

There is no doubt that probiotic foods, especially yogurts, are having an increasingly significant impact on a health-conscious public. This is in spite of the fact that many of the claims made about these products regarding their prophylactic and therapeutic properties for certain human diseases are not yet substantiated.

In a book on probiotics (1), the editor – a scientist who worked in the former National Institute for Research in Dairying at Shinfield, UK – points out that the word ‘probiotic’ is derived from a Greek word meaning ‘for life’. It has had several different meanings attributed to it, although the author’s own redefinition of probiotics as ‘live microbial feed supplements which beneficially affect the host (animals) by improving their intestinal microbial balances’ appears to reflect current concepts adequately.

The editor traces the more recent history of probiotics back to the pioneering work and theories expounded by Elie Metchnikoff working at the Pasteur Institute in Paris at the beginning of this century. He linked the longevity of Bulgarian peasants with their high consumption of fermented milks which, he claimed, had a beneficial effect on their gut microflora.

In a more recent book (2), the same author – again acting as editor – brings the probiotic story more or less up-to-date. The work includes chapters on: probiotics and intestinal infections; antibiotic-associated diarrhoea; treatment by living organisms taken orally (probiotics); lactose maldigestion; antimutagenic and antitumour activities of lactic acid bacteria; and stimulation of immunity by probiotics.

In another review on probiotic foods (3), the author distinguishes between bioyogurts – in which intestinal strains of lactic acid bacteria are used – and traditional yogurts made with *L. delbrueckii* subsp. *bulgaricus* and *Str. thermophilus*. He traces the development of the use of lactic acid bacteria as probiotics and their use in bioyogurts.

Probiotics boom in Germany

A report in *Dairy Industries International* describes the dramatic growth in the German probiotic products market (4). Indeed, in no country is there greater interest in probiotic foods, especially bioyogurts, than in Germany – as indicated by the following reports.

The first (5) reviews the development of the probiotic milk product market and presents a prognosis of future trends. Apart from giving news about the activities of companies in this area, diagrams are presented on the turnover of probiotic products in Germany during two-month periods in 1995 and 1996.

In a comprehensive overview of probiotic cultures and the scientific knowledge concerning their role in human nutrition, a scientist from the Federal German Dairy Research Centre in Kiel, Germany (6), tabulates scientifically verified benefits of individual cultures used in probiotic products. He cites specific examples of research in which

Yogurt – Part 2

In the second part of his look at literature on the worldwide yogurt market, Ernest Mann reports on the probiotic sector

and discusses the possible health benefits of probiotic cultures and directions for future research.

