XXII euro FOOD chem

BOOK OF ABSTRACTS

XXII Congress

EuroFoodChem

June 14-16, 2023 | Belgrade, Serbia

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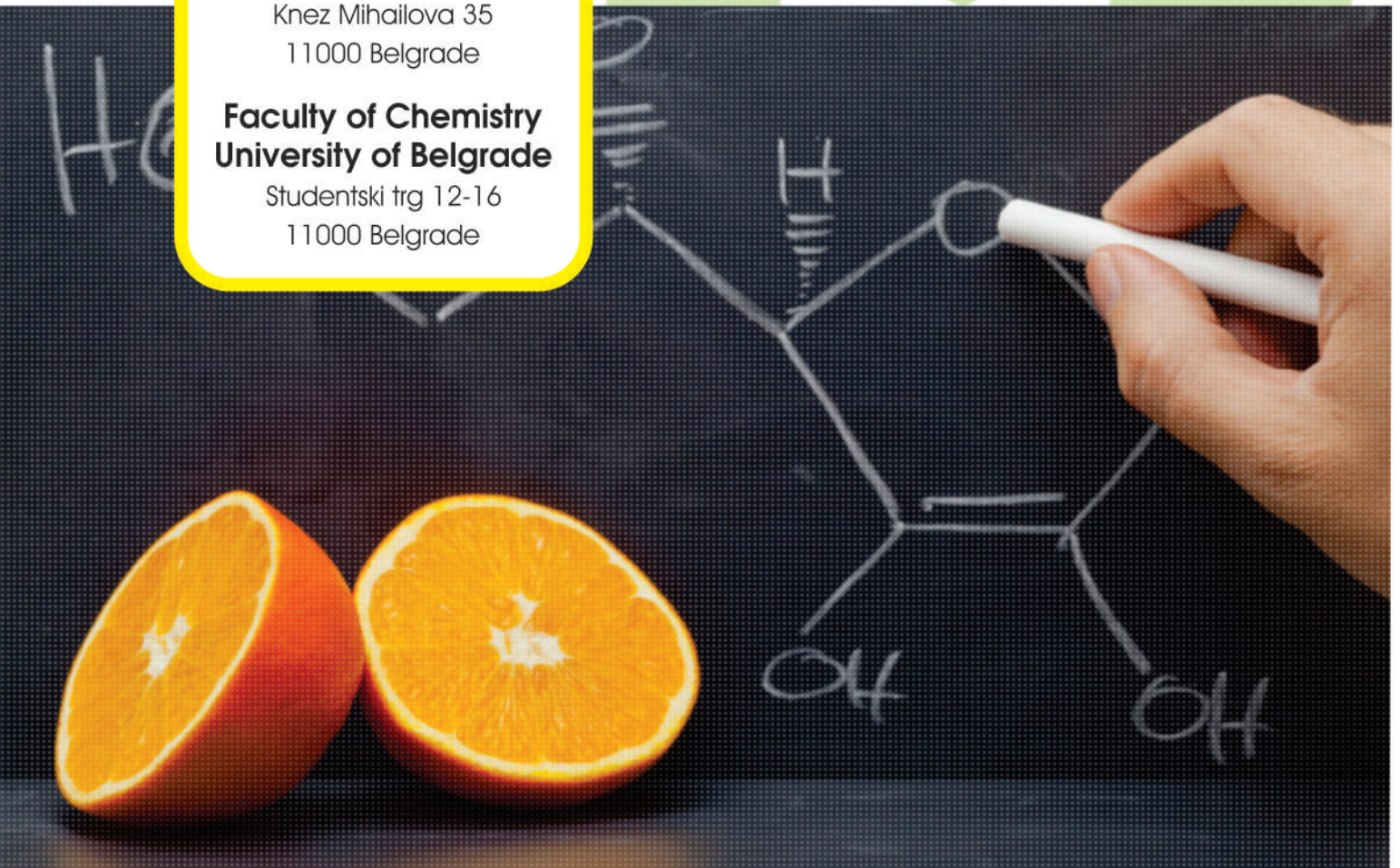

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CONGRESS TOPICS

- **Food composition, quality, and safety**
- **Food sustainability, including byproducts valorization**
- **Novel foods**
- **Food and health, functional foods, and ingredients**
- **Chemical reactions and interactions of food components**
- **Chemical changes in food under processing and storage**
- **Food adulteration, authenticity, and traceability**
- **Novel methods for food chemistry**
- **Food contaminants**

GENERAL INFORMATION

Official Language:
English. No simultaneous translation will be provided:

Registration Desk opening times.

Day 1: June 14, 2023, 8:30-10:30h
Day 2: June 15, 2023, 8:30-10:30h
Day 3: June 16, 2023, 8:30-10:30h

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Certificate of Attendance: Will be given at the registration desk and sent by email after the end of the Congress.

