INTERNATIONAL COMPETITION

PATENT SEARCH REVEALS EEC BIOTECH STRENGTHS

LONDON—"Our reports appear to show a stronger EEC position than had been reported in earlier studies. Europe was relatively stronger than Japan in the key area of enzyme immobilization. Most European activity seems to be occurring in well-established fermentation, pharmaceutical and fine chemical companies, responding to rising fuel and raw material costs by improving process engineering. Other significant areas are enzyme reactors, analysis and diagnosis, and biomass. Patterns of 'outpatenting' seem to show that companies within the EEC are in at least as much rivalry with each other as with companies in non-member states."

These are among the conclusions of a study of patents as indicators of activity in biotechnology, conducted on behalf of the European Economic Community by Harry Rothman and Andrew Ashton at the Technology Policy Unit of the University of Aston in Birmingham. Part of the FAST (Forecasting and Assessment in Science and Technology) program, their survey has also included the mapping of biotechnology research by techniques such as citation analysis and co-citation clustering. As described in *Industrial Biotechnology Wales* (**4**:2, 1985), this technique indicates that the Common Market countries generate about 30 percent of the world's literature in four key microbial fields, with Great Britain contributing 40 percent of the Community's total.

Japan did not produce the high levels of publication output that Rothman and Ashton had anticipated. "We suspect that this indicates a bias and weakness in the American and Eurocentric information data bases that were drawn upon," they say, highlighting