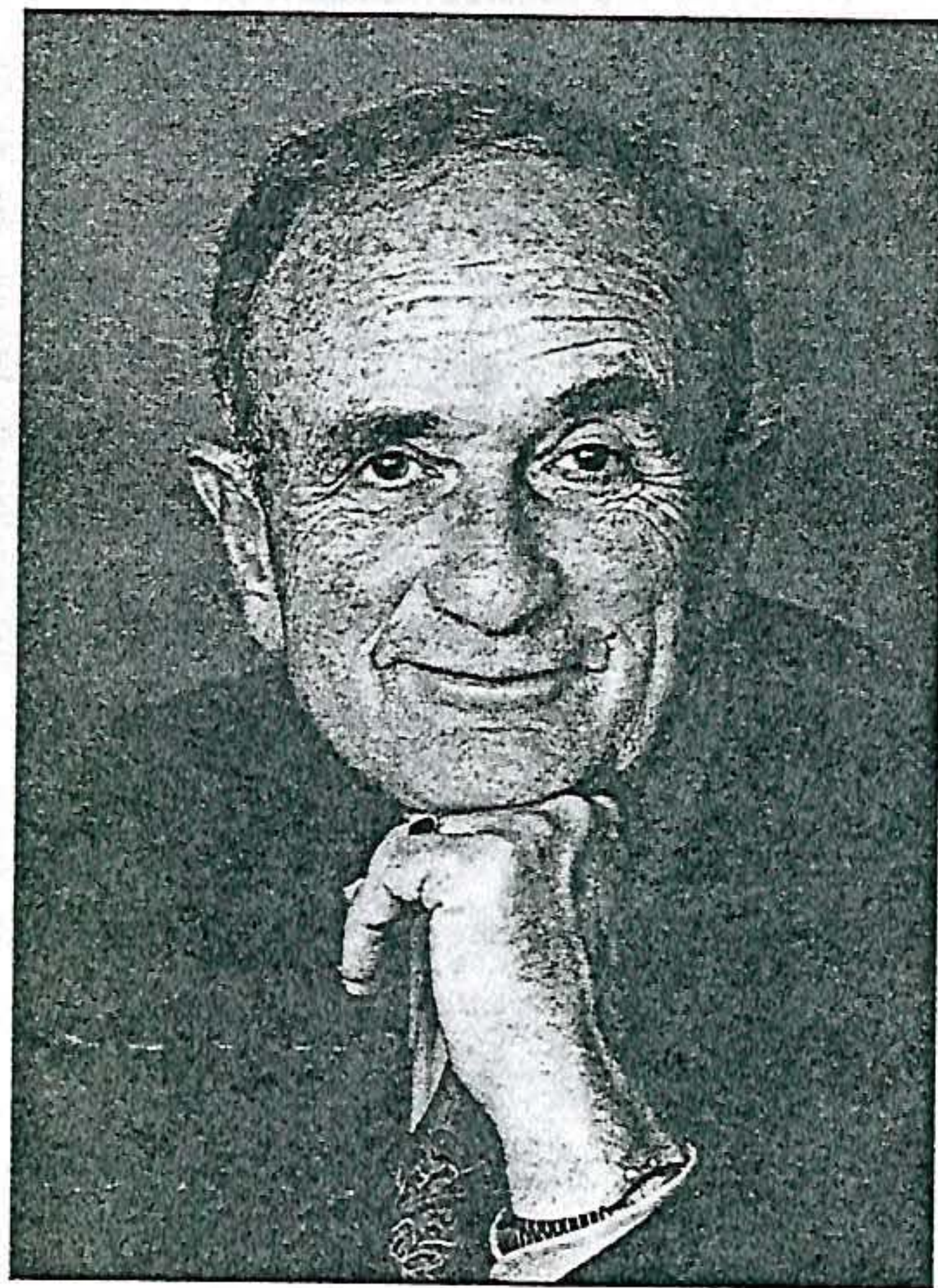
Another German scientist (7) has presented a critical analysis of probiotic bacterial populations in the yogurt sector with special reference to their potential effects on intestinal microflora. The beneficial effects of both aerobic and anaerobic probiotic cultures in the body are differentiated and the activation of the body’s own immune system by a beneficial intestinal microflora is considered.

Reference is also made to laboratory methods for investigating the intake and uptake of cultured products inducing antibody production. In a presentation at a Technical Dairy Conference in Ahlem, Germany (8), the author recommends measures to counter misleading advertising claims regarding probiotic milk products. He advocates extensive scientific research into the effects of probiotic cultures in light of the unreliability and insufficiency of much of the current information available.

A German clinician (9) has reviewed literature on the use of probiotic milk products in the nutrition and medical treatment of human subjects. He offers a ‘shopping list’ of claimed beneficial effects in the treatment of a wide range of medical conditions.

The last review from Germany (10) covers the following topics: definitions of probiotics, probiotics and synbiotics; the history of the probiotic principle; probiotics in use in Germany and Central Europe; the principle of efficacy in the use of probiotics; problems of stability of probiotic cultures; and safety aspects in the use of probiotics.

“He linked the longevity of Bulgarian peasants with their high consumption of fermented milk”



The Yakult phenomenon

No probiotic milk product has generated more interest worldwide in recent years than the Japanese Yakult product. A German article (11) concentrates chiefly on the manufacture of the product in Germany, although it is also made in the Netherlands, Belgium and the UK.

For Yakult production, special *L. casei* Shirota cultures are flown in from Japan and added to reconstituted skim-milk. After incubation at 37°C for six days, sugar and flavourings are added. The mixture is then diluted with sterilised water, homogenised and packaged in 65ml bottles. The typical yellow-brown colour of the product results from a Maillard reaction over a two hour period during which the initial mixture is held at 98°C. The final product contains 40% milk and has a pH of 3.4.

The capacity of the German subsidiary plant, at two million units per week, was the subject of a planned increase to one million units per day by the end of 1997. Although sales in Germany were running at 13,000 units per day, it was hoped to increase the sales level to 500,000 units per day by 2001.

In a recent comprehensive review of probiotic bacteria, going back to Metchnikoff who is described as the ‘father of

probiotics' (12), reference is made to numerous studies claiming to prove that probiotic milk products can have beneficial effects on various diseases. The conditions studied include diarrhoea in children, inhibition of pathogenic bacteria, allergic dermatitis, food allergies, lowering of blood cholesterol, and bladder cancer control.

In terms of the marketing of probiotics, there is currently considerable innovation and competition worldwide, as illustrated by the expansion of the Yakult company outside Japan and the alliances formed with the Finnish company Valio, which has negotiated over 16 licensing agreements for its manufacture in different parts of the world. The European probiotic market alone is currently estimated to be worth in the region of £520 million.

