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Revisiting mycotoxins in the holistic-strategic dairy herd health management

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Ubiquitous presence of fungi as well as their toxins, or mycotoxins is a well known phenomenon in dairy practice. However, their role in the frame work of comprehensive dairy herd management has received insufficient attention.

The battle against mycotoxins starts during forage cultivation and harvesting, and should be continued during storage, feed preparation and delivering to the animals.

1. Cultivation and harvesting

A well-grown corn or alfalfa field, eventually, causes a lower burden of fungi that is transferred to the farm. For example, drought reduces immunity of corn forage against the fungi, which in turn, would be able to contaminate the forage more easily. On the other hand, leaving a proper height of postharvest corn stalk in the field is instrumental because the lower part of the plant is the most contaminated to fungi as well asmycotoxins.

2. Storage

During storage, feedstuffs are prone to be attacked by fungi. Several strategies should be implemented routinely in dairy farms in order to prevent spoilage and molding of feedstuffs, especially, corn silage. Several types of silos are currently used in farms around the world, which provide aerobic conditions for proper fermentation. It is generally accepted that bag silos is better than bunker silos, which the later provide a more appropriate fermentative conditions than trench silos.Using cutters in scraping silos is preferred to take corn silage using loaders or shovel and pick, because, it prevents the penetration of air into the silo.Using silage inoculants or silage supplements are highly encouraged during harvesting and packing silos.Inoculated silages produced 8% more rumen microbes than untreated. That could support up to 2kg more milk/cow/day.

Feed preparation and delivering to the animals: false presumptions First false presumption: mycotoxins are not just Aflatoxins

Sometimes, farmers rely falsely on their results of aflatoxins levels in bulk tank milk and might be mistakenly convinced that there is no need to monitor mycotoxins in their feedstuffs. It has been shown that synergistic effects may take place when there are low levels of both aflatoxins and fumonisins. Heifers may be affected by receiving low levels of both synergistic mycotoxins as well, leading to growth retardation and delayed puberty. The same

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is true when coincidence of low levels of Deoxynivalenol (DON) and Zearalenol (ZEA) causes fertility problems in both dairy cattle and heifers.

Second false presumption: Just adsorbant agents is sufficient to minimize the risk of mycotoxins

While it is true that several binding agents are able to adsorb mycotoxins and prevent their entrance into the body, there are some mycotoxins that attach to the receptors at the cell surface. Some of them should be biotransformed instead of adsorption. Specific enzymes and biological components convert mycotoxins into nontoxic, environmentally-safe metabolites in the digestive tract of animals. For example, ZEA attaches to the estrogen receptor, due to its structural similarity to estrogen. Some of them, e.g. fumonisin, will be released after adsorption when pH in the digestive tract increases.

4. Mycotoxins and proinflammatory conditions in dairy cattle

During heat stress (HS) and subacute rumen acidosis (SARA) several tissue damages may occur. Serum amyloid A and Haptoglobin and tumor necrosis factor- α have been reported to increase during periods of proinflammatory conditions, whichruminal endotoxin production increases as well, while the rumen microbiota population decreases.Mycotioxins exacerbate the situation and cause more damage to rumen microbes, which eventually, decrease both energy precursors production and delivery of microbial protein to the abomasum.

Collectively, reduced rumen fermentative efficiency, domination of a proinflammatory status, increased permeability of bowel epithelium to endotoxins and mycotoxins may cause liver tissue damage, leading to ketosis and fatty liver syndrome. Excessive loss of weight may lead to thinner digital fat cushion and is associated with increased horn claw lesions, in addition to direct effects of some mycotoxins, e.g. fumonisin B1 in lamellar separation of hoof epithelium. So, control of mycotoxins should be an integrated part of herd health management to ensure economically sustainable development of dairy farms.

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