health and PUO; βeta-haemolytic streptococcal septicaemia with pyrexia, intravascular haemolysis and excess urobilinogenuria certainly raised the suspicion of the much more common disease in the early stages. Pregnancy, especially in the unmarried, and particularly if there is misleading information on the last menstrual period, can be a difficult differential diagnosis.

Anicteric infective hepatitis

In 32 of the 41 patients in this series (shown to have hepatitis) it was possible to measure the serum bilirubin levels within the first few days of clinical illness (table IV). There is no hard and fast rule about the level of serum bilirubin at which a patient becomes visibly jaundiced, because of such variables as duration of the raised level, complexion, lighting, and so on, but I suggest that values around 5 mg per cent in children might be a reasonable dividing line in general practice. If this is accepted, then seven out of eight patients were not obviously jaundiced at initial contact, and, what is more, most of them remained anicteric throughout their relatively mild and brief illness. Havens (1962) has stressed the epidemiological significance of this phenomenon; infective hepatitis with jaundice is possibly the atypical manifestation of a relatively common infection.

Conclusion

It is clear that teaching on this disease needs revision—it requires to be put in its proper perspective. This can only be done by studies in general practice and by family doctors. It is not too much to suggest that such a factual approach as that attempted here might profitably be applied to a much wider range of conditions taught in hospitals, the clinical picture of which is necessarily distorted by the process of selection applied in the daily working of our National Health Service: an approach which Keith Hodgkin (1966) has used to such good effect.

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Discussion

Dr D. Buchanan (*Dundee*): To avoid taking blood from every child who is 'off his food' is there any simple test for hepatitis which can be carried out in the surgery or should a sample of urine be sent to the laboratory?

Dr Jamieson: There is no short cut and no simple test other than the urine test, which is a very easy test in the consulting room. In the study that we are planning, we have adopted the transaminase and the dehydrogenase tests as the most delicate indicators of hepatocellular damage, and for this reason we are hoping to extract blood even from young children. For routine I believe that the examination of urine would provide useful information and this can be done quite easily in the home.

Dr C. D. Rigg (*Auckinleck*): Is any reason known for the differing incubation periods of serum hepatitis and infective hepatitis?

Dr Jamieson: No sir. Hepatitis is a disease which poses many problems, and incubation periods are just one aspect we do not know about. If the two types were caused by the same virus then the parenteral route would probably have the shorter incubation period, not the longer as is the case. But until the virologists have isolated the virus, we cannot be sure.

Professor Anderson: Unless practitioners are going to engage in the kind of prospective study that Dr Knox has been describing, there is not much point in sending specimens to a laboratory to make a diagnosis more quickly. This may seem a little cynical, but until we can make a diagnosis of hepatitis on a precise virological basis, I would not encourage doctors to carry out tests which are only going to mean that the case is diagnosed perhaps 24 or 48 hours before they would make a diagnosis themselves.

Dr Knox: The more we can take the empiricism out of diagnosis the better, and there are two particular reasons why this should be so for infective hepatitis. One is that there exists some means of prophylaxis in gamma-globulin. The disease occurs mainly in the setting of overcrowding, poor homes, young children, and it may well be that the earlier we give gamma-globulin the more likely it is to be effective. My second reason for a firm diagnosis is a much wider philosophical one and that is, to facilitate our handling of the patient and the relatives. For that reason I would take issue with the experts on the panel and say that we really want to have tests performed preferably by a specialist, but if necessary by ourselves.

Professor Anderson: This is nonsense. Dr Knox is not taking into account that biochemical laboratories are already overwhelmed with specimens, and unless he can prove that there is some real value in forming an early diagnosis then he should not add to that burden. I would also have to remind Professor Grist and Dr Jamieson of the hotch-potch of nonsense about the use of gamma-globulin in rubella. Now that we can carry out precise biological tests, we know why it is such a nonsense: about 80 per cent of women are immune anyway, therefore you would expect 80 per cent of your patients not to catch the disease. We do not know which members of the community are immune to hepatitis, and we do not know what the gamma-globulin contains. The successful gamma-globulin experiments have all come from America where hepatitis is exceedingly common, but it is still an uncommon disease in Scotland. Scottish gamma-globulin therefore does not contain much antibody, and it would be nonsense to inject children with large quantities of an unknown material which is extremely expensive, just because it *might* do some good. Nobody can claim that I do not like to make a precise diagnosis; I started virology in Glasgow with that very purpose of precision of diagnosis. But this chemical test is not precise.

Dr Robertson (*Edinburgh*): How long do viruses survive extracellularly, especially in virus hepatitis?

Professor Grist: It depends on the virus. Some are so highly unstable that the specimen must be rapidly conveyed from the patient to the laboratory; otherwise there is no hope of isolation of the virus. Enteroviruses and those that behave like the adenovirus (including the hepatitis virus) have to be able to stay alive and active in the gut at body temperature for some time until the bowel is evacuated. They then have to be able to stand up to conditions in the outside world for sufficiently long to have a reasonable chance of transmission by one route or another: faecal, oral, possibly via water, and so on. Therefore these viruses are very stable, and provided they are not dried they persist for a long time.

Dr J. Hogg-Smith (*Langholm*): Can Professor Anderson indicate the parts of the population prone to suffer from viral illness?

Professor Anderson: Professor Grist has given a partial answer in regard to age. He showed that in social classes IV, V and VI, the overcrowded, the people who tend to have larger families, who live under poor social conditions, develop their natural antibody very speedily, most of them by 5 years of age. In the social class I and II children grow into adult life without having developed antibody at least against one type of poliovirus. Secondly, country dwellers are less likely to develop antibody than town dwellers who develop it much earlier, so that country dwellers might be expected to be prone to some kinds of virus infection in adult life, which should have occurred in infancy. The third point is that when polio does come back the chances are that more adults than children will have it, because, even with the

waning amount of immunization done in the community because parents are beginning to forget about polio, there is no doubt that we do have a good amount of infancy and child vaccination going on, but the adults are often missed out in this kind of programme. If you have patients going off to Africa or India for two or three months, you should always immunize them against polio as well as smallpox, because this is one of the hazards of foreign travel.

Dr H. Baumgart (*Dundee*): Does one attack of rubella confer life-long immunity, or are there several infectious diseases with similar symptoms, such as rash and cervical adenopathy?

Dr Jamieson: Clinical diagnosis of rubella is extremely difficult. The diseases giving rise to the main difficulty are glandular fever and echo virus infection. They can produce rash, and sore throat. I have stood at the bedside of a patient whom I was perfectly certain had rubella yet the virologists have shown no antibody whatsoever developing in that patient. We must therefore place our faith on the tests done by virologists. I do not know whether any immunity is ever life-long but certainly it appears to be a good immunity as judged by the fact that in studies now being done, 80–90 per cent of women have serological evidence of past rubella.

Dr J. Barrie Brown (*Montrose*): A town draws its water supply from a sewage-polluted river, intermittent infection with different viruses is common, and chlorination tends to vary in effectiveness because of the organic content of the water. What concentration of chlorine per million parts would be adequate? Is there any alternative method apart from boiling?

Dr Weir: One part per million of chlorine is required.

Professor Anderson: While that is public health practice and is fine so far as coliforms and other bacteria are concerned, whole hosts of viruses would not be affected in the slightest. Therefore in an epidemic, the only method of sterilizing the water effectively would be by boiling and for some viruses, indeed, it might need to be boiled for quite a long time. There is no absolute answer, but I think I am right in stating dogmatically that most chemical methods of sterilization would fail against viruses.