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Sent: Thursday, 13 June 2002 12:01
To: dietandhealth@who.int
Subject: Joint WHO/FAO Expert Consultation Report

Referring to the draft Report on the "Diet, Nutrition and the Prevention of Chronic Diseases" I attach information of three recent publications to be considered in preparing the final recommendations.

I have long been concerned about the future of milk production, if the fat component of milk is not used, since milk belongs to the most complete food stuffs available for humans. The genetic correlation between its protein and fat contents is c. 0.6 and that between the yields 0.8.

On page 13 of my own paper I mention that there are about twice as much permanent grasslands and pastures than cultivated areas or tree plantations in the world. In many developing countries this important to remember in planning the nutrition of people.

On the basis of my education in biology, genetics, agriculture and statistics I have appreciated the many-sidedness of milk and wanted to utilize the interactions of its different components, by using ca. 0.6 l whole or 3.9% milk daily. I filled 75 years 2 weeks ago and have not used pills or spent time in hospitals.

Sincerely,

Kalle Maijala
Prof. Emer.

Position paper (Livest. Prod. Sci 65 (2000): 1-18)

COW MILK AND HUMAN DEVELOPMENT AND WELL-BEING

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Abstract

Fifty years ago animal foods were considered complete foods and important for human health. In most developed countries substantial dairy cattle and milk production industries existed which made major contributions to human welfare including the provision of cow milk to infants and young children.

Then, over the last forty years, hypotheses have been developed largely by the medical profession and associated fields of research on the unfavourable roles of dietary cholesterol (DC), animal fats and serum cholesterol (SC) in coronary heart diseases (CHD). These postulates resulted in new and strange equalities such as $DC + \text{animal fat} = SC = \text{CHD}$. These hypotheses were followed by simplistic dietary recommendations with warnings against animal fats. These warnings have been heeded by the medical profession in many developed countries and under medical authority large sections of the public have made dietary changes and the per capita consumption of milk has fallen.

More recently other risk factors have been found for CHD, and knowledge of their relative importance has increased. Understanding has grown over the question of versatility, optimums and interactions between nutrients. Other new factors in this field include: the minor effect of DC on SC, the U-shaped effect of SC on total mortality in men with no effect in women less than 50 years of age, positive effects of other milk constituents on SC, different effects of high density C (HDL-C) and low density C (LDL-C) and of saturated, monounsaturated and polyunsaturated fatty acids (SFA, MUFA, PUFA) on CHD risk, the harmful effects of *trans*-FA, the meaninglessness of the P/S ratio, the medical and non-medical side effects of lowering SC and the high heritability of SC. These new recoveries have not been given the publicity accorded to the original hypotheses. It is the aim of this paper to seek a balanced review of the subject in the light of new scientific evidence. Further the broader implications of the topic for society, human development and well-being are also considered.

Thus there are two main theses in this paper. One is to review the hypotheses of the relationship between cow milk and human coronary heart disease. These hypotheses are examined and their original historic deficiencies are discussed. This is followed by the new and emerging scientific evidence to support, question or refute these original hypotheses. The second major thesis in this paper deals with the impact which these hypotheses have had upon the pattern of human nutrition which are reflected in many important economic, social and other nutritional issues, all of which merit attention. It is considered inadequate to base general recommendations in the field of human health and well-being solely or mainly upon postulations about the relationship between milk and CHD without taking into account the larger and more complex issues. In addition to the general field of human health, the consequences of these hypotheses include the responses of the dairy production and processing industries. For example, if the hypotheses are reliable, tested and to become basic components of human nutrition, then the milk production industry has to reshape its system to produce a product more suited to the changes in consumption. If however, the assumptions are not substantiated permanently the such a re-tooling of milk production is futile. Milk production represents a major component in global food production and the implications of change are enormous. Issues to be considered include the efficiency of dairy cow in converting plant material, inedible to humans, to a human food of high nutritional value, the economic and nutritional contribution of dairy cattle production systems to beef production, the strong genetic correlations between the fat content, the protein content and the yield of milk per cow, the slowness of achieving changes in milk composition in bovine species with low reproductive rates and long generation intervals, and interactions between nutrients.

