TECHNICAL NOTE
Antibiosis, Genesis and Probiotic Components; two Imperishable Products

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INTRODUCTION

The belief that by improving intestinal microbiota is advantageous for the body, goes back to the late Nineteenth Century, when Elie Metchnikoff suggested yogurt consumption as a way to fight outbreaks of dysentery that scourged France in 1889 (Pelczar and Reid, 1966). The recommendation made by this eminent Ukrainian researcher, at the Pasteur Institute was rooted in Slavic Empiricism, especially from Bulgaria. It was also influenced by a known phenomenon: antibiosis, or microbial antagonism, observed by his teacher, Louis Pasteur, founder of the institution and father of microbiology. The French genius had noted that *Bacillus anthracis* grew well in urine, but not in the presence of opportunistic bacteria. Although Pasteur had no time to steer away from his science out of mere curiosity, he took note of it. Others would strive to find an explanation (Barreto and Rodríguez, 2006). Metchikoff clearly saw that microorganisms (bacteria) struggled for a habitat and food; two of them could not fill the same space, so the idea of yogurt came up. The intestine of dysentery could host either the *Shigella dysenteriae* pathogen, or *Lactobacillus bulgaricus*, a predominant species in yogurt (cited by Barreto and Rodríguez, 2006). The experience was successful; as was the production and sale of yogurt, then widespread in France. Unfortunately, during further experiments, Metchnikoff went back to antibiosis, as he stated in his book *Prolongation of Life.* It was a streak of failed attempts to stop aging, a topic he worked on to his final days (Pelczar and Reid, 1966; Sanders, 2011). In spite of that, the existing antagonism among microscopic organisms had become known, but the probiotic concept would still wait a few years longer for disclosure.

Along the Twentieth Century, another concept would develop parallelly to related specialties. Thus, what was once known as "healthy food" gave way to "functional nutrients"; that is, food that apart from incorporating nutrients, also promotes health and wellbeing, and reduces the risk of acquiring disease. Within this category are phytonutrients, probiotics and prebiotics (Floch *et al*., 2011). Although the term has been taken up again, it should not be considered a Twenty-First Century discovery, as demonstrated below.

DEVELOPMENT

Probiotic stems from the Greek *probios* (for life), though there are contradictions as to who was the first one to use it in that sense. Some have given credit to Vergio (1954), who compared the adverse effects of antibiotics on intestinal microbiota with favorable actions due to factors he was unable to determine, calling them probiotics (Arribas, 2009). Although Lilley and Stillwell (1965) took over the term and enriched it in the sense of "substances secreted by a microorganism that stimulate the growth of another", Parker (1974) gave the term, and Vergio, more credit, by defining it as "all the organisms and substances that contribute to intestinal microflora balance". The title of the paper in which the proposal appeared is more than self-evident: *Probiotics, the other half of the antibiotic story*.

However, none of these elegantly written disquisitions would have come into existence in so many western minds, at least in the stated dates, if the Japanese pediatrician Minoru Shirota (1930), moved by Metchnikoff´s idea, had failed to isolate a *Lactobacillus casei* strain to survive the harsh conditions in the

digestive tract and settle successfully in the large intestine. Like his predecessor, Shirota was convinced that the secret for a long and healthy life depended on adequate balance of intestinal microbiota. In 1935 a company was founded (Yakult Honsha Co., Ltd.) in charge of producing and distributing Yakult overseas; it a kind of yogurt with a natural citric flavor achieved through fermentation of skimmed milk and sugar with *Lactobacillus casei* Shirota variety, the name then given to the isolate, also known as "Yakul strain". Whether the Japanese used the term probiotic or not, has not been established in this technical note; but he did deserve honors, by recognizing the merits won by the Ukrainian scientist, as a source of inspiration to develop a product that years later would mark a new era in human nutrition and health. Metchnikoff was a few years later recognized as the Father of Probiotics (Torres, 2002).

In the late Twentieth Century and the Twenty-First, new definitions of the term probiotic have been provided, along with alternatives for its use, and time has witnessed its successes and failures. Andrews (1992), put together probiotics with antibiotics, vitamins, minerals, organic acids, enzymes and oligosaccharides in one group, which was then called prophylactic agents, whose aim was to promote newborn and young animal survival and growth, a proposal that had been closely linked to livestock production systems to now, despite success on probiotics, as opposed to antibiotics (Rodríguez *et al.*, 2013).

One positive example is, undoubtedly, a proposal by Sanders (2011), to have single or mixed cultures of live microorganisms, which can be applied to humans or animals, benefitting the host by improving the original intestinal microflora properties. That definition could be more accurate if Schrezenmeir de Vewaw´s views (2001) had been taken into account: Preparations or products that contain specific organisms viable in sufficient amounts to alter microflora in the host´s compartments (by establishing or colonizing), thus producing beneficial effects. This variant explains the use of such products in ruminants and their successful results (Barreto and Rodríguez, 2010).

Wrapping up, it is useful to validate how much of that antibiosis there is in probiotics, apart from the debt of gratitude in its genesis. For that purpose, scientifically proven properties such as the ones below will be assumed.

1. Inhibition of intestinal and non-intestinal pathogens;
2. Inhibition of pathogen-produced toxins and foodstuffs;
3. Stimulation of enzyme production at enterocyte levels, producing an increase in nutrient absorption capacity, and;
4. Production of bioactive effect substances for the host (Corcionivoschi *et al.*, 2010).

That way, antibiosis is a component of probiotic activity, expressed in property 1 and partially in property 2. Appropriate probiotic selection, according to the species where it will be used, is one of the most important elements of success in this alternative, where two old-fashioned concepts have proven their validity.

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