Report

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Nutrition and human development

The 2005 Marabou conference focused on the nutritional issues behind differences in ethnic sensitivities to the principal disease burdens of our time (1).

The conference took as its starting point the nutritional transitions during the last century and the importance of the availability of both macronutrients and key micronutrients for the growth and development of children. New knowledge about vitamins and other nutrients, together with wartime food and nutrition policies, improved the situation in Western countries dramatically. However, the disease pattern changed in the Western world, with a rapidly rising incidence of coronary artery disease and some cancers. The cardiovascular deaths then fell, whereas obesity and type 2 diabetes have been recognised as major problems in the last decade. The lower and middle-income countries are now being nutritionally transformed with a concomitant rapid increase in heart disease and diabetes. In particular, abdominal obesity seems to induce greater health problems in the lower and middle-income countries of the developing world, even at rather modest weight gains. Foetal malnutrition and later inappropriate diets seem to be particularly related to the escalation of diabetes and cardiovascular disease in these countries. The molecular, cellular and nutritional basis of these linkages was the overriding theme of the conference.

Foetal programming and epigenetics

Both human epidemiological studies and animal experiments show that altered nutrition during development could permanently affect the metabolic responsiveness of the offspring. Epigenetic mechanisms seem instrumental in these adaptations. Methylation of DNA is one mechanism for altering gene expression and also the reactivity of these genes to metabolites. The genomic imprinting by methylation can affect not only the developing individual, but also the foetal gonads, and thereby the next generation, i.e. even the grandchild of the exposed mother.

Key nutritional factors in pregnancy

Although nutrition in pregnancy has been recognised as important for a very long time, there is still uncertainty about the nutrient needs in pregnant women. New evidence now suggests that the availability of non-essential rather than essential amino acids is important for the length of the baby at birth and in infancy. The mother's long-term intake of essential fatty acids, particularly the n-3 long-chain fatty acids, seems important for normal visual and brain development. The importance of adequate folate intake in early pregnancy is now well established, and new evidence from India suggests that maternal vitamin B_{12} deficiency may be important in explaining limited tissue growth in small children. The crucial role of iodine both in pregnancy and throughout life is well established, and iron is also crucial at critical stages in brain development.

New growth standards and their implications

The recently developed new growth standard curves for 0–5-year-old children highlight the importance of prolonged breast-feeding for ensuring both adequate and appropriate growth of the infant. These curves, obtained from children born to affluent, non-smoking women in the USA, Norway, Ghana, Oman and India, show a remarkably similar growth pattern despite the different environmental and genetic background and epigenetic conditioning of the mothers. The reasons for the great variation in, for example, adult length, however, are not known.

The nutrition transition: a new scientific and public health challenge

The increasing overweight in women entering pregnancy is accompanied by a marked increase in gestational diabetes and a previously unseen rise in the prevalence of large babies. This is accompanied by increased risks of foetal malformations, obesity and type 2 diabetes, as well as damage to mother and child during parturition. These increasing health problems in two-thirds of the world's population present new public health challenges that have to be addressed urgently, despite our still poor understanding of the extent and reversibility of the epigenetic and other nutrient-related changes in organ and metabolic programming.

Reference

1. Nutrition and human development. Nutr Rev 2006; 64 No. 5 (Part II): S1–S92.

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