European Communities
Commission
Background Report
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BIOTECHNOLOGY: EUROPE'S NEWEST NATURAL RESOURCE

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Summary

World shortages of raw materials, the unrelenting search for new sources of energy and the unreliability of traditional sources of raw materials in the Third World are convincing science policy makers to fund more research in biotechnology.

The European Commission has tackled the difficult question of how to overcome national and institutional reticence and to pour more money into the Community effort in biotechnology. In January of this year, the European Commission presented the results of their deliberations to the Council of Ministers - a proposed programme of research (1) for the next five years, costing 23.5 million EUA (about £16 million). The cost of the programme would be met by an equal sum from the participating countries, so that the research programme would in reality cost £32 million. This sum, spread over nine countries, is small compared to what firms such as Cetus are spending on research and development, so the expert group had some difficulty selecting priorities for the programme.

New products, new processes

Conservationists have joined 'big business' pundits to proclaim that the impact of biotechnology will be greater than the microchip. These enthusiasts believe that more research in biotechnology - the industrial processing of materials by biological agents such as micro-organisms - will yield new, non-polluting sources of industrial chemicals, organic fertilisers, and drugs, which will conserve our dwindling oil reserves. New processes for mining metals, producing ethanol for fuel and for domestic waste disposal could win important export contracts for the country that forges ahead in biotechnology. Even government planners, notoriously conservative, are being wooed by the dream that these new processes may take up the employment slack left by the gradual transfer of heavy industries such as steel manufacturing to the Third World.

Private industry in Japan and the United States have already invested heavily in biotechnology. Unfortunately, with the exception of West Germany, most of the EEC countries lag far behind, France and Britain included. There are big profits to be made; Japan's industrial activity in biotechnology stretches back over 40 years and earns over £5 billion each year. This figure represents over five per cent of the country's Gross National Product. In the United States, scientists banded together during the last decade to form entrepreneurial commercial enterprises such as Cetus and Genentech to better exploit their research in biotechnology. With their entry into the race, it is time for European scientists to reasses the commercial importance of their research and to collaborate more effectively to combat competition from abroad before it is too late.

There is already a long list of successes using micro-organisms, plant and animal cells, which grow quickly in vast fermenters, to manufacture antibiotics and vaccines, novel foods and animal feedstuffs. But these successes were achieved, until very recently, by technical advances in traditional fermentation methods

(1) COM(79) 793 Final 11 January 1980.

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*** Note: Background reports are intended as non copy-right ready-reference material on topics of current interest concerning the European Community. An index will be provided periodically so anyone receiving the reports can refer to each number more easily.

which date back thousands of years to when man first brewed beer from cereals. Now genetic engineering has ushered in a revolutionary phase in biotechnology. Within the next decade, experts in genetics, biomolecular engineering and microbiology will be able to persuade a micro-organism to integrate genetic material (or DNA) foreign to its own into the structure of its cell. Spliced into the bacterial DNA, the 'foreigner' will instruct the bacterial cell to manufacture 'foreign' proteins. This has already been achieved in the laboratory. Scientists at Biogen - the European-based biotechnology firm - claim to have engineered a bug which will make the human protein interferon, which attacks disease-causing viruses, and could be a cure for certain types of cancer. The trick will be to scale up the growth of the fast-growing host cells from the small fermenters in the laboratories to the massive vats in commercial plants.

The difficulty faced by all science policy makers faced with allocating small sums to biotechnology research is whether to support projects which will yield products of known commercial value, such as the widely-used industrial chemical ethanol, or to tackle the more complex human proteins such as insulin or interferon. Human proteins may be more scientifically interesting yet may take 10-15 years to become commercially economic. Even then, the market will be small and safety regulations may prove a large stumbling block to industrial production in the factory.

Stimulating research

The aim of the European Commission's programme is to stimulate biotechnology research already going on within the Community which is suitable for commercial exploitation. So the six 'projects' outlined in the proposal relate to two industrial themes. The first deals with the development of processes based on not one but two or more enzymes operating at different stages. Enzymes catalyse biological reactions and a problem industrial engineers have always faced is that enzymes are difficult to control and are used up in these reactions, making them unsuitable for continuous commercial manufacture. If these enzymes can be immobilised in such a way so as to continue working in complex systems for as long as several years, then such 'bioreactors' will yield much more elaborate products 'important to European industries'.

The second theme revolves around using genetic engineering to alter micro-organisms of 'importance to European industries'. This involves a lot of basic research into the way genes are transferred from a foreign source into bacteria such as Escherichia coli and even the development of new hosts.

Safety study

Aware of the safety implications of growing engineered bugs in large numbers in the open conditions of a factory, the Commission's expert group allocates one project to studying the likelihood that these bugs will mutate to more dangerous forms and to improving detection of dangerous contaminants. In preparing the programme, the Commission's experts relied on three studies (1) which examined work already in progress within the Community.

Should the Council of Ministers approve the programme, each participating country will send two representatives to a committee which will not only coordinate

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(1) COM (77) 283 final, 30 June 1977. Genetic Manipulations in Applied Biology; study contract 346-77-7 ECI NL, Professor A. Rorsch, EUR 6078, 1978. Production of Biological Catalysts, Stabilization and Exploitation; study contract 345-77-6 ECI F, Professor D. Thomas; EUR 6079, 1978.

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the programme, but will also decide which of the many projects, already rolling in, will receive funding. However, biotechnology is moving ahead so rapidly that in five years time new priorities will have to be set. A subcommittee of FAST - the EEC's research programme for forecasting and assessment in science and technology - is already at work planning a long term strategy. The Commission has set aside over 520 000 EUA (about £317 000) for the five year programme; again the participating institutions will contribute an equal amount. The projects range widely, looking not only at the options for scientific research within the Community but also at the wider issues of manpower and training, the social acceptability of biotechnology, the implications for the Third World and the impact on the environment.

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