Second World Yogurt Summit: what do we need to remember?

Every year, the Yogurt in Nutrition Initiative for a Balanced Diet (YINI) brings together scientific experts from all around the world to present recent progress in research on yogurt and health. While the reports on the first summit have just been published in the *American Journal of Clinical Nutrition* (1), the 2014 edition (#YINI2014) drew 250 health and research professionals to San Diego, California for the summit, which was held in conjunction with the 2014 Experimental Biology conference. The summit came to a perfect close with a tasting session featuring yogurt- containing recipes created by Ellie Krieger, the star dietitian of the Food Network USA, and contained in her new book "Weeknight Wonders".[1]

Introducing the conference, Professor Mauro Fisberg (Federal University of Sao Paulo, Brazil) covered the history of yogurt through the centuries, emphasizing its close links to the evolution of civilizations. In fact, yogurt is a very ancient food, and the first traces of it have been found between 5,000 and 10,000 years before Christ in the Neolithic Period. At that time, early humans already understood that yoghurt could be used to preserve milk by means of lactic fermentation, a trait that would be associated with yogurt for millennia. It was this trait to which the Turks, in the Middle Ages, first attributed the curative properties of yogurt. For several centuries, yogurt gained fame in Asia and Europe, where it was greatly enjoyed as a dessert. However it was not until the twentieth century, specifically thanks to Metchnikoff (a Russian bacteriologist who was one of the first to describe the benefits of yogurt) that it acquired a scientifically-accepted reputation as a healthy food. Today yogurt is a product defined by the United Nations Food and Agriculture Organisation (2) as a cultured milk product obtained by the necessary and exclusive presence of two strains of bacteria of lactic origin: *Lactobacillus delbruecki bulgaricus* and *Streptococcus thermophilus.* These two strains of bacteria are what give yogurt its unique consistency and also, through fermentation, make it easy to digest, especially for people who are lactose intolerant (3).

Different consumption habits from country to country

Nowadays yogurt can take different forms and be called by different names such as Da-Hi (India), Zabadi (Egypt), Raita (Asia and India), and Yogurt (USA). It is also widely recognized as a healthy food: it contains calcium with a high bioavailability, live fermentation cultures, and vitamins as well as lactose that is relatively easy to digest. European countries, including Russia, consume the largest quantity of traditional yogurts. Worldwide, yogurt consumers generally adopt healthier nutrition and lifestyle behaviors. This is particularly the case in France, where people who eat a lot of yogurt (more than six portions per week) have a healthier and more varied diet than those who eat less of it (zero to three portions a week) (4).

[1] http://www.amazon.com/Weeknight-Wonders-Delicious-Healthy-Dinners/dp/1118409493

Yogurt is beneficial from a very early age

Professor Luis Moreno (University of Zaragoza, Spain) reminded us of the critical need for dairy products at certain times in our life, particularly in childhood. In fact, the consumption of milk and dairy products has fallen in many countries over the last few decades among children and adolescents, with a significant proportion of them no longer meeting the dietary recommendations. For this age group, dairy products remain an important source of numerous micronutrients (calcium, phosphorus, magnesium, zinc, iodine, potassium, vitamins A, D, B_2 and B_{12}), as well as high-quality protein. The health benefits of dairy products have multiple health benefits, which begin early in life. Prof. Moreno summarized the conclusions of a recent literature review (5) that showed a neutral or an inverse correlation between the consumption of milk and dairy products in childhood and adolescence and the incidence of excessive body fat, dental caries and hypertension. These data are reinforced by the results of his work carried out as part of HELENA, a cross-sectional European study including nine countries (Greece, Germany, Belgium, France, Hungary, Italy, Sweden, Austria and Spain) that measures the risk factors for cardiovascular disease among a cohort of 511 adolescents (6). Prof. Moreno and his team have shown that the consumption of milk, milk- and yogurt-based drinks and yoghurt are associated with lower BMI, smaller waist measurements and a reduction in skinfold thicknesses (an indicator of body fat stores), and two cardiovascular risk factors. Moreover, for girls, dairy product consumption in general was associated with a significantly lower cardiovascular risk score.

