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Diet and the unborn child

The omega point

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Omega-3 fatty acids are a crucial component of a healthy diet—particularly, it seems, for pregnant women wanting bright, sociable children

THERE is an old joke that goes, “I'm on a seafood diet—I see food and I eat it.” Sadly, these days, the average see-food diet doesn't include enough seafood, even though fish are a good source of a group of nutrients known as omega-3 fatty acids.

It has been known for some time that omega-3 acids are important, but data from a long-term study of British children suggest they are even more important than had previously been realised. In particular, the amount of omega-3 in a pregnant woman's diet helps to determine her child's intelligence, fine-motor skills (such as the ability to manipulate small objects, and hand-eye co-ordination) and also propensity to anti-social behaviour.

That, at least, is the conclusion of Joseph Hibbeln, a researcher at America's National Institutes of Health who has been working with a set of data from the Avon Longitudinal Study of Parents and Children. The Avon study was begun 15 years ago by Jean Golding, of the University of Bristol, with the aim of unravelling the genetic and environmental pathways that predispose children to disease. It contains data on 14,000 expectant mothers and their offspring.

Dr Hibbeln and Dr Golding have been examining this data bank for the effects of maternal nutrition—in particular, the effects of omega-3 intake. Dr Hibbeln announced their conclusions on January 17th at a scientific meeting organised in London by the Institute of Brain Chemistry and Human Nutrition.

Perhaps the most startling finding was that the children of those women who had consumed the smallest amounts of omega-3 fatty acids during their pregnancies had verbal IQs six points lower than average. That may not sound much, but it would have a serious effect on a country's brainpower if it were widespread. And the finding is particularly pertinent because existing dietary advice to pregnant women, at least in America, is that they should limit their consumption of seafood in order to avoid exposing their fetuses to trace amounts of brain-damaging methyl mercury. Ironically, that means they avoid one of the richest sources of omega-3s.

Dr Hibbeln, however, says his work shows that the benefits of eating such fish vastly outweigh the risks from the mercury in them. Indeed, in the Avon study, it was those children exposed to the lowest levels of methyl mercury who were at greatest risk of having low verbal IQ.

The researchers' second finding was that at 3½ years of age, those children with the best measures of fine-motor performance were the ones whose mothers had had the highest intake of omega-3s. Their third finding was that a low intake of omega-3s during pregnancy led to higher levels of pathological social interactions such as an inability to make friends as a child grew up.

Dr Hibbeln said that the “frightening data” showed how 14% of those seven-year-olds whose mothers had had the lowest intake of omega-3s during pregnancy demonstrated such behaviour, compared with 8% of those born to the highest-intake group. This is particularly worrying in the light of work which shows that pathological behaviour in childhood is a good predictor of a lifetime of aberrant behaviour.

Some caution is needed. Studies such as this one, which rely on correlating one variable with another, are not enough to draw firm conclusions on their own, since correlation is not necessarily causation. But these results are supported by several lines of data. One is that the graphs show “dose response” curves—in other words, different levels of omega-3s have different effects. There is also a lot of experimental work showing that omega-3s have behavioural effects on adults. One of Dr Hibbeln's other studies, for example, showed that omega-3 supplements given to violent alcoholics reduced their anger levels by a third within three months.

It also helps to have a plausible mechanism, and Dr Hibbeln thinks there is one. Research published in 2000 by a group in Canada showed that giving omega-3 supplements to piglets doubled the levels of molecules called serotonin and dopamine in the frontal cortexes of the animals' brains. One of serotonin's jobs is to show growing nerve cells how they should connect from the frontal cortex, where reasoning takes place, to the limbic system, the seat of many emotional responses. That is, at the least, suggestive.

Six of the worst

Dr Hibbeln's study concentrated on omega-3 intake directly. But there is a second way that its level might be reduced—by competition with a similar group of fatty acids called omega-6s. Indeed, it may be the ratio of omega-3 to omega-6 in the membranes of cells—particularly nerve cells—which is at the root of the problem, since this can affect the ability of messenger molecules to pass through the membrane. The average cell membrane of an American, whose diet is low in fish and high in omega-6-rich vegetable oils, contains 20% omega-3-based lipids and 80% omega-6-based ones. (Some 10% of American calories now come from linoleic acid in maize and soya oils, the principal sources of omega-6s.) In a Japanese cell membrane, by contrast, the

figures are 40% and 60% respectively. The upshot is that Japanese-type cells may be a lot more sensitive to messenger molecules than American-type cells.

The wider social ramifications of such results are unknown, but they may not be negligible. For instance, two reports published by British charities earlier this week, one from the Mental Health Foundation and the other from Sustain, a group that campaigns for better food, claim that changes in diet over the past 50 years—particularly changes in omega-3 and omega-6 consumption—are an important factor behind the rise in mental ill-health in Britain. An old proverb suggests that you are what you eat. If Dr Hibbeln and Dr Golding are right it seems you act what you eat, too.