine/peer-review-publications-pdfs/2002/De%20La%20Llata.%20Effects%20of%20increasing%20L-lysine%20HCl.pdf

[34] University of Georgia, Amino Acid Content in Organic Soybean Meal: https://fieldreport.caes.uga.edu/publications/C1140/amino-acid-content-in-organic-soybean-meal-for-the-formulation-of-organic-poultry-feed/

[33] Washington State University, Protein and Amino Acid Requirements for Poultry: https://wpcdn.web.wsu.edu/wp-puyallup/uploads/sites/346/2014/11/Protein-and-amino-acid-for-poultry-final.pdf

[32] Purdue Extension, Protein and Amino Acid Requirements for Poultry: https://www.extension.purdue.edu/extmedia/as/as-584-w.pdf

[70] CJ Bio, L-Lysine: https://cjbio.net/en/products/bestamino/llysine

[72] Evonik, Biolys: https://www.evonik.com/en/products/an/pr_52055049.html

[73] Evonik, Biolys Brochure: https://www.evonik.com/content/dam/evonik/documents/Biolys%20Brochure.pdf.coredownload.pdf

Appendix A - Proposed Annotation and Compliance Framework

Recommended Proposed Annotation

The following language is the petitioner's recommended starting point for amendment of 7 CFR § 205.603(d):

L-Lysine (CAS # 56-87-1), including L-lysine monohydrochloride (CAS # 657-27-2), L-lysine sulfate, and liquid L-lysine forms - for use only in feed for organic poultry and swine to meet documented essential amino acid requirements when organic and nonsynthetic feed sources are insufficient to provide a nutritionally adequate ration without excessive crude protein supplementation or other formulation tradeoffs inconsistent with sound organic management. Use must be supported by ration formulation records and disclosed in the organic system plan. The substance, including necessary formulation components, carriers, stabilizers, and manufacturing inputs, must not be produced using excluded methods.

Control Points Embedded in the Annotation

Element	Reason for inclusion
Poultry and swine only	Limits the request to the species where the case is strongest and most reviewable.
Documented essential amino acid requirements	Distinguishes nutritional necessity from convenience or production enhancement.
Organic and nonsynthetic feed-source insufficiency	Preserves preference for organic/nonsynthetic sources and frames L-lysine as a limited corrective tool.
Avoidance of excessive crude protein supplementation	Links the annotation to environmental stewardship, nutrient management, and ration precision.
OSP disclosure and ration formulation records	Provides a practical certification and enforcement mechanism.
Necessary formulation components disclosed and compliant	Recognizes commercially stable feed additive forms without approving undisclosed additives.
No excluded methods	Addresses the primary organic integrity concern associated with fermentation-derived amino acids.

Certification Implementation

The annotation is intended to be implemented through ordinary material review and Organic System Plan oversight. A certifier should be able to verify:

- the operation produces or handles organic poultry or swine feed within the scope of the listing;
- the specific L-lysine source and commercial form are identified;
- carriers, stabilizers, salts, fermentation coproducts, anticaking agents, and other associated components are disclosed;
- manufacturer documentation adequately addresses excluded methods;
- ration formulation records establish a documented essential amino acid need;
- the use avoids excessive crude protein supplementation or an equivalent formulation tradeoff;
- the use is disclosed in the Organic System Plan or feed-mill input approval process; and
- the product is used as a nutritional feed additive, not as a medication, growth promotant, or substitute for required organic livestock practices.

Short-Form Alternative

If NOSB prefers a shorter annotation, the following version preserves the core limits while leaving implementation details to guidance and certification review:

L-Lysine - for use only in feed for organic poultry and swine to meet documented essential amino acid requirements when organic and nonsynthetic feed sources are insufficient to provide a nutritionally adequate ration without excessive crude protein supplementation. Use must be documented in the organic system plan and supported by ration formulation records. Must not be produced using excluded methods.

Relationship to the Technical Petition

The technical petition contains the legal and factual basis for the requested listing. This appendix is intentionally limited to the proposed language and its enforceable control structure; nutrition, alternatives, environmental effects, manufacturing, and stakeholder evidence are addressed in the appendices that follow.

Appendix B - Essentiality, Necessity, and Development of the NOSB Record

L-lysine is nutritionally essential. Synthetic L-lysine is not universally essential in every organic ration, but it may be necessary for organic poultry and swine production where compliant feed sources cannot meet digestible L-lysine requirements without creating animal welfare, environmental, formulation, or economic tradeoffs inconsistent with sound organic management.

The relevant question is not whether every organic producer will use L-lysine or whether natural feed ingredients contain L-lysine. The question is whether, for the specified poultry and swine uses, a compliant L-lysine source may be necessary to meet existing organic livestock obligations without creating animal-welfare, environmental, formulation, or economic tradeoffs inconsistent with sound organic management.

Section 205.238(a)(2) requires organic livestock producers to provide feed rations sufficient to meet nutritional requirements, including proteins and/or amino acids [15]. Section 205.603(d) is the National List category for synthetic feed additives allowed in organic livestock production [16]. Organic production therefore imposes an affirmative duty to provide adequate nutrition as well as restrictions on synthetic inputs.

Three Levels of Essentiality

- Nutritional essentiality: L-lysine is an essential amino acid for poultry and swine and must be supplied through the diet.
- Formulation necessity: A limiting amino acid can determine whether a ration is nutritionally adequate. Where digestible L-lysine cannot be supplied in the proper amount and balance from available organic feedstuffs, producers may be forced to overfeed crude protein or accept an imbalanced ration.
- Organic-system necessity: A compliant L-lysine source may support adequate nutrition, animal welfare, reduced nitrogen excretion, efficient use of organic feed resources, and economically viable organic poultry and swine production.

Natural Sources and Practical Necessity

The existence of L-lysine in soybean meal, peas, and other organic feedstuffs does not by itself resolve the National List question. The relevant inquiry is whether those sources can reliably supply digestible L-lysine in the right amount, ratio, life stage, and ration context without causing other problems.

Organic soybean meal is a valuable amino acid source and has been specifically studied for organic poultry formulation [34]. Swine protein-source selection nevertheless depends on amino acid profile and digestibility, energy content, anti-nutritional factors, variability, consistent sourcing, cost, and production goals [48]. The alternatives analysis in Appendix F evaluates these issues in detail.

Why Limited Prior Visibility Does Not Show Absence of Need

Limited prior public comment should not be treated as proof that a need is absent. The NOSB record is shaped by petitions, sunset reviews, discussion documents, meeting agendas, and questions formally placed before stakeholders. L-Lysine has not had the repeated, focused, species-specific review history that methionine has had [1, 2].

Producers may experience an L-lysine constraint indirectly as expensive feed, limited ration flexibility, heavy reliance on soybean meal, crude protein over formulation, manure nitrogen, litter or bedding concerns, or difficulty balancing available ingredients.

This is particularly relevant in swine, where L-lysine is commonly first limiting and central to ration formulation [38]. In poultry, L-lysine remains part of the essential amino acid profile for broilers, layers, and turkeys even when methionine is the first limiting amino acid [32].

Organic operations may keep production moving by increasing protein ingredients, relying heavily on soybean meal, accepting higher crude protein, or absorbing higher feed costs. Those workarounds do not necessarily represent the best organic outcome and may mask the underlying constraint rather than expressing it as demand for L-lysine.

In the analogous methionine context, NCAT/ATTRA explained that high plant-protein rations can create health and environmental concerns and that alternative ingredients may be expensive or unavailable in organic form [30]. An L-lysine constraint may likewise be absorbed through feed bills, ingredient substitution, nitrogen load, and practical inefficiency rather than expressed as an explicit request for L-lysine.

Methionine became highly visible because it was repeatedly placed before NOSB through petitions, annotation changes, and public comment. The 2024 recommendation and NOP response demonstrate that the record can evolve as practical production consequences become clearer [22, 23]. Appendix C addresses that precedent without treating it as determinative of the L-lysine petition.

Conclusion

A more limited prior record is not evidence against need. A narrowly annotated L-lysine listing would help organic poultry and swine producers meet essential amino acid requirements while preserving organic integrity and reducing avoidable welfare, environmental, formulation, and economic tradeoffs.

Appendix C - Methionine Precedent Timeline and Lessons

Scope of the Precedent

Methionine and L-lysine are distinct amino acids with different nutritional contexts. The methionine record does not compel approval of L-lysine. It is nevertheless the closest National List precedent because it shows how NOSB and NOP have weighed essential amino acid needs, animal welfare, environmental consequences, alternatives, annotation design, and organic integrity.

Timeline of Methionine Review and Rulemaking

Year / action	Methionine event	Key point for L-lysine
1993 and 1999 - amino acid reviews	NOSB reviewed amino acids for possible addition to § 205.603. The USDA petitioned-substances index states that amino acids were not recommended for rulemaking in those early reviews.	A petition for L-lysine should not be framed as a broad request to approve amino acids as a class. It should be narrow, species-specific, and tied to documented need.
2001 / 2003 - initial methionine allowance	NOSB reviewed DL-methionine and related forms; methionine was later added to the National List at § 205.603(d), effective November 3, 2003, for organic poultry production.	The initial success of methionine came through a narrow poultry-specific allowance, not a general livestock amino acid listing. This supports a disciplined petition architecture for L-lysine.
2005 - extension with preference for natural alternatives	NOSB recommended extending synthetic methionine in organic poultry production to October 1, 2008, to allow time for further research on organic alternatives. The vote was 11 yes, 0 no, 2 abstain, 1 recuse.	NOSB may approve a synthetic amino acid while still expressing a clear preference for natural alternatives. The L-lysine petition should acknowledge and preserve that preference.
2008 - essentiality and market-disruption finding	In 2010 rulemaking history, AMS summarized the 2008 NOSB determination that organic and natural methionine sources existed but were not available in sufficient supply; NOSB concluded methionine was necessary for nutritionally adequate organic poultry diets and essential to organic production.	This is one of the strongest precedents for L-lysine. The issue is not whether natural sources exist somewhere, but whether they are sufficient, available, and practical for nutritionally adequate organic production.
2010 - step-down approach	NOSB recommended continued allowance with staged limits, attempting to meet basic maintenance needs, satisfy consumer preference to reduce synthetic methionine, and motivate development of natural alternatives.	L-lysine should anticipate the same balancing exercise. The proposed guardrails should be strong enough to satisfy organic integrity concerns without imposing arbitrary limits that undermine nutrition.

Year / action	Methionine event	Key point for L-lysine
2015 - welfare and crude protein overfeeding recognized	NOSB recommended an annotation allowing methionine rates averaged over the life of the flock. The record described deficiency concerns, poor feathering, feather pecking, cannibalism, ammonia, foot blisters, and crude protein overfeeding as practical consequences of insufficient methionine flexibility.	This is the central functional precedent. A synthetic amino acid may reduce, rather than increase, organic-system stress when the alternative is crude protein overformulation or nutritionally imbalanced feeding.
2019 - lifetime averaging implemented	USDA's petitioned-substances index records a methionine annotation change effective January 28, 2019, reflecting the move toward averaged inclusion over the life of the flock.	The regulatory system can translate NOSB's practical nutrition concerns into enforceable annotation language. For L-lysine, documentation and OSP oversight may be preferable to fixed numerical caps.
2024 - NOSB recommends removing numerical limits	NOSB recommended removing methionine inclusion limits. It found that limits negatively affected organic poultry health, did not hasten natural alternatives, and should not be prioritized over bird health. NOSB voted 14-0 for the annotation change.	This modernizes the precedent. NOSB has recognized that amino acid restrictions can impede compliance with organic livestock nutrition obligations and may not effectively drive alternative development.
2026 - AMS proposes corresponding rulemaking	AMS published proposed rulemaking to remove current restrictions on methionine use in organic poultry feed, stating that doing so would provide producers flexibility to meet flock health and nutrition needs.	NOP's response confirms that the methionine precedent remains active and relevant. The L-lysine petition should ask NOSB to apply the same logic carefully to poultry and swine.

Appendix D - Poultry Nutrition

Key Conclusions

- L-lysine is an essential amino acid that poultry must obtain through the ration.
- Methionine is commonly first limiting in poultry diets, but L-lysine remains a defined and nutritionally significant requirement for broilers, laying hens, turkeys, and other poultry.
- Crude protein is an imprecise proxy for amino acid adequacy; digestible amino acid supply and balance are the more relevant formulation measures.
- Organic feed ingredients can supply L-lysine in many rations, but availability, digestibility, balance, consistency, cost, and required inclusion levels vary.
- A documented-use allowance would provide a targeted ration-balancing option when available sources require excessive crude protein or create other material tradeoffs.
- Amino acid precision can reduce dietary nitrogen, excretion, ammonia potential, and manure or litter-management burdens.