An asset in appetite control

In the short term, yogurt helps appetite control and calorie intake, as Prof. Angelo Tremblay (Université de Laval, Canada) explained. According to this obesity specialist, the "satiation effect" of yogurt, or its ability to help you feel full, is mainly explained by the specific characteristics of yogurt and its consumption:

- it is usually a substitute for higher calorie foods that are less nutrient-dense;
- some of the nutrients it contains have specific effects: calcium and milk proteins are said to induce satiation, with either a reduction in food intake at the next meal or a delay in food intake;
- the food matrix of yogurt (the ratio of casein-to-whey proteins, added fiber, etc.) may also create conditions favourable to reducing appetite;
- the consumption of dairy products apparently has a positive impact on the secretion of certain hunger-reducing intestinal peptides (e.g. PYY);
- the addition of certain probiotics may favourably regulate intestinal flora.

These intrinsic properties of yogurt are consistent with research into the effect of regular yogurt consumption on long term weight control. In a recent study from the Framingham Heart Study which has followed a cohort of American adults since 1991 (7), consumers of at least three portions of yogurt per week gained less weight (-50%) over time and had a smaller waist measurement (-15%) than those who did not eat yoghurt. These results further corroborate the findings of a 2011 study (8) of more than 120,000 adult Americans, which concluded that the consumption of yogurt, fruit,

vegetables and whole grains was associated with a lower gain in weight over time, with yogurt consumption being associated with the least weight gain. During the poster sessions at #YINI2014, Prof. Martinez-Gonzalez also presented the results of a longitudinal Spanish study undertaken over a period of about six years, which indicated that major yogurt consumers (one yogurt per day) may be less susceptible to becoming obese or overweight (9). For Prof. Tremblay, although these data do not constitute proof that yogurt is a causal factor, they strongly support a link between yogurt and excess body weight, as well as the slowing of weight gain over time.

Protein-enriched yogurt: an ideal healthy snack?
The effect of milk proteins on satiation (fullness) may potentially have a dose-response relationship. Recently, a study (10) evaluating the impact of yogurt with different protein concentrations, in comparison to no afternoon snack, demonstrated that a snack consisting of a Greek yogurt, i.e. the yogurt with the highest protein content, reduced hunger the most and significantly increased the feeling of satiation.

The role of yogurt among older people
Yogurt and dairy products are useful for the very young and remain so for senior citizens. By way of example, yogurt helps encourage protein, calcium and vitamin D intake among post-menopausal women, particularly when it is enriched with these nutrients. Prof. René Rizzoli (University Hospital of Geneva, Switzerland) is the representative of the International Osteoporosis Foundation (IOF) at YINI. According to Prof. Rizzoli, studies agree that among post-menopausal women over the age of 50, the combination of an increased protein intake, vitamin D and regular physical exercise is associated with higher muscle mass and greater muscular strength. To come up with clinical recommendations for protein and vitamin D intake after the menopause in order to prevent musculoskeletal problems, Dr Rizzoli participated in a task force at the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) in 2013 (11). Although nutritional supplements were available, the working group recommended regular physical exercise at least three times a week, optimal dietary intake of vitamin D (800 to 1000 IU per day) and proteins (1 g per kilogramme of body weight per day), in particular high-quality proteins such as those found in dairy products.

Do the protein recommendations for older people need to be reviewed?
Yes, as far as Prof. Robert R. Wolfe (University of Arkansas for Medical Sciences, USA) is concerned. There is a need to emphasizethe importance of a protein-rich diet for senior citizens, not just to maintain muscle mass and strength, but also for cardiovascular and bone health (12). He suggested that the optimal protein consumption for elderly people is probably close to about 1.5g per kilogram of body weight per day (13) compared to 0.8 g/kg based on the US Dietary Reference Intakes, a requirement which the consumption of yogurt can help to satisfy without excessive calories. Due to its high quality amino acid composition, dairy products represent an undeniable nutritional advantage, particularly in comparison to vegetable proteins such as soy. This advantage is illustrated well

by the Digestible Amino Acid Score or DIASS, a new scoring system put forward by the FAO that allows the quality of protein to be determined on the basis of the volume of digestible essential amino acids it contains. Dairy products get the best results (140%), whereas the majority of vegetable proteins have a DIASS of less than 80%. The benefit of dairy proteins is therefore that they can provide all the essential amino acids that can be absorbed by the body more easily than vegetable proteins, with a lower calorie intake.

