Malnutrition and Brain Damage

Causes of Faulty Myelination

Malnutrition may produce permanent brain damage by preventing the proper formation of the myelin sheath, the fatty covering of nerve fibres. The myelin sheath once it is established, is one of the most metabolically stable structures, in the animal body. This has been shown by incorporating radioactive isotopes in the myelin constituents of growing animals and seeing how long it remains. In the experiments it was found that the radio-activity persisted for more than a year with little loss, proving that the sheath was not appreciably altered during that time.

Faulty myelination may be produced by disease or nutritional disorder. Some idea of the extent of such effects can be obtained by studying the metabolism of neutral lipids (fats) and from an examination of changes that occur in the lipid composition of brain and spinal cord, as more than half the total brain lipid is located within the myelin sheath.

Vulnerable Period

Prof. A.N. Davison, of Charing Cross Hospital, London, and his colleague Dr. John Dobbing have been studying the build-up of lipids in animals and found that this was most active during the period of myelination, while in adults the synthesis of myelin lipid in the nervous system was low. This led them to believe that the period of myelination may be the most vulnerable period of development. Restrictions at this time could interfere with myelination and cause permanent damage.

The theory explains why the adult brain is better protected against the effects of starvation while the young developing brain is so vulnerable. Dr. Dobbing has found, for example, that adult rats fed only on sucrose lost a lot of body weight but no significant brain weight. However, in other experiments dietary restrictions applied to suckling rats produced change in their brain weight.

Rehabilitation Experiments

Poor mental performance might be related to restrictions on the developing brain. It has been shown, for example, that changes in learning behaviour resulted from feeding under-nourished male rats for eight weeks on a protein-deficient diet.

The question as to the permanence or not of such effects on intellectual performance is clearly of considerable importance. Rehabilitation experiments have been carried out in developing rats and pigs after they had been subjected to various periods of under-nutrition. In one series of experiments by Dr. Dobbing, piglets were underfed for a year, and rehabilitation for two years on an unrestricted diet failed to restore brain and body weight to that of a normal three-year old animal. When rats were undernourished for short periods, or when the undernutrition occurred late in development it proved possible to restore both brain and body weight to normal.

Children suffering from kwashiorkor, a milignant malnutritional disease found mostly in African children, become listless and apathetic. Any more lasting mental effects that may be found might possibly be related to the effects of protein undernutrition on the developing brain, for some deficiency in the myelin lipids has been found in children dying from the disease.

Tethered Mosquitoes used in Fight against Elephantiasis

TETHERED mosquitoes, flying in a stream of air but not moving, are being used in the fight against the tropical disease elephantiasis.

At the University of Liverpool, the insects are under study because the worm that causes the disease is carried by mosquitoes. Changes of wing-beat frequency are being examined, because during a part of its life-cycle the worm lives in the flight muscle of the insect, so changes in infected mosquitoes' flight performance may require changes in control measures against the carriers.

Cause of Disease

Elephantiasis is caused by blockage of the lymphatic glands and channels by parasitic worms, called filariae. Legs—and arms—can become swollen to monstrous proportions. The worms are transmitted by mosquito bites. They mature in the human body and then release millions of microfilariae into the blood stream, from where they are taken up again by mosquitoes feeding on blood for the round to begin again.

Flight muscle is the power plant of the mosquito's wings and it is richly supplied with oxygen and nutrients. The parasitic larvae feed on this and, of course, affect the mosquito's flying capabilities. The aim of the Liverpool research is to find out how much the effect is, by measuring the wing-beat frequency and other things such as duration, speed and range of flight.

Wind Tunnel

The mosquito is tethered by a dab of glue onto an entomological pin, being fixed in the correct

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