Why L-lysine Matters in Poultry Nutrition

Poultry requires amino acids to synthesize body proteins and support tissue maintenance, feathering, egg production, immune function, and other physiological processes. Essential amino acids cannot be synthesized in sufficient quantities and must be supplied by the diet. When one essential amino acid is below requirement, it becomes limiting and impairs efficient use of the others [33, 36].

Methionine is often the first limiting amino acid in common poultry diets, but that fact does not make L-lysine optional. Purdue Extension identifies L-lysine requirements for broilers, laying hens, and turkeys and explains the importance of amino-acid-based formulation. L-lysine is required in larger absolute amounts than methionine at every life stage across all three classes of poultry, and it serves a role beyond meeting its own requirement: because the ideal ratio of every other essential amino acid to L-lysine holds steady across diet, environment, and genetics, nutritionists use L-lysine as the reference point from which the entire amino acid profile is calculated [32].

Broilers

Broiler amino acid needs change across the production cycle. Purdue Extension notes that feeding phases are used to more closely match the requirements of the developing bird. The relevant petition point is not that L-lysine is always first limiting, but that it is required at defined, changing levels and that a crude-protein target can mask a L-lysine deficiency or imbalance [32].

In organic systems, increasing soybean meals or another protein ingredient to solve a single amino acid constraint may oversupply total protein and other amino acids. Reduced-crude-protein diets likewise require adequate supplementation of limiting amino acids, including methionine and L-lysine, to avoid impaired performance.

Laying Hens

Laying hens require balanced amino acid nutrition for maintenance, egg production, egg size, feather condition, and flock health. L-lysine is among the key requirements identified for layers. A targeted allowance is relevant where supplying L-lysine indirectly through high crude-protein ingredients increases nitrogen intake and excretion without improving organic integrity [32].

Turkeys and Other Poultry

Amino acid requirements vary by species, age, physiological stage, genetics, and production purpose. Turkeys and other poultry therefore support a ration-record approach rather than a single universal use rate. The petitioned use should be justified by the animal class and ration formulation rather than presumed from species alone.

Crude Protein and Amino Acid Adequacy

Crude protein does not establish whether essential amino acids are present in the correct amounts and ratios. Where amino acids are supplied in excess of the limiting amino acid, the excess may be deaminated and excreted as nitrogen rather than used for body protein synthesis. Washington State University and Purdue Extension describe formulation to amino acid requirements to reduce total dietary nitrogen intake and nitrogen excretion [32, 33].

For organic poultry, lack of a compliant L-lysine source may lead to increased use of organic protein ingredients. That response can increase crude protein, nitrogen excretion, ammonia potential, feed cost, and manure or litter burdens while remaining an imprecise solution to a specific amino acid constraint.

Organic Feed Ingredients and Practical Limits

Organic soybean meal is an important and generally digestible L-lysine source. Research on organic soybean meal confirms its value for poultry formulation [34]. It remains an intact protein ingredient rather than a precise amino acid correction tool, and its usefulness depends on processing, digestibility, consistency, supply, cost, and the balance of the complete ration.

Other protein alternatives - including pulses, fish meal, dairy by-products, yeast products, and emerging insect meals - may contribute to amino acid supply but can be constrained by availability, organic status, consistency, digestibility, consumer expectations, and formulation limits. These alternatives are assessed comparatively in Appendix F.

Animal Welfare and Environmental Relevance

Adequate amino acid nutrition is part of organic livestock care under 7 CFR § 205.238(a)(2) [15]. This petition does not equate L-lysine with methionine or claim that every welfare issue is caused by L-lysine. The narrower point is that a deficiency or imbalance can limit protein synthesis and efficient use of the ration.

Where a targeted L-lysine source permits a lower-crude-protein balanced ration, it may reduce nitrogen imports, excretion, ammonia potential, and litter or manure-management burdens. The environmental benefit is conditional on documented need and balanced formulation, not on supplementation alone.

Poultry-Specific Conclusion

The poultry evidence supports access to compliant L-lysine when available in organic and nonsynthetic feed sources cannot provide digestible L-lysine in appropriate balance without excessive crude protein or other material tradeoffs. Poultry use should remain subject to the annotation and compliance framework in Appendix A.

Appendix E - Swine Nutrition

L-lysine is commonly the first limiting amino acid in swine diets and the reference amino acid for ideal-protein formulation. A documented-use allowance may be necessary where available organic feedstuffs cannot meet stage-specific digestible L-lysine requirements without excessive crude protein, nitrogen loss, ration imbalance, welfare concerns, or avoidable cost.

Why L-lysine Is Central in Swine Nutrition

The University of Nebraska Swine Nutrition Guide states that L-lysine is first limiting in most swine diets [38]. Peer-reviewed literature likewise describes L-lysine as the first limiting amino acid in typical swine diets and a basic substrate for body proteins, peptides, and other molecules [52].

Swine diet formulation also uses L-lysine as the reference amino acid. Requirements for other amino acids are commonly expressed as ratios relative to L-lysine because proper concentrations and balance are essential for protein synthesis [41]. This makes L-lysine an anchor for the whole ration rather than merely an isolated additive.

Crude protein is an incomplete measure. A ration can be high in crude protein and still be deficient in digestible L-lysine; increasing protein to raise L-lysine can oversupply other amino acids and nitrogen. USDA NRCS guidance supports formulating to specific amino acid requirements while reducing excess crude protein where possible [56].

Life-Stage Considerations

Nursery Pigs

Nursery pigs have high amino acid needs relative to body weight and feed intake. Feed-grade amino acids are used in conventional nutrition to meet requirements while reducing crude protein and diet cost. The organic relevance is not automatic adoption of conventional practice, but recognition that this life stage is nutritionally sensitive and may be difficult to serve through intact protein sources alone.

Grow-Finish Pigs

Grow-finish L-lysine needs are closely related to growth rate and feed intake. Kansas State provides a practical estimate of approximately 20 grams of standardized ileal digestible L-lysine per kilogram of daily gain [43]. This illustrates that digestible L-lysine needs can be calculated and documented in ration records.

Gestating and Lactating Sows

Sow diets require particular caution. University of Nebraska advises careful use of crystalline amino acids as substitutes for intact protein in gestation and lactation diets, especially in limit-fed animals [38]. This supports life-stage documentation and balanced formulation rather than open-ended use.

Organic Ingredient Constraints

Organic swine rations depend on organic grains and protein sources. Organic soybean meal is valuable, but protein-source selection is affected by availability, price, consistency, digestibility, amino acid profile, energy,

and anti-nutritional factors [48]. A targeted L-lysine allowance would not eliminate intact protein needs; it would permit more precise correction when those ingredients cannot efficiently supply the limiting amino acid.

The relevant comparison is between a balanced ration using a documented amount of compliant L-lysine and a ration that must add enough intact protein to reach the L-lysine target while oversupplying nitrogen and other amino acids.

Environmental, Welfare, and Farm Implications

Reduced-crude-protein swine diets supplemented to meet amino acid requirements can reduce nitrogen excretion. Environmental learning resources and peer-reviewed reviews describe this direction of effect across nursery and grow-finish production [59, 60].

Amino acid adequacy can also have welfare and behavioral implications. A 2023 study associated low-protein, amino-acid-deficient diets with poorer performance and more damaging behavior, with indispensable amino acid supplementation counteracting those effects [55]. The study is not an organic standards model, but it supports the narrower conclusion that amino acid balance is relevant to livestock care.

Feed cost is a supporting, not independent, basis for the petition. Where producers overuse expensive organic protein ingredients to compensate for a L-lysine constraint, the cost may impair farm viability without improving animal welfare or organic integrity. The integrated economic analysis appears in Appendix F.

Balanced Use and Technical Caution

L-Lysine cannot be used as a substitute for overall amino acid balance. Kansas State research shows that replacing too much intact protein with L-lysine HCl without accounting for the next limiting amino acid can reduce performance [49]. Any allowance should therefore depend on complete ration formulation, not simply a L-lysine inclusion rate.

Summary Table

Issue	Swine Nutrition Relevance	NOSB Relevance
First limiting amino acid	L-lysine is commonly the first limiting amino acid in swine diets.	Supports the essentiality and necessity argument for swine-specific use.
Ideal protein formulation	Other amino acid requirements are often expressed relative to L-lysine.	Shows L-lysine is central to balanced ration formulation, not merely a discrete additive.
Digestible L-lysine	Stage-specific requirements are better expressed as standardized ileal digestible L-lysine than total crude protein.	Supports documentation through ration formulation records.
Crude protein overformulation	Increasing protein sources to meet L-lysine needs may oversupply nitrogen and other amino acids.	Supports environmental and farm-system rationale.

Issue	Swine Nutrition Relevance	NOSB Relevance
Organic ingredient constraints	Organic soybean meal and other protein sources may vary in availability, cost, digestibility, and amino acid profile.	Supports alternatives analysis and practical necessity.
Animal welfare	Amino acid deficiency or imbalance can affect performance and behavior.	Connects the listing to organic livestock care rather than convenience.
Guardrails	L-lysine must be balanced with other amino acids and should not replace whole-feed nutrition.	Supports a narrow annotation and OSP/certifier review.

Appendix F - Alternatives, Environmental, and Farm Viability Analysis

Evaluation Standard

An alternative is not adequate merely because it contains L-lysine. The practical question is whether it can supply digestible L-lysine in the needed amount and balance, at the relevant life stage, in compliant form and at workable inclusion levels, without excessive crude protein, nutrient loss, welfare compromise, or undue farm-level burden.

The analysis considers nutritional adequacy, amino acid balance, organic availability, formulation practicality, environmental effect, animal welfare, economic feasibility, and enforceability.

Why Crude Protein Is Not an Adequate Substitute

Pigs do not have a requirement for crude protein as such; they require the amino acids that make up protein, with profile and digestibility determining protein quality [40]. Poultry guidance likewise treats L-lysine as an explicit requirement rather than a crude-protein percentage [32].

Where digestible L-lysine is deficient, adding protein ingredients may oversupply other amino acids and nitrogen. Purdue Extension reports that each percentage-point reduction in crude protein, when amino acid needs remain met, may reduce nitrogen excretion and ammonia emissions by approximately 8 to 10 percent in poultry and swine [57].

Comparative Alternatives Matrix

Alternative	Primary contribution	Main strengths	Key limitations	Overall conclusion
Organic soybean meal / soy products	High-quality plant protein; strong L-lysine contribution	Widely used; familiar; strong amino acid profile	May require excessive crude protein; cost and organic supply constraints; not a precise L-lysine tool	Essential feed ingredient but incomplete substitute
Peas, faba beans, lentils, other pulses	Protein and crop-diversification value	Can support organic rotations and regional sourcing	Variable digestibility, fiber, anti-nutritional factors, supply limits	Useful partial alternative
Fish meal / marine proteins	Concentrated protein and amino acids	Nutritionally dense; useful in some poultry and young animal diets	Cost, sustainability, preservative, sourcing, market concerns	Useful but not universal
Dairy and animal-derived proteins	Highly digestible protein in specific uses	Can work in specialized young animal rations	Limited organic supply, cost, acceptance, and regulatory constraints	Context-specific, not broad substitute

Alternative	Primary contribution	Main strengths	Key limitations	Overall conclusion
Other oilseed meals	Protein diversification	Can reduce dependence on soy	Variable L-lysine, fiber, anti-nutritional factors, lower energy	Partial alternative
Yeast, algae, single-cell proteins	Novel protein and amino acid sources	Future sustainability potential	Cost, scale, organic status, excluded method questions	Promising but not established
Insect meals	Emerging protein source	Potential circular-economy value	Organic status, substrate, scale, cost, variability	Future option, not current substitute
Pasture and forage	Welfare, behavior, system integrity	Supports organic husbandry and environmental goals	Not precise or reliable L-lysine source for monogastrics	Important practice, not nutrient substitute
Genetics / slower growth	Reduced nutritional pressure and system fit	Can support organic integrity	Does not eliminate amino acid needs; may impose market/cost burdens	Complementary strategy
Phase feeding / formulation	Nutrient precision and lower waste	Strongly aligned with organic stewardship	Cannot overcome missing digestible L-lysine in ingredient set	Necessary but not always sufficient

Key Findings by Alternative

Organic soybean meal and soy products

These are foundational feed ingredients with a strong amino acid profile and good L-lysine digestibility. They are not precise correction tools, and higher inclusion can increase crude protein, nitrogen, cost, and dependence on a constrained organic supply.

