



# Fate of the mycotoxins deoxynivalenol and enniatins when cooking pasta

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## Background

During food processing mycotoxins can be converted, e.g. by enzymatic processes or react with the matrix. Other processes may cause physical changes such as leaching of mycotoxins into water when cooking pasta, or trapping the mycotoxins in a protein/starch network after fermentation or heating. Knowledge on the fate of mycotoxins during processing may assist risk assessors on the interpretation of data on occurrence of mycotoxins in raw materials.

## Objective

The aim of this study was to assess the influence of cooking of pasta on the occurrence of the mycotoxins: deoxynivalenol (DON), enniatin A (ENNA), enniatin A1 (ENNA1), enniatin B (ENNB) and enniatin B1 (ENNB1) in naturally contaminated pasta's available from retail stores.



## Materials and Methods

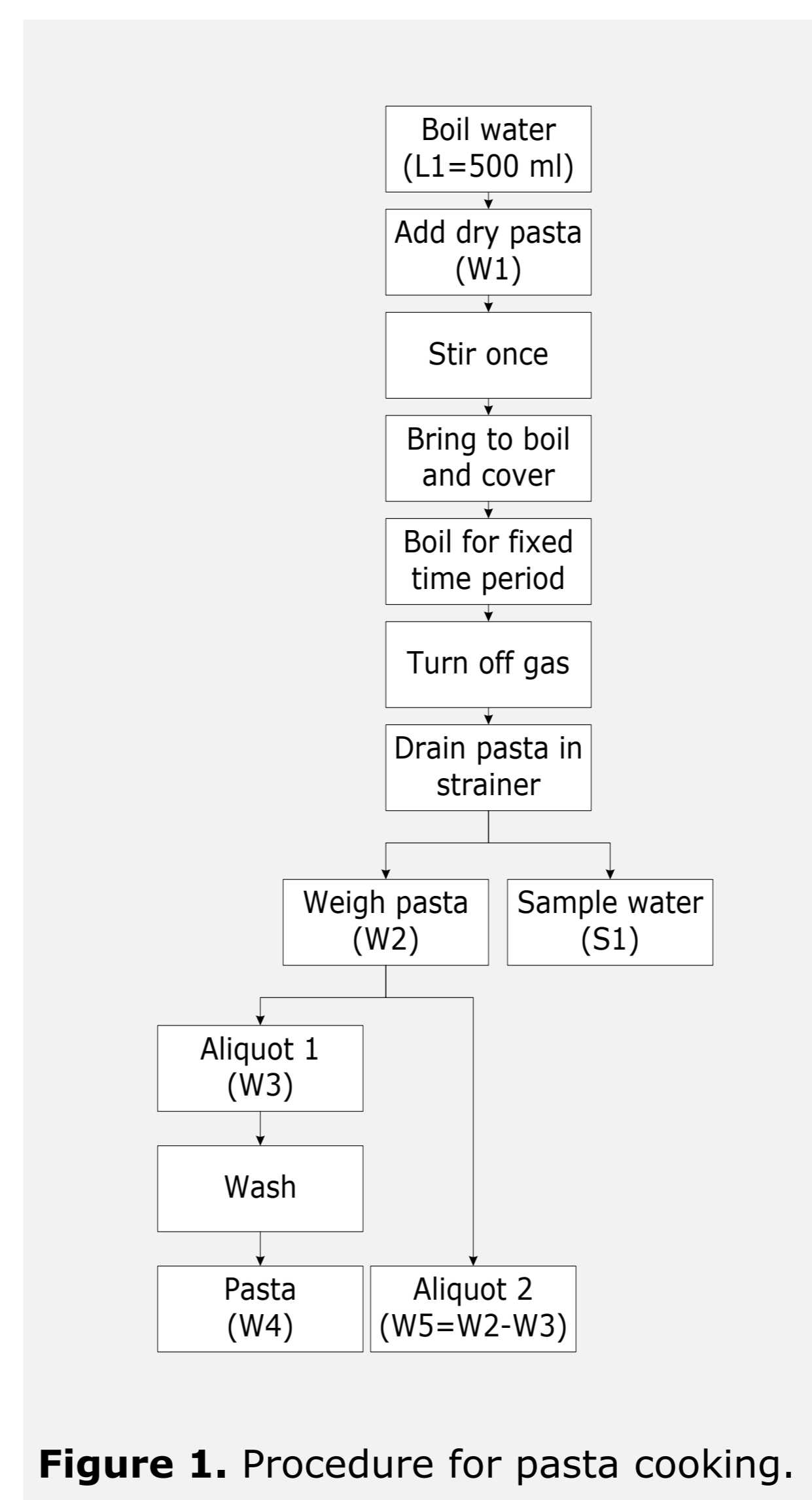


Figure 1. Procedure for pasta cooking.

Three naturally contaminated and one blank dry pasta were selected. The four pastas were cooked (10 min), according to a protocol in a laboratory setting representing home-cooking conditions (Fig. 1). Samples of raw pasta (W1), cooked pasta (W5), the cooking water (S1) and cooked pasta after rinsing (W4) were stored at -20°C and ground under liquid N<sub>2</sub> before analysis. The samples were analysed (duplicate) for DON, ENNA, ENNA1, ENNB and ENNB1 using an in-house validated method (extraction with acidified acetonitrile/water (80%/20%); filtration & separation/identification/quantification using LC-MS/MS with acidified eluents). The moisture content of the samples was measured to calculate the mass balance.

