

ENZYME-BASED PROTECTION AGAINST ZEARALENONE: SECURING THE SAFETY OF ANIMAL FEEDS

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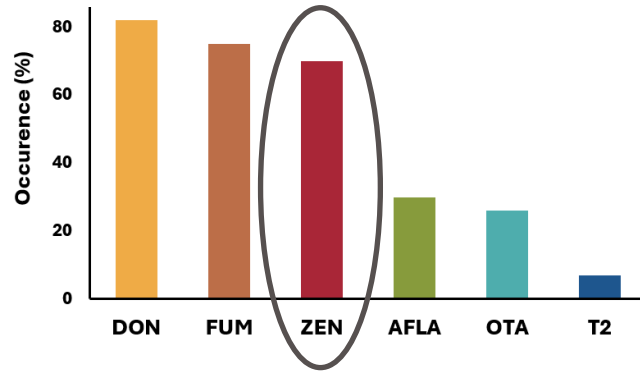
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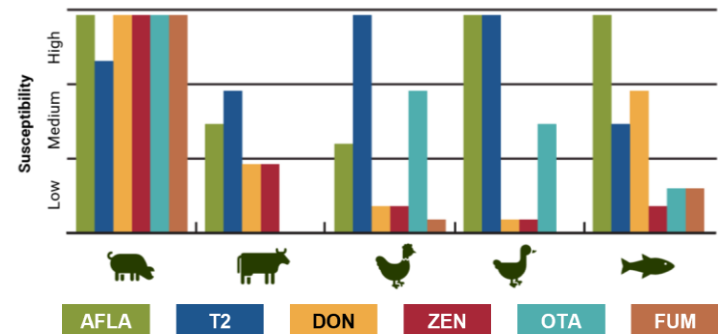
Mycotoxins – Impact on a global scale

Mycotoxin occurrence in finished feed



Animal feeds frequently contains mycotoxins, especially zearalenone (ZEN). The mycotoxin, primarily produced by *Fusarium sp.*, has an estrogen-like molecular structure, disrupting hormone homeostasis leading to reproductive health problems upon acute and chronic dietary exposure, mostly in gilts and swine.^[1,2]

Mycotoxins can enter the human food chain indirectly via residues found in milk, meat, eggs, and their derivatives. Therefore, it is crucial to address mycotoxin contamination at the animal feed stage to prevent further risks in the food chain.^[3,4]



[1] <https://doi.org/10.1016/j.gaost.2022.10.001>

[2] <https://www.dsm.com/>

[2] <https://doi.org/10.1016/j.micpath.2020.104095>

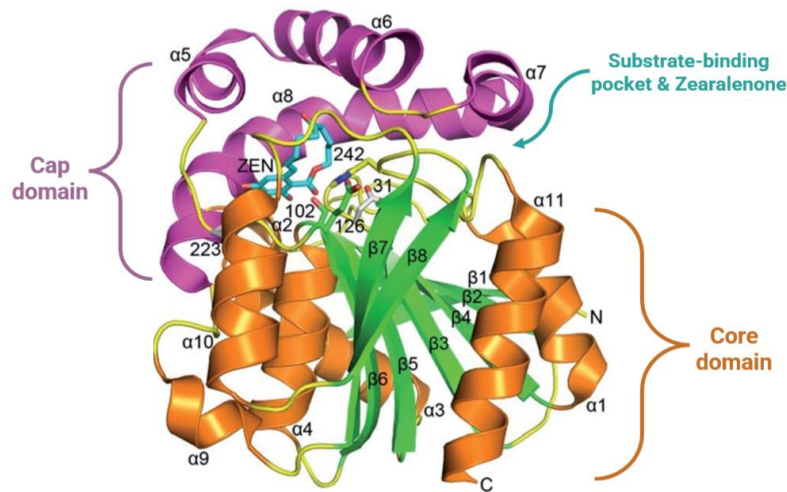
[4] <https://pigsxl.de/futterhygiene/>

Enzymatic degradation

Currently, discarding the grains or the use of adsorbents are the most commonly used strategies to deal with the mycotoxin contamination.

Enzymatic degradation of zearalenone enables cereals initially contaminated with mycotoxins to be safely applied for animal feed and protect the animals for any negative effects of zearalenone in the feed.^[5]

The KDP research focuses on the discovery of novel enzymes for the biotechnological inactivation of zearalenone. Lactone hydrolases have attracted considerable attention because they can degrade ZEN to a non-toxic form by hydrolyzing the lactone bond in the molecule.^[6]



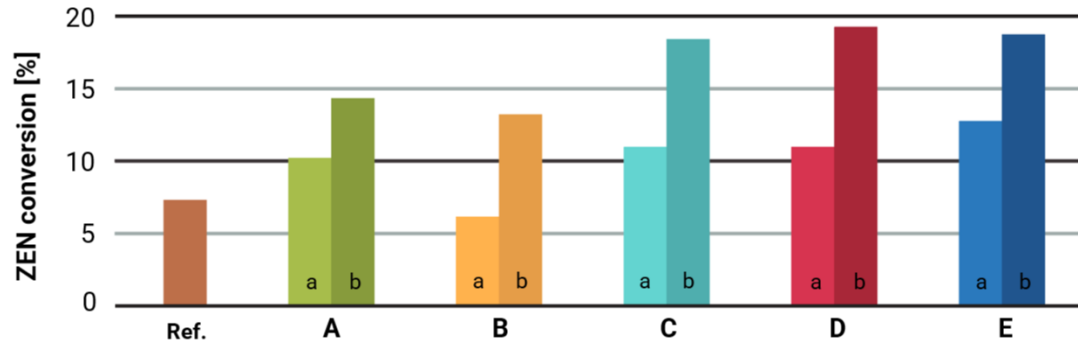
[5] <https://doi.org/10.1016/j.cjche.2020.11.011>

[6] <https://link.springer.com/article/10.1007/s00253-022-12205-5>

Understanding the enzyme kinetic parameters is critical for product development.

The goal of the research is to identify new enzymes with a low binding constant value (K_M) to ensure specificity for zearalenone and a high catalytic constant value (k_{cat}) to allow for the rapid detoxification of the mycotoxin in the low environmental concentrations of ZEN.

We aim to further improve the stability and activity of the enzymes with protein engineering to make them applicable as a feed additive for livestock. Currently, in addition to screening for new enzyme candidates, we are working on the immobilizing the produced enzymes onto various carriers.



Immobilized enzyme on five types of carriers, in different enzyme:carrier ratios (a: 1:1, b: 2:1).

Reference: enzyme solution in the same dilution as the immobilized enzyme samples.

