

Though the orthotic needs of patients treated under the N.H.S. are met by numerous commercial firms, there is no Health Service control of the standards of training. Of the 1000 appliance fitters only some 400 are licenciates or Fellows of the British Institute of Surgical Technicians. The normal method of acquiring knowledge is still by apprenticeship, but the recent explosion of knowledge in orthotics has now made this system of training inadequate. It is now considered that a three-year course of formal training is enough to produce an orthotist, but courses are available only in London and Glasgow, and there is little prospect of the average small firm with under 10 employees being able to afford to spare an employee for three years.

If the training of orthotists leaves much to be desired, so too does the training of medical students. There can be few medical schools giving any instruction to students about the appliances that are available. In the hospital service itself many specialties are concerned with appliances for disabled patients, yet trainees in those specialties are seldom instructed in their prescription. Community medicine specialists and general practitioners may also prescribe appliances, yet the difficulties facing anyone who seeks special knowledge are formidable. A British section of the International Society for Prosthetics and Orthotics has recently been formed to bring together all the disciplines connected with orthotics. Its members are mainly doctors and engineers concerned with prosthetics and orthotics, but only a few orthotists have joined. Even orthopaedic surgeons are not strongly represented.

Almost all the research on appliances is carried out in the university and district hospital workshops. There does not appear to be any co-ordination of their work apart from informal contact between the workers. The British Standards Institute has some concern with surgical apparatus, but its impact has not been great. Some difficulty is experienced in evaluating new appliances owing to the lack of an organization to co-ordinate trials. What is needed is for the recommendations of the reports to be carried out.

<sup>1</sup> *Report of the Working Party on Aids for the Disabled*. British Medical Association, 1968.

<sup>2</sup> *Report of the Committee on Prosthetic and Orthotic Services in England, Wales and Northern Ireland*. London, British Orthopaedic Association, 1973.

<sup>3</sup> *The Future of the Artificial Limb Service in Scotland*. H.M.S.O., Scottish Home and Health Department, 1970.

## Faecal Fibre Fortunes

George Bernard Shaw, that well known critic of British medicine, remarked<sup>1</sup> that "Most discoveries are made regularly every fifteen years." The wheel has turned, and the health promoting value of a high-residue diet is now being widely proclaimed by travellers from far off lands and reiterated and enhanced by the diet columnists in the popular press. On the face of it this seems fairly harmless. The makers of breakfast cereals, the health food shops, and the over-the-counter end of the pharmaceutical industry can sell stool bulking agents without much trouble, ranging from bran via pseudo-Swiss mixtures looking like hamster diet to sorbitol (which ferments, fluffing out the stool with gas). It will be interesting to see how their T.V. advertising agents handle this assignment, despite the B.B.C.'s Horizon programme gift of publicity for the cause.

Aesthetically, encouraging consumers to pass large bulky stools does not have the same attraction as the clean-round-the-bend image of a glass of sparkling fruit salts.

Right, you may say, what is all the fuss about? No one would deny that the laxative effect of bulky stools may well help those who worry about being constipated and it will reduce the discomfort of piles. It may well, indeed, reduce the incidence of appendicitis and diverticular disease. This alone would hardly raise a stir among the public at large or sell much bran products but it has now been woven into the tapestry of the causation of large bowel cancer and it is this which brings it into the big league of Western medicine. In Britain there are 16 000 deaths per year from this disease and 40 000 in the United States. Several million dollars per year are being poured into research on all aspects of bowel cancer in the United States alone, and there are many other programmes running in Europe and elsewhere in the world. In view of the obvious importance of this disease and the size of the effort being mounted to try and alter its course it is perhaps wise to stop and ask whether the homespun tale of high-fibre diet really has a cancer-preventing effect before it passes into folklore without being formally validated.

We have been told that there is great virtue in trying to simulate the faecal output of the black African villager, who if he lives long enough, though plagued with infestation and infection seems to be remarkably free from a host of alimentary tract diseases including cancer of the large bowel.<sup>2</sup> Others have even suggested that Africans' relative freedom from schizophrenia, urinary infection, and migraine could all be ascribed to the virtues of a high residue diet.<sup>3</sup> At present the evidence is circumstantial, skilfully blended together into a plausible story that has been embellished with random measurement of stool bulk and transit times in black Ugandan villagers, English schoolboys, and matelots, showing that the African not only has the bigger stools but they pass down the alimentary tract faster. That hardy favourite of the cancer epidemiologists, the Japanese migrant, has been drawn into the argument. In Japan the incidence of large bowel cancer in men is 7.5/100 000 per annum,<sup>4</sup> while in Japanese living in Hawaii it is 32.2/100 000 per annum. Some would say that was due to their change of diet, and it may be so, but what was unexpected was that their transit times were not significantly different.<sup>5</sup> This suggests that it may be the chemical composition of the faecal content in the bowel that is all important and not its volume.

