STILL USING CHOLINE CHLORIDE IN ANIMAL NUTRITION? DISCOVER ITS RISKS AND A SUPERIOR NATURAL ALTERNATIVE

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INTRODUCTION: THE CRITICAL ROLE OF CHOLINE IN ANIMAL NUTRITION

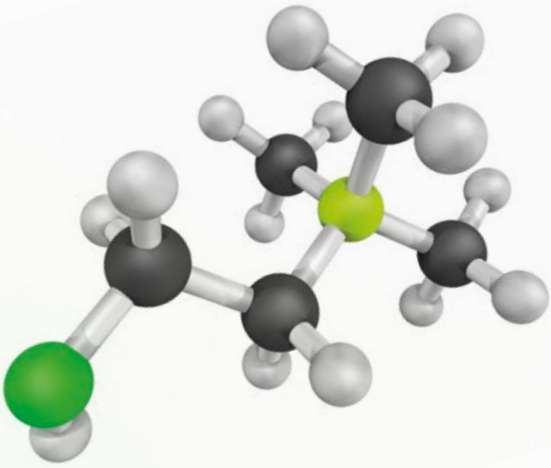
Choline is an essential nutrient that plays both nutritional and regulatory roles within the organism. **It is a precursor for sphingomyelin,** a component of animal cell membranes, particularly in the myelin sheath surrounding nerve cells, **which is crucial for proper nerve function.**

Another vital substance synthesized from choline is acetylcholine, a neurotransmitter involved in muscle control and various brain functions *(Workel et al., 2004).*

Additionally, choline serves as the precursor for **phosphatidylcholine, a major constituent of cell membranes**, and is involved in methylation processes, contributing to the recycling of methionine *(Zeisel, 2004)*

Beyond its basic nutritional roles, choline also plays a regulatory function, especially in **energy metabolism and the utilization of fats** *(Moretti et al., 2020).*

As a methyl group donor, choline participates in various biochemical processes, including the **metabolism of fats, proteins, and DNA**, and is involved in maintaining proper cell function and structure *(Blusztajn et al., 2012; Obeid, 2013)).*



CHOLINE CHLORIDE: ESSENTIAL BUT PROBLEMATIC

Choline chloride is one of the most commonly used forms of choline in animal nutrition, available in different concentrations. Typically, choline **chloride is found in concentrations of 50% or 60% in powdered form and 75% in liquid form.**

However, it's crucial to note that **these percentages refer to the concentration of choline** chloride, not pure choline, meaning that about 25% of choline chloride consists of chloride, not choline *(National Research Council [NRC], 1994).* This distinction is important when calculating the nutritional contribution to an animal's diet.

Risks of excessive chloride: Chloride is an essential ion in the organism, maintaining osmotic balance and supporting enzymatic, nervous, and muscular system functions.

However, excessive chloride intake can result in metabolic disorders such as **metabolic acidosis, tibial dyschondroplasia, and ascitic syndrome** *(Edwards, 1984; May et al., 1986).*

Excess chloride can **exacerbate these issues when combined with other chloride-rich ingredients** such as Lysine HCl and common salt, leading nutritionists to adjust the formulations by using alternatives like sodium bicarbonate or potassium carbonate. These adjustments can increase feed costs.

The acceptable limits for chloride in poultry diets vary, with some authors recommending **a maximum of 0.2% to 0.4% chloride,** which could easily be exceeded by combining high-chloride ingredients, thereby posing risks to animal health *(Leeson and Summers, 2001).*

Vitamin stability and premix challenges: Choline chloride can also affect the stability of other vitamins in animal feed *(Whitehead, 2000)*. Research shows that **vitamins A, E, and K3 can lose significant potency** when stored in the presence of choline chloride *(Singh et al., 2010)*.

*For example, a study found that **vitamin activity could drop by 39% to 80% over the course of a year**, depending on the type of vitamin and the presence of choline chloride (Robinson and Mack, 1991).*

This degradation can be particularly problematic in premixed feed, where consistent vitamin levels are crucial.

To mitigate this, some manufacturers either reduce storage time or include excess vitamins to compensate for the losses, although this can become economically unfeasible.

Another significant issue with choline chloride is its hygroscopic nature. **The compound readily absorbs moisture from the environment,** which can lead to clumping and a reduction in volume.

This makes it challenging to produce stable premixes and complete feeds, and some manufacturers have stopped using choline chloride to avoid these problems, **while others have added inert carriers to improve the flowability of the final product.**

While this helps with the manufacturing process, it increases product volume, leading to higher storage and transportation costs *(Bastianelli et al., 2004)*.

