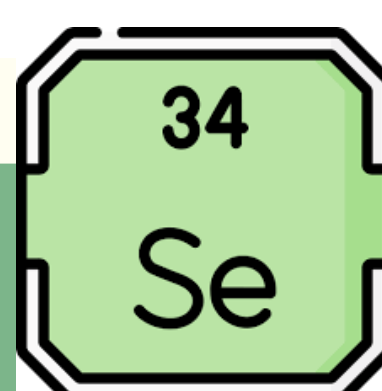




INTRODUCTION

Selenium (Se):

- **Essential micronutrient** which **mammals cannot produce**.
- 1818: discovery and named after the Greek moon goddess Selene. 1957: first report of Se deficiency in livestock on **white muscle disease (WMD)**.
- Carries out various vital **physiological roles**.



OBJECTIVES

- To review the **importance of Se** in livestock, especially **ruminants** and the causes, consequences and management of **inadequate Se levels** in sheep.
- To present the **options and benefits** of Se supplementation.
- To create a **triptych** directed towards **farmers and veterinarians** in Spain.

SELENIUM IN THE SOIL, IN PLANTS AND CROPS

- Soil: **0.1-2 mg Se/kg**; levels **> 0.5 mg Se/kg** are sufficient for livestock.
- Plants and crops: **soil** Se supply and plant **species** determine their Se content. Most crops and pastures are **non-accumulators** of Se and contain around **0.005-0.15 mg Se/kg** in Europe.