Peas, faba beans, lentils, and other pulses

Pulses can support diversified and regional feed systems, but amino acid profile, digestibility, fiber, starch, anti-nutritional factors, palatability, and supply vary. They are useful ingredients rather than consistent one-for-one substitutes.

Fish meal and marine proteins

These can provide concentrated amino acids but may be constrained by organic availability, cost, quality variability, sustainability considerations, flavor or odor limits, and consumer expectations.

Dairy by-products and other animal-derived proteins

These can contribute useful amino acids in some systems, but availability, organic status, handling, consistency, biosecurity, and formulation fit limit broad substitution.

Canola, sunflower, flax, and other oilseed meals

Oilseed meals support diversification but differ in L-lysine content, digestibility, fiber, anti-nutritional factors, and feasible inclusion rates.

Yeast, algae, and single-cell proteins

These may become valuable, concentrated alternatives but presently face variable composition, regulatory status, organic availability, scale, and cost constraints.

Insect meals

Insects may eventually provide a circular protein source, but certified organic production, feed status, scale, consistency, and cost remain substantial limitations.

Pasture, forage, and outdoor access

These remain central organic practices and may contribute nutrients and behavior opportunities, but they cannot reliably meet precise L-lysine requirements for poultry and swine across life stages.

Breed selection and slower-growing genetics

Genetics and adjusted production expectations can reduce nutrient demand in some systems, but they do not eliminate the obligation to provide a nutritionally adequate ration.

Improved formulation, phase feeding, and feed management

These are essential first-line practices and should accompany any allowance. They improve matching of feed to animal need but cannot create digestible L-lysine that is not present in the available ingredient set.

Environmental Pathway

Step	Without compliant L-lysine	With narrowly annotated L-lysine
Amino acid need	Digestible L-lysine need may be met indirectly through more crude protein or more protein-rich organic ingredients.	Digestible L-lysine can be supplied directly when documented as necessary.
Crude protein level	Rations may be formulated above optimal crude protein levels to supply enough L-lysine.	Rations can be formulated closer to essential amino acid requirements.
Nitrogen intake	Excess protein increases nitrogen intake beyond what the animal can retain.	Lower crude protein can reduce excess nitrogen intake while maintaining nutrition.
Excretion pathway	More nitrogen is excreted in manure, urine, or poultry litter.	Reduced excess nitrogen can lower manure/litter nitrogen burden.
Farm system effect	Greater manure/litter management pressure, ammonia potential, bedding challenges, and nutrient loading risk.	Improved nutrient-use efficiency and more precise organic feed-resource use.
Organic integrity	Avoiding the synthetic input may not improve organic outcomes if it forces inefficient overfeeding.	Use is limited by OSP review, ration records, documented need, and excluded method restrictions.

The environmental benefit is conditional. L-Lysine should be credited only where ration records show that it permits lower crude protein or otherwise improves amino acid balance. Supplementation without a demonstrated reduction in excess protein or nutrient loss would not establish the claimed environmental benefit.

In poultry and swine, excess nitrogen becomes part of manure, litter, bedding, ammonia, nutrient cycling, and potential water- or air-quality concerns. Sources addressing poultry formulation, swine feed-grade amino acids, and nitrogen excretion support the direction of the analysis [33, 38, 57, 59, 60].

Farm Viability and Economic Discipline

Feed is a major recurring cost in poultry and swine production. The petition should not argue that lower cost alone makes a synthetic substance essential. The defensible economic point is narrower: where an operator must overuse costly organic protein to correct a specific L-lysine constraint, the added expense may be unrelated to organic integrity and may accompany nitrogen, welfare, and ration-balance tradeoffs.

USDA organic survey data demonstrate that organic livestock and poultry production is economically significant [61, 62, 63]. A constraint that increases feed cost without improving organic outcomes can discourage continued participation, particularly for smaller and mid-scale operations with limited purchasing leverage.

Precision-feeding research supports the general principle that closer matching of amino acid supply to animal need can reduce L-lysine intake, feeding cost, and nutrient excretion, although conventional precision systems should not be treated as direct organic models [53].

Integrated Finding

Organic and nonsynthetic alternatives should remain the first line of ration formulation. The evidence does not show that any single alternative reliably replaces a narrowly annotated L-lysine allowance in every poultry and swine ration where digestible L-lysine is limiting. A compliant source may be necessary when the alternatives cannot meet documented requirements without excessive crude protein, ration imbalance, nitrogen burden, welfare compromise, or undue feed-resource inefficiency.

Appendix G - Manufacturing, Formulation, Excluded Methods, and Product Documentation

Commercial Forms Within the Petition Scope

Public manufacturer information supports the commercial existence of dry L-lysine monohydrochloride, L-lysine sulfate or fermentation-broth products, and liquid L-lysine. Each form raises different concentration, associated substance, handling, and documentation questions.

Commercial form	General description	Formulation/stability relevance	Review implications
L-lysine monohydrochloride	Concentrated crystalline or granular salt form widely used in feed.	Generally dry, concentrated, relatively easy to specify by assay; may require granulation or flow aids depending on product.	Likely easiest form to evaluate if manufacturer provides purity, SDS, COA, contaminants, manufacturing process, and excluded method documentation.
L-lysine sulfate / fermentation-product forms	Feed-grade L-lysine supplied as a sulfate salt with fermentation coproducts or biomass-derived nutrients.	May improve flowability, mixing, or cost; product may include coproducts from fermentation that are nutritionally relevant.	Requires more detailed review of coproducts, residual biomass, organism/substrate history, contaminants, and whether all components fit the petitioned use.
Liquid L-lysine	Aqueous L-lysine preparation used in liquid feed systems or liquid dosing.	Raises questions about stability, concentration, microbial control, pH, handling, and possible stabilizers.	Should be covered only if formulation components, preservatives/stabilizers, storage conditions, and use patterns are disclosed.

General Manufacturing Pathway

Commercial L-lysine is generally produced by fermentation. A representative pathway includes:

- preparation of a carbohydrate substrate;
- fermentation using a selected production microorganism;
- separation, concentration, purification, or conversion of the fermentation broth;
- formation of the intended salt, sulfate, broth-based, or liquid product;
- drying, granulation, stabilization, or pH adjustment;
- standardization to feed-grade assay and quality specifications; and
- packaging and distribution for feed manufacture.

Manufacturer-specific documentation is necessary for the production organism, organism history, substrates, processing aids, acids and bases, carriers, stabilizers, coproducts, residual biomass, contaminants, and waste streams.

Formulation and Stability

Issue	Why it matters in feed use	Documentation to request
Assay and concentration	Feed formulation depends on accurate nutrient contribution. Different forms provide different L-lysine concentrations.	Typical assay, guaranteed analysis, analytical method, COA range, and lot variability.
Flowability and dust	Feed mills need materials that convey, meter, and blend safely and uniformly. Dust may create worker exposure or combustible dust considerations.	SDS, particle-size data, bulk density, flowability data, dust controls, and handling instructions.
Mixing and segregation	Amino acids are often included at low rates. Uniform distribution matters for animal nutrition and compliance.	Mixability data, granulation/agglomeration process, recommended inclusion and blending instructions.
Moisture and shelf stability	Moisture can affect caking, assay stability, microbial risk, and handling.	Shelf-life statement, storage conditions, moisture specification, packaging controls.
Liquid stability	Liquid products may require pH control, microbial stability, compatible dosing equipment, and storage instructions.	Concentration, pH, stabilizers/preservatives if any, storage temperature, shelf life, microbial specification.
Coproducts and carriers	Fermentation coproducts or carriers may be nutritionally relevant, but they must be disclosed for organic review.	Ingredient/component disclosure, source, function, percentage range, safety data, and excluded method status.

Necessary components should be functionally justified and fully disclosed. The listing should not automatically cover unrelated carriers, coatings, proprietary additives, or technologies outside the poultry and swine feed scope.

Excluded Methods Review

Excluded method compliance is a threshold issue because amino acid fermentation may involve genetically engineered production strains, genetically engineered agricultural substrates, or processing aids and formulation components that require review. The petition requests only sources that comply with 7 CFR § 205.105 [14].

A generic 'non-GMO' claim is not sufficient by itself. The review must address the production organism and predecessor strains, genetic engineering or gene editing, fermentation substrates, processing aids, carriers, stabilizers, residual production material, and other associated components.

The highest-risk points are the production microorganism, carbohydrate substrate, downstream processing aids, formation of salts or liquid products, fermentation-broth coproducts, and undisclosed proprietary components. Product-specific attestations should be supported by process descriptions and traceable documentation rather than broad marketing statements.

Appendix H - Manufacturer Feasibility and Market Development Considerations

Purpose of This Appendix

This appendix addresses the current state of the domestic L-lysine manufacturing space, and the information manufacturers are likely to need before treating organic-compliant L-lysine as a viable market. It is intended to supplement the technical petition and the excluded methods, manufacturer-documentation, and supplier-sourced documentation appendices.

The purpose is not to ask the National Organic Program or National Organic Standards Board to approve existing commercial L-lysine products without verification. Rather, this appendix explains why a National List review may be necessary to create the regulatory signal that allows manufacturers, certifiers, feed mills, and organic livestock producers to determine whether a compliant supply pathway can be developed.

Current Manufacturing Landscape

Stakeholder outreach indicates that domestic feed-grade L-lysine production is concentrated among three principal manufacturers: Evonik, ADM, and CJ America. This concentration matters because the development of an organic-compliant L-lysine supply will likely depend on whether one or more of these manufacturers can justify the technical, operational, and commercial work needed to produce or document a compliant source.

Feed-grade L-lysine is generally fermentation-derived. This distinguishes L-lysine from DL-methionine, which has historically been discussed as a chemically manufactured amino acid. For L-lysine, the organic-compliance questions therefore center on the fermentation organism, strain-development history, fermentation substrate, processing aids, downstream conversion, product stabilization, and any carriers or associated formulation components.

Information Manufacturers Need to Evaluate Market Viability

The outreach indicates that major L-lysine manufacturers would be more likely to evaluate organic-compliant production seriously with a credible indication of market potential. The following information would help manufacturers determine whether the organic livestock market could justify alternative strain selection, compliant substrate sourcing, segregation, documentation, and price modeling.

Information Need	Why It Matters
Market size	Estimated number of organic poultry and swine animals in the United States, by production class where possible.
Organic share of total production	An estimate of organic poultry and swine production as a percentage of the broader domestic monogastric livestock sector.
Expected inclusion rate	Estimated use per animal unit, per ton of feed, or by production phase under the proposed annotation. This should be presented as a reasonable range rather than a fixed universal rate.
Annual demand estimate	A back-calculated annual volume of organic-compliant L-lysine demand based on animal numbers, feed consumption, and expected inclusion rates.
Price feasibility	An estimate of the price premium or minimum selling price needed to make a lower yield, segregated, or otherwise compliant production pathway commercially viable.
Documentation expectations	A clear list of what manufacturers must provide for organic review: specifications, SDSs, labels, COAs, process summaries, excluded method affidavits, substrate information, and component disclosures.
Tolerance for uncertainty	A directional estimate may be sufficient to initiate manufacturer discussions. Stakeholder outreach suggested that an estimate within approximately plus or minus 20 percent may be adequate for early market evaluation because inclusion rates vary with commodity prices and feed ingredient quality.