Further, there are other broader issues including the incidence of other human conditions and diseases besides CHD, which can be affected by the presence or absence of milk in the diet, the genetic differences between individuals and human races, the need to address the hunger of the world's human population and further economic, social and psychological factors. Many questions need research to find sustainable breeding goals and milk production systems which are related to the reality of how milk contributes to human development and welfare.

The paper concludes by considering the negative impact which the questionable hypotheses have had upon an important component of food production, namely dairy cattle farming which historically has contributed enormously to human development and welfare. The author considers there is a vacuum of knowledge here which cannot be filled simply by expertise in the medical field alone. The issue is a prime candidate for interdisciplinary research.

Abbreviations: C=cholesterol; CHD=coronary heart disease; CLA=conjugated linoleic acid; DC=dietary C; FA=fatty acid; HDL-C=high density lipoprotein C; LDL-C=low density lipoprotein C; MUFA=monounsaturated FA; PUFA=polyunsaturated FA; SC=serum C; SFA=saturated FA; TC=total SC.

Keywords: Animal fat, Animal protein, Cholesterol, Diet, Health, Heredity, Interactions, Milk, Mortality, Optimum, Versatility

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Tejgazdaság LXI: 2:2001: 1-10 (with English abstract and titles)
NUTRITIONAL VALUE OF MILK BASED ON THE LATEST RESEARCH FINDINGS
 Szakály,S., Schäffer,B., Horn,P., Sarudi,Cs., Szakály,Z. & Dohy,J.

Abstract

Authors briefly survey all natural and induced bioactive components of milk and their physiological effects which have been explored by the world research at the end of the 20th century.

They state as the summarized results of this research that among the world's foodstuffs milk and dairy products are the richest in bioactive materials, this statement applying to all micro- and macrocomponent groups of milk, including the much-maligned milk fat.

While the bioactive materials of milk fat are effective primarily in the struggle against cancer, the effects of bioactive milk protein components are many-sided. Some of them are opioid agonists and opposing groups, immunostimulants and immunomodulators, binders of fatty acids, vitamins and elements, regenerators of scarf-scin, having insulin-like effect, while others have antihypertensive, antithrombotic, antimicrobial, anticarcinogenic and antiatherogenic effects. It should be mentioned that whey proteins are richer in bioactive materials than casein.

Lactase became valuable mainly due to the production of prebiotics (lactitol, lactulose etc.) and consequently to the promotion of probiotics, but it also plays a role in calcium absorption as an adjuvant.

Of the minerals, milk calcium plays a role not only in the protection of healthiness of bones and teeth but also in decreasing high blood pressure, and in the prevention of colon cancer and kidney stone formation. It is advantageous that milk contains three times more potassium than sodium. The antioxidant milk selenium decreases the risk of arteriosclerosis and cancer and also slows the aging process.

Protective effects of different milk vitamins, e.g. vitamin A, β -carotene, vitamin E and vitamin C are well known. Recent discovery is the role of folate-binding proteins, vitamin B6 and B12 and folic acid of milk in the prevention of hyperhomocysteinemia causing arteriosclerosis and thrombus formation by itself.

Recent research emphasizes the importance of naturalness of milk, its contribution to maintenance of acid-base balance of the organism and the fact that milk is protected against prions of BSE-disease.

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BENEFICIAL NATURAL BIOACTIVE SUBSTANCES IN MILK AND COLOSTRUM

Eds: Schrezenmeir, J., Korhonen, H., Williams, C.M., Gill, H.S. & Shah, N.

Foreword: During the last two decades, increasing research interest has been paid to identifying dietary components that have a measurable impact on human biology. Within this framework, the term "bioactivity" has arisen as a loose definition encompassing "food components that can affect biological processes or substrates and hence have impact on body function or condition and ultimately health".

