would need to be vaccinated to protect a tiny proportion of those infected from possible serious sequelae. The work needed and its cost seem disproportionate, given current discontents and economic stringency. The vaccine might find useful application in selected groups—say, youths shown by antibody studies to be susceptible—particularly if it could be combined with other attenuated vaccines, such as that against measles.

6 Overman, J R. Archives of Internal Medicine, 1958, 102, 354.
7 Kilham, L. American Journal of Diseases of Childhood, 1949, 78, 324.
9 Journal of the Royal College of General Practitioners, 1974, 24, 552.

Intravenous feeding in infancy

When ten years ago Dudrick and his colleagues1 showed that children fed intravenously could grow and develop normally they opened a new era of management of chronic gastrointestinal disease. So, not surprisingly, it was not long before the methods were applied to the newly born, and especially to babies with congenital anomalies treated surgically. 3 The infusion used in these early series consisted of carbohydrate as a source of calories and either protein hydrolysates or a synthetic amino-acid solution. Complications included both thrombosis and infection, and, while venous thrombosis was reduced by the use of Silastic central venous catheters, long-term administration of protein solution into a central vein often led to sepsis, especially that due to fungi. Some teams kept infections down to very low levels by strict adherence to Listerian principles of antisepsis; others reported rates of fungal septicemia of 250, or more, and half of these babies died.

Clearly the risks of infection could be reduced if a method could be found in which a peripheral vein could be used. The solute load could be reduced by using ethyl alcohol as the carbohydrate, but this was still found to be too irritant. Fox and Krasa showed that the glucose concentration could be reduced by increasing the fluid load: provided this was introduced slowly newborn infants could tolerate up to 250 ml per kg body weight per 24 hours. The addition of 0-5 units of heparin per ml reduced the incidence of phlebitis, while the deficiency of essential fatty acids which developed in infants on any prolonged fast-free regimen was avoided by the daily application of sunflower seed oil to the baby's chest. This last is important, because not only does linoleic acid deficiency produce skin changes but it also increases the risk of infection.

The next step was to add fat to the infusion. In Europe soya bean oil emulsion (Intralipid) was accepted as being safe over long periods and was soon commercially available, and more recently in the United States fat has been used as the source of calories. The mixture of amino-acids, sugars, and fat emulsion is claimed to be more physiological and is preferred for neonates having surgical procedures. Such a solution is comparable to breast milk and Intralipid is practically isotonic with plasma and has a high calorie content per unit volume; hence administration by a peripheral vein is not only feasible but effective and relatively trouble-free.

After the correction of major gastrointestinal anomalies in the newborn oral feeding may be impossible for a prolonged period. For example, gut mobility may be impaired for three weeks or more after repair of a ruptured exomphalos. In short bowel syndromes, too, intravenous feeding may be required for weeks or even months until by growth and adaptation the bowel can absorb sufficient nutrients for adequate growth. In these cases parenteral feeding is undoubtedly essential and life saving. In preterm infants whose respiratory difficulties may make major demands on their limited resources, in babies with temporary malabsorption problems after gastroenteritis, and during the few days of catabolism after surgery in the neonatal period the indications for intravenous feeding are less clear and the advantages have to be weighed carefully against the disadvantages. On the one hand, brain growth is rapid in the first few weeks of life, even more so in the preterm baby, and a period of starvation may interfere with it. On the other hand, many problems arise from intravenous feeding. Once a suitable infusate has been chosen giving an adequate supply of calories and protein, varying amounts of calcium, sodium, potassium, and chloride will have to be added. Often these are prepared in the pharmacy, though an increasing number of variations are becoming commercially available, reducing the possibilities of infection by additions to bottles or giving sets. Glucose intolerance occasionally occurs, but usually in very low birth weight babies or those with severe renal anomalies.

Hypomagnesaemia and copper deficiency have been reported in babies who have been suffering from diarrhoea. Hyperammonaemia has also been recorded but it does not appear to be clinically important and is apparently due to subclinical hepatic insufficiency. Trace elements are usually not given during the first four weeks; thereafter the need for them can be covered fairly adequately by giving 10 ml kg fresh frozen plasma every week. Mandatory laboratory monitoring in these babies includes daily serum electrolyte studies and weekly estimations of the calcium and phosphorus concentrations.

Infection may occur through the infusate, by the catheter wall, or by bloodborne organisms colonising on the catheter. The risk of infection probably increases by 50% weekly after the first week. Microdrop filters may help prevent bacteria from entering the circulation, but they cannot be used when infusing Intralipid or blood. The best defence is strict asepsis when the drip set is handled.