Bacteriologists in Britain<sup>6 7</sup> and in the United States<sup>8</sup> have observed that the incidence of large bowel cancer is related to the faecal concentration of bile acids and the types of bacteria in the large intestine able to degrade these compounds (such as clostridia able to desaturate the steroid nucleus). This theory is more compatible with a postulated relation between the incidence of large bowel cancer and the intake of dietary fat.<sup>9</sup> The advocates of the fibre-is-good-for-you theory have added this bacteriological evidence to their hypothesis by pointing out a fast transit time would reduce the contact of the mucosa with the carcinogens and the time available for producing them. Hill,<sup>10</sup> the young Turk of the bacteriological camp, has criticized this idea by showing that a faster transit does not affect the production of metabolites of cholesterol or of bile acids. A prospective study of the bile acids and faecal flora in high-risk patient groups (patients with multiple polyposis or ulcerative colitis and polyps) and a normal population may eventually confirm or disprove the causal relation of these factors to large bowel cancer. Unfortunately it will take five to ten years to know the answer. In the meantime the vogue for the instant convenient high-residue

breakfast may have been promoted, albeit in good faith, on little scientific evidence. The coronary disease prevention lobby that was all the rage with politicians in the past went through this dietary phase 30 years ago, but alas it did not stem the tide. This time it is the cancer prevention school who have taken up the bran banner, and it will be interesting to see how long its disciples will follow.

- <sup>1</sup> Shaw, G. B., *The Doctors Dilemma*. Act 1.
- <sup>2</sup> Burkitt, D. P., *Cancer*, 1971, 28, 3.
- <sup>3</sup> Cleave, T. L., *The Saccharine Disease*. Bristol, Wright, 1974.
- <sup>4</sup> Doll, R., Muir, C. S., and Waterhouse, J., (eds) *Cancer in Five Continents*, vol. 2. Berlin, Springer, 1970.
- <sup>5</sup> Gloger, G. A., et al., *Lancet*, 1974, 2, 80.
- <sup>6</sup> Hill, M. J., et al., *Lancet*, 1971, 1, 95.
- <sup>7</sup> Hill, M. J., et al., *Lancet*, 1975, 1, 535.
- <sup>8</sup> Wynder, E. L., and Reddy, B. S., *Cancer*, 1974, 34, 801.
- <sup>9</sup> Wynder, E. L., et al., *Cancer*, 1969, 23, 1210.
- <sup>10</sup> Hill, M. J., *Digestion*, 1974, 11, 289.

## Drug Metabolism and Increasing Age

In many animals the liver microsomes of fetuses and neonates have little or no ability to metabolize drugs. Enzyme activity usually appears after birth and increases with age to reach a maximum in adulthood.<sup>1</sup> In human infants the activity of drug metabolizing enzymes is lower than in adults,<sup>2</sup> but recent reports suggest that the age-dependence of hepatic drug metabolizing enzymes which is found in animals may not apply in children. Indeed children in the age range 1-8 years appear to metabolize some drugs at almost twice the rate of adults. This has been reported for drugs such as antipyrine and phenylbutazone, which are metabolized primarily in the liver by the mixed function oxidase system dependent on cytochrome P450.<sup>3</sup> An increased rate of metabolism has also been shown in children for diazoxide, phenobarbital, and clindamycin.<sup>4-6</sup> One explanation may be that the ratio of the weight of the liver to the body in children may be 30-50% greater than in adults. In animals such as rats, on the other hand, the ratio of liver to body weight increases with age and reaches a maximum in the adult.<sup>1</sup>

