

British graduates seems to be rising—within the last few months five university medical staff (three of them professors) who have been regular scientific advisers to the *B.M.J.* have left Britain for good, and inquiries at the B.M.A. overseas bureau are running at more than five times the level of 1973. In many branches of science, and medicine is one of them, university staff travel so widely that they are on good terms with their colleagues in most parts of the world. Via the grapevine information is available quickly and accurately about employment prospects in almost any country, and each year a few British graduates decide that their career prospects would be better in another country or they are attracted to the way of life there. For most academics and clinicians, however, the attractions have not been enough to justify transplanting themselves and their families to a foreign style of living. In contrast to the situation in India or Korea, satisfying work has been readily available in Britain.

The signs suggest that that situation has changed. The upsurge of interest in emigration is surely due to the frustrations so many doctors are meeting in their day-to-day work. Budgets have been cut back so hard, and staff are so short in many areas, that administrative problems are beginning to overshadow all else. Disputes about private practice or levels of pay are less important than the facilities available for doing a good job. Once the academic is kept from satisfaction at his bench, or the clinician from treating his patients, by financial or administrative problems they will begin to look around for a place where they can get on again with the work they enjoy.

Where is our evidence? There is very little available; but the morale of academic and hospital staff seems lower than for many years. Perhaps the gloom-merchants have finally convinced the mass of the population that Europe is in a progressive decline; but for the educated, professional man his job is the central feature of his life—as the American report stresses time and again, quoting with approval Albert Camus “Without work all life goes rotten. But when work is soulless, life stifles and dies.”

¹ Congressional Research Service, *Brain Drain: A Study of the Persistent Issue of International Scientific Mobility*. Washington, U.S. Government Printing Office, 1974.

² *The Washington Post*, 21 January 1973.

³ Smith, A. J., *British Medical Journal*, 1974, 2, 429.

⁴ *British Medical Journal*, 1974, 4, 606.

Byssinosis : Compensation or Prevention ?

Working conditions have improved since the first three decades of the century, when a consistent excess in mortality was observed among blowing and carding room operatives,¹ and perhaps again since the early mill surveys in Lancashire,² but byssinosis remains remarkably prevalent in today's textile industry. Carding engines have been fitted with exhaust systems to remove cotton trash, but with low grade cottons and higher carding speeds they are inefficient in capturing the very fine particles of vegetable dust that cause byssinosis.³ Recently published prevalence surveys of cotton mills processing coarse cotton, in both the U.S.A. and Britain, report that the prevalence of byssinosis (including workers with occasional Monday chest tightness) varies among carding room operatives from 20% to 50%, among spinners from 5% to 20%, among winders from 10% to 20%, and in some mills occurs among weavers as well.⁴⁻⁶

The Department of Health has recently announced an amendment to The National Insurance (Industrial Injuries) (Prescribed Diseases) Regulations which extends coverage for byssinosis.⁷ This was done by reducing from ten years to five the minimum period of exposure to cotton or flax dust, by extending coverage to those working in spinning, winding, and beaming processes, and by removing the condition that the “loss of faculty” be permanent, thus including those with earlier stages of the disease. The amendment is a long overdue recognition of observations reported in 1967⁸ and, if prevalence studies in the cotton textile industry may be used as a guide, will sharply increase the number compensated from the latest available rate (1972) of 48 per year.⁹ Desirable as it may be to provide compensation for occupationally acquired disability, the danger in this amendment is that it may delude those responsible for working conditions in the textile industry that the problem is somehow being dealt with. This could not be further from the truth.

Determination of the dose-response relationship between byssinosis prevalence and fine dust concentration has provided a reasonable target for environmental control of workroom particulate levels.^{10 11} Because some cases may still be expected to occur at and below recommended target concentrations it is generally recognized that pre-employment examinations and medical surveillance are also required to prevent irreversible airways obstruction. Based on these data, cotton dust standards have been formulated in the U.S.A. and Britain.^{12 13} Neither standard is enforceable by law, though in the U.S.A. a previous threshold limit value based on total cotton dust is in effect under the Occupational Safety and Health Act. Studies of textile machine ventilation have shown that the relatively low dust levels recommended are technically feasible. The economic feasibility of installing these systems and of initiating and maintaining medical surveillance in an industry with a traditionally low profit margin remains a greater issue, yet there are no available data on the cost of adopting the recommended schemes. Is it in fact not possible to conduct an effective medical surveillance programme that would conserve manpower and prevent disease? Is the cost of improved exhaust ventilation and segregation of dusty processes so high?