SEEKING BETTER SOLUTIONS: ALTERNATIVES TO CHOLINE CHLORIDE

Given the limitations and challenges associated with choline chloride, several alternatives have been introduced to replace it or complement its use.

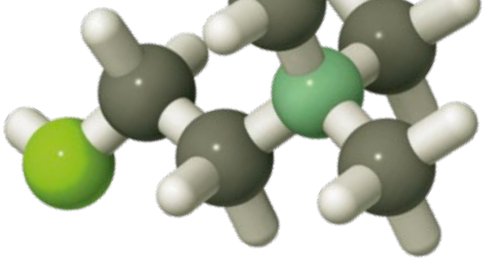
Among these alternatives, **soy lecithin, betaines, and polyherbal products** are the most notable.

Herbal or Polyherbal products: a functional and sustainable option

Polyherbal products, which emerged around 20 years ago, are designed to replace choline chloride in animal feed.

These products, often derived from **Ayurvedic medicine**, typically consist of multiple plant species.

Ayurveda views health in a holistic way, treating the body with medicines formulated from plant extracts.



Polyherbals, unlike single-plant supplements, combine various plants to maximize the range of active compounds.

This diversity enhances the overall therapeutic effect while **reducing the risk of toxicity due to the lower concentrations of individual active compounds** *(Tripathi and Mishra, 2007).*

However, the lack of extraction or processing of active compounds means that contaminants (such as pesticides, mycotoxins, and other harmful substances) may be present in these products.

This necessitates stringent **quality control** during both the cultivation and manufacturing processes **to ensure the safety and efficacy** of the final product *(Hassan et al., 2015).*

How polyherbal products work as choline chloride replacements

Polyherbal products generally rely on phosphatidylcholine (PC) as the main active compound. Phosphatidylcholine is already **metabolically active,** meaning it bypasses several metabolic steps required for choline chloride to be converted into its active form.

Typically, **these products contain between 0.5% and 3.2% phosphatidylcholine.**

Although the concentration might seem low, it is important to note that phosphatidylcholine already plays an active role in energy metabolism, especially in the regulation of lipid utilization.

Phosphatidylcholine stimulates PPARα (Peroxisome Proliferator-Activated Receptor Alpha), a group of receptors that regulate energy metabolism, including fat oxidation *(White et al., 2019).*

This activation favors the use of dietary lipids as energy rather than storing them as body fat, **which leads to improved weight gain and leaner carcasses.** This is particularly beneficial in animal production, where lean meat is often a desired outcome *(Casperson et al., 2012).*

Another advantage of polyherbal products is that they **do not contribute excess chloride to the diet,** reducing the risk of chloride-induced metabolic disorders and improving electrolyte balance.

Moreover, these products **do not degrade vitamins** *(Singh et al., 2010)* **and pigments,** unlike choline chloride, allowing longer shelf life and reducing nutrient loss in stored feed *(Mehri et al., 2014)*.

Polyherbal products are also more environmentally friendly, as they are derived from plants rather than petroleum-based choline chloride. Additionally, their costs tend to be more stable and less prone to fluctuations based on petroleum prices, making them a more predictable option for feed formulation *(Garg et al., 2018)*.

How to choose a polyherbal product

Selecting the right polyherbal product to replace choline chloride requires careful consideration of several factors:

Mechanism of action (MOA)

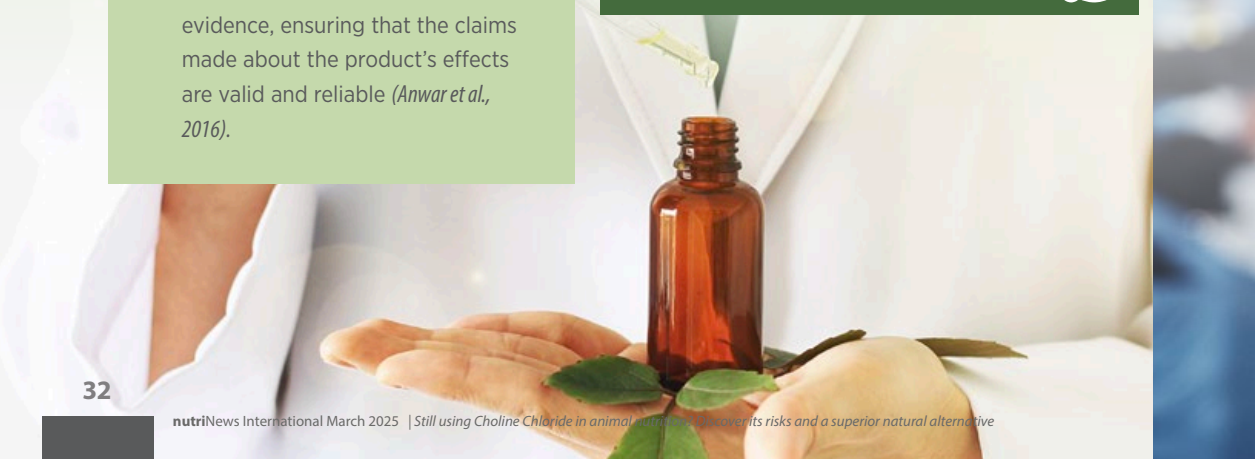
It's crucial to understand how the polyherbal product works at a biochemical level. Natural products often come with variability in their active compounds, and polyherbals are complex due to their combination of different plant species.

