



## Changes in expected taste perception of probiotic and conventional yogurts made from goat milk after rapidly repeated exposure

M. P. Costa,\*<sup>1</sup> C. F. Balthazar,\* R. M. Franco,\* E. T. Mársico,\* A. G. Cruz,† and C. A. Conte Junior\*

\*Fluminense Federal University, Food Technology Department, CEP 24230-340, Niterói, RJ, Brazil

†Master in Food and Science Programme, Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro, CEP 20270-021, Rio de Janeiro, RJ, Brazil

### ABSTRACT

Goat milk yogurt is an excellent source of fatty acids, protein, and minerals; however, it is not well accepted by many consumers, due to its typical flavor derived from caprylic, capric, and caproic acids present in this milk and dairy products. Recently, the repeated-exposure test has been used to increase the consumption of particular foods. This methodology has been used to increase children's willingness to eat food in some settings and has also been used to reduce sodium in soup. Based on these considerations, the aim of this study was to investigate whether repeated exposures may increase acceptance of both goat milk yogurt and probiotic goat milk yogurt. In a pre-exposure session, a total of 45 panelists (28 females and 17 males) from southeastern Brazil, who were not used to consuming dairy goat milk, evaluated the expected taste perception and the perceived liking after tasting 3 yogurt preparations. Then, consumers were randomly divided into 3 groups and participated in rapidly repeated exposure sessions performed within 6 d. Each panelist consumed only the yogurt that he or she would be exposed to. The day after the exposure sessions, all panelists returned to participate in the postexposure session and were asked to evaluate acceptance, familiarity, and the "goaty taste" characteristic of each yogurt. Regarding the expected liking before tasting, results showed higher expectations for cow milk yogurt compared with goat milk yogurt, which proved that consumers were not familiar with the goat milk yogurt. Likewise, only cow milk yogurt presented high acceptance and familiarity rates, confirming that these panelists were used to consuming cow milk products. With respect to the rapidly repeated exposure, 6 d were enough to significantly increase the consumers' familiarity with goat milk yogurt and probiotic goat milk yogurt. However, this method was not suitable to significantly increase the acceptance

of such products. Nonetheless, a correlation existed between the exposure sessions and the increase in acceptance of the exposure groups. Thus, hypothetically, the increasing of exposure sessions could be a strategy to increase goat milk product acceptance.

**Key words:** caprine milk, *Lactobacillus acidophilus*, familiarity, acceptance

### INTRODUCTION

Goat milk is an excellent source of FA, protein, and minerals. The importance of goat milk as a functional food is related to its high digestibility and nutritional value, as well as its therapeutic and dietary characteristics (Fonseca et al., 2013). Goat milk fat globules have a smaller size and high proportion of short- and medium-chain SFA, such as butyric, caproic, caprylic, and capric, and long-chain MUFA and PUFA, which are easily absorbed and more digestible than those from cow milk (Park et al., 2007). Moreover, it is hypoallergenic, being commonly consumed by individuals who are allergic to cow milk, such as children and elderly people (Albenzio et al., 2012). For this reason, goat milk is widely used for fermented milk processing and other dairy products. However, its higher caproic, caprylic, and capric acid concentrations, which are responsible for its distinctive taste, make this product not well accepted by consumers (Park et al., 2007; Mayer and Fiechter, 2012). Goat milk yogurt presents a lower overall acceptance compared with cow milk yogurt (Eissa et al., 2010; Masamba and Ali, 2013) because of its unpleasant "goaty" taste, as it is perceived by consumers, even in goat milk yogurt with added fruit pulp (Senaka Ranadheera et al., 2012).

Fermented dairy products, especially yogurt, are commonly used as food vehicles to deliver probiotics to consumers (Wang et al., 2012; da Costa et al., 2013a). Probiotics are live microorganisms, which when consumed in adequate amounts, confer a health benefit on the host (Sanders, 2009). Some health benefits attributed to probiotics include the improvement of intestinal health by regulating the microbiota, immune system stimulation and development, synthesis and enhance-

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<sup>1</sup>Corresponding author: marioncosta@id.uff.br or marionpdc@vm.uff.br

ment of the bioavailability of nutrients, reduction of lactose intolerance symptoms, and reduction in the risk of certain diseases (Oelschlaeger, 2010). Taking into consideration the health benefits related to probiotics ingestion, the dairy industry has also invested in probiotic product development because of sensory advantages that bacterial strains confer to the final product (Vinderola et al., 2000; Costa and Conte-Junior, 2013). *Lactobacillus acidophilus* LA-5 may produce flavor compounds, such as acetaldehyde, which are recognized as important flavor components in yogurt. *Lactobacillus acidophilus* may increase the total acetaldehyde content in yogurts and, thus, influence the final product flavor (Güler-Akın and Akın, 2007; Ekinçi and Gurel, 2008). Moreover, probiotic goat milk yogurt may become more acceptable and sensory appealing to consumers (Senaka Ranadheera et al., 2012).