## Results and discussion

The results are shown in figure 2. All mycotoxins were recovered either in the pasta or in the cooking/rinse water. Roughly 40% of the DON was transferred from the pasta to the cooking water. This outcome is according to expectation and in agreement with literature<sup>1,3</sup> due to the hydrophilic character of the molecule. The enniatins remained virtually completely in the pasta. This outcome was expected (hydrophobic character) but not in agreement with the conclusions of Serrano *et al.*<sup>2</sup> (2013). They found a 100% reduction of enniatin B in a liquid pasta resembling system (PRS) spiked with enniatins. It is expected that the deviation between the results of the two studies originates from the limitations of the PRS.

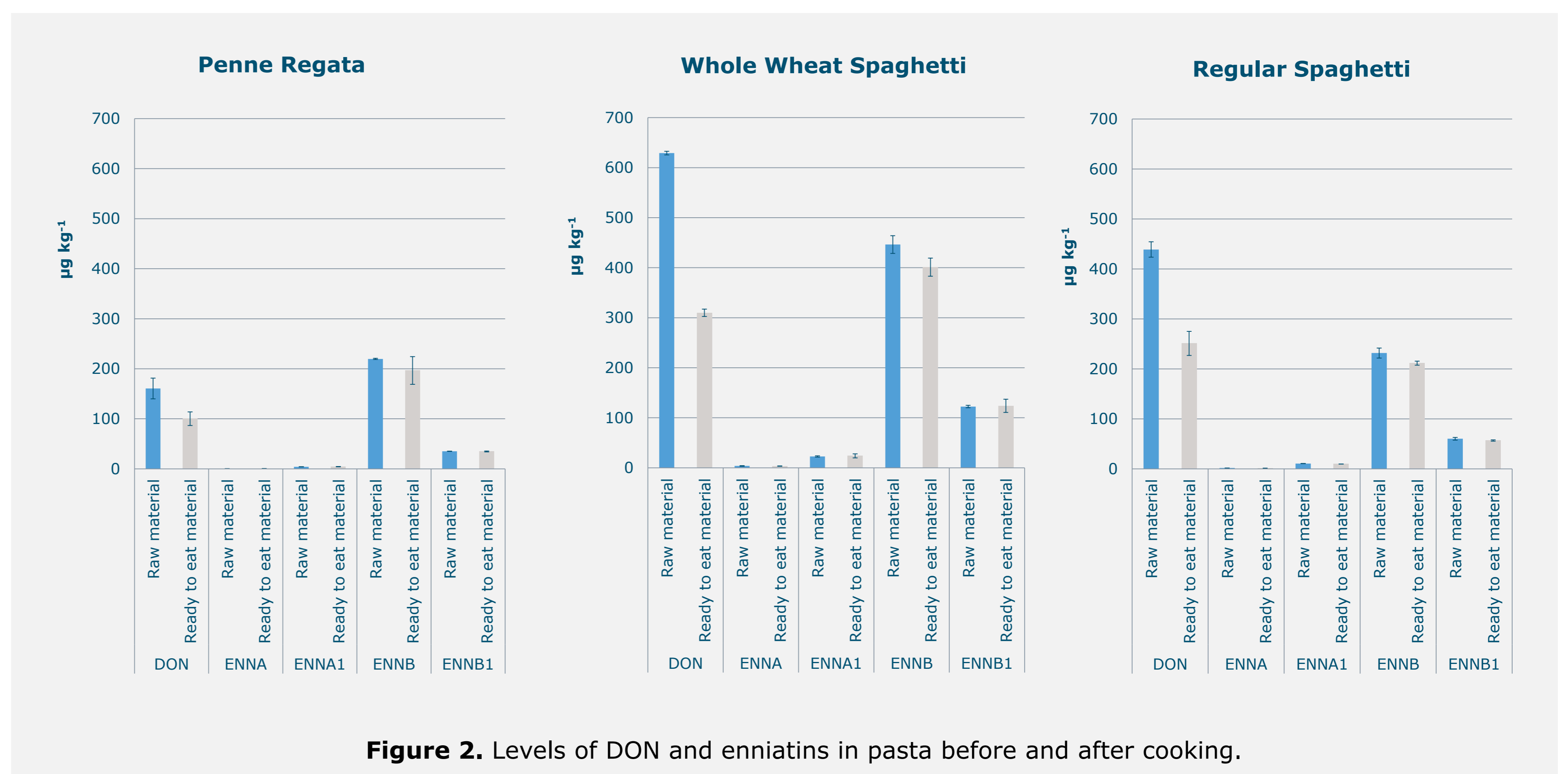


Figure 2. Levels of DON and enniatins in pasta before and after cooking.

## Conclusions

Boiling in water for 10 minutes decreased deoxynivalenol content in naturally contaminated pasta with 40% but had no influence on the concentration of enniatins. Deoxynivalenol leaches into the boiling water. It can however, not be excluded that changes in cooking times and rinsing intensity may slightly modify the mycotoxin retention percentages.

## References

- <sup>1</sup> Brera C. *et al.* (2013) *Food Control* 32:309-312
- <sup>2</sup> Serrano AB. *et al.* (2013) *Food Chemistry* 141:4215-4225
- <sup>3</sup> Visconti A. *et al.* (2004) *Toxicology Letters* 153:181-189

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