

Rumen protection of protein (resource efficiency)



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- **Type of challenge:** Environment.
- **Challenges:** Resources management (nutrient losses); soil contamination (nitrates); air pollution (ammonia).
- **Action:** Improvement of nitrogen efficiency and reduction of nitrogen emission.
- **Animal category:** Ruminants.
- **Techniques:** Increase of the amount of rumen undegradable proteins by protecting proteins from degradation in the rumen via heat (e.g. extrusion, expeller process), chemical treatment (lignosulfonate; sodium hydroxide) or addition of plant compounds like tannins, or combination of these.
- **Mode of action:** The alkali treatment contributes to the formation of lysinoalanine which reduces the degradation rate of protein by ruminal bacteria into ammonia; the heat treatment and use of lignosulfonates facilitate the Maillard or nonenzymatic browning reaction to an amino-sugar complex, which is more resistant than normal peptides to enzymatic hydrolysis; tannins (hydrolysable and condensed tannin) are polyphenolic polymers of relatively high molecular weight with the capacity to form complexes mainly with proteins due to the presence of a large number of phenolic hydroxyl groups; all these techniques increase the amount of protein digested and absorbed in the small intestine, thereby increasing nitrogen retention.
- **Potential efficacy:** Treatment of soybean meal can increase the supply of amino-acids in the duodenum by 40 to 70%, with some differences among essential amino acids; this allows a potential reduction of the amount of proteins in the diets up to 2 units.
- **Nature of evidence of efficacy:** Scientific publications.
- **Factors impacting on efficacy:** Source of protein, method of treatment, tannin chemical structure and concentration.
- **Mode of use:** The treatment is performed on individual feed materials.
- **Requirements / limitations:** If microbial nitrogens requirements are not met, rumen organic matter fermentation decreases and likewise feed intake as a consequence.
- **Economic consequences:** Higher cost (energy for heat treatment) that can be mitigated by use of carbohydrates and lignosulfonates that facilitate browning reaction. Compensation of the costs by improvement of feed efficiency and reduction of nitrogen emissions.
- **Other considerations:** Rumen protection techniques protect also other nutrients such as fat or starch thereby improving the overall digestibility. Heat treatment allows also controlling pathogens. Rumen protection may also help addressing milk fever. Use of tannins reduces ammonia and methane emissions.

- **References:**

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- EIP-AGRI Focus Group (2017) [Reducing emissions from cattle farming](#)

- **Other techniques:** Lowering of crude proteins together with use of amino acids.

Charter Ambitions: 2, 5