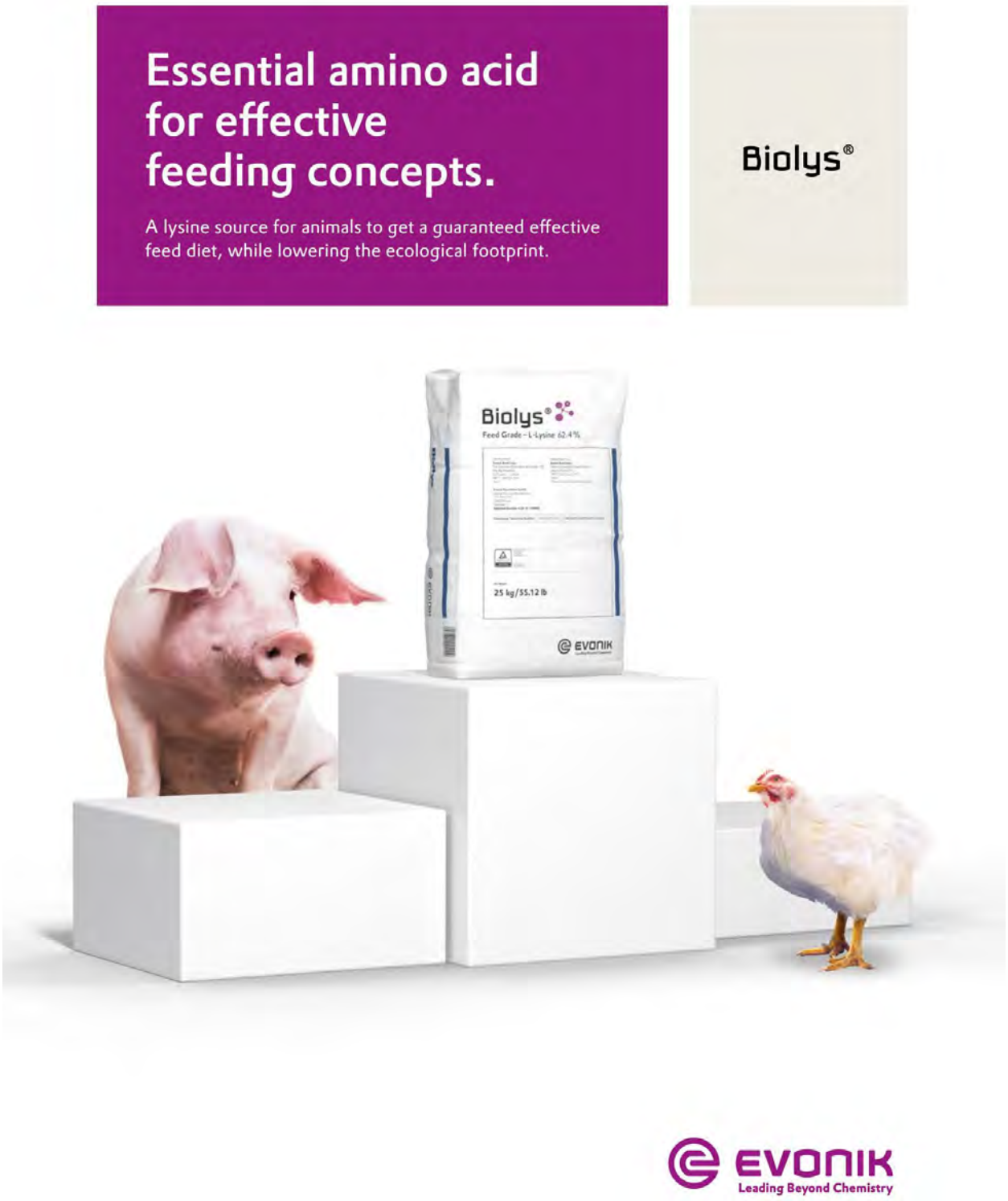
Conclusion

Organic-compliant L-lysine may require additional verification or adaptation of current commercial production systems. NOP and NOSB can evaluate whether L-lysine should be eligible under a strict annotation, while leaving product-specific approval to manufacturer documentation, certifier review, and compliance with the excluded methods prohibition.

Appendix I - Representative L-Lysine Feed Additive Source Documents

Exhibit Index

#	Source / product	Document included	Document Role
1	Evonik - Biolys®	Brochure / use instructions / nutritional matrix / product facts	Supports feed-additive use, forms, handling, stability, and product facts.
2	Evonik - BIOLYS® bulk	Safety Data Sheet	Supports safety, composition, handling, storage, and hazard information.
3	ADM - Liquid L-Lysine 50%	Product sheet / use instructions	Supports identity, fermentation-broth origin, use, handling, enclosed tank/metering system, and nitrogen-efficiency statements.
4	ADM - Liquid L-Lysine 50%	Liquid delivery system sheet	Supports use/delivery system, handling, and feed-mill implementation.
5	CJ Bio / CJ America - BestAmino™ L-Lysine	Leaflet / specification-bearing product information	Supports product forms and specifications for L-Lysine HCl, Lysine 70, Lysine 64, and liquid forms.
6	CJ Bio America - L-Lysine Monohydrochloride 99%	Safety Data Sheet	Supports animal-feed use, hazard information, and supplier identity.
7	CJ Europe - L-Lysine HCl Feed Grade	Safety Data Sheet	Useful as representative support for L-lysine HCl feed grade safety.


Essential amino acid for effective feeding concepts.
A lysine source for animals to get a guaranteed effective feed diet, while lowering the ecological footprint.
Biolys®
Biolys®
Feed Grade – L-Lysine 62.4%
25 kg/55.12 lb
EVONIK
EVONIK
Leading Beyond Chemistry

MEGATRENDS

We are what we feed

The world's population continues to grow – and so does the challenge of securing enough healthy food. Since meat, fish, eggs, and dairy products represent a large share of global needs, the science of animal nutrition has a key role to play in addressing the food challenge. The future depends on innovative, sustainable, and efficient feed concepts.



BETTER FEED MEANS BETTER FOOD

We're aware of humanity's challenges and strive to improve global animal protein production. Our knowledge, based on science and experience, guides us. Animal nutrition impacts livestock farming's environmental footprint. Fortunately, we understand food production's science and environmental impact better than ever. Precise knowledge of livestock nutrition enables us to develop products that enhance animal health and performance.

REDUCED GROUNDWATER POLLUTION WITH BIOLYS®





-9%

1 percentage points crude protein (CP) reduction in pig diets – 9 percent less nitrogen (N) excretion to the environment



This broad range of offerings helps the food industry meet the challenges of today and tomorrow. For example, groundwater pollution from livestock waste is a rising concern. Biolys® helps producers lower crude protein content of their feed. A 1% drop in dietary protein reduces nitrogen in manure and ammonia emissions by 9%. Biolys® also decreases water consumption, resulting in less manure volume.

3 QUESTIONS

The people who make up Evonik

What is your role at Evonik Animal Essential Nutrition?
As the Strategic Marketing Director for Efficient Nutrition at Evonik Animal Nutrition, I am responsible for overseeing the development and implementation of our marketing strategy in North America.

How can Biolys® contribute to more sustainable animal farming?
By supplementing animal feed with specific amino acids, such as lysine or methionine, the overall crude protein content of the feed can be reduced while still meeting the animal's nutritional requirements. This not only reduces the environmental impact of animal farming by decreasing the amount of resources required to produce animal feed, but it also reduces the amount of nitrogen excreted by the animal, which can contribute to air and water pollution. Additionally, using supplemental amino acids can improve the efficiency of animal production, allowing farmers to produce more meat, milk, or eggs with fewer resources.



TERTIO NEL
Strategic Marketing Director

What motivates you most in your job?
I have the privilege of working in one of the best industries out there – the animal nutrition and health industry. I am motivated by the opportunity to promote proven products and services that help address the global food challenge.

Your key message
Our amino acids are manufactured to the highest quality standards, ensuring that they are safe, effective, and reliable. We use only the highest quality raw materials and employ rigorous quality control measures to ensure that our products meet or exceed industry standards.

Better feed, better livestock production

Price pressure, consumer demands, regulatory and environmental requirements – raising livestock profitably in today's changing markets is challenging. Consistently using high-quality feed with functional feed ingredients can give farmers an advantage in efficiency. Feed additives not only boost feed conversions; they also reduce waste output and support animal health and welfare. The result: higher growth rates and profitability, lower ammonia and nitrogen emissions.

Lysine is a key element in effective feeding concepts. Yet not all sources of the essential amino acid are created equal: Biolys® contains a minimum of 62.4 percent L-lysine in the form of sulfated salt and coproducts from the fermentation process which are valuable for nutrition. Biolys® has been tested and validated in many trials with poultry, pigs, and fish under a variety of production conditions, growth stages, and management systems. Excellent flowability makes it easy to mix in feed. It allows exceptionally precise dosing, lower safety margins, and reduced amounts of crude protein in the feed formulation.

Ideal protein diets – less crude protein, higher profitability

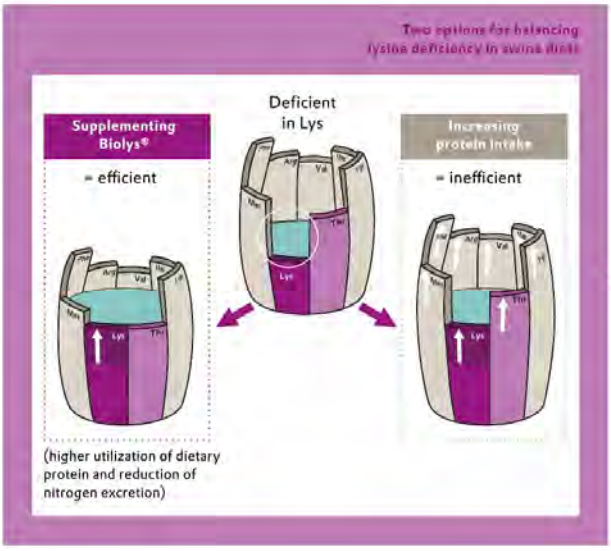
A high-protein feed may guarantee sufficient amino acids for livestock growth, but at a high cost. The game-changing ideal protein concept uses precise amino acid specifications to meet the needs of essential nutrients with cost-effective feed additives.

The ideal protein concept is one of the most important advances in animal nutrition. It is based on the fact that animals need a balanced or ideal pattern of amino acids to maximize growth performance and nitrogen retention. All absorbed amino acids in excess of the first limiting amino acid are catabolized, increasing nitrogen excretion and using expensive energy, diverting it away from growth. The concept takes lysine, which is almost exclusively utilized for body protein accretion, as a starting point. The amount of lysine required, adjusted to the genetic potential of different animals and production conditions, is used as a reference to define the need for other essential amino acids. This ideal ratio is the key to calculating the right amount of amino acids and reducing crude protein. The result: optimized growth performance and maximized nitrogen utilization.

Amino acids vs. crude protein

Crude protein is among the most costly components of livestock feed. Recent price developments have further underscored the fact that formulating diets to meet amino acid recommendations using high levels of intact protein sources is simply inefficient. In addition to high costs, the disadvantages include metabolic stress placed on animals catabolizing and excreting excessive amino acids.

Drawing on scientific findings and decades of hands-on experience, Evonik has established standardized ileal amino acid recommendations for different types of livestock. The resulting reduction in crude protein requirements and targeted use of amino acids – the ideal protein concept – maximize growth performance and profitability, while lowering environmental impact.



Animal nutritionists have long known that animals do not need crude protein itself, but rather the essential amino acids it contains. Yet high-protein diets were the only way to provide safety margins, ensuring that more than enough of the required amino acids are contained. Today, precise amino acid specifications make it possible to reduce safety margins and fine-tune feed compositions. This approach, the ideal protein concept, saves money, and cuts down nitrogen emissions.



