

Nutrition and the brain

Nutrition and the Brain. Vol. 1: Determinants of the Availability of Nutrients to the Brain. Pp. xi+324. Vol. 2: Control of Feeding Behaviour and Biology of the Brain in Protein-Calorie Malnutrition. Edited by Richard J. Wurtman and Judith J. Wurtman. Pp. 313 (Raven: New York, 1977.) £19.50 each volume.

A NUMBER of years ago a distinguished neurochemist remarked that if people continued to take up neurochemistry at the rate obtaining at the time, then everyone in the world would be a neurochemist long before the end of the millennium. The rate at which books about nutrition and the brain have recently appeared seems to threaten a comparable natural disaster; and here are two more. The fact that your reviewer seems to be one of the few workers in the field who has not yet found the energy to produce one, may be the reason for a certain weariness, if not sourness in his approach and a developing propensity for denunciatory overstatement. But at least it will be agreed that a field with so much contemporary competition demands more than usual justification from the late arrivals.

Someone, somewhere, will find almost all of them very useful; but unfortunately the very misleading title of the series, *Nutrition and the Brain*, will not lead the literature surveyor to many of the better chapters unless they appear separately in the indexes under such headings as 'Cerebral Energy Metabolism', 'The Natural Diet of Primates', and so forth. However widely one interprets the word 'Nutrition', and however all-pervasively 'the Brain' controls the rest of physiology, the Editors have surely assumed too readily that their subject encompasses the whole of nutritional biochemistry and neurobiology.

Thus, if the young scientist entering the field happens to be fascinated by evolutionary aspects of the natural diet of Primates, then he will be as entranced as was your reviewer by the erudition of the first long chapter. But who is to blame him if he reflects that all the mammalian orders grow remarkably similar brains (in compositional and metabolic terms at least) whether they are gatherers or hunters, carnivores or vegetarians, ruminants or rodents; and that these matters are therefore unlikely to concern him. If he is a neurochemist, he will already have read one of Sokoloff's other excellent accounts of cerebral energy metabolism. If he is not, I suspect he

will not be much helped, even by such a classic account, until we reassure him that the subject is not one which bears at all directly on the problems of the starving billions or overstuffed millions of this wicked world.

The chapter on amino acid availability to the brain may at first sight seem more relevant, especially to those who have not yet caught up with the 'protein fiasco' and still believe that what the Third World needs most of all from us is steak. The whole topic of the blood-tissue relationships of the brain with regard to amino acids is a marvellous one for those interested in transport mechanisms or in certain in-born errors of metabolism. It is, however, of no direct interest in the present context.

It has been known for some time that certain putative neurotransmitters are synthesised within the brain from particular precursor amino acids; that the blood levels of these latter influence the brain levels of the former and are themselves influenced by dietary intake. It therefore persuasively follows that in this particular instance, something about the diet influences substances which are held to be to do with sleep, or mood, or otherwise with neurotransmission. This leads by delightful prestidigitation to the argument that since, under *in vivo* conditions, one metabolic pathway in the brain can be shown to be controlled by precursor substrate concentration; and since the latter is often derived from dietary sources, then who knows but that all the other metabolic pathways may not ultimately be under nutritional control as well? We can therefore discuss as many of them as we please. I suppose it depends what you mean by "ultimately". If this kind of argument persuades you of the relevance to '*Nutrition and the Brain*' of its energy metabolism; of amino acid, folic acid, B₁₂ and choline availability to the tissue, and of the role of B vitamins in nervous function, then these books are for you; but not, I fear, for me.

You may even be interested in the blood-brain barrier, other than as a convenient incantation for writing off phenomena which are otherwise difficult to "explain". In that case you can choose between chapter 2 in which the BBB is responsible for the brain's metabolic idiosyncracies but whose nature and location are uncertain; and chapter 3, in which the anatomical site is no mystery to the author and its properties quite well enough defined to "explain" a hopelessly mixed bag of transport mechanisms; and chapter IV which gives us yet another point of view on what may be the best-preserved neurobiological hoax of the twentieth century. At least the impartial reader

will not be lulled into complacency by any uniform consensus, and the hunt will continue for some kind of impermeable wash-leather separating the blood from the brain.

Volume 2 gets prematurely bogged down in a discussion of the control of eating behaviour in 145 pages with 827 references, as if the main elements of the main title (*Nutrition and the Brain*) have in some way become juxtaposed. The remaining three chapters, however, at last get down to the matter in hand. A chapter on the effects of undernutrition on brain morphology is mostly, and properly, about influences on brain development, although the authors complain that there is no information about the adult state in this respect. Could it not be that there is nothing interesting to see in the brains of starved adults (except in those exceptionally rare encephalopathies so beloved of the last chapters in tomes on clinical neurology)? I happen to think that in this whole, surprisingly lesion-free neuropathology of developmental undernutrition, the most rewarding contemporary growing-point may lie in current attempts at quantitative neurohistology. So, it is a bit disconcerting to be quoted here as not thinking much of the idea. There are some formidable technical obstacles to be overcome, however, before brain structures can be realistically counted, so that the whole of world knowledge in this area could be summarised on half a page with about four references; thus, it is perhaps to be expected that this chapter too dwells on matters outside its stated subject, or fills in the pages by reproducing chunks from elementary textbooks of neurohistology.

The second half of volume 2, however, blossoms forth with two quite outstanding chapters on the effects of widespread varieties of malnutrition on biochemical aspects of brain development, and on human behaviour. Both are masterpieces of clarity: the first in systematically describing what we know without ambiguity; the last in making it perfectly clear that there is no more difficult and confusing topic than the effects of infant malnutrition on human behaviour. The first, by Nowak and Munroe will be a classic reference point for a long time to come. The last, by Pollitt and Thomson should be a powerful antidote to those politicians and the less perceptive of their scientific advisers who still persist in that simplistic non-question, "Does infant malnutrition cause mental retardation?"

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