Understanding polyphenol adsorption to oral models as a secondary mechanism for astringency

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Astringency is described as a tactile sensation of puckering, tightening and dryness in the oral cavity, commonly induced for by phenolic compounds1. The major mechanism attributed to this phenomenon is the interaction between salivary proteins and polyphenols and respective formation of insoluble complexes that precipitate in the oral cavity. However, more recently, this research line is growing curious about the importance of secondary mechanisms (salivary film disruption, polyphenol-membrane interactions, and mechanoreceptors) in the perception of different subqualities of astringency. However, there is still little to no proof that can substantiate these theories. A recent study from our team as already shown some first evidence that, depending on their structure, polyphenols may bind in different ways to the oral constituents and therefore elicit different mouthfeels2. In this study, the total adsorption of compounds to salivary cellular models was evaluated (Figure 1). Overall, Alum, a strong astringent standard, has shown a higher adsorption potential to the oral models compared to the other mixtures and higher affinity to oral epithelial models. Since alum can't precipitate salivary proteins, these results hint that compound adsorption may be an important mechanism to elicit astringency for certain compounds. Analysing the interaction of Grape Seed Extract (GSE) and Tannic Acid (TA) with oral epithelial cell models, the resultant adsorbed compounds of GSE had up to an eight-fold decreased adsorption when compared to Alum (0.016 mg/cm2), at similar initial concentrations. For Green Tea Infusion (GTI), a higher adsorption was achieved in models where saliva was not present, up to 2-fold. To further substantiate these results a correlation with a certified sensorial analysis is currently being performed.

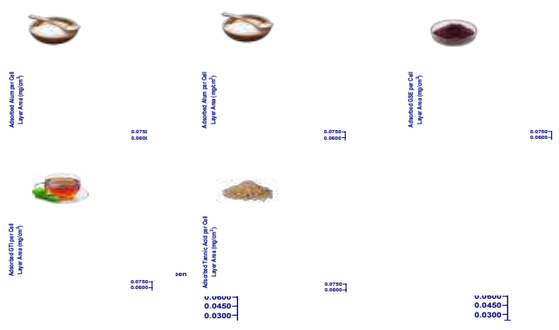

Fig.1. Total adsorption of compounds to salivary cellular models per monolayer area. Oral models constituted by epithelial cells (HSC-3 or Caco-2), whole saliva and mucin, were applied to interact with three concentrations of a sensorial standard and different families of polyphenols: Alum (at 1 $g.L^{-1}$, 1.5 $g.L^{-1}$ or 2.75 $g.L^{-1}$), Grape seed extract (at 0.2 $g.L^{-1}$, 0.6 $g.L^{-1}$ or 1 $g.L^{-1}$), Tannic acid (at 0.1 $g.L^{-1}$, 0.3 $g.L^{-1}$ or 0.5 $g.L^{-1}$) and Green Tea Infusion (at 0.43 $g.L^{-1}$, 0.87 $g.L^{-1}$ or 1.69 $g.L^{-1}$).

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Investigation of structural changes in ovalbumin induced by two types of MPs and its impact on protein digestibility

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Ovalbumin (OVA) is the most abundant protein in chicken egg white. It is one of the major allergens in eggs. Micro- and nanoplatic particles (MNPs) are a widespread contaminant and have been found in food and water. It is still unclear how MNPs might affect human health. However, due to their large surface area they have been found to bind various biopolymers, including proteins. These biopolymers can be bound more strongly or loosely, and are referred to as hard and soft corona, respectfully [1]. MPs have been found in eggs, in the size range of 50-100 μm [2]. It is shown that these particles can interact with proteins and induce structural changes, but there is still not enough information on this topic [3]. These structural changes could lead to a decreased digestibility in the gastrointestinal tract, which could increase the immune response to known allergens.

The aim of this study was to determine whether there are structural changes present in the OVA after incubation with two types of MPs – 120 μm polyethylene terephthalate (PET) and 120 μm polystyrene (PS) and whether they could influence digestion of OVA with gastrointestinal enzymes. 20 mg of MPs were incubated with 1.3 mg/mL ovalbumin for 4 h at room temperature in a 20 mM phosphate buffer at pH 7. Bulk ovalbumin was separated from the MPs by centrifugation and by filtration through a 0.22 μm PVDF filter. Soft corona was obtained by washing the MPs with water, and the MPs were later removed as described with bulk ovalbumin. Formation of amyloids was monitored with a Thioflavin T (ThT) assay at room temperature and after thermal treatment, and additional structural analysis was performed by circular dichroism (CD) spectrometry in the far-UV region. Thermal stability was also determined by spectrofluorimetry. Digestion with two proteases (pepsin and trypsin) was performed to determine whether there is a change in the gastrointestinal digestibility of OVA.

Results from the ThT assay show that at room temperature there is no significant difference between the fluorescence emission obtained for all samples, with bulk OVA from both MPs showing a slight decrease. However, there is an increase of fluorescence after thermal treatment in all OVA samples, where OVA from the soft corona emits significantly less fluorescence than control and bulk samples for both types of MPs. Additionally, soft coronas have been shown to have more β-sheet content than other samples, which is more pronounced for OVA incubated with PET. For the heated samples there is a sharp change from α-helix to β-sheets in all the samples, but it is the most dramatic in the soft coronas. This could impose rigidity to the tertiary structure, which would explain why the ThT molecule does not bind as strongly. Despite differences in both the secondary and tertiary structure, the thermal stability is almost the same in all samples. Digestion of the samples shows that the soft corona incubated with PS tends to be more resistant to trypsin than other samples after 2 min, but it is not significant. For digestion with pepsin there is no difference between the samples. In conjunction with the previous results, which indicates a structural stabilisation of the soft corona at pH 7, it is not surprising that there is an increased resistance to trypsin, compared to pepsin which is a gastric enzyme and for which digestion is performed at an acidic pH.

In conclusion, there is a structural change present in samples upon contact with MPs, particularly in the soft corona, of which the most pronounced is a decrease of α-helix content and increase in β-sheet content as determined by far-UV CD. This leads to a structural stabilization which could further impact the digestibility of the OVA protein and impact its allergenicity. However, this must be confirmed with further experiments.

Acknowledgments: This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 965173.

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IMPRESUM

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