Intralipid presents certain problems of its own. Its clearance rate may be reduced in small-for-dates infants and preterm infants of less than 32 weeks' gestation. Hyperlipidaemia has been blamed for premature coronary artery disease. Fat pigment is usually seen in the Kupffer cells but does not seem to interfere with liver function. Eosinophilia occurs, but it is not harmful. Thrombocytopaenia may occur during Intralipid infusion, but has not been positively related to it. Administration by an infusion pump helps to spread the load throughout the 24 hours. Visual inspection of the plasma will detect lipaemia, and if this is present the Intralipid infusion should be temporarily stopped.

Though many newborn infants given total intravenous feeding die, this mortality rate is probably related more
to the underlying disease than to the treatment, and in these sick children risks must be taken. In supplementary or short-term parenteral feeding, however, unnecessary risks are unjustifiable. Careful monitoring and strict aseptic control may reduce such risks to a minimum, but in every case the advantages of the treatment must clearly outweigh its hazards.

11 Panter-Brick, M, European Journal of Intensive Care Medicine, 1976, 2, 45.
16 Winick, M, Rosso, P, and Brasil, J A, Nutritio et Dieta, 1972, 17, 60.

**Learned voluntary control of heart rate and rhythm**

Normal people become aware of the autonomic control of the heart and blood vessels only when this becomes extreme, when it has ceased to be purely automatic—for example, tachycardia of fear or the hypotension of a faint induced by the sight of blood. Nevertheless, there are so many ways that this automatic regulation can be reset by the interference of other parts of the nervous system—the fall in heart rate and blood pressure during sleep, the rise while doing mental arithmetic—that it is automatic only in the sense that it is not usually under direct conscious control. Since activity in the higher centres so profoundly influences the control systems, many investigators have speculated that these could be brought under voluntary control if the individual was provided with a signal recording the state of the system. The use of such a signal has become known as biofeedback.

We now have convincing evidence that trained individuals can achieve small, short-term changes in both heart rate and blood pressure if they are provided with a visual or auditory signal to show them the results of their efforts. Weiss and Engel1 first used biofeedback to treat a group of eight patients with cardiac arrhythmia, five of whom learnt to decrease the frequency of the abnormal beats. More recently Pickering and Miller2 used the technique to investigate and treat two patients with frequent premature ventricular contractions. They justified the time spent on this approach on two grounds:

- Firstly, that the drugs commonly used to treat premature ventricular contractions are potentially dangerous myocardial depressants; and, secondly, that drug treatment is inappropriate because of the evidence that the nervous system can influence the onset and disappearance of premature ventricular contractions.3 Certainly the frequency of premature beats falls during sleep and increases during psychological stress.4,5

Their first patient had bigeminal rhythm and was provided with an oscilloscope signal from a cardiac monitor. Gradually, over 25 training sessions spread over several months, he acquired some conscious control. Eventually he was in sinus rhythm for 20%, of the time when he was just resting and 27% of the time when he was trying consciously to influence the rhythm. This patient’s suppression of bigeminal rhythm was associated with an increase in heart rate, though it was not wholly due to this change. The second patient had premature ventricular beats and was provided with a ratemeter signal. He quite quickly learnt to increase his heart rate by 20-25 beats minute by conscious effort. Once he achieved a sinus rate of about 117 beats minute the arrhythmia was usually suppressed.

The use of biofeedback to control cardiac arrhythmias raises two questions. Firstly, how does the patient achieve the effect? Secondly, is the effect large enough and well enough sustained to be of any therapeutic value? In both the cases described an increase in rate seems to have been important, though not the sole explanation. Clearly if the method is to be of practical value the patient must be able to apply the training he has received in the laboratory with the biofeedback signal when he no longer has that signal available. The second of Pickering and Miller’s patients seemed to be able to do this, but the first could not. Possibly, too, the increase in the heart rate achieved to suppress arrhythmias might have had other adverse consequences if it had been maintained over long periods. Just as investigators who make therapeutic claims for new drugs have to prove their safety and efficacy in long-term use, so must advocates of biofeedback.

1 Weiss, T, and Engel, B T, Psychosomatic Medicine, 1971, 33, 301.

**Motorcyclists’ injuries and crash helmets**

Motorbikes are dangerous: a motorcyclist is eight times more likely to be fatally injured than the occupant of a car per unit distance travelled.1 Despite this, the number of motorcyclists on our roads is rising and probably will continue to do so as the cost of transport goes up. Accompanying the increase in motorcycle use the Royal Society for the Prevention of Accidents2 has noted an increase in the number of casualties among users of “powered-two-wheelers” in the first nine months of 1976—part of a general upward trend over the last five years. The implications of this trend are serious, affecting not only motorcyclists but also other road users; clinicians concerned with patient care; design engineers of safety equipment, such as crash helmets; and the rest of the community, who share the costs (nowadays put at around 5%...