

# Why steamed hay can lead to protein deficiency in horses

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Hay treated with hot steam is safer for horses but provides them with less protein. The horse forage is treated with steam to rid it of potentially harmful microorganisms and to bind particles that could otherwise be

inhaled. However, a team of scientists from Martin Luther University Halle-Wittenberg (MLU) has discovered that this also causes a chemical reaction which damages the proteins in the hay and makes them harder for horses to digest. This can lead to signs of nutrient deficiency in the animals and, for example, impair growth or muscle development. The team reports on their scientific work in the journal *Animals*.

Hot [steam](#) is used to heat hay up to 100 degrees Celsius, which kills harmful microorganisms and binds [fungal spores](#) and dust to the hay. "Many horses suffer from lung problems such as equine asthma. The steaming process virtually eliminates all of the living microorganisms and particles in the hay that could be inhaled during feeding and damage the lungs. In theory, the end result is a very good forage," explains Professor Annette Zeyner from the Institute of Agricultural and Nutritional Sciences at MLU.

However, her team discovered that the treatment also has its disadvantages as the steam damages the proteins in the hay. "A high proportion of the proteins, and the crucial amino acids contained in them, can no longer be digested by the small intestine—in other words the horse lacks these proteins as a result of the steam treatment. However, some of these protein components are essential for horses and they cannot be absorbed in the [large intestine](#)," Zeyner says.

The researchers demonstrated this by examining various hay samples. In the steamed hay, they found an increased number of products that are generated by the Maillard reaction, an indication that the proteins in the hay have been damaged. This is a reaction that also takes place when food is cooked, baked or fried and is responsible for browning or the development of flavors.

"Proteins are composed of amino acids. The steaming damages them and they form new complexes with sugars in the hay," says the first author of

the study, Caroline Pisch, from MLU. This makes them difficult for horses to digest. According to the researchers' analyses, the treatment reduced the amount of protein that can be absorbed by the [small intestine](#) by almost half.

According to Zeyner, this can lead to an undersupply of essential [amino acids](#) from the feed protein, which is problematic for growing horses or lactating mares; young [horses](#) need proteins to grow, and mares need them to produce milk. To make matters worse, protein deficiency causes very unspecific symptoms in the affected animals. These include impaired muscle development and a dull or shaggy coat with so-called "hunger hair"—long isolated hairs in the horse's coat. Horse owners can counteract this risk by enriching the animals' diet with protein-rich single feedstuffs such as yeast and [soybean meal](#) or high-quality [protein](#)-rich compound feeds.

**More information:** Caroline Pisch et al, Effect of Hay Steaming on the Estimated Precaecal Digestibility of Crude Protein and Selected Amino Acids in Horses, *Animals* (2022). [DOI: 10.3390/ani12223092](https://doi.org/10.3390/ani12223092)

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