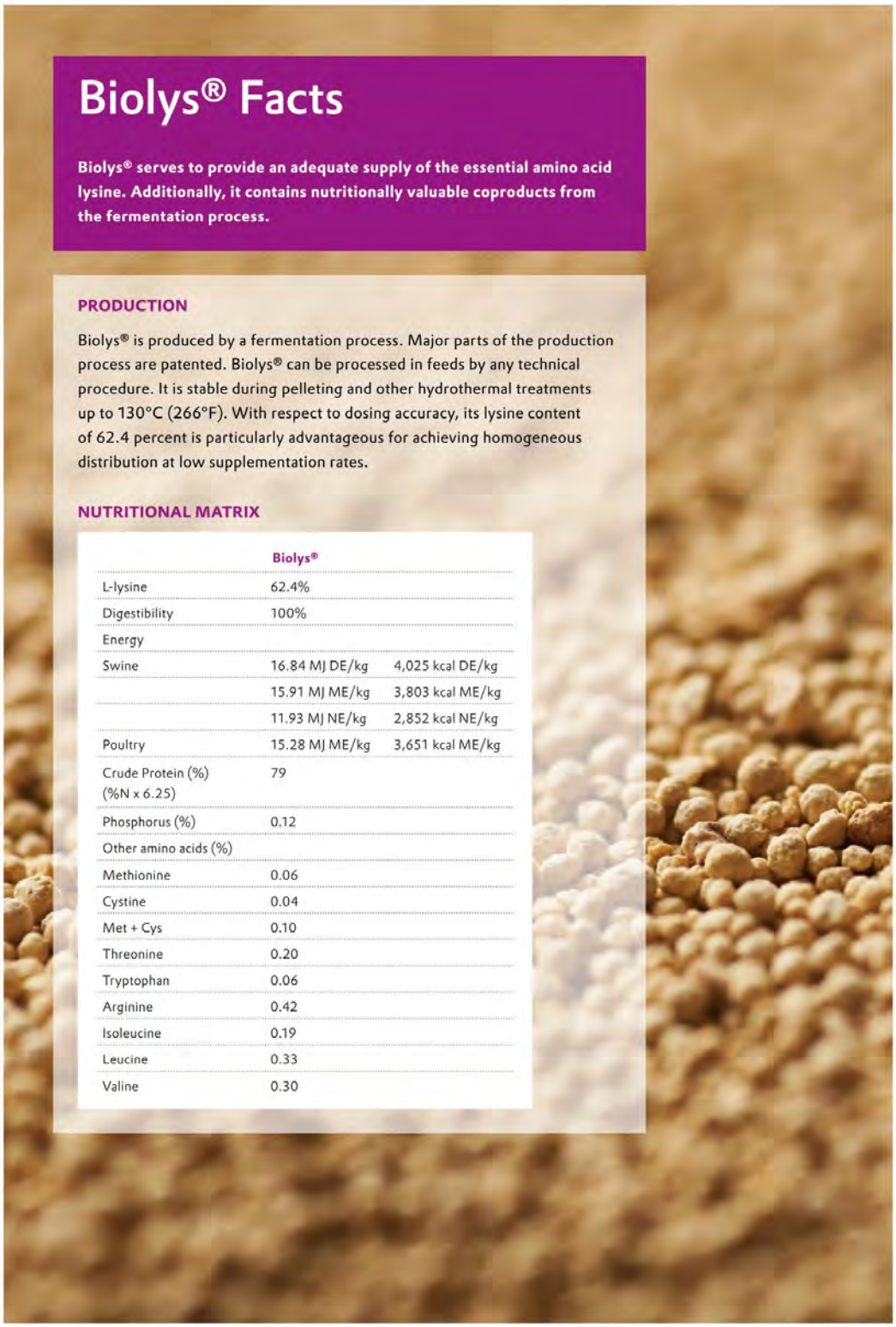
Best results in three steps



Precise analysis of raw materials is essential for high feed quality. Evonik offers three tools to support this process: AMINONIR®, AMINOProx®, and AMINONRG®. The benefit: quick predictions of nutrients and accurate calculation of energy content in feed raw materials.

Nutritionists can accurately design feeds only if they know the animal's needs at different growth phases and the composition of each feed ingredient. For all major species, Evonik offers specific recommendations with AMINOChick®, AMINO-Pig® and other IT tools.

Feed is more effective if ingredients are accurately dosed and homogeneously mixed. Evonik's dosing system AMINOSys® helps ensure quality while allowing the reduction of amino acid safety margins for lower cost.More than 600 AMINOSys® customers world-wide can attest to its effectiveness.



Biolys® Facts

Biolys® serves to provide an adequate supply of the essential amino acid lysine. Additionally, it contains nutritionally valuable coproducts from the fermentation process.

PRODUCTION

Biolys® is produced by a fermentation process. Major parts of the production process are patented. Biolys® can be processed in feeds by any technical procedure. It is stable during pelleting and other hydrothermal treatments up to 130°C (266°F). With respect to dosing accuracy, its lysine content of 62.4 percent is particularly advantageous for achieving homogeneous distribution at low supplementation rates.

NUTRITIONAL MATRIX

	Biolys®	
L-lysine	62.4%	
Digestibility	100%	
Energy		
Swine	16.84 MJ DE/kg	4,025 kcal DE/kg
	15.91 MJ ME/kg	3,803 kcal ME/kg
	11.93 MJ NE/kg	2,852 kcal NE/kg
Poultry	15.28 MJ ME/kg	3,651 kcal ME/kg
Crude Protein (%) (%N x 6.25)	79	
Phosphorus (%)	0.12	
Other amino acids (%)		
Methionine	0.06	
Cystine	0.04	
Met + Cys	0.10	
Threonine	0.20	
Tryptophan	0.06	
Arginine	0.42	
Isoleucine	0.19	
Leucine	0.33	
Valine	0.30	

6

A positive impact on both business and the environment





ABOUT OUR PRODUCTION SITES

Biolys® is produced at the Evonik sites Blair (US) and Castro (Brazil). Both plants are located in the midst of corn-producing regions. Here, our highly motivated teams convert corn-derived dextrose into Biolys®, using biotechnological processes.

DRIVE PROFITABILITY

Biolys® is made from corn sugar and provides an effective and reliable source of lysine for the compound feed industry. It supports performance due to high lysine concentration, high energy, and additional amino acids from the biomass. Adding AMINO-branded service concepts and digital tools to the equation results in precise feed formulations and dosing of lysine, leading to overall lower feed costs and higher profitability. This way, feed mills can reduce batch times and accelerate throughput for greater profit.

CUT COSTS

Boosting business profitability is easy when using Biolys® and benefiting from high lysine concentration plus valuable coproducts from fermentation. Because of the additional phosphorus, nutritive amino acids, energy, lipids, and carbohydrates of the biomass, Biolys® is more efficient and cost-effective than lysine HCl sources. If this information is incorporated accurately into the raw material matrix of the feed formulation software and the rations calculated by means of least cost optimization, Biolys® is preferred over lysine HCl in all poultry and pig diets.

FACILITATE PROCESSING

Biolys® is made by state-of the-art fermentation and downstream technologies leading to excellent handling and processing properties. Biolys®, the innovative form of feed grade L-lysine, is available as a free-flowing granulate with a high bulk density. The particle size distribution secures optimum homogeneity in feed. Biolys® is a true champion for efficient animal nutrition.

IMPROVE SUSTAINABILITY

Since 2021, Evonik has managed to reduce the CO_2 emissions from this production process by roughly 20 percent, leading to the lowest carbon footprint for lysine available on the market.

Species

Supplemental lysine significantly improves the diets of various species, including poultry, swine, and aquatic animals. Livestock production, animal well-being, and the environment can all benefit when feed is supplemented with optimum amounts of high-quality lysine.



POULTRY

Lysine (Lys) is the second limiting amino acid in commercial poultry diets. Lysine is an essential amino acid (AA) required for protein synthesis and thus necessary for optimizing growth performance, egg production, and carcass yields. In addition, dietary Lys level is routinely used as the basis for expressing the requirements of all other essential amino acids in the ideal protein concept. Therefore, properly meeting the Lys requirements in poultry diets is of utmost importance. For this, supplemental Biolys® allows improvement of the amino acid balance of poultry diets while improving growth performance and feed efficiency and reducing nitrogen excretion.



SWINE

In typical swine diets, Lys is the first limiting amino acid. Thus, to ensure maximum protein deposition, Lys needs to be supplied to meet the requirements of pigs. While body protein synthesis is the primary use, dietary Lys is also utilized for carnitine synthesis and obligatory oxidation. The most common sources of Lys are L-lysine·HCl and L-lysine sulfate (Biolys®). Numerous studies have proved that the bioavailability of Lys in Biolys® and L-lysine·HCl are not different in pigs. Dietary supplementation with Biolys® reduces dietary crude protein level, which is associated with a reduction in nitrogen excretion and lower feed costs.



AQUACULTURE

Lysine is commonly the second limiting amino acid, after methionine, in fish and shrimp feed. Biolys® supplementation in aqua feed formulations allows nutritionists to be flexible with raw material selection and reduce diet cost, while balancing the diets for lysine. Balancing fish feed with supplemental Biolys® results in significant better commercial KPIs. It is also part of an effective strategy for replacing fish meal with alternative, less expensive protein sources as well as reducing excess dietary protein levels. Such a strategy supports the sustainability of aquaculture in terms of both economics and environmental impact.

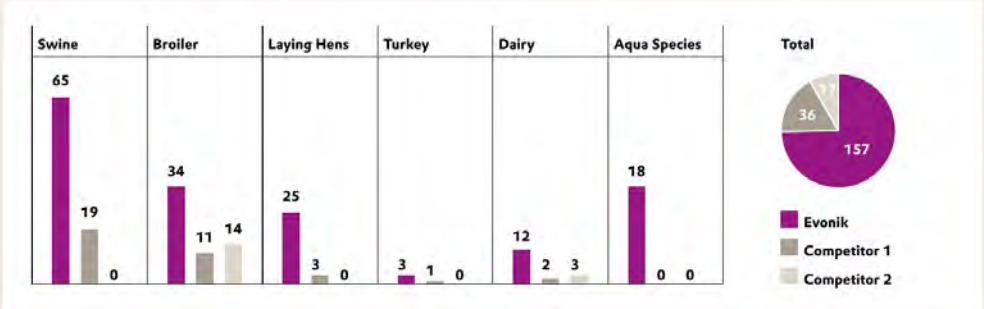
Scientific support

**At Evonik, we are committed to science and how to use it to master challenges.
This is why research is part of our day-to-day business.**



In addition, we publish articles in scientific journals and the press, and produce our own customer magazines AMINONews® and AMINOTec®. We also report commercial trial results via Facts&Figures.

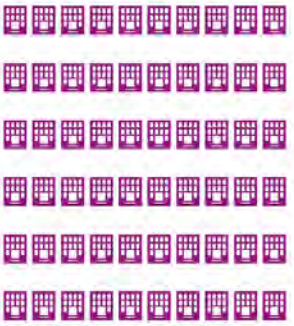
Due to the high number of publications generated by Evonik we are happy to put together a selection of relevant articles according to your needs – simply ask.



Based on SCOPUS search for species and affiliation limited to Articles and Reviews for the years 2012 to 2016

9

A winning combination



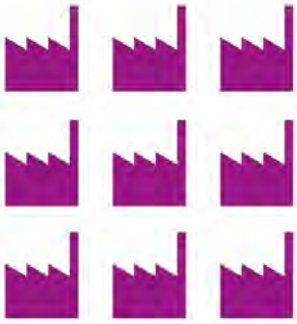
OWN OFFICES IN 60 COUNTRIES

Customers ordering Biolys® receive more than a product – we offer a combination of targeted services, digital tools, and products. Our experts provide specialized knowledge and experience to help unlock the full value of Biolys®. With offices in more than 60 countries, we ensure maximum responsiveness and service quality, guaranteeing availability of our products to customers in over 100 countries. Evonik scientists stay in close contact with universities, research institutes and other members of the scientific community, and share their knowledge in scientific papers and trainings.



13 LABS ON 5 CONTINENTS

We have 13 labs on five continents that provide NIR and wet chemistry services, placing leading analytical capacity for essential amino acids at our customers' disposal. This allows customers to quickly and conveniently asses the components of raw material quality – key information in formulating the best diet for livestock. To enable the implementation of low-protein concepts, we offer a portfolio of essential amino acids and additional healthy nutrition solutions.



PRODUCTION FACILITIES WORLDWIDE

Accurate dosing ensures cost savings and reduces waste. This is especially important for expensive micro ingredients. To support this need, we have developed handling solutions for our products. Combined with other services, this ensures that the animal gets the exact level of amino acids according to the respective growth phase.

With plants on three continents and over 50 warehouses worldwide, we can deliver reliably – on time and in the right quantity. Customers can count on us not only for an excellent product, but for a whole package that adds up to best results.



The greatest global challenge is to ensure food security. Eight billion human lives depend on it. However, it matters how we source animal protein. That's why it's absolutely necessary to act with exceptional care: We need to increase food safety and security, while improving animal health and welfare and reducing the ecological footprint of animal farming. There is only one way to do it right: using science. Only well thought-through, evidence-based solutions can establish a truly sustainable and secure food supply. Our focus is on three areas of action.



OUR PLANET NEEDS US TO DO MORE WITH LESS



ANIMAL WELFARE IS ABOUT MORE THAN JUST LIVESTOCK



ENSURING FOOD SECURITY FOR ALL OF US

IN DIALOGUE

You can reach us in many ways – by email, social media, telephone, or a personal visit. We look forward to serving you.

Check out our video – We are Evonik Animal Nutrition.

11

EVONIK OPERATIONS GMBH
Nutrition & Care
Animal Nutrition Business Line

animal-nutrition@evonik.com
www.evonik.com/animal-nutrition

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It is the customer's sole responsibility to arrange for inspection and testing of all products by qualified experts. Reference to trade names used by other companies is neither a recommendation nor an endorsement of the corresponding product, and does not imply that similar products could not be used.
12/2024

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EVONIK
Leading Beyond Chemistry

SAFETY DATA SHEET

Classified in accordance with 29 CFR 1910.1200

1. Identification

Product identifier: BIOLYS® bulk

Chemical name:
L-Lysine sulphate and its by-products from fermentation

Other means of identification
None.