Lengthening of the plasma half-lives of antipyrine and phenylbutazone has been noted in the elderly, and differences in their absorption or protein-binding have been suggested as possible explanations.<sup>7</sup> With increasing age plasma albumin levels tend to fall,<sup>8</sup> and a change in the degree of binding of drugs by plasma proteins could increase the concentration of free drugs available for action, for distribution to the tissues, and also for drug metabolism. In a group of elderly patients Hayes *et al.*<sup>9</sup> have shown a decrease in the plasma binding capacity for warfarin. The decrease in binding correlated with a fall in the plasma albumin concentration. No change in the affinity of plasma albumin for the drug occurred. In a second paper the same authors reported a marked increase in the clearance of phenytoin in patients over 65 years of age compared with those under 45, whether phenytoin (which is metabolized by hepatic microsomal enzymes) was given orally or intravenously.<sup>10</sup> The clearance correlated inversely both with the phenytoin-binding capacity of plasma and with the plasma albumin concentration, both of which were reduced in the elderly patients. These findings support the suggestion that a greater availability of the drug for

metabolism and excretion would result from decreased binding to plasma albumin.

Drug metabolism is only one of many factors concerned in the response to drugs. Other variables which complicate the interpretation of clinical studies include absorption, distribution, excretion, route of administration, dosage, other drugs, disease states, nutrition, temperature, individual variation, and genetic factors.<sup>11</sup> Studies on drug metabolism and protein-binding of drugs must, therefore, be interpreted with caution. Nevertheless, there are important implications for drug dosage regimens in the elderly, in whom an increased number of adverse reactions to drugs have been reported.<sup>12</sup>

- <sup>1</sup> Kato, R., et al., *Biochemical Pharmacology*, 1964, 13, 1037.
- <sup>2</sup> Pelkonen, O., et al., *Clinical Pharmacology and Therapeutics*, 1973, 14, 840.
- <sup>3</sup> Alvares, A. P., et al., *Clinical Pharmacology and Therapeutics*, 1975, 17, 179.
- <sup>4</sup> Pruitt, A. W., Dayton, P. G., and Patterson, J. H., *Clinical Pharmacology and Therapeutics*, 1973, 14, 73.
- <sup>5</sup> Garrettson, L. K., and Dayton, P. G., *Clinical Pharmacology and Therapeutics*, 1970, 11, 674.
- <sup>6</sup> Kauffman, R. E., et al., *Clinical Pharmacology and Therapeutics*, 1972, 13, 704.
- <sup>7</sup> O'Malley, K., et al., *British Medical Journal*, 1971, 3, 607.
- <sup>8</sup> Woodford-Williams, E., et al., *Gerontologia*, 1964, 10, 86.
- <sup>9</sup> Hayes, M. J., Langman, M. J. S., and Short, A. H., *British Journal of Clinical Pharmacology*, 1975, 2, 69.
- <sup>10</sup> Hayes, M. J., Langman, M. J. S., and Short, A. H., *British Journal of Clinical Pharmacology*, 1975, 2, 73.
- <sup>11</sup> La Du, B. N., Mandel, H. G., and Way, E. L., *Fundamentals of Drug Metabolism and Disposition*. Baltimore, Williams and Wilkins Company, 1971.
- <sup>12</sup> Hurwitz, N., *British Medical Journal*, 1969, 1, 536.

## Shoulder Pain from Subluxation in the Hemiplegic

Shoulder pain is a fairly frequent complaint of patients with hemiplegia. It may be blamed on the shoulder-hand syndrome, sympathetic dystrophy, frozen shoulder, or the thalamic syndrome; but in fact these causes are rare, and by far the most frequent explanation is that of subluxation of the shoulder on the hemiplegic side. This more mundane cause, though well known to many practising clinicians, has been neglected in print—for example, receiving a mention neither in a recent monograph on cerebrovascular disease<sup>1</sup> nor in a comprehensive textbook of geriatrics.<sup>2</sup>

A recent paper from a Glasgow geriatric department<sup>3</sup> provides a valuable and timely reminder, redirecting the attention of clinicians dealing with hemiplegic patients to this neglected but common complication. Radiological evidence of subluxation was found in 17% of an unselected group of hemiplegic patients. Earlier surveys<sup>4-6</sup> have indeed shown far higher prevalences in hemiplegics of various age groups of 40-60%. These varying rates probably reflect differences between the series, subluxation being more likely where the paralysis is flaccid and accompanied by disuse oedema so as to increase the weight of the dependent paralysed arm,<sup>5</sup> and occurring with far greater frequency where arm paralysis is more severe.<sup>4</sup>

The mechanism of subluxation is simply failure of the normal muscular support to the shoulder, on which its stability principally depends. Thus subluxation is seen only on radiographs taken in the erect position,<sup>3 4 6</sup> and absence of supporting muscle tone has been shown electromyographically.<sup>5</sup>