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## Antioxidant activity under *in vitro* gastrointestinal digestion of pork patties supplemented with edible mushroom extracts (#583)

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### Introduction

A meat product is said to be functional when it contains ingredients with a specific technological and/or health benefit (Fernández-Ginés et al. 2005). These products are characterized by possessing some biological active compounds that can exert a positive physiological effect. The underlying idea behind functional foods is to reduce the prevalence of chronic diseases by curbing the habitual consumption of popular meat products (Fernández-Ginés et al. 2005; Arihara, 2006). Natural ingredients such as citrus and oat fiber, fish, olive and sunflower oil, fructooligosaccharides, soy protein isolates, rye bran, rosemary extract, tea chatechins and tomato juice have been used in cooked meat products to improve nutritional and functionality (Fernández-Ginés et al. 2005). Edible mushroom extracts (EME) have been used either in traditional medicine or as a food ingredient, and they can exhibit functional properties (e.g., antioxidant effect) associated with the presence of phytochemicals such as polysaccharides, polyketides, terpenes, steroids and phenolic compounds (Giavasis, 2014). However, their ocurrence and antioxidant activity can be affected by the chemical conditions and enzymatic activity carried on in the gastrointestinal tract (Soler-Rivas et al. 2009). *In vitro* digestion models are widely used to study structural changes, digestibility, and release of food components (plants, emulsion-based food, dairy, fish and meat) under simulated gastrointestinal conditions (Hur et al. 2011). Thus, the aim of this study was to determine the effect of *in vitro* gastrointestinal digestion (ivGID) on antioxidant activity of pork patties supplemented with aqueous-ethanol EME.

### Methods

Firstly, bioactive compounds of edible mushrooms powders (*Ganoderma lucidum* and *Pleurotus ostreatus*) were extracted with water (1:10) and the extraction was assisted by a ultrasound method (42 KHz/ 25 °C/ 30 min). Subsequently, the mixture was centrifuged (4,200 x g/ 10 min) and resulted solution was filtered (Whatman No. 4 filter paper), concentrated under reduced pressure, lyophilized and stored at -20 °C under dark, until analysis. Pork meat (M. *semimembranosus*, 24 h *postmortem*) was mixed with fat (10% in final formulation, w/w), salt (1.5%, w/w) and water (5%, v/w), and subsequently supplemented with EME (*G. lucidum* and *P. ostreatus*, 0 and 0.5%). All patties were grilled until reaching an internal temperature of 71 °C and vacuum-packaged for further analyses. The ivGID (Hur et al. 2011) proceeded during 2 h in a flask with pepsin at 2.0-2.5 pH and 150 rpm. Thereafter, the pH was adjusted to 5.0-5.5 and a solution of pancreatin, lipase and bile bovine was added. The conditions (37°C, 150 rpm) were maintained for 4 h. Analyses of the total antioxidant activity [total phenolic content (TPC), DPPH• activity, and reducing power activity (RPA)] were conducted (Huang et al. 2011). Data were analyzed by ANOVA and means were separated with a Tukey's test ($P<0.05$).

### Results

As shown in Figure 1, TPC values increased ($P<0.05$) after *iv*GID, and the highest ($P<0.05$) TPC values (223.9 mg gallic acid equivalents/g) were exhibited by patties treated with the *P. ostreatus* extract. DPPH• activityvalues in EME samples also increased ($P<0.05$) after the *iv*GID, and the highest ($P<0.05$) values were found in samples treated with the *P. ostreatus* extract (73.3% of DPPH• inhibition). In addition, the *iv*GID tended to reduce ($P<0.05$) the RPA in all samples under study.