Research into the product's MOA should be based on scientific evidence, ensuring that the claims made about the product's effects are valid and reliable *(Anwar et al., 2016)*.

Energy partitioning and efficiency

The main nutritional functions of choline in animals—acetylcholine synthesis, phospholipid formation, and **methyl group donation**—are relatively easily met through other dietary components, including methionine, serine, and betaine.

However, **choline's role in energy metabolism through phosphatidylcholine is more complex**, and polyherbals that can effectively modulate energy distribution, reduce fat deposition, and improve energy efficiency in animals are highly valuable *(Zhang et al., 2014)*.



Quality and specificity of technical data

A detailed technical file is essential when evaluating polyherbal products.

This file should include data from multiple experiments, **ideally performed under various conditions,** and backed by objective analyses that assess the product's performance and efficacy.

It's also important to consider the reputation and expertise of the institutions conducting these studies.

Sanitization process

Given the potential for contamination in plant-based products, **an efficient sanitization process is vital** to ensure the microbiological safety of polyherbal products.

Common methods include gamma-ray irradiation and the application of organic acids, both of which **help control bacterial and fungal contamination** without compromising the product's quality.

Certifications and quality control

Polyherbal products, especially those derived from plants that have not undergone extensive processing, must adhere to strict quality control standards.

Look for certifications such as GMP+ and FAMI-Qs to ensure that the products have been produced in a safe, controlled, and compliant environment.

This also helps to ensure that the product meets legal and safety standards for animal feed *(Kumar et al., 2017)*.

NATU-B4™: THE NEXT GENERATION OF CHOLINE CHLORIDE REPLACEMENT

Introduction: 22 years of innovation and scientific validation

This text focuses from now forward on the evolution and benefits of **Natu-B4™, a polyherbal product designed as a choline chloride replacement**. First launched in 2003, Natu-B4™ was originally intended to replace pure choline chloride in animal feed.

Over the last 22 years, extensive studies have demonstrated not only its ability to replace choline chloride but also additional health and performance benefits.

The product combines several plants used in Ayurvedic medicine and provides choline in the form of phosphatidylcholine, along with other important phospholipids for energy metabolism.

History and Development

Natu-B4™ has undergone more than 100 studies in over 10 species, revealing its optimal application and mechanisms of action.

Initially replacing choline chloride, it has now proven to provide multiple benefits, particularly in **improving the bioavailability of nutrients, enhancing fat metabolism, and increasing energy efficiency** *(Kim et al., 2019)*.

Industrial Characteristics and Stability

Natu-B4™ is a non-hygroscopic powder that is stable at high temperatures and resistant to degradation by intestinal microbiota.

This stability allows it to maintain its efficacy in premixes, pelleted, and extruded feeds without affecting other nutrients *(Singh et al., 2010)*.

Studies show that Natu-B4™ causes no vitamin loss compared to choline chloride, even under high-temperature conditions.

Mechanism of Action

Natu-B4™ works by stimulating peroxisome proliferator-activated receptors (PPAR-α), which regulate fatty acid metabolism and improve feed conversion *(White et al., 2019)*.

PPAR-α activation enhances energy efficiency and reduces fat accumulation in the liver *(Vázquez and Laguna, 2000; Panadero et al., 2008)*.

Studies have shown that Natu-B4™ supplementation in broiler chickens increases PPAR-α gene expression by 39% compared to choline chloride *(White et al., 2019)*.

Extensive *in-vivo* studies across multiple species

Numerous studies across different species have confirmed the benefits of **Natu-B4™**:

CHICKENS: A bioequivalence study found that 1 kg of Natu-B4™ is equivalent to 4.84 kg of 60% choline chloride, with similar productive yields and reduced liver fat *(Farina et al., 2014)*.

PIGS: Natu-B4™ supplementation led to leaner carcasses with greater muscle depth and improved fat-to-protein deposition *(Gonzalez et al., 2021)*.