SELENIUM IN THE OVINE ORGANISM

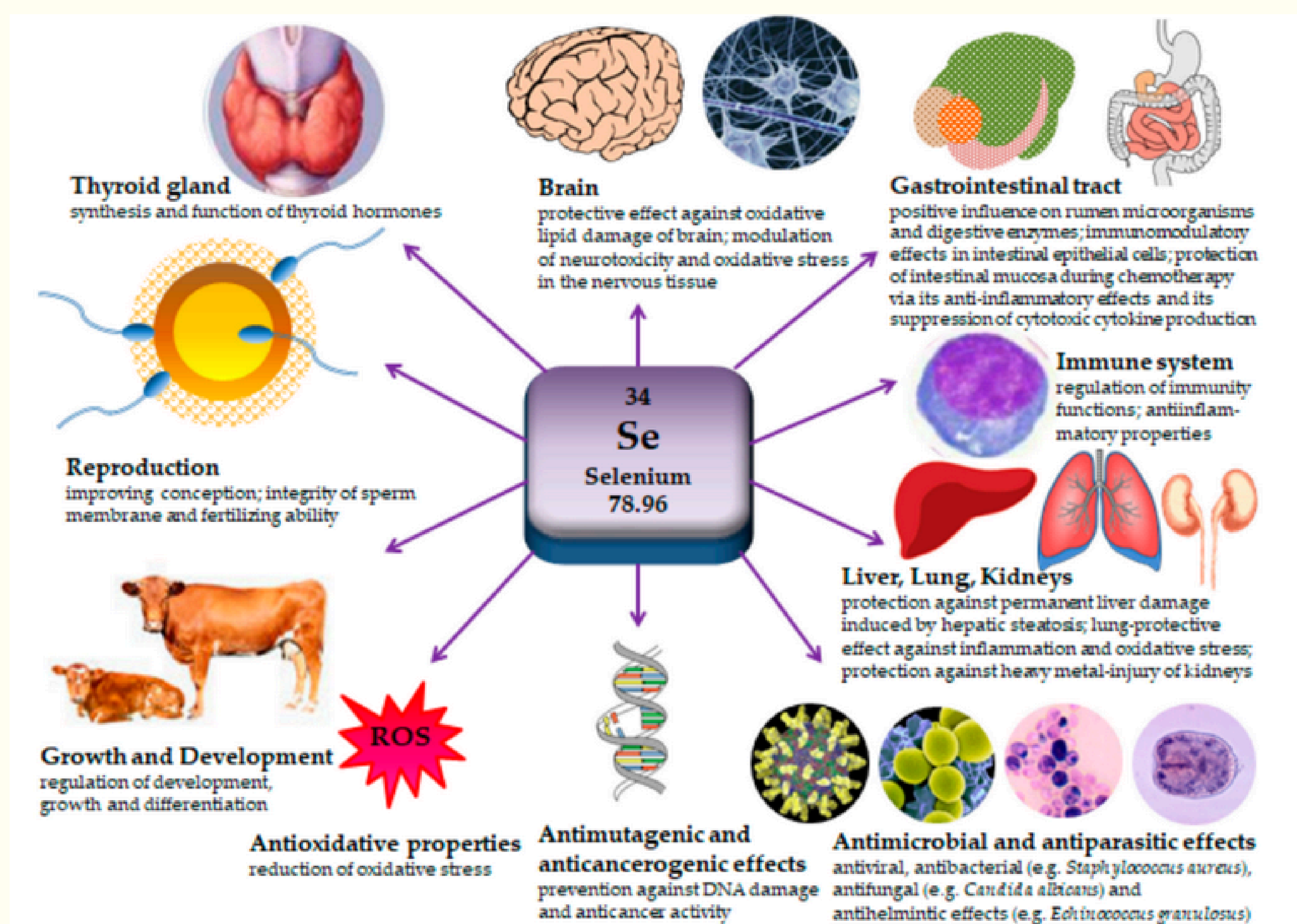


Figure 1: Some properties of Se (Hosneldova et al., 2017)

- Se enteral **absorption** in ruminants is **low** (11-40%).
- Component of the **SePs** involved in **reproduction, immunity, growth and development, metabolism, antioxidant defence**, the thyroid, cardiovascular and endocrine systems. They have anti-inflammatory, antimutagenic, anticarcinogenic, antiviral, antibacterial, antifungal and antiparasitic properties.

DIETARY SE LEVELS

Depend on **age** and **physiological status**.

Regulatory maximum content of Se in feedstuff:

Food and Drug Administration: 0.3 mg/kg DM

European Commission: 0.5 mg/kg DM, including 0.2 g/kg from organic sources

Recommended dietary levels:

NRC (National Research Council): 0.05-0.15 mg/kg DM

INRA (National Institute for Agricultural Research): 0.1-0.2*DM intake according to milk production

Table 1: Dietary Se levels in sheep (Council et al., 2006; Nozière et al., 2018)

SELENIUM DEFICIENCY

White Muscle Disease Se-responsive ill-thriftiness

- Se and/or vitamin E **deficiency**.
 - **Lambs** who access pastures for the first time.
 - **Motor weakness** and possible **death**.
 - Treatment and prevention: **Se and vitamin E**.
- Impairment of:
- **Productive efficiency:** weight gain, milk and wool production.
 - **Reproductive parameters:** fertility, semen quality, abortions and placental retentions.
 - **Immune system:** mastitis.

SELENOSIS

- Se toxicity: **Se-accumulating plants** or **excessive Se supplementation**.
- Variable symptoms and possible **death**.
- Prevention is based on **adequate diet management**.

SELENIUM SUPPLEMENTATION

- **Fertilizers** and **mineral supplements:** nutritional blocks, boluses, pellets, injectable solutions... Either **inorganic** (selenite, selenate) or **organic** (selenomethionine, Se-yeast) with better bioavailability. New promising approaches like **selenium nanoparticles (SeNps)** have enhanced absorption and reduced toxicity.

Se supplementation is **always** recommended but there are critical moments:

- **Gestation**
- **Lactation**
- **Before mating**
- **Postnatal**
- **Weaning**

Because...

During gestation and lactation, the **maternal Se** status dictates that of the lamb. Se enrichment improves **colostrum** quality, **milk** yield and composition, lamb **birth weights** and **survival rates**. Before mating it enhances **fertility** and **prolificacy**. In males, it ensures correct **spermatogenesis** and improves **testes morphology** and **sperm quality**. In lambs, it supports **growth** and **development**. Se supplementation also enhances **immunity**, **feed intake** and **rumen microbiota activity** and lessens the effects of **heat stress**.

