

MAPPING ANTIBIOTIC USE IN THE BEEF CATTLE SUPPLY CHAIN OF THE MINERVA S.A

The beef cattle supply chain of **Minerva S.A.** involves purchasing cattle (**97.9%**) to be slaughtered in own unit operations (i.e., own beef cattle), in addition to acquisition of animal protein from third-party industry of beef cattle (**2.1%**). In this document, we described updates concerning the antibiotic use in the suppliers of the own beef cattle supply chain.

1. Roadmap at mapping antibiotic use in the beef supply chain of Minerva S.A.

Since 2012, the **Minerva S.A.** monitors antimicrobial use in the own beef supply chain using a **Producer Assurance Letter**, which is under the responsibility of the **Food Safety Corporate** (Figure 1). In summary, the letter is signed and delivered by the producer, whenever he sent cattle to our unit operations. The producer can attest that it was not administered veterinary medicaments, including antibiotics, along the last **150** days from the date he sent animals to be slaughtered; or he can attest that it was administered medicaments along the last **150** days. In case of signing the second statement, the producer also needs to describe details of the medicaments administered. As part of our policy, periodically, samples of meat are also analyzed to attest nonexistence of any contaminants, including residuals of antibiotics, which is regulated and audited by National Programs of Residue Control, with particularities for each country that **Minerva S.A.** has unit operations. To date, it was not reported any case nor any type of antibiotic residual in samples analyzed. In 2022, our company acquired two new unit operations for sheep slaughtering, which the control of antibiotic use in the supply chain is also regulated and based on the National Residue Survey Program.

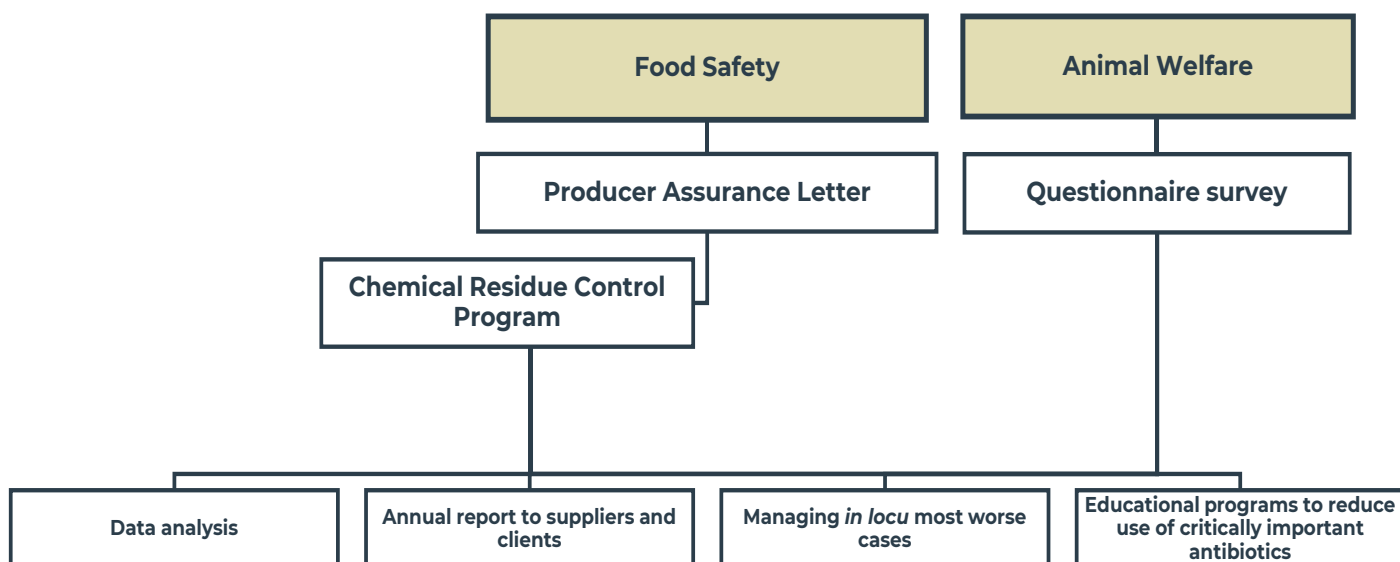


Figure 1: Summary of the action plan at Minerva S.A. to control and monitoring antimicrobial use.