Several large-scale projects examining the role of probiotics in health and disease are underway. The European Union, for example, is currently supporting a probiotics project costing over two million ECU. Nine European research partners – including Nestlé, Arla, Valio, Hansen, as well as researchers in Finland, the Netherlands, Italy and Ireland – are collaborating. The issues under scrutiny embrace the safety and effects of probiotics in healthy individuals and in patients with inflammatory bowel disease.

In a critical overview of the effects of probiotic milk products on human health, a researcher from the Swiss Federal Institute of Dairy Research at Liebefeld-Bern (13) discusses both the claimed positive and negative effects on humans. Among the claimed positive effects are those of *L casei* on diarrhoea caused by rotaviruses, and those of *Enterococcus faecium* and *L acidophilus* on cholesterol levels. The possible negative effects of probiotic milk products on people with weakened immune systems are also considered.

Croatian scientists (14) have demonstrated *in vitro* that *L acidophilus* M92 possesses antimicrobial activity against enteropathogenic, sporeforming and fungal microorganisms. The study also indicated that *L acidophilus* M92 had a high chance of survival in the gastrointestinal tract.

Not entirely conclusive were the results of an Israeli study (15) on the comparative effects of the ingestion of pasteurised yogurt versus yogurt containing live *L acidophilus* on the prophylaxis of recurrent bacterial vaginosis and *Candida* vaginitis. However, the results indicated that a daily ingestion of 150ml of the probiotic yogurt was associated with an increased prevalence of colonisation of the vagina and rectum by the probiotic strain, possibly with reduced episodes of bacterial vaginosis.

The first of three Indian studies (16) was concerned with the preparation and evaluation of yogurts made with *L acidophilus* strains 301 and 1899. Yogurt made with the former strain exhibited inhibitory activity towards enteric pathogens while that made with the latter strain exhibited a hypocholesterolaemic effect. No significant differences in compositional, textural or sensory properties between traditional and probiotic yogurts were observed, although the

latter product contained lower levels of acetaldehyde.

The second Indian study (17) was concerned with the comparative characteristics of cultured milks, traditional yogurt and probiotic yogurts made from fresh milk or pre-refrigerated milk. The third (18) covered a quality comparison of traditional and probiotic yogurts prepared from milk pre-cultured with two different strains of psychrotrophic *Pseudomonas* spp.

Data from a controlled study involving human subjects – carried out in the Netherlands (19) – demonstrated the effectiveness of a newly developed cholesterol-lowering yogurt made by culturing milk with traditional yogurt cultures and by adding two strains of *L acidophilus* as probiotics. During a three week trial, 30 men consumed three 125ml portions of the yogurt daily in combination with breakfast, lunch and dinner. This resulted in significant reductions in total serum cholesterol, low-density lipoprotein (LDL) and the LDL:high density lipoprotein ratio compared with control subjects not given the yogurt.

The first in a series of research reports from Australia (20) on different aspects of probiotic bacteria and probiotic yogurts is concerned with the effects of freeze-drying and storage on the microbiological and physical properties of AB-yogurt. The second report (21) covers the results of a study on the viability of yogurt and probiotic bacteria in yogurts made from commercial starter cultures. The study showed that the viability of probiotic strains of bifido bacteria and *L acidophilus* in the presence of traditional yogurt cultures is improved when the dissolved O₂ concentration is low in the product.

The following three Australian studies, all from the same Research Laboratory at Victoria University of Technology, Werribee Campus, were all concerned with different attempts to improve the viability of *L acidophilus* and *Bifidobacterium* spp in yogurt. In the first of these studies (22), it was demonstrated that the viability of probiotic bacteria in yogurt is improved when ruptured cells of traditional yogurt cultures are used in combination with whole cells of the probiotic bacteria without compromising flavour.

The effectiveness of ascorbic acid as an O₂ scavenger in improving the viability of probiotic bacteria in yogurts made with commercial starter cultures was less clear (23). The viability of both types of bacteria were assessed during manufacture and 35 days storage of yogurts supplemented with four levels of ascorbic acid using four commercial starter cultures.

In a similar study (24), the effects of four different levels of cysteine on the viability of yogurt bacteria and probiotic bacteria were tested during the manufacture and storage of yogurt. But the results were inconclusive.

Finally, a rare report from China (25) refers to the characteristics of probiotic strains of *Lactobacillus* and *Bifidobacterium* with special reference to their ability to grow in acid, alkaline and neutral culture media. □

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