Natu-B4™

RUMINANTS: Studies in sheep and dairy cows indicated that Natu-B4™ can replace ruminally protected choline (RPC) products, enhancing milk production, reproductive health, and reducing liver fat *(Cañada et al., 2018; Godinez-Cruz et al., 2015)*.

PETS: Natu-B4™ at the gene level demonstrated properties to prevent cardiovascular and metabolic diseases, cancer prevention, inflammatory and immune response, and behavior and cognitive processes in dogs *(Mendoza-Martinez et al., 2022)*.

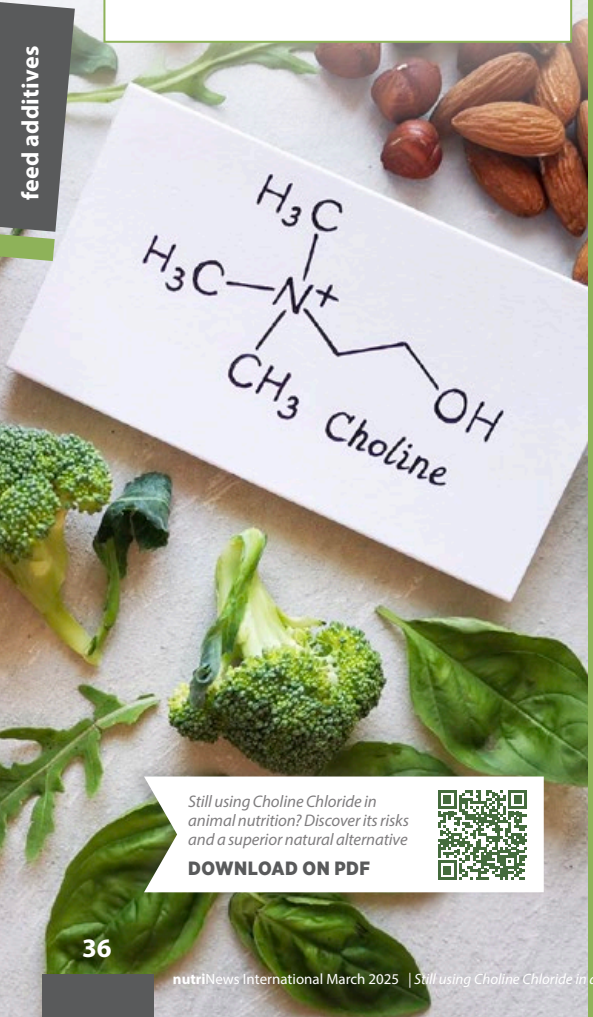
Quality Control and Certifications

Natu-B4™ is **FAMI-QS and ISO-certified,** ensuring rigorous manufacturing and quality standards.

The product is sanitized for microbiological safety, and all raw materials undergo thorough contaminant monitoring.

It is also approved for use in organic feed *(FiBL, 2025).*

FAMI QS ISO



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CONCLUSION: WHY IT'S TIME TO MOVE BEYOND CHOLINE CHLORIDE

Polyherbal products stand out as **the most comprehensive and cost-effective replacement.**

They offer several advantages, including better metabolic outcomes, **reduced chloride intake, improved energy efficiency**, and reduced risks of contamination and nutrient degradation.

With advancements in scientific knowledge and analytical techniques, polyherbal products can now be selected with greater confidence and reliability, making them an increasingly popular choice in animal feed formulations.

When choosing a choline chloride replacement, it is crucial to evaluate both the economic and functional benefits of the product.

Polyherbal products provide a more sustainable and reliable option for animal nutrition, benefiting both the animals' health and the feed manufacturer's bottom line.

Celebrating 22 years in 2025, Natu-B4™ remains a leader in herbal alternatives to choline chloride. Nuproxa Switzerland offers extensive application support and after-sales services to ensure optimal usage across Europe.

To learn more about Natu-B4™, contact Nuproxa www.nuproxa.ch

Natu-B4®

A Swiss Group

Beyond choline replacement.

Superior performance, naturally!

- Activates energy metabolism
- Improves zootechnical performance
- Sustainable - petrochemical free
- Non-hygroscopic
- Improves deposition of lean meat in the carcass
- Replaces choline chloride effectively and cost-efficiently
- Stability and easy handling in feed and premixes

Backed by 22 years of research, **Natu-B4®** is a stable, polyherbal solution that enhances nutrient bioavailability, optimizes lipid metabolism and significantly improves energy efficiency in animal nutrition.

Unlock the full potential of animal nutrition

Discover how **Natu-B4®** can improve energy efficiency, liver health and performance in your feed formulations. Contact us today to learn more!

Certified company
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efficient solutions, naturally