febrile and possibly viral illness, suggesting that narcolepsy may be "caught." Furthermore, recovery from typical narcolepsy does occur, though it is rare. Secondly, narcolepsy is sometimes associated with (though probably not caused by) multiple sclerosis, and it has also been reported with other immune associated disorders. Thirdly, a quarter of all narcoleptics have minor abnormalities in the cerebrospinal fluid including lymphocytosis, an increase in the protein content, and, in one case, oligoclonal bands. This evidence justifies a search for immune factors in narcolepsy; but, as with type I diabetes, a long search may be needed and patients will probably need to be studied soon after the onset of symptoms.^{12 13}

Trials of immunosuppression in human narcolepsy are not justified, though the results of this treatment in narcoleptic dogs will be awaited with great interest.¹⁴ We have done one plasma exchange of 6 litres in a patient with narcolepsy and severe cataplexy resistant to clomipramine, but it had no effect on sleep latency, daytime drowsiness, or cataplexy. Treatment relies on amphetamine-like drugs for narcolepsy and clomipramine for cataplexy, but the response is variable and side effects are frequent.

There is an unexpected genetic as well as clinical association between narcolepsy and multiple sclerosis (A So, J Trowsdale, K Welsh, personal communication). Between 40% and 80% of patients with multiple sclerosis are DR2 positive. Almost all DR2 positive patients with multiple sclerosis appear to have the same DQ β molecular subtype as occurs in narcolepsy.

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Recognising whooping cough

Now that the sight and sounds of a whooping cough paroxysm are broadcast to the nation through repeated television advertising there might seem little excuse for a doctor who fails to diagnose this unpleasant disease. In fact, missed or late diagnosis is commonplace.

A review of hospital case notes in the United States showed that during an eight year period admitting house officers initially considered pertussis in only 24 of 61 children later found to have the disease.¹ Inexperience may have been the explanation, but British general practitioners, too, show wide variation in their willingness to make the diagnosis—at least in adults.² Part of the explanation is that mild infection may present with minimal symptoms. Recognition in the initial catarrhal stage is likely only if practitioners are alert to a history of contact.

In children the disease differs clinically in various ways, from bronchiolitis, acute bronchitis, and pneumonia. Children with whooping cough are very unlikely to have a temperature of over 38.4°C, or to wheeze; but most vomit when they have the paroxysms. The cough itself is less spontaneous than in other chest infections: it is provoked by feeding and other exertion and is frequently worse at night.^{1 3 4} The last two features may cause confusion in infants with that type of asthma which presents with cough rather than wheeze, but malaise and vomiting are unusual in asthma. Chronic asthmatics reasonably well controlled with

prophylactic medication may report an increased tendency to cough as the only symptom of pertussis. Rather than automatically increase antiasthmatic treatment the clinician would do well to join his patient on a brief run. The cough provoked has a different quality from that of exercise asthma: adult patients with chronic obstructive airways disease who acquire pertussis can themselves describe the unusual nature of the cough. In general, adults suffer similar symptoms to children except a whoop is most rare and persistent sore throat is a frequent additional complaint.²

The laboratory has something to offer: microbiological confirmation is specific but insensitive. The usual methods of collection and transport of specimens from the surgery to hospital are too complex and lengthy for this fastidious organism. Direct fluorescent antibody testing on nasopharyngeal aspirates gives a rapid answer which is reliable if positive, but false negative results are common.⁵ Immunoelectrophoresis looks promising, and early experience suggests that its sensitivity is better than that of microbiological culture.⁶ These newer techniques give a result the same day and they will be valuable as they become more widely available.