125 g of yogurt four and a half times a week: lower risk of diabetes!

Like obesity, diabetes and type-2 diabetes in particular is a disease that is becoming more and more common (14). This is the context in which the promising discoveries relating to the effect of yogurt on the development of type-2 diabetes were announced, in a presentation by Prof. Nita Forouhi (University of Cambridge School of Clinical Medicine, UK). Specifically, these discoveries highlight the need to consider more carefully in future specific foods (e.g. milk vs. yogurt), rather than broad categories (e.g. dairy products), in observational studies. The first results presented concerned the EPIC-Interact study (15) undertaken in eight European countries with a cohort of 16,835 individuals. Although the analysis of questionnaires on consumption frequency did not reveal an effect of the total dairy product intake on the risk of developing type-2 diabetes, higher consumption of a combination of fermented dairy products (cheese, yogurt and fermented milks) was associated with a 12% lower risk in comparison to lower consumption. In a second approach, the Epic-Norfolk 2 cohort further specified the role of yogurt in this protective effect. The study published in 2014 in the prestigious journal *Diabetologia* (16), included an exhaustive evaluation of a seven-day nutritional diary kept by 4,000 Britons followed for 11 years. The results revealed that people who regularly consumed fermented milk products with a low fat content (yogurt, cottage cheese, sour cream) presented a 24% lower risk of developing type-2 diabetes than those who did not consume them. When the researchers specifically examined people who consumed yogurt, they demonstrated (after excluding confounding factors) that people who regularly consumed about 4.5 pots of yogurt a week enjoyed a relative reduction in their extra risk of contracting type-2 diabetes, estimated at 28%. Scientists are now interested in the mechanisms underlying this protective effect. Among the hypotheses being followed up are the actions of certain substances in yogurt such as calcium, vitamin D and magnesium.

More yoghurt, less hypertension?

During the poster sessions, Dr Paul Jacques (Tufts University, USA) presented the results of a study showing the impact of yogurt consumption on metabolic diseases. Conducted among American consumers, this study demonstrated that each weekly portion of yogurt can reduce the risk of hypertension by 6 % (17).

What about the future?

The last speakers at #YINI2014 discussed the emerging scientific opportunities surrounding dairy products, particularly fermented products. Prof. Olivier Goulet (Hospital Necker-Enfants Malades, Paris, France) summarized the recent advances in the analysis of the composition and understanding of the function of intestinal microbiota. One of the key points that he stressed was the considerable impact of early microbial colonisation upon the health of the future adult. The specialist used the term "microbial programming" to explain this phenomenon, which can be disrupted in particular by premature birth, Caesarean section delivery or the use of antibiotics. Numerous recent research studies have clearly established a link between obesity and the composition and functions of intestinal flora. On this subject, certain studies have suggested a potential role for fermented milk products as well as probiotics and prebiotics in regulating the intestinal microbiota, among the future options that may contribute to the prevention of obesity as well as other pathologies such as inflammatory diseases or allergies. Certain probiotics, in particular specific strains of *Lactobacilli* and *Bifidobacteria*, may also affect the mood and/or behavior of an individual, especially stress and anxiety, as Dr John Bienenstock (McMaster University, Canada) emphasised. These effects can be explained by the bidirectional communication that is established between the brain, the nervous system and the intestine.

Closing the conference, Prof Toon Van Hooijdonk (Wageningen University, the Netherlands) reviewed the challenges faced by exponential worldwide population growth with the availability of food supplies (18). In this respect, dietary proteins will play a decisive role in the coming decades in meeting needs in the face of limited resources and the production of greenhouse gases. In the case of dairy products, the FAO is expecting an explosion in demand, with an increase from 700 billion to 1000 billion kg between now and 2050 (19). This demand will force the entire dairy sector to increase milk production by dairy cows by improving the animals' ability (which has already risen by about 25%) to convert poor quality proteins (i.e. vegetable proteins) into high quality proteins, while taking care to optimize their ecological footprint.

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