Clearly, elimination of vegetable dust or its detoxification at the picking or ginning stage would provide the most efficient and economical means of prevention. Three studies of the effects of washing and steaming cotton on respiratory symptoms and dust levels have been reported within the last year.¹⁴⁻¹⁶ Though these efforts appear to have fallen short of the mark, this approach to prevention is sound, and efforts should continue to find such a long range solution. A cleaner picking process would be an obvious step in this direction. No basic solution is, however, on the horizon.

We are therefore left with a static situation in which dust levels in most mills exceed recommended concentrations, the prevalence of respiratory symptoms among workers remains high, and the steady stream of those compensated for irreversible lung damage continues. But is compensation to be the means by which modern industrial societies should recognize and justify occupational disease and disability? Is prevention just a concept, the price of which is too high? Surely the time has come for serious inroads into prevention of byssinosis, and for the new Health and Safety Commission to recommend the application of standards for further dust control and medical surveillance.

¹ Schilling, R. S. F., *British Medical Bulletin*, 1950-51, 7, 52.

² Schilling, R. S. F., et al., *British Journal of Industrial Medicine*, 1955, 12, 217.

- ³ Wood, C. H., and Roach, S. A., *British Journal of Industrial Medicine*, 1964, 21, 180.
- ⁴ Molyneux, M. K. B., and Tombleson, J. B. L., *British Journal of Industrial Medicine*, 1970, 27, 225.
- ⁵ Fox, A. J., et al., *British Journal of Industrial Medicine*, 1973, 30, 42.
- ⁶ Merchant, J. A., et al., *Journal of Occupational Medicine*, 1973, 15, 212.
- ⁷ Statutory Instruments, *The National Insurance (Industrial Injuries) (Prescribed Diseases) Amendment (No. 2) Regulations*, London, H.M.S.O.
- ⁸ Mekky, S., Roach, S. A., and Schilling, R. S. F., *British Journal of Industrial Medicine*, 1967, 24, 123.
- ⁹ Department of Health and Social Security in *Social Security Statistics*, 1972. London, H.M.S.O., 1973.
- ¹⁰ Merchant, J. A., et al., *Journal of Occupational Medicine*, 1973, 15, 222.
- ¹¹ Berry, G., Molyneux, M. K. B., and Tombleson, J. B. L., *British Journal of Industrial Medicine*, 1974, 31, 18.
- ¹² NIOSH Cotton Dust Criteria Document, HEW Publication No. (NIOSH) 75-18. U.S. Government Printing Office, 1974.
- ¹³ British Occupational Hygiene Society, *Annals of Occupational Hygiene*, 1972, 15, 165.
- ¹⁴ Merchant, J. A., et al., *British Journal of Industrial Medicine*, 1973, 30, 237.
- ¹⁵ Imbus, H. R., and Suh, M. W., *British Journal of Industrial Medicine*, 1974, 31, 209.
- ¹⁶ Merchant, J. A., et al., *British Journal of Industrial Medicine*, 1974, 31, 261.

Ethics of Selective Abortion

Prenatal diagnosis of fetal abnormality requires a sample of amniotic fluid to be removed at 15-16 weeks gestation, and a further 2-3 weeks of tissue culture is needed before a satisfactory chromosomal diagnosis can be made. If the fetus is shown to be abnormal and termination of pregnancy recommended, inevitably the procedure has to be carried out late in the mid-trimester. When the risks of such an operation are added to the 1-2% chance that the amniocentesis may precipitate a spontaneous abortion it is clear that prenatal diagnosis is far from a trivial investigation. Nevertheless, specialist centres throughout Britain are now offering diagnostic amniocentesis when there are grounds for suspecting that the fetus may have a serious genetic disorder—either the birth of a previous abnormal child to the parents or a family history of abnormality. The four main categories are chromosomal abnormalities such as Down's syndrome; X-linked disorders, such as Duchenne muscular dystrophy, where determination of the sex of the fetus is a guide for action; metabolic disorders, such as Tay-Sachs's disease, in which the diagnosis depends on assay of a specific enzyme; and malformations such as spina bifida in which a raised alpha-fetoprotein level is almost certainly diagnostic.