Making a correct diagnosis is always intellectually satisfying but in the case of pertussis how much does it matter? American interns who diagnose Reye's syndrome instead of pertussis may well overtreat their patients, while in Britain

infants in hospital might receive unnecessary intravenous antibiotics if thought to have pneumonia. Does early diagnosis make any difference to the outcome? Individual medical practitioners variously recommend erythromycin or co-trimoxazole, salbutamol, steroids, antitussives, sedatives, and atropine methonitrate. Reviewing published reports on treatment, Broomhall and Herxheimer concluded there was no firm evidence for the value of these.⁷

Many doctors believe that early diagnosis is worth while on the grounds that treatment with antibiotics, which needs to be for at least 14 days, reduces infectivity and therefore limits spread. This may be useful when patients are admitted to a hospital ward, but at home old fashioned quarantine is likely to be as effective. Unfortunately, treating asymptomatic close contacts has not been proved protective.⁸ Perhaps the most important reason for trying to make a correct diagnosis in the child at home is the relief of parental anxiety inevitable when there is uncertainty.

The only way to prevent this extremely unpleasant disease is to encourage a high uptake of vaccine.

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Ventricular assist devices

The use of mechanical assist devices to support the failing heart is not new. The first clinical attempts with a "left heart assist"¹ were in 1963 and since then devices of this kind have been implanted in around 100 patients—but the concepts, the materials, and even the indications have changed.

In contrast with the total artificial heart, ventricular assist devices are used in parallel with the patient's own heart. Usually one is inserted in a patient with univentricular failure and two in a patient with biventricular failure. The basic elements are a blood sac, inlet and outlet valves, and a drive mechanism. Typically the blood sac has a capacity of 50-70 ml and is made of flexible, smooth, seam free polyurethane. The valves used to maintain unidirectional flow range from standard mechanical valves of the tilting disc variety to pericardial, porcine, and even dural types. The power source may be either electrical or pneumatic, though research is still being conducted into nuclear and other energy sources. Since most devices are intended to be temporary the conduits can be led through the chest wall; some ventricular assist devices are implantable with only electrical leads leaving the body. The ideal solution in these cases would be an implantable power source that could be recharged through the intact skin; research in animals is well advanced.

At present there are three main indications for the use of assist devices. Firstly, some patients cannot be weaned from cardiopulmonary bypass despite maximal conventional support, including the intra-aortic balloon pump. Secondly, the condition of some patients accepted by a transplant programme may be deteriorating rapidly with no donor heart immediately available. The final group—at the moment less clearly defined—consists of patients in cardiogenic shock after a myocardial infarction, who might require either temporary or permanent support.

What sort of results have been reported? Two of the surgeons with the largest experience around the world are W S Pierce at Pennsylvania and D G Pennington at St Louis. Pierce and colleagues have reported 17 patients who could not be weaned from cardiopulmonary bypass; eight of these eventually recovered their ventricular function and were

discharged from hospital.² Pennington reported 21 patients, 10 of whom were weaned from the ventricular assist device with seven being discharged from hospital.³

The fear that use of ventricular assist devices would distort existing transplant programmes does not appear to be justified by experience. This has shown the potential of the left ventricle to recover after a period of support.⁴ Ventriculograms in survivors have shown that about half had either normal or mildly depressed ventricular function, though their hearts had been practically lifeless on the operating table.³ Furthermore, such patients do not become cardiac cripples: of the 14 in that series eight were employed, five were retired but active, and only one remained disabled.

How many patients might be suitable for support from a ventricular assist device? Nearly 7% of patients treated by open heart surgery cannot be weaned from cardiopulmonary bypass.^{5,6} Most, however, respond to volume loading, support with inotropic drugs, and intra-aortic balloon pump counterpulsation. This leaves about 1% of patients with persisting ventricular inadequacy who require further circulatory support. When the facilities for using ventricular assist devices are not available long term circulatory support is given to patients of this kind by the roller pump method or extracorporeal membrane oxygenation.^{7,9} The longer that the patient remains with the bypass, however, the more damage is caused to the blood elements and in time to the vital organs. Ventricular assist devices may allow the support of these patients with fewer complications.

The technical aspects of the use of ventricular assist devices are still under investigation. For example, Sethia *et al* have shown that it is preferable to use the left atrium rather than the left ventricle as a source of blood,¹⁰ and Pennington and colleagues argue that patients with biventricular failure do well only with biventricular support¹¹—but these problems will be resolved in time. The ethical implications are also stimulating debate. Though no mechanical device has the emotional impact of a heart transplant, potential recipients face similar stresses. A main consideration is that the