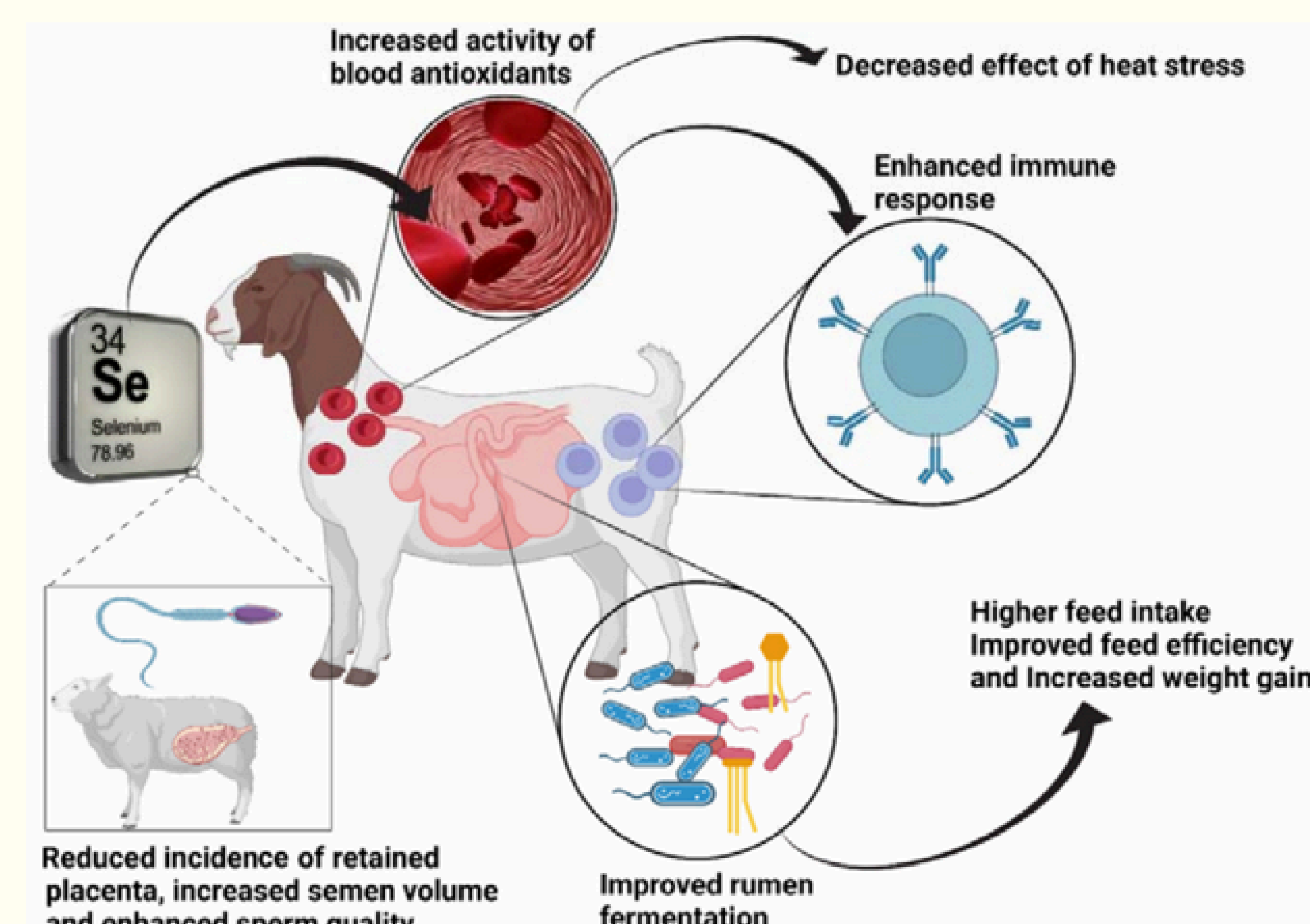


Figure 2: Some benefits of Se supplementation in small ruminants (Amin et al., 2022)

ESSAY AND TRIPTYCH



CONCLUSION

Se is an **essential micronutrient** for livestock, with vital physiological roles.

- Intake depends on **soil content and plant species**.
- **Dietary recommendations** ensure **optimal productivity and health**.
- **Supplementation:** available **products** with distinct properties, including **promising alternatives**. It is **always** advised, especially at some steps of the **production cycle** and shows many **benefits**.