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BOOK of ABSTRACTS

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Implications of Polystyrene Microplastics on the Gastric Digestion of Bovine Milk

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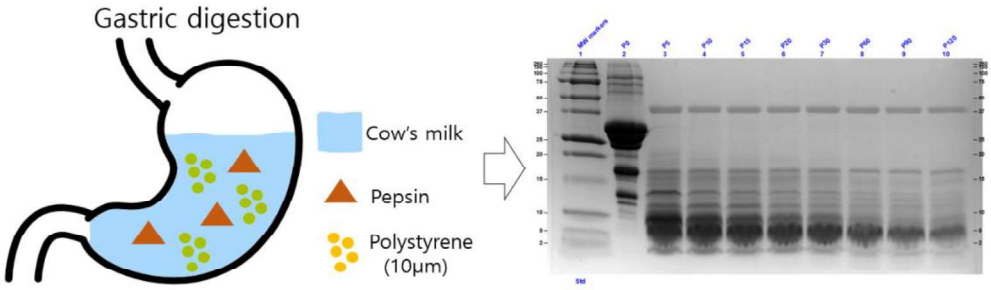

The prevalence of microplastics (MP) pollution in different zones of the environment has been established by several studies [1]. Due to its widespread presence, MP have found its way into food items. Fish, shellfish, water, milk, salt, and sugar are just some examples of the food we commonly consume that are contaminated with MP [2]. Human ingestion of MP is already well-established but there is limited data regarding how MP affect human gastric digestion of food components, especially proteins.

In this study, we investigated the effects of polystyrene (PS) MP on pepsin, the major protease in human gastric digestion. Pepsin activity was tested during exposure to two different sizes -10 µm (PS10) and 100 µm (PS100), and three different quantities- low count (142 particles), moderate count (1420 particles), and high count (14200 particles), of PS using haemoglobin as substrate. Results showed that exposure to PS100 has no effect on enzyme activity. However, exposure to high count PS10 considerably reduced pepsin activity from 2957 ± 310 U/mg to 1674 ± 270 U/mg.

To test the effect on food digestion, high count PS10 was added to a sample of commercially available liquid bovine milk (defatted). In this case, the static in vitro simulation of gastric digestion was followed to mimic human digestion of food [3]. Milk digesta at different time points (5, 10, 15, 20, 30, 60, 90, 120 minutes) were obtained to monitor the progress of protein degradation.

SDS-PAGE showed no difference in the peptide bands from 30-120 minutes. However, bands corresponding to caseins were not observed at 5 minutes when PS10 was present. Additionally, 14 kDa fragments were not observed at 10-20 minutes.

Washing of the PS particles followed by SDS-PAGE revealed a faint pepsin band from all time points. At 5 and 10 minutes, faint peptide bands >10kDa were also observed. These suggest that pepsin and some milk peptides were adsorbed on the surface of PS10. Zeta potential analysis of PS revealed a slightly negative surface charge which could explain the adsorption and disappearance of peptide bands. This adsorption of pepsin on PS did not seem to affect its overall protease activity. However, the interaction of milk peptides with PS may reduce the nutrients human could acquire from milk.

Acknowledgements

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