



Key Role of Selenium in Animal Nutrition

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Selenium (Se) is one of the basic trace elements influencing the physiological functions and growth performance of animals. However, concentrations of selenium exceeding biological requirements can lead to acute and chronic poisoning. Regarding livestock and poultry production, researchers have suggested that supplementation with appropriate doses of selenium not only plays a vital role in improving slaughter performance and quality of livestock and poultry products, but also promotes selenium enrichment in animal tissues, thereby producing functional products for livestock production. Conversely, Se overdose generates oxygen radicals and leads to apoptosis by inducing oxidation and cross-linking of protein thiol groups essential for cell survival.

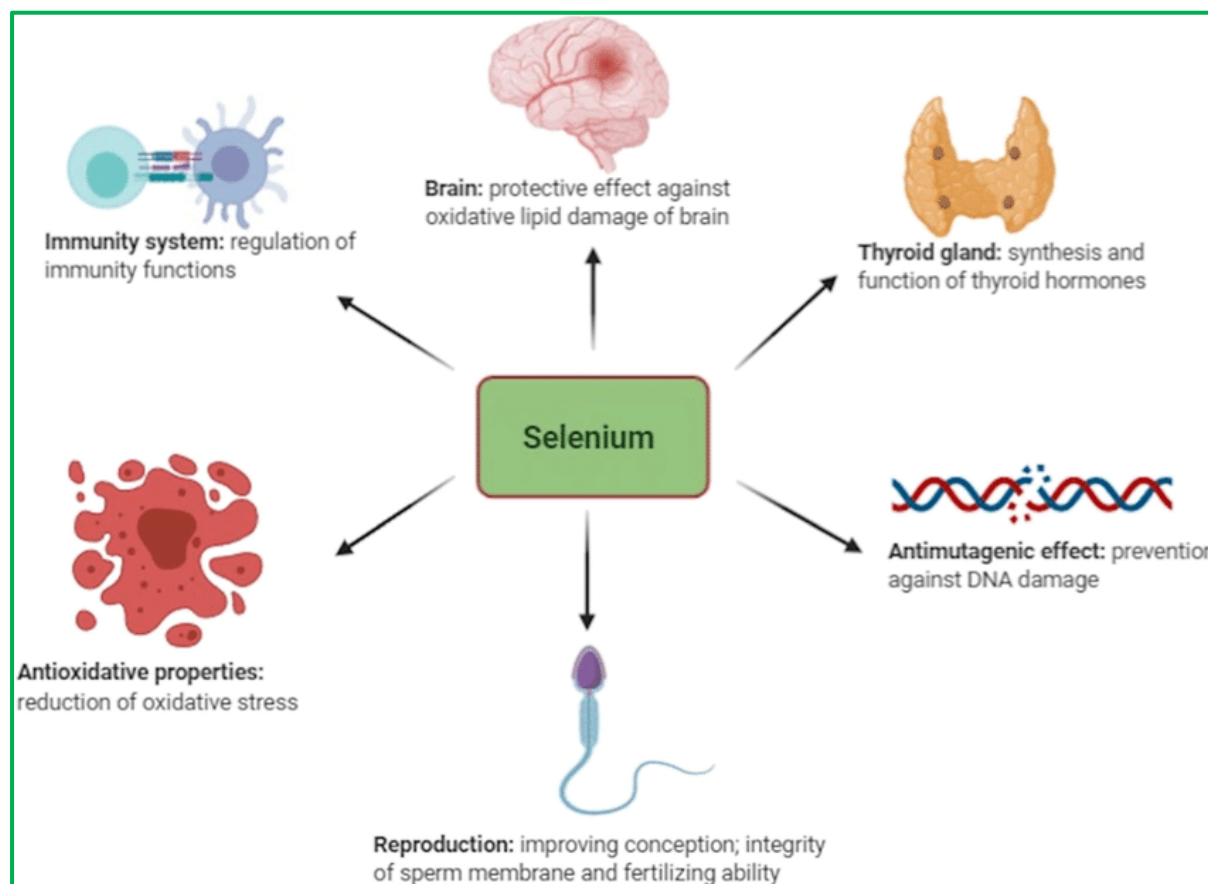
Based on absorption and metabolism mechanisms, this work focuses on the role of selenium compounds, both organic and inorganic forms, in defense against oxidants, as well as their potential pro-oxidant properties. Based on these conflicting roles, we further discuss the effect of Se on meat quality of livestock and poultry, provide references for selenium fortification biological technology research and the development of Se-rich products.

Selenium (Se), one of the essential nutrients for human health and animal growth, is involved in various physiological functions such as antioxidant and immune responses and metabolism. The role of dietary selenium, in its organic and inorganic forms, has been well documented in domestic animals. In addition, many feeding strategies have been developed for different animals to increase the concentration of Se in animal products to address Se deficiency and even as a potential nutritional strategy for the treatment of free radical-related diseases.

A type of selenium

Se additives in animal feed are divided into 2 main forms: organic Se and inorganic Se. The general consensus is that organic Se in the form of selenoamino acids and selenium-enriched yeast (SY) is more effective than inorganic Se in increasing growth performance, antioxidant status and tissue selenium concentration, as well as improving meat quality. The quality of farm animals, mainly due to their higher bioavailability and tissue retention. Inorganic Se exists in the form of Se compounds with different valence states, including selenite (SeO_3^{2-}), selenate (SeO_4^{2-}), selenium (Se), and selenide (Se^{2-}) (Kieliszek, 2021). Se nanoparticles (SeNPs), inorganic Se molecules designed by controlling the shape and size of the particle at the nanometer scale, have become an interesting research topic in recent years. Compared with organic and traditional inorganic forms, SeNPs have been considered as a promising feed additive for promoting immune and antioxidant power due to their novel properties such as large specific surface area, increased surface activity, and reduced toxicity. However, SeNPs are still in their early stages of development and are still a minor source of Se in animal and poultry nutrition and are not legal or regulated in Europe and the USA.

Some concerns have also been raised regarding the toxicity of SeNPs and the optimal dosage of additives, which need further study.



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Importance of selenium

- Selenium forms part of a number of enzymes and other proteins in animal tissues. In particular it is a component of the enzyme glutathione peroxidase (GSH-PX). This enzyme inhibits and destroys naturally occurring peroxides that cause cell damage.
- Nutrition helps in the proper growth and maintenance of the cells. It provides energy to carry out different life processes.
- Selenium is an essential component of various enzymes and proteins, called selenoproteins, which help to make DNA and protect against cell damage and infections; these proteins are also involved in reproduction and the metabolism of thyroid hormones.