

identified by the physician, it would seem reasonable to urge the use of a product which has either been shown to be predictably bioavailable, or has been tested by clinical use over a long period of time. Investigators studying bioavailability should be encouraged to publish and present their results for full and open discussion in the scientific literature until methodology is better established. Government bodies should not encourage substitution when the evi-

dence of product comparability has not been made available for the evaluation by physicians and pharmacists.

The cost of bioavailability studies is high; whether they are made the responsibility of the individual manufacturer or the responsibility of the Health Protection Branch, their requirement will increase the cost of drugs. Priority in bioavailability should be given to studies of drugs where product substitution may be clinically important.

Only with such studies will the physician feel secure in substituting one brand of a drug product for another.

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Enteral hyperalimentation with elemental diet

The major advances in the resuscitation and salvage of critically ill patients which occurred in the previous decade have been followed by significant advances in nutritional therapy. This has been a natural sequence because the need for specialized nutritional support was not evident until modern sophisticated intensive care led to the survival of increasing numbers of critically ill and cachectic patients who could not receive nutrition in the normal manner. Earlier attempts to provide positive nitrogen balance by the use of intravenous albumin, plasma, protein hydrolysates and fats were generally unsuccessful. In 1967, however, Dudrick demonstrated that it is possible to maintain normal body weight and to produce growth and development in both dogs and humans by supplying all nutrients solely by vein if an adequate calorie-nitrogen ratio is provided. In spite of some potential side effects, this method of treatment has proved to be a life-saving addition to our nutritional armamentarium.

Another approach to the problem of providing positive nitrogen balance to patients with gastrointestinal disorders has been the development of elemental diets. One of these diets was developed in the surgical research laboratories of the Montreal General Hospital and has been used in patients since 1967. Preliminary studies using this diet were reported in the *Journal* of July 22 (page 123). This experience and that of Randall's group in Rhode Island have estab-

lished the usefulness of these diets in the nutritional support of patients with certain disease states. The basic composition of the various elemental diets presently in use is relatively similar and not unlike that of intravenous hyperalimentation solutions. The protein in an elemental diet is provided as amino acids, either in pure form or as the hydrolysate of a specific protein with the addition of necessary amino acids. Carbohydrate is provided as glucose or sucrose; the latter is favoured because it reduces osmolarity. Small amounts of starch may be added for flavouring purposes. Vitamins, minerals, and trace elements are also included. The major differences in these diets is the fat content, which varies from no fat or minimal fat to 30% of the caloric content; in the Montreal General Hospital diet 20% of this is medium-chain triglycerides. With increasing knowledge of metabolic and nutritional abnormalities in specific disease states, it may be possible in the future to tailor an elemental diet to the specific needs of the individual patient.

Elemental diets are nutritionally complete and since they are predigested leave minimal or no residue to provide bulk or support the growth of bacteria in the lower gastrointestinal tract. They are therefore valuable in the treatment of patients with impaired digestion or with a decreased mucosal absorbing area. They may in the future assume an important role as a preoperative bowel preparation to provide ade-

quate nutrition with minimal or no residue.

This new approach to nutritional therapy has been a significant advance in the field of clinical nutrition. It has not yet been established which composition is best suited to treat a specific clinical problem. These diets may have properties in the control of gastrointestinal disease which are at present unknown. Preliminary studies suggest that the normal gastrointestinal hormonal response to food is altered and that there are changes in the secretions produced by the stomach and pancreas. The effects of elemental diets on the bacterial flora of the lower gastrointestinal tract may be of considerable importance and require further study. The role of elemental diets in the preparation of patients for major surgery and in the protection of the gut from radiation and chemotherapy-induced injury remains to be explored. Well controlled studies using liquid diets of the same composition but in elemental and non-elemental form will have to be carried out since our knowledge to date in this area is based solely on animal studies where definite benefits from the elemental nature of the diet have been shown.

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