Recommended restrictions
Recommended use: Feed additive
Restrictions on use: Not known.

Manufacturer/Importer/Distributor Information

Company Name	:	Evonik Corporation 299 Jefferson Road Parsippany, NJ 07054 USA
Telephone	:	+1 973 929 8000
Fax	:	+1 973 929 8040
E-mail	:	product-regulatory-services@evonik.com

Emergency telephone number:

24-Hour Health Emergency	:	+1 800 424 9300 (CHEMTREC - US & CANADA) 800 681 9531 (CHEMTREC MEXICO) +1 703 527 3887 (CHEMTREC WORLD)

2. Hazard(s) identification

Hazard Classification

OSHA hazard(s)
Combustible dust

Label Elements

Hazard Symbol:	No symbol
Signal Word:	No signal word.
Hazard Statement:	Not applicable

Precautionary Statements	Not applicable
Hazard(s) not otherwise classified (HNOC):	May form combustible dust concentrations in air.

3. Composition/information on ingredients

Chemical name:
L-Lysine sulphate and its by-products from fermentation

Substances

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
L-Lysine, sulfate		60343-69-3	>=75%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Composition information of impurities and stabilizers

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
By-products from fermentation			<=25%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Composition Comments: The components are not hazardous or are below required disclosure limits.

The exact concentration has been withheld as a trade secret.

4. First-aid measures

Description of necessary first-aid measures

General information: Pay attention to self-protection. Remove victims from hazardous area. Immediately remove soiled or soaked clothing and remove it to a safe distance. Keep victim warm, in a stabilized position and covered. Do not leave victims unattended. If the casualty is unconscious: Place the victim in the recovery position.

Inhalation: Inhalation is possible if aerosols, mists, dusts, or smoke form. Move victims into fresh air. With labored breathing: Provide with oxygen. Consult a doctor. If the casualty is not breathing: Perform mouth-to-mouth resuscitation, notify emergency physician immediately.

Skin Contact: Wash off affected area immediately with plenty of water for at least 15 minutes. If symptoms persist, consult a physician for treatment.

Eye contact: With eye held open, thoroughly rinse immediately with plenty of water for at least 10 minutes. In case of persistent discomfort: Consult an ophthalmologist.

Ingestion: Rinse mouth. Immediately give large quantities of water to drink. Obtain medical attention.

Personal Protection for First-aid Responders:	In the event of fire, wear self-contained breathing apparatus.

Most important symptoms/effects, acute and delayed

Symptoms:	None known.
Hazards:	Other dangerous properties can not be excluded.

Indication of immediate medical attention and special treatment needed

Treatment:	This substance does not have any noteworthy noxious potential. Damage to health is thus not expected.

5. Fire-fighting measures

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Water. mist
Unsuitable extinguishing media:	quenching powder Carbon Dioxide.
Specific hazards arising from the chemical:	In the case of fire, the following hazardous smoke fumes may be produced: carbon monoxide, carbon dioxide, nitric oxides, hydrocyanic acid.In the event of fire and/or explosion do not breathe fumes.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	Contaminated fire-extinguishing water must be disposed of in accordance with the regulations issued by the appropriate local authorities. Fire residues should be disposed of in accordance with the regulations.
Special protective equipment for fire-fighters:	In the event of fire, wear self-contained breathing apparatus.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Use personal protective equipment. Keep unauthorized personnel away.
Accidental release measures:	Avoid dust formation.
Methods and material for containment and cleaning up:	Use mechanical handling equipment.
Environmental Precautions:	Obey relevant local, provincial and federal laws and regulations. Do not contaminate any lakes, streams, ponds, groundwater or soil.

7. Handling and storage

Handling

Technical measures (e.g. Local and general ventilation):	Ensure suitable suction/aeration at the work place and with operational machinery. Earthing of equipment. Take precautionary measures against static discharges.
Safe handling advice:	Handle in accordance with good industrial hygiene and safety practice. If there is the possibility of skin/eye contact, the indicated hand/eye/body protection should be used.
Contact avoidance measures:	No data available.
Hygiene measures:	Wash face and/or hands before break and end of work. Cleanse and apply cream to skin after work.

Storage

Safe storage conditions:	Store in a cool and shaded area. Keep containers dry and tightly closed to avoid moisture absorption and contamination.Keep away from sources of ignition - No smoking. Avoid dust formation. VDI 2263 "Dust fires and dust explosions; dangers, evaluation, preventive measures."
Safe packaging materials:	No data available.
Storage Temperature:	No data available.

8. Exposure controls/personal protection

Control Parameters
Occupational Exposure Limits
None of the components have assigned exposure limits.

Appropriate Engineering Controls	Ensure suitable suction/aeration at the work place and with operational machinery. Earthing of equipment. Take precautionary measures against static discharges.

Individual protection measures, such as personal protective equipment

Eye/face protection:	Safety glasses with side-shields conforming to EN166

Skin Protection

Hand Protection:	Additional Information: Wear protective gloves made of the following materials: rubber or plastics., Change protective gloves regularly.
Skin and Body Protection:	A safety shower and eye wash fountain should be readily available. To identify additional Personal Protective Equipment (PPE) requirements, it is recommended that a hazard assessment in accordance with the OSHA PPE Standard (29CFR1910.132) be conducted before using this product.

Respiratory Protection:	A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 or applicable federal/provincial requirements must be followed whenever workplace conditions warrant respirator use. NIOSH's "Respirator Decision Logic" may be useful in determining the suitability of various types of respirators.
Hygiene measures:	Wash face and/or hands before break and end of work. Cleanse and apply cream to skin after work.

9. Physical and chemical properties

Appearance	
Physical state:	solid
Form:	dry, free flowing granules
Color:	Light brown
Odor:	Characteristic
Odor Threshold:	No data available.
pH:	Not determined.
Melting Point:	Not determined.
Boiling Point:	Not applicable
Flash Point:	Not applicable solid
Evaporation Rate:	No data available.
Flammability (solid, gas):	Not classified as a flammability hazard comparable product
Explosive limit - upper:	not to be determined
Explosive limit - lower:	60 g/m3
Vapor pressure:	No data available.
Vapor density (air=1):	No data available.
Density:	No data available.
Relative density:	No data available.
Solubility in Water:	partly soluble > 363 g/l (23 °C) comparable product
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	-3.05 tested substance: L-Lysine
Self Ignition Temperature:	> 200 °C (VDI 2263-1) (in dm3 wire basket (IMDG code))
Decomposition Temperature:	No data available.
Kinematic viscosity:	No data available.
Dynamic viscosity:	Not applicable solid | Not applicable solid
Other information	
Bulk density:	620 - 670 kg/m3
Particle Size:	11 m
Explosive properties:	Dusts of the product are explosible.
Oxidizing properties:	Not to be expected in view of the structure
Dust Explosion Description Number Kst:	109 m.b_/s
Minimum ignition energy:	> 300 mJ (VDI Guideline 2263 sheet 1) sieve fraction with inductance > 44 mJ calculated
Minimum ignition temperature:	450 °C (VDI Guideline 2263 sheet 1) (BAM-furnace) grain size < 63 m
Metal Corrosion:	No data available.
Dust explosion properties:	St1 ST-1

Minimum Exposable Concentration (MEC):	60 g/m3
Burning Number:	Burning Number: 2 Combustibility test in accordance with VDI 2263 BZ 2 - briefly ignites and rapidly extinguishes.

10. Stability and reactivity

Reactivity:	No data available.
Chemical Stability:	Stable under recommended storage conditions.
Possibility of hazardous reactions:	Dust can form an explosive mixture in air.
Conditions to avoid:	See chapter Conditions for safe storage, including any incompatibilities
Incompatible Materials:	No further information available
Hazardous Decomposition Products:	No hazardous decomposition products known.

11. Toxicological information

Information on likely routes of exposure

Inhalation:	Relevant route of exposure. Information on effects are given below.
Skin Contact:	Relevant route of exposure. Information on effects are given below.
Eye contact:	Relevant route of exposure. Information on effects are given below.
Ingestion:	If handled correctly, not a relevant route of exposure. Information on effects are given below.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation:	No data available.
Skin Contact:	No data available.
Eye contact:	No data available.
Ingestion:	No data available.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral **Product:**	LD 50 (Rat): > 5,110 mg/kg comparable product
Dermal **Product:**	Not classified for acute toxicity based on available data.
Inhalation **Product:**	NOAEL (Rat): 5.3 mg/l Dusts, mists and fumes, comparable product

Repeated dose toxicity
Product: NOAEL (Rat(male/female), Oral): 1,869 mg/kg comparable product

Skin Corrosion/Irritation
Product: Not irritating OECD 404 (Rabbit): Not irritating comparable product

Serious Eye Damage/Eye Irritation
Product: Not irritating Rabbit: comparable product

Respiratory or Skin Sensitization
Product: Buehler Test, OECD 406 (Guinea Pig): Not a skin sensitizer. comparable product

Carcinogenicity
Product: Not classified Contains no carcinogenic substances as defined by NTP, IARC and/or OSHA.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogens present or none present in regulated quantities

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogens present or none present in regulated quantities

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050), as amended:
No carcinogens present or none present in regulated quantities

Germ Cell Mutagenicity

In vitro
Product: Ames test (OECD 471): negative
Chromosomal aberration (OECD 473): negative

In vivo
Product: No data available.

Reproductive toxicity
Product: Not classified

Specific Target Organ Toxicity - Single Exposure
Product: No data available.
Components:
By-products from fermentation: Not classified

Specific Target Organ Toxicity - Repeated Exposure
Product: Based on available data, the classification criteria are not met.

Aspiration Hazard
Product: No data available.

Components:
L-Lysine, sulfate: Not applicable
By-products from fermentation: Not classified

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: LC 50 (Cyprinus carpio (Carp), 96 h): > 200 mg/l
LC0 (Cyprinus carpio (Carp), 96 h): > 200 mg/l

Aquatic Invertebrates
Product: EC 50 (Daphnia magna, 48 h): > 1,000 mg/l comparable product
NOEC (Daphnia magna, 48 h): 340 mg/l comparable product

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: EC 50 (Desmodesmus subspicatus (Scenedesmus subspicatus), 72 h): > 2,000 mg/l growth rate
EC 50 (Desmodesmus subspicatus (Scenedesmus subspicatus), 72 h): 450 mg/l Biomass

Persistence and Degradability

Biodegradation
Product: No data available.

BOD/COD Ratio
Product: No data available.

Bioaccumulative potential
Bioconcentration Factor (BCF)
Product: No data available.

Partition Coefficient n-octanol / water (log Kow)
Product: Log Kow: -3.05 tested substance: L-Lysine

Mobility in soil: No data available.

Components:

L-Lysine, sulfate	No data available.
By-products from fermentation	No data available.

Other adverse effects: No further information available

13. Disposal considerations

Disposal methods: Waste must be disposed of in accordance with federal, state, provincial and local regulations.

Contaminated Packaging: Packaging material should be recycled or disposed of in accordance with federal, state and local regulations.

14. Transport information

Domestic regulation

49 CFR
Not regulated as a dangerous good

International Regulations

UNRTDG
Not regulated as a dangerous good

IATA-DGR
Not regulated as a dangerous good

IMDG-Code
Not regulated as a dangerous good

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable for product as supplied.

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
None present or none present in regulated quantities.

US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)
None present or none present in regulated quantities.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050), as amended
None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):
None present or none present in regulated quantities.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Combustible dust

US. EPCRA (SARA Title III) Section 304 Extremely Hazardous Substances Reporting Quantities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances
None present or none present in regulated quantities.

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required
None present or none present in regulated quantities.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)
None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65
No ingredient requiring a warning under CA Prop 65.

US. New Jersey Worker and Community Right-to-Know Act
No ingredient regulated by NJ Right-to-Know Law present.

US. Massachusetts RTK - Substance List
No ingredient regulated by MA Right-to-Know Law present.

US. Pennsylvania RTK - Hazardous Substances
No ingredient regulated by PA Right-to-Know Law present.

US. Rhode Island RTK
No ingredient regulated by RI Right-to-Know Law present.

16.Other information, including date of preparation or last revision

Issue Date:	03/16/2020
Version #:	1.4
Further Information:	No data available.
Revision Information	Changes since the last version are highlighted in the margin. This version replaces all previous versions.
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Liquid L-Lysine 50%



FOR ALL ANIMAL DIETS

ADM meets our customers' growing amino acid needs with a worldwide transportation network, supplying the industry around the globe with high-quality, uniform feed-grade amino acids.