The ethical problems raised by this new area of medicine have been discussed by Professor Harry Harris in his Rock Carling lecture.¹ Some authorities—including Lejeune,² the discoverer of the chromosomal basis of Down's syndrome—have taken the view that any selective abortion is morally indefensible. More prevalent is the opinion that the rights of the fetus should be balanced against those of the mother and the rest of the family; so that if the abortion of a fetus with Down's syndrome is homicide then, as Harris says, it is an ethically acceptable form of homicide.

When the genetic defect produces severe, unremediable physical or mental handicap the issues are clear cut. Much more difficult are disorders such as haemophilia, for which treatment is now available which can prevent severe disability; but in such conditions parents of one haemophiliac son might feel prepared to take on another child only if they could be certain it would not be affected.

Need society be concerned on eugenic grounds? With recessive disorders selective abortion is likely to lead to an increase in the number of abnormal genes in the population, since affected fetuses will be replaced by normal ones until the family reaches the wanted size. Two-thirds of these healthy

children will be heterozygotes; the affected fetuses, who would have died without reproducing and so could not have contributed genes to the next generation, will be replaced by healthy heterozygotes who could. Calculations suggest that such an effect will be very small for autosomal recessive genes but could be much larger if selective abortion was practised widely for X-linked abnormalities.

Two other theoretical problems are presented by selective abortion. Its widespread use might reduce the tolerance shown by society to living defectives. A child with haemophilia or muscular dystrophy living in a society in which most of his potential fellow-sufferers had been destroyed prenatally might be seen by the community as one unfit to be alive. It could also be argued that the ethical justifications for destroying a defective fetus might apply just as well to destruction of a newborn defective child. Could we be at the top of a slippery slope?

Harris's conclusion is emphatic. "It is no mean achievement to be able to offer to parents who have already had a child with a severe autosomal recessive abnormality such as Tay-Sachs's disease the opportunity of being certain their next child will not suffer from this condition. Previously all they could have been told was that there was a 1 in 4 chance that any future child would have the same abnormality." When benefits of this kind can be offered to parents ethical arguments are not likely to stand long in the way of further development of prenatal diagnosis and selective abortion.

¹ Harris, H., *Prenatal Diagnosis and Selective Abortion*, London, Nuffield Provincial Hospitals Trust, 1974.

² Lejeune, J., *American Journal of Human Genetics*, 1970, 22, 121.

Bone Marrow Transplants in Leukaemia

For more than 20 years it has been known that animals given a supralethal dose of total body irradiation (T.B.I.) can be saved from marrow aplasia by an infusion of syngeneic marrow cells.¹ The value of this approach was first confirmed in a man who had received an otherwise lethal dose of T.B.I. accidentally; the marrow graft from his genetically identical twin was life saving.² In theory patients with severe marrow hypoplasia from other causes could be supported in a similar manner, and indeed success using this procedure has now been reported from several centres.

One group in Seattle has reported 16 bone-marrow transplants between identical twins where the recipients were suffering from various forms of acute leukaemia and were considered to be in the terminal phase of their disease.³ Seven patients had myeloblastic leukaemia, seven lymphoblastic, and two had a blast crisis complicating chronic granulocytic leukaemia. All patients were treated with chemotherapy including high dose cyclophosphamide and T.B.I. (1,000 rads) before marrow grafting. The median duration of stay in hospital after the graft was only 24 days, and patients were managed using conventional reverse-barrier nursing techniques without the help of protected environments. Of the 16 patients treated, 14 achieved a complete remission and six are still in complete remission at 11-44 months without maintenance chemotherapy. Both patients with blast crises in chronic granulocytic leukaemia relapsed at 3-5 months, but the relatively long remissions in some of the other patients suggest that this approach is of value in selected cases—and