The Minerva S.A. is also collecting information on antibiotic use at farm level in the own beef supply chain since 2022, using a **Questionnaire Survey**, which is under the responsibility of the **Animal Welfare Corporate**. This mapping considers the time beyond those **150** days from the date the supplier sent cattle to be slaughtered in our unit operation. The questionnaire is annually answered by the suppliers, where they can report the purpose of use (e.g., as clinical, prophylactic, metaphylactic or growth promoter), and the type of antibiotic used. In 2023, the questionnaire was revised, and new questions were included for tracking the dose of antibiotics administered in mg per unit of body mass.

To continue to get more advances at mapping antibiotic use in our supply chain, we expect to start mapping the number of animals that received the reported dose of antibiotics.

2. Free-antibiotic use in the beef cattle supply chain of Minerva S.A.

The Minerva S.A. attests that **10.4%** of its beef supply chain is organic certified and with free-antibiotic use. As one of the strategies to reduce the use of antibiotic in its animal protein supply chain, the Minerva S.A. will continue to seek niche market and encouraging beef cattle suppliers to obtain organic certification.



3. Preliminary outcomes from the questionnaire survey

In 2023, the **Minerva S.A.** had **48%** of its own beef cattle supply chain mapped concerning the use of antibiotics, an advance of **14.5%** relative to 2022. In the Fig. 2 is depicted the proportion of the own beef supply chain that reported no use of antibiotics, and usage for clinical, metaphylactic, prophylactic therapies. In 2023, most of our beef cattle suppliers reported to use antibiotics for treating clinical infection (**36.2%**), while at least **6%** reported antibiotic use for prevention of diseases (i.e., prophylactic) and **2.2%** for on group-based therapies (i.e., metaphylactic). The use of antibiotics in our own beef cattle supply chain, either for clinical or prophylactic and metaphylactic therapies, was reported to be mostly for treating and/or preventing **respiratory diseases** and **rumen acidosis**.

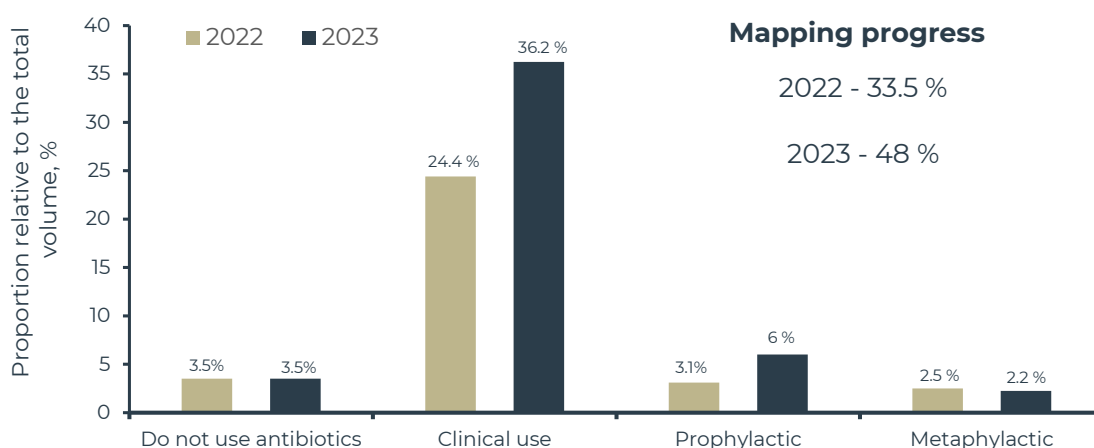


Figure 2: Antibiotic use in the own beef cattle supply chain of Minerva S.A. in 2023 and 2022.

4. Type of antibiotic used and reported dose administered in the beef cattle supply chain in 2023

In the table 1 is depicted the type of critically important antibiotics administered, and the dose reported by the beef cattle suppliers used for clinical and/or prophylactic/metaphylactic therapies in 2023. The **Minerva S.A.** will continue to encourage beef suppliers for abolishing use of any type of antibiotics for prophylactic and metaphylactic therapies. Additionally, it is worth to mention that, even for clinical therapies, the **Minerva S.A.** will continue to encourage beef suppliers to use other alternative treatments over the use of critically important antibiotics for human and veterinary medicine.

Table 1: Type of antibiotics and reported dose in the beef supply chain.

Medically important antibiotics	Reported dose, mg kg ⁻¹
Critically important	
Quinolon	26
Cephalosporin (1 st - 2 nd generation)	33.75
Macrolides	14.9
Cephalosporin (3 rd - 4 th generation)	25.25
Glycopeptides	49
Polymixins	56
Penicilins	49
Highly important	
Aminoglycosids	28.5
Tetracyclines	56.3