PRODUCT NO.
035101

ADM Liquid L-Lysine 50% is a cost-effective way to supplement rations containing feedstuffs that are low or deficient in lysine. Reducing dietary crude protein lowers nitrogen excretion and improves nitrogen efficiency.

ADM Liquid L-Lysine 50% is transported in bulk and incorporated at the feedmill. The product is maintained in a completely enclosed tank and metering system. The system is computer controlled so inclusion levels are accurate and give real-time inventory monitoring.

ADVANTAGES

ADM Liquid L-Lysine 50% is a high-quality lysine source delivered in bulk to a dedicated, self-contained dispensing system. Thus, it eliminates the physical handling and disposal of bags and pallets associated with crystalline lysine, as well as reducing warehouse needs. This self-contained system uses the latest technology to accurately apply the required amount of lysine directly into the mixer.

The environmental and safety benefits are clear: there is no dust to contend with in the mill atmosphere and no disposal of bags or pallets is required. In addition to keeping the mill cleaner and safer for employees, the elimination of bags and pallets helps preserve our natural resources and reduces landfill waste.

WHAT IS IT? ADM Liquid L-Lysine 50% is an aqueous solution of L-lysine. It is obtained by concentrating lysine from the fermentation broth. It contains the same active molecule (L-lysine) as L-lysine monohydrochloride (L-lys-HCl) and possesses the same nutritional qualities.

Why Choose ADM Liquid L-Lysine?

- Vertically integrated
- Simplifies handling
- Increases storage efficiency
- Eliminates landfill waste
- Supports formulation flexibility
- Provides excellent mixability
- Biodegradable
- Strict quality control
- High-quality, uniform product



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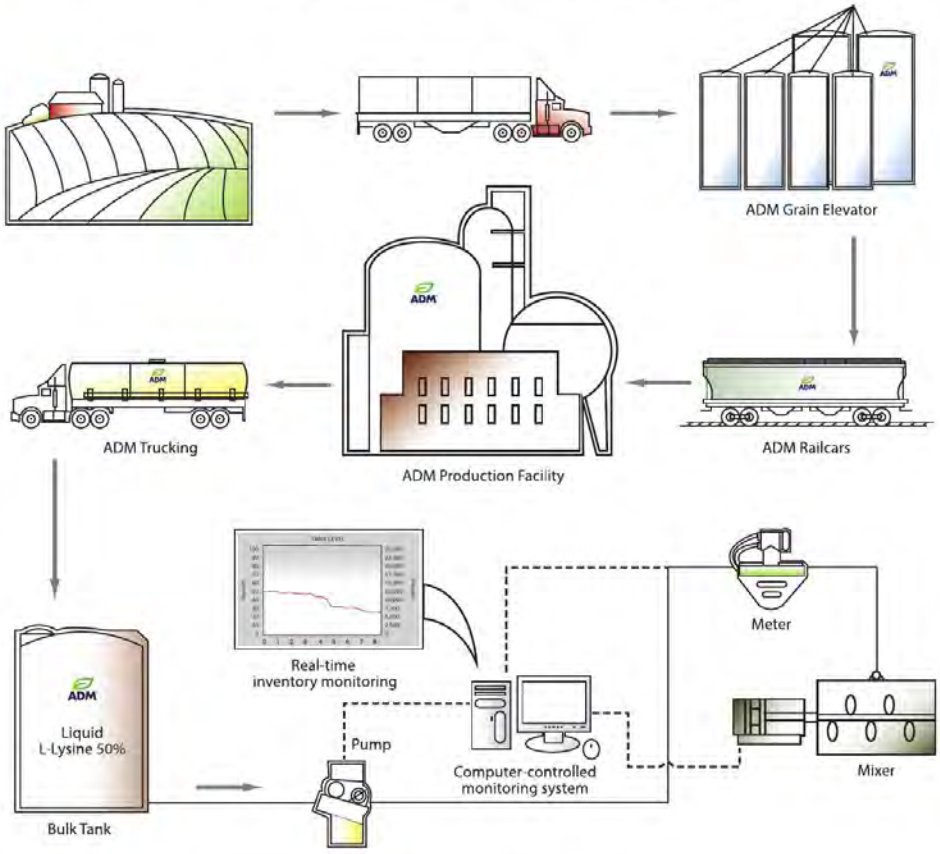
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Liquid L-Lysine 50%



Liquid Delivery System

ADM is working for you from start to finish. From corn harvest to incorporating L-Lysine into feed operations, ADM owns the product all the way through the supply chain, thus ensuring a reliable and trusted source of Liquid L-Lysine for your operation. You can be confident that ADM's amino acids have been through the most stringent manufacturing and quality assurance processes.



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CJ BIO

BEST AMINO™

L-LYSINE

WHAT IS L-LYSINE?

L-Lysine is the reference amino acid in modern animal nutrition; it must be provided in all types of animal feed to ensure optimal performance.

UPGRADE YOUR DIET WITH CJ BIO

– A GLOBAL AMINO ACID MARKET LEADER

01 Advanced fermentation technology

- CJ is the number one global bio company in the green bio market and a leader in the feed amino acid market.
- Fermentation has no adverse effects to the environment, while acid hydrolysis process causes environmental pollution.



02 Various specs for our customers

- CJ BIO offers L-Lysine in HCl, sulfate, liquid and other forms to meet the specific needs of our customers around the globe.

03 Stable supply of L-Lysine

- With five production spots around the world, we ensure stable supply of L-Lysine.



L-Lysine is an essential amino acid for monogastric animals. It cannot be synthesized by the organism and needs to be provided with the feed. Therefore, supplementation of free L-Lysine is required to fully tap the animals' growth potential. Lysine is the most limiting amino acid affecting protein deposition (muscle building, weight gain...). Essential amino acid requirement is expressed relatively to Lysine. CJ BIO's L-Lysine is produced by microbial fermentation with Corynebacterium glutamicum from natural raw materials.

VARIOUS SPECS FOR OUR CUSTOMERS

Each L-Lysine form has its advantages, mainly depends on the feed type produced and available dosing equipment.

• HCl

Pasuruan (Indonesia), Piracicaba (Brazil), Fort Dodge (USA), Shenyang, Liaocheng (China)

Guarantee	PS/PR/FD	SY/LC		
Lysine(%)	79	78.8	min	HPLC analysis, AOAC 999.13
Moisture(%)	1.0	1.0	max	105℃ for 4 hours
Purity(%)	99.0	98.5	min	L-Lysine HCL on dry matter

• Sulphate

Pasuruan(Indonesia), Piracicaba(Brazil), Liacheng(China)

Guarantee	PS/PR/LC		
Lysine(%)	55	min	HPLC analysis, AOAC 999.13
Moisture(%)	4	max	105℃ for 4 hours
Purity(%)	70	min	L-Lysine HCL on dry matter

• Liquid

Pasuruan (Indonesia), Piracicaba (Brazil), Fort Dodge (USA)

Guarantee	PS/PR/FD		
Lysine(%)	50	min	HPLC analysis, AOAC 999.13
Moisture(%)	50	max	105℃ for 4 hours
Purity(%)	50	min	L-Lysine HCL on dry matter

• L98

Piracicaba (Brazil)

Guarantee	PR		
Lysine(%)	78	min	HPLC analysis, AOAC 999.13
Moisture(%)	2	max	105℃ for 4 hours
Purity(%)	98	min	L-Lysine HCL on dry matter

- This product contains 78% of lysine which is the same as the existing products. Unlike conventional products, HCL content is low and levels of other nutrients such as crude protein, energy and free amino acids are high.

STABILITY OF SUPPLEMENT: CJ BIO'S LYSINE PRODUCTION SPOTS



Safety Data Sheet

Revision Date: 5/29/15

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifiers

Product Name	L-Lysine Monohydrochloride 99%
Product Number	
Brand	CJ
Use of Substance/Preparation	Animal feed
Synonyms/Alternate Names	L-Lysine HCl; L-Lysine HCl 99%

Supplier Information

Company	CJ Bio America 1946 Harvest Avenue Fort Dodge, IA 50501 USA
Telephone	515-302-8028
Fax	515-574-3190
Emergency Phone Number	

2. HAZARD IDENTIFICATION

Emergency Overview	May be irritating to eyes, skin and respiratory system; Fine dust dispersed in air may ignite.
Appearance	Tan
Physical State	Solid; Granular
Odor	Slight odor

Potential Health Effects

Routes of Exposure	Eye contact, skin contact, inhalation
Acute Effects	
Eyes	May cause irritation
Skin	May cause irritation
Inhalation	May cause irritation
Ingestion	Health injuries not known or expected under normal use; Not for human consumption.
Chronic Effects	None known.
OSHA Defined Hazards	Not classified
GHS Label Elements	N/A – Not a hazardous substance or mixture
GHS Signal Word	N/A – Not a hazardous substance or mixture

GHS Precautionary Statements	N/A – Not a hazardous substance or mixture

3. COMPOSITION/INFORMATION ON INGREDIENTS

Common Name	L-Lysine monohydrochloride
Formula	$C_6H_{14}N_2O_2 \cdot HCl$

Non-Hazardous Components

Chemical Name	CAS No.	Weight %	North American Hazard Indicator
L-Lysine monohydrochloride	657-27-2	100	-

4. FIRST AID MEASURES

Eye Contact	Rinse thoroughly with copious amounts of water
Skin Contact	Rinse immediately with copious amounts of water; Soap may be helpful.
Inhalation	Move to fresh air
Ingestion	Rinse mouth with water; Drink water to dilute; Consult a physician if necessary.
Notes to Physician	Treat symptomatically
Protection of First Aid Providers	Use personal protective equipment.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Product is capable of burning but is not readily ignited; Risks of ignition followed by flame propagation or secondary explosions should be prevented by avoiding accumulation of dust.
Suitable Extinguishing Media	Water; Carbon dioxide (CO_2); Dry chemical.
Unsuitable Extinguishing Media	None
Hazardous Combustion Products	Carbon monoxide (CO); Carbon dioxide (CO_2); Nitrogen oxides (NO_x); HCl.

Explosion Data

Sensitivity to Mechanical Impact	No information available.
Sensitivity to Static Discharge	Yes (dust)
Specific Hazards Arising from the Chemical	No known hazards.

NFPA

Health	0
Flammability	1
Stability & Reactivity	0
Physical Hazard	-



6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Ensure adequate ventilation
Environmental Precautions	Prevent further chemical release if safe to do so.
Methods for Clean-up	Sweep up and shovel into suitable containers for disposal.

7. HANDLING AND STORAGE

Handling	Handle is accordance with good industrial hygiene and safety practice; Ensure adequate ventilation; Avoid dust formation in confined areas; Fine dust dispersed in air may ignite; Refer to NFPA 64, "Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities."
Storage	Keep containers dry and tightly closed to avoid moisture absorption and contamination. Keep away from sources of ignition.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits

Chemical Name	ACGIH TLV	OSHA PEL	MEXICO	NIOSH IDLH	OHSA
Particulates not otherwise regulated	TWA: 10 mg/m³	TWA: 15 mg/m³ (total), 5 mg/m³ (respirable)			TWA: 10 mg/m³ (total), 3 mg/m³ (respirable)

Engineering Measures	Ensure adequate ventilation, especially in confined areas; Apply technical measures to comply with the occupational exposure limits.

