***Ciona intestinalis* as a flavor enhancer in beef burgers**

Pateiro M (1), Domínguez R (1), Norén F (2), Munekata PES (1), Kousoulaki K (3), Purriños L (1), Lorenzo JM (1)

1. Centro Tecnológico de la Carne de Galicia, Ourense, España.
2. Marine Biogas, Marine Feed Sweden AB, Stenungsund, Sweden
3. Department of Nutrition and Feed Technology, Nofima AS, Bergen, Norway

Dirección de e-mail: mirianpateiro@ceteca.net

ABSTRACT

Sea squirts are the best-known class of tunicates. Among these marine invertebrates, *Ciona intestinalis* stands out. It is an aquatic animal similar to an anemone that is cultivated in the same way as mussels. In the recent years, the interest for this organism has increased, since as it grows it contributes to a cleaner sea. Moreover, the outer tunic has an excellent cellulosic and ash composition, and the inner animals contain important contents of proteins and omega-3 fatty acids. Added to this, it has excellent potential as a flavor enhancer due to the rich umami taste and soft marine aromas with a distinct saltiness. This product could have an interesting application in meat products as a flavor enhancer, providing an alternative to reduce the use of some synthetic additives commonly used in meat products. The object of the present study was to evaluate the effect of the incorporation of two levels of the umami ingredient (5 and 10 mL/kg) on the sensory quality of beef burgers. Along with these treatments, a control batch were used to compare the results. The sensory acceptance of reformulated burgers was evaluated by a panel composed of 30 panelists, who are habitual consumers of this type of product. Briefly, beef burgers were cooked in an oven at 180 ºC up to 70 ºC in the thermal center. Samples were coded with random three-digit numbers and presented to panelists on plastic plates along with water and unsalted toasted bread to clean the palate and remove residual flavors in individual booths. The attributes of odor and taste of cooked burgers were evaluated using a 7-point hedonic scale (from 1 = dislike very much to 7 = like very much). The XLSTAT-Sensory version 2018 software was applied to evaluate the sensory data. One-way ANOVA was conducted, and Tukey's test was used to determine significant differences. No significant differences were observed between samples. However, the incorporation of the Ciona flavor enhancer resulted in a slight improvement of the organoleptic characteristics. The effect on odor and taste was greater when the concentration of umami increased. In this regard, the results indicate that samples formulated with 10 mL/kg had the best acceptance for odor (5.8 *vs.* 5.5 and 5.6 for burgers with 10 and 5 mL/kg of Ciona and control samples, respectively), which is equivalent to "like moderately" on the hedonic scale. In the case of taste, control samples and those with 10 mL/kg of Ciona showed the best scores (6.0, 5.8 and 5.5 for control samples and burgers with 10 and 5 mL/kg of Ciona, respectively). Therefore, umami rich *Ciona intestinalis* sauce could be used as an alternative to other flavor enhancers commonly used in the meat industry.

This research was funded by the EU Commission through the BBI-JU H2020 Project AQUABIOPRO-FIT (Grant Agreement no. 790956).

Keywords: Sea squirts,umami taste, sensory improvement, meat products