### Conclusion

It has been demonstrated that the addition of natural extracts contains phytochemicals compounds in meat formulations that can increase the antioxidant stability, however, these compounds do not exert the same activity pattern during *in vivo* conditions (Falowo et al. 2014; Gonçalves et al. 2019). Phenolic compounds are phytochemicals considered to be major promoters of radical DPPH• inhibition and RPA in EME (Giavasis, 2014; Soler-Rivas et al. 2009) but they are affected by several factors such as pH, temperature and enzymatic reactions; hence, different outcomes (i.e., increase or decrease) in TPC can be expected after the digestion, depending on the stability of each phenolic type in the food matrix (Gonçalves et al. 2019). In our study the RPA was reduced (>50%) by *iv*GID, whilst TPC and DPPH• anti-radical activity were enhanced with the supplementation of *G. lucidum* and *P. ostreatus* extracts (>90 and >30% by both, respectively) when compared to the control samples. In agreement with our study, it has been reported that the antiradical activity and phytochemicals content of edible mushrooms (*Agaricus bisporus*, *Lentinula edodes* and *Boletus edulis)* was enhanced by *iv*GID (Soler-Rivas et al. 2009). It has also been reported a positive effect of a *Agaricus brasiliensis* residue added to milk enriched with Omega-3 to prevent lipid oxidation and bioavailability of bioactive compounds after *iv*GID (Vital et al. 2017). In conclusion, the use of EME as an ingredient in this processed meat product can be considered a novel strategy to improve their functionality, but it also can be used to develop meat products with health benefits.

Notes

## References


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**Notes**

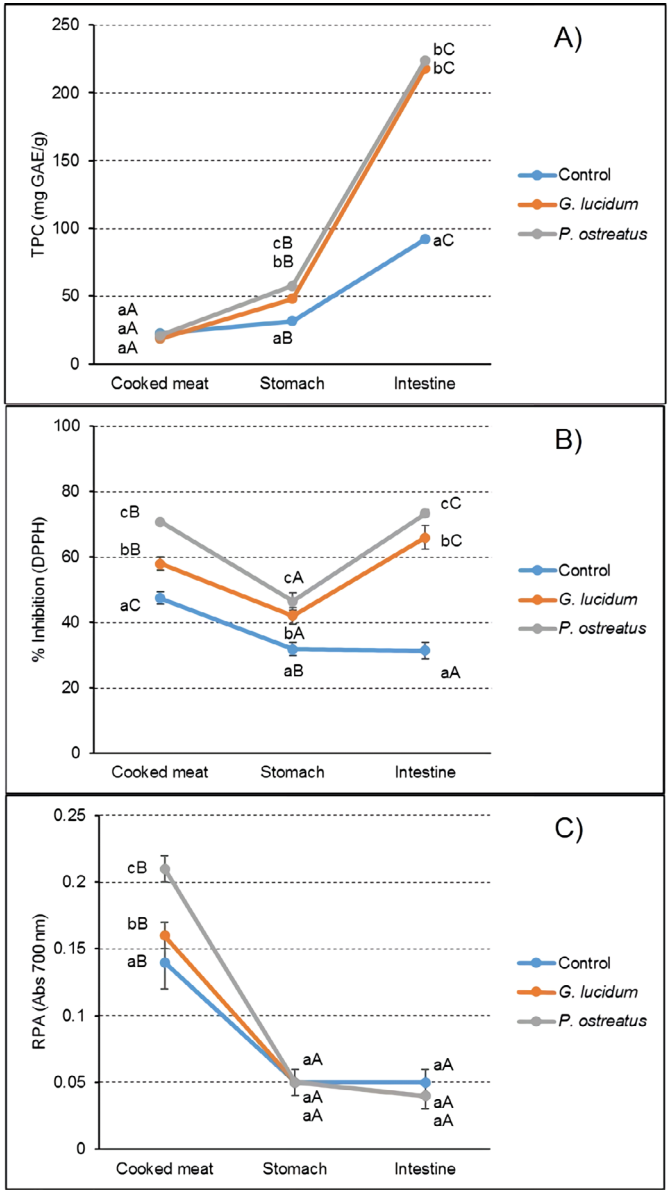


**Figure 1.**
*In vitro* gastrointestinal digestion effect on TPC (A), DPPH• activity (B) and RPA (C) of pork patties treated with EME. Means bearing different superscripts within the same treatment (A-C) or across treatments (a-c) indicate differences ($P<0.05$).

**Notes**