Personal Protective Equipment

Eye/Face Protection	Safety glasses
Skin & Body Protection	Long sleeved clothing; Protective gloves.
Respiratory Protection	In case of insufficient ventilation, wear suitable respiratory protection.
General Hygiene Consideration	Handle in accordance with good industrial hygiene and safety practices.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Tan
Physical State	Solid; Granular
Odor	Slight odor
Odor Threshold	No information available
Flash Point	Not applicable
Autoignition Temperature	No data available
Boiling Point	Not applicable
Melting/Freezing Point	Approx. 260°C/500°F
Flammability Limits in Air	No information available
Exposure Limits	No information available
Minimum Ignition Temperature	460°C/860°F
pH	Neutral
Vapor Pressure	Not applicable
Solubility	Insoluble in alcohol and ether
Water Solubility	Soluble (642 g/L at 30°C)
Evaporation Rate	Not applicable
Bulk Density	0.55 – 0.75 g/mL
Specific Gravity	No information available
Oxidizing Properties	No information available

10. STABILITY AND REACTIVITY

Chemical Stability	Stable under normal conditions
Conditions to Avoid	Heat, flames and sparks; Other sources of ignition.
Incompatible Materials	None known
Hazardous Decomposition Products	None known
Possibility of Hazardous Reactions	None under normal processing

11. TOXICOLOGICAL INFORMATION

Acute Toxicity	
LD50 Oral	10000 mg/kg (Rat)
LD50 Dermal	No information available
LC50 Inhalation	No information available
Chronic Effects	
Carcinogenicity	No known carcinogenic chemicals in product
OSHA	Not listed
ACGIH	Not listed
NTP	Not listed
Mexico	Not listed
IARC	Not listed
Subchronic Toxicity	No information available
Irritation	No information available
Corrosivity	No information available
Sensitization	No information available
Neurological Effects	No information available
Mutagenic Effects	No information available
Reproductive Effects	No information available
Developmental Effects	No information available
Teratogenicity	No information available

Target Organ Effects	Respiratory system; Eyes; Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Contains no substances known to be hazardous to the environment; Contains no substances known to be non-degradable in waste water treatment plants.
Persistence/Degradability	Readily biodegradable
Bioaccumulation/Accumulation	Not applicable
Mobility	Soluble in water

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods	May be landfilled or incinerated, when in compliance with local regulations; Dispose of in compliance with the laws and regulations pertaining to this product in your jurisdiction.
Contaminated Packaging	Empty containers may be taken for local recycling, recovery or waste disposal.

14. TRANSPORT INFORMATION

Domestic Transport Regulations (USA)	DOT – Not regulated
Domestic Transport Regulations (CAN)	TDG – Not regulated
Domestic Transport Regulations (MEX)	MEX – Not regulated
International Transport Regulations	
ICAO	Not regulated
IATA	Not regulated
IMDG/IMO	Not regulated

15. REGULATORY INFORMATION

International Inventories The components of this product are reported in the following inventories:

Chemical Name	TSCA	DSL	NDSL	EINECS	ELINCS	AICS	ENCS	CHINA	PICCS	KECL	NZLoC
L-Lysine monohydrochloride	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

Legend DSL – Domestic Substance List (Canada); EINECS – European Inventory of Existing Commercial Chemical Substances (EU); AICS – Australian Inventory of Chemical Substances (Australia); ENCS – Existing and New Chemical Substances (Japan); PICCS – Inventory of Chemicals and Chemical Substances (Philippines); KECL – Korean Existing and Evaluated Chemical Substances (Korea); NZLoC – New Zealand Inventory of Chemicals (New Zealand); TSCA – Toxic Substances Control Act, Section 8(b) Inventory (USA).

USA – Federal Regulations

Ozone Depleting Substances	No Class I or Class II material is known to be used in the manufacture of, or contained, in this product.
SARA 313	Not known to contain reportable chemicals.
SARA 311/312 Hazardous Categorization	

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPS) – 40 CFR 61	Not known to contain any HAPS.

State Regulations

California Proposition 65	Not known to contain Proposition 65 chemicals above those naturally present in their agricultural source.
State Right-to-Know	No known components subject to "Right-To-Know" legislation of any U.S. state.

Canada

WHMIS Product Classification	Not a WHMIS controlled product.
WHMIS Ingredient Disclosure List IDL	No known component is listed on the WHMIS Ingredients disclosure list.
Canadian National Pollutant Release Inventory (NPRI)	No known component is listed on NPRI.

16. OTHER INFORMATION

Prepared By	CJ Bio America
Preparation Date	5/29/15
Revision Date	5/29/15
Revision Summary	Initial draft into GHS format

The information provided on this SDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any other process, unless specified in the text.

Safety Data Sheet

according to Regulation (EC) No 1907/2006

L-Lysine HCl Feed Grade

Print date: 17.06.2015 Page 1 of 7

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

L-Lysine HCl Feed Grade

CAS No: 657-27-2

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture

Feed additive

1.3. Details of the supplier of the safety data sheet

Company name:	CJ Europe GmbH
Street:	Ober der Röth 4
Place:	D-65824 Schwalbach
Telephone:	+49-6196-5901-0
e-mail:	info@cj-europe.com
Responsible Department:	info@cj-europe.com

Further Information

The substance does not require registration according to Regulation (EC) No 1907/2006 [REACH].

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Directive 67/548/EEC or 1999/45/EC

This substance is not classified as hazardous according to Directive 67/548/EEC.

Classification according to Regulation (EC) No. 1272/2008 [CLP]

This substance is not classified as hazardous according to Regulation (EC) No. 1272/2008.

2.2. Label elements

2.3. Other hazards

No information available.

SECTION 3: Composition/information on ingredients

3.1. Substances

Chemical characterization

L-Lysin monohydrochloride min. 99%

Further Information

No information available.

SECTION 4: First aid measures

4.1. Description of first aid measures

General information

In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible).

After inhalation

If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for

breathing.

After contact with skin

After contact with skin, wash immediately with plenty of water and soap.
Remove contaminated, saturated clothing immediately.

After contact with eyes

In case of contact with eyes flush immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart and consult an ophthalmologist.

After ingestion

If accidentally swallowed rinse the mouth with plenty of water (only if the person is conscious) and obtain immediate medical attention.
Do NOT induce vomiting.

4.2. Most important symptoms and effects, both acute and delayed

No information available.

4.3. Indication of any immediate medical attention and special treatment needed

No information available.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media

Carbon dioxide (CO2). Water spray jet. alcohol resistant foam.

Unsuitable extinguishing media

Full water jet

5.2. Special hazards arising from the substance or mixture

No information available.

5.3. Advice for firefighters

Co-ordinate fire-fighting measures to the fire surroundings.

Additional information

Collect contaminated fire extinguishing water separately. Do not allow entering drains or surface water.
Dispose of waste according to applicable legislation.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

See protective measures under point 7 and 8.
Provide adequate ventilation.
Personal protection equipment: see section 8

Do not touch or tread spilled product.

6.2. Environmental precautions

Do not allow to enter into surface water or drains. Cover drains.

6.3. Methods and material for containment and cleaning up

Take up mechanically, placing in appropriate containers for disposal.
Use approved industrial vacuum cleaner for removal.

6.4. Reference to other sections

See protective measures under point 7 and 8.
Disposal: see section 13

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L-Lysine HCl Feed Grade

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling

When using do not eat, drink or smoke.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Avoid generation of dust.
Dust must be exhausted directly at the point of origin.

Advice on protection against fire and explosion

Dust explosive
Provide earthing of containers, equipment, pumps and ventilation facilities.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels

Keep container tightly closed in a cool, well-ventilated place.
Keep/Store only in original container.

Advice on storage compatibility

Keep away from food, drink and animal feedingstuffs.
Keep away from: Oxidising agent

Further information on storage conditions

Keep away from: Frost, Heat, Humidity
Keep away from sources of heat (e.g. hot surfaces), sparks and open flames.

7.3. Specific end use(s)

No information available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.2. Exposure controls

Appropriate engineering controls

Devices with local exhaust
Provide earthing of containers, equipment, pumps and ventilation facilities.

Protective and hygiene measures

Only wear fitting, comfortable and clean protective clothing.
Avoid contact with skin, eyes and clothes.
Wash hands before breaks and after work.
Take off contaminated clothing and wash it before reuse.

Eye/face protection

Suitable eye protection:
Eye glasses with side protection
goggles

Hand protection

Suitable gloves type:
NBR (Nitrile rubber) DIN EN 374,
Butyl caoutchouc (butyl rubber) DIN EN 374
Wear cotton undermitten if possible.

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Skin protection
Wear suitable protective clothing.

Respiratory protection
Particle filter device (DIN EN 143)

Environmental exposure controls
No information available.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state:	solid
Colour:	white - light beige
Odour:	characteristic

	Test method
pH-Value:	not applicable
Changes in the physical state	
Melting point:	260 °C
Initial boiling point and boiling range:	not determined
Sublimation point:	not determined
Softening point:	not determined
Pour point:	not determined
Flash point:	not determined
Flammability	
Solid:	not determined
Gas:	not determined

Explosive properties
The product in the delivered form is not dust explosion capable; the enrichment of fine dust however leads to the danger of dust explosion.

Lower explosion limits:	not determined
Upper explosion limits:	not determined
Ignition temperature:	not determined
Auto-ignition temperature	
Solid:	not determined
Gas:	not determined
Decomposition temperature:	not determined

Oxidizing properties
Not oxidizing.

Vapour pressure:	not determined
Vapour pressure:	not determined
Density:	not determined
Bulk density:	0,67-0,75 kg/m³

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Water solubility: (at 30 °C)	642 g/L

Solubility in other solvents
No information available.

Partition coefficient:	not determined
Viscosity / dynamic:	not determined
Viscosity / kinematic:	not determined
Flow time:	not determined
Vapour density:	not determined
Evaporation rate:	not determined

9.2. Other information

No information available.

SECTION 10: Stability and reactivity

10.1. Reactivity
The product is stable under storage at normal ambient temperatures.

10.2. Chemical stability
The product is stable under storage at normal ambient temperatures.

10.3. Possibility of hazardous reactions
Possibility of hazardous reactions: Oxidising agent

10.4. Conditions to avoid
No information available.

10.5. Incompatible materials
Oxidising agent

10.6. Hazardous decomposition products
No information available.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

SECTION 12: Ecological information

12.1. Toxicity
No information available.

12.2. Persistence and degradability
No information available.

12.3. Bioaccumulative potential
No information available.

12.4. Mobility in soil
No information available.

12.5. Results of PBT and vPvB assessment
This substance does not meet the PBT/vPvB criteria of REACH, annex XIII.

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12.6. Other adverse effects

No information available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Advice on disposal

Dispose of waste according to applicable legislation.

Contaminated packaging

Dispose of waste according to applicable legislation.

SECTION 14: Transport information

Land transport (ADR/RID)

14.1. UN number:	No dangerous good in sense of this transport regulation.
14.2. UN proper shipping name:	No dangerous good in sense of this transport regulation.
14.3. Transport hazard class(es):	No dangerous good in sense of this transport regulation.
14.4. Packing group:	No dangerous good in sense of this transport regulation.

Inland waterways transport (ADN)

14.1. UN number:	No dangerous good in sense of this transport regulation.
14.2. UN proper shipping name:	No dangerous good in sense of this transport regulation.
14.3. Transport hazard class(es):	No dangerous good in sense of this transport regulation.
14.4. Packing group:	No dangerous good in sense of this transport regulation.

Marine transport (IMDG)

14.1. UN number:	No dangerous good in sense of this transport regulation.
14.2. UN proper shipping name:	No dangerous good in sense of this transport regulation.
14.3. Transport hazard class(es):	No dangerous good in sense of this transport regulation.
14.4. Packing group:	No dangerous good in sense of this transport regulation.

Air transport (ICAO)

14.1. UN number:	No dangerous good in sense of this transport regulation.
14.2. UN proper shipping name:	No dangerous good in sense of this transport regulation.
14.3. Transport hazard class(es):	No dangerous good in sense of this transport regulation.
14.4. Packing group:	No dangerous good in sense of this transport regulation

14.5. Environmental hazards

ENVIRONMENTALLY HAZARDOUS: no

14.6. Special precautions for user

No dangerous good in sense of this transport regulation.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

No dangerous good in sense of this transport regulation.

SECTION 15: Regulatory information

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according to Regulation (EC) No 1907/2006

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulatory information

Water contaminating class (D): 1 - slightly water contaminating

15.2. Chemical safety assessment

For this substance a chemical safety assessment has not been carried out.

SECTION 16: Other information

Further Information

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.

Endnotes and Source Verification Notes

Verification note. The source list below consolidates the references provided in the petition package and preserves live links where URLs were available. Core USDA/NOP/NOSB, eCFR, FDA, university extension, and representative supplier/manufacturer sources were checked against their cited identity and use in the packet. eCFR links are retained to the official section pages; where automated access was limited, the section identity and relevant text were confirmed through accessible search results and official/mirror snippets. Supplier-facing documents remain representative and should be replaced or supplemented with final current supplier affidavits, labels, SDS, COAs, specifications, and excluded methods documentation before final submission if newer confidential supplier materials are obtained.

Endnotes and Compiled References

L-Lysine National List Petition Package

Purpose. This appendix compiles the external references cited or identified across the L-lysine petition package for proposed addition of L-lysine to 7 CFR § 205.603(d) for use in organic poultry and swine feed. References are grouped by topic to help NOP assess completeness and to help NOSB members locate the regulatory, scientific, technical, and practical support for the petition record.

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