While it may be argued that any dietary component, consumed in great enough quantity, will be likely to impart a biological effect of some description, the definition of bioactivity is usually refined by two caveats:

- (1) That for a dietary component to be considered "bioactive" it should impart a measurable biological effect at a physiologically realistic level;
- (2) That the "bioactivity" being measured has the potential (at least) to affect health in a beneficial way, thus excluding from this definition potentially damaging effects (such as toxicity, allergenicity and mutagenicity, which are undoubtedly a reflection of "bioactivity" in its broadest sense).

The range of physiological processes that can be affected by dietary bioactivity is vast, and includes functions related to digestion, nutrient absorption and post-prandial synthesis; mineral uptake and assimilation; the functioning of the intestinal microflora; hepatic and pancreatic turnover; and effects on the brain, cardiovascular and immune defence systems. The challenge to the practical researcher is to identify what food components constitute bioactivity, and to determine whether these influences are sufficient to affect health.

Bovine colostrum and milk represents a unique source of bioactive substances from a major dietary constituent. Human studies have clearly identified maternal milk as a biologically active fluid, and the degree of homology between bovine and human proteins at least suggests that many bioactive substances in bovine milk should have the potential, at least, to impact on human physiology. Indeed, over the last two decades, an increasing body of scientific evidence has accumulated to indicate that several physiological processes are indeed affected by bovine milk components.

This collection of review papers summarises and synthesises our current state of knowledge with respect to the bioactivity of bovine milk and its molecular components. In the first section, an overview is presented of those bioactive substances that have been identified in bovine milk and colostrum, including their purported bioactivity and physiological levels of biologically active components. In the second section, discussions of biological activity are expanded to draw in those areas where milk-borne bioactive substances have been shown to have an influence on physiological processes, paying particular attention to short-falls in our current knowledge base, and the potential for development of milk-based foods that can utilise bioactivity to improve human health.

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Effects of milk-derived bioactives: an overview (N.P. Shah)

Occurrence, biochemical and technological characteristics of bioactive substances (15 papers, 108 pp.)

Physiological effects and potential health benefits (5 papers, 47 pp.)

Natural bioactive substances in milk and colostrum: effects on the arterial blood pressure system; In vivo antimicrobial and antiviral activity of components in bovine milk and colostrum involved in non-specific defence; Bovine milk antibodies for health; Effects of bioactive substances in milk on mineral and trace element metabolism with special referencer to casein phosphopeptides;

Bioactive substances in milk with properties decreasing risk of cardiovascular diseases (M.Pfeuffer & J.Schrezenmeir)

Abstract: Milk is often seen as a potential promoter of atherosclerosis and coronary heart disease because it is a source of cholesterol and saturated fatty acids. But there are several studies indicating that milk and milk products may not affect adversely blood lipids as would be predicted from its fat content and fat composition. There are even factors in milk and milk products which may actively protect from this condition by improving several risk factors. Calcium, bioactive peptides and as yet unidentified components in whole milk may protect from hypertension, and folic acid, vitamin B6 (pyridoxine) and b12 (cyanocobalamin) or other unidentified components of skim milk may contribute to low homocysteine levels. Conjugated linoleic acid may have hypolipidaemic and antioxidative and thus antiatherosclerotic properties. Epidemiological studies suggest that milk and milk products fit well into a healthy eating pattern emphasizing cereals and vegetables.

Anticancer properties of bovine milk (H.S.Gill & M.L.Cross)

Abstract: Improved means of cancer prevention and treatment remain key goals of global health programmes. This is particularly true in Western society, where the elderly represent a large proportion of the population, and where the likelihood of tumour development is compounded by risk factors such as poor fibre/high fat diets and environmental pollution. Dietary intervention represents an attractive, non-invasive means of providing anticancer preventive and therapeutic benefits to at-risk individuals. This review focuses on the evidence for anticancer properties of bovine milk and milk-derived components. Evidence of a role for whole milk constituents, as well as purified minor components, in combating tumorigenesis is outlined. Shortcomings in current studies are highlighted, and future opportunities for targeted research to characterize important anticancer properties of milk are discussed.

