

delegate put it, the proposal seems to have a snowball's chance in hell at Santiago. The best that can be hoped for, it seems, is a regime in patrimonial seas no worse than that currently applying to research on the continental shelf under the 1958 Geneva Convention.

As for research on the high seas, the outcome really depends on who wins the battle to define the International Seabed Authority's role. Some developing countries are eager to establish a strong authority which would itself exploit the manganese nodules that cover certain areas of the Pacific. The world's nations would then be paid a percentage of the returns from the operation.

This proposal is being opposed largely by the developed countries (see *Nature*, **243**, 429; 1973; and **239**, 421; 1972). They argue that the cost of setting up such a body, the problems of running it internationally and the difficulty of staffing it with experts in what is a totally untried technology, make the proposal impractical, even if ideologically attractive. Their alternative is to have the seabed authority license areas of the ocean to interested states who would in turn hire the companies with the know-how actually to mine the nodules. Developing countries would benefit as much as developed, the argument runs, because they could also license the companies with the necessary expertise (all of whom, not unnaturally, are based in the developed countries). A third proposal emerged at Geneva which would do something to combine the two approaches, allowing the authority both to license areas of the ocean for exploitation and to organize the exploitation itself when it has the expertise.

What the final outcome will be remains to be seen. One theory is that the attacks on scientific research are being made in order to achieve one of the other objectives—the 200-mile patrimonial sea for example. But until the voting system has been worked out in New York later this year, and until nations are really putting their cards on the table, it is not possible to predict the end result with any certainty. It does, however, seem more than likely that scientific research in the waters above the continental shelf is likely to be hampered to a greater extent than at present.

DRUGS

'Paraquat' Attacked

PRESS reports that eleven-year-old Peter Holdsworth is the only person to have survived poisoning with the weedkiller 'Paraquat' are untrue. According to ICI, the makers of the weedkiller, it has recently been estimated that there have been twenty-two survivors from

sixty-four cases of severe poisoning. But Peter's recovery is surprising enough, and the treatment used at the Hammersmith Hospital is experimental enough, to have aroused considerable interest.

He was expected to die because he was excreting the poison at a rate of $5 \mu\text{g ml}^{-1}$ on the third day after swallowing it, which indicated a blood level of 'Paraquat' high enough to make lung damage inevitable. The usual course of 'Paraquat' poisoning is corrosive damage to the tissues of the mouth and gut, followed by kidney and liver damage—from all of which the patient can recover—but followed, after about two weeks, by fibrosis of the lungs from which there is no recovery.

Sufferers of 'Paraquat' poisoning usually die of suffocation because of lung damage, for which there is no known antidote. The question is, has the Hammersmith Hospital team now found one? The treatment involved three drugs. The least controversial of these was 'Beclamethasone', a corticosteroid which is already in use as a specific drug for the control of asthma. The Hammersmith team hoped that it would help to prevent the development of non-functional fibrous scar tissue in the lungs. But the effectiveness of such steroids administered to 'Paraquat' cases is still a matter of debate.

The administration of the other two drugs, neither of which is in general clinical use, was based entirely on theoretical speculation. 'Paraquat' seems to have a particular affinity for lung tissue, where it probably binds to cell membranes. A team at the surgical and toxicological units of the Edinburgh Royal Infirmary once transplanted a lung into a poisoned child only to see fibrosis set in because of the persistence of a residuum of 'Paraquat' in the thorax. The Hammersmith team was therefore looking for a chemical that might dislodge the 'Paraquat' molecule from its putative binding site on the membranes. They hit on 'D-propranolol' because it happens to bind to lung tissue and because it is at the moment under investigation at the Hammersmith Hospital for reasons totally unrelated to 'Paraquat' poisoning. It is, in fact, one constituent of the ICI heart drug 'Inderal', which is composed of a mixture of the D and L isomers of 'Propranolol'. The L isomer is the active constituent of 'Inderal', and the pharmacological action of the D isomer is still the subject of research. It was used in the treatment of Peter Holdsworth as a possible competitor for 'Paraquat' on the membranes of the lung tissue. Whether this was its actual effect, if indeed it had any, will be impossible to say without further research.

The rationale for 'Orgotein', the third of the drugs, seems to have been some-

what wilder. 'Orgotein' is the trade name for the enzyme superoxide dismutase, produced by Fisons. Superoxide dismutases are present in varying amounts in the tissues of the body, where they transform highly reactive (and therefore damaging) free-radical oxygens into molecular oxygen and hydrogen peroxide. It is known from research on plants that 'Paraquat' can be reduced by biological systems to free-radical oxygen which causes damage to plant cells—although it is still not clear how great a part free-radical damage plays in the destruction of weeds by 'Paraquat'.

The administration of 'Orgotein' to Peter Holdsworth was thus based on extrapolation from work on plants, with the aim of breaking down hypothetical free radicals which might contribute to the destruction of lung tissue. There is, however, no evidence for free-radical damage in 'Paraquat' poisoning in animals. Nor is there any evidence that free radicals are formed from 'Paraquat' in animal tissues. This would require a substantial reduction voltage which is available in plants in the photosynthetic reactions.

Furthermore, the reactions in question are intracellular and it is most unlikely that a macromolecule such as superoxide dismutase could penetrate the cell membrane. So all in all, the case for the therapeutic contribution of 'Orgotein' seems fairly dubious.

Until more data have been collected, and the clinical details of this particular case are published, it will of course be impossible to evaluate properly the last-ditch treatment which seems to have been so well rewarded at the Hammersmith Hospital. But the fact that a child has recovered in spite of having sustained some lung damage from a dose of 'Paraquat' will be enough to stimulate vigorous interest in the drugs used.

RESEARCH AWARDS

Anyone for an Award?

THE Science Research Council has had a 5% shortfall in applications for its research studentships. Some 200 studentships out of a total of 3,950 on offer are still vacant, and although not all departments and applicants have given their final answers on allocations it seems more than likely that there will be appreciably more studentships available than there are students to take them at the start of next term.

A slightly different story is found at the other research councils. At the Natural Environment Research Council all available awards will be granted, but the council's rejection rate for applicants for PhD awards has fallen from 15 to 20 per cent during the past few years, to virtually nil this year. But while applications for its 261 research student-