Expectations play an important role in product perception before it is tasted. These may positively or negatively influence the product flavor (Deliza and MacFie, 1996). The expectations imply a psychological anticipation that something will occur or be experienced. In general terms, we can define an expectation as a belief that an object possesses a particular attribute or that a behavior would result in a particular consequence. Hence, operationally, we might define it in terms of perceived probability or anticipated magnitude for these attributes or consequences (Cardello, 2007). It is possible to analyze whether consumers' expectations are met by the product's actual performance and, otherwise, how the expectations affect consumers' perceived product performance (Cardello and Sawyer, 1992). A product expectation might also influence long-term consumer satisfaction. Hedonic expectations are generated from emotional and cognitive processes, which lead to anticipation of how much the product is liked or disliked before consumption. Ares et al. (2010) obtained a different perception of chocolate desserts, which suggested the importance of consumer expectations on perception and hedonic reaction toward food products. Another study demonstrated that high expectations influenced the liking of local apple juices (Stolzenbach et al., 2013).

Repeated-exposure methodology has been recognized as a useful strategy to increase the overall liking of a certain class of foods in a specific group or in a more general context, for all populations (Williams et al., 2008). This approach has also been used in several different situations in sensory and consumer science. Williams et al. (2008) conducted an experiment with 6 children during 10 to 15 d of exposures. Sixty-three infants or children were repeatedly exposed to a specific food for 8 d (Liem and Graaf, 2004) and results showed that the exposure method increased liking. Anzman-

Frasca et al. (2012) showed that simple familiarization procedures can be used to promote increased overall acceptance and intake of vegetables among 47 young children. In addition, Lakkakula et al. (2010) used elementary school children to assess the sensory properties of poorly liked vegetables and results showed that 14 d of repeated exposures to poorly liked vegetables twice per week for a 4-wk period increased liking for most of these items. Recently, this method has been used with reduced-sodium soups, performed in just 8 exposure days with 37 consumers (Methven et al., 2012), 46 participants (Liem et al., 2012), and sport drinks using 128 consumers (Kinnear and de Kock, 2011).

The aim of this study was to assess expectation of unusual consumers toward goat milk yogurts (probiotic and conventional), and to investigate whether repeated exposures can be used to increase acceptance of this product. The results can be relevant for goat milk industries that intend to gain more consumers for their products.

## MATERIALS AND METHODS

### Experimental Design

The experimental design for this study is represented in Figure 1. For this experiment, 45 participants were selected. First, in the pre-exposure session, participants underwent an expected taste perception, in which the expectation of yogurts was evaluated. Afterwards, participants received, individually, each yogurt (cow, goat, and goat probiotic yogurt) and analyzed the perceived liking after tasting. In the following step, the participants were divided into 3 groups: (1) cow milk yogurt (control, **CNTL**), (2) goat milk yogurt (exposure group 1, **EXP1**), and (3) probiotic goat milk yogurt (exposure group 2, **EXP2**). Participants had to consume the product for 6 consecutive days, evaluating the acceptance and familiarity. Finally, the 45 participants returned for a postexposure session when the 3 yogurts were analyzed for characteristic flavor derived from goat products, acceptance, and familiarity.

### Yogurt Processing

To produce the yogurts, 13 L of UHT cow whole milk (Macuco, Rio de Janeiro, Brazil) and 25 L of UHT goat whole milk (Caprilat, Paraná, Brazil) were used, as well as sugar (5%, vol/vol), in each yogurt. Thermophilic yogurt cultures (YF-L903; Chr. Hansen, Valinhos, Brazil) were added to cow milk yogurt and goat milk yogurt at a concentration of 1% (vol/vol). *Lactobacillus acidophilus* LA-5 (Chr. Hansen) was inoculated at a concentration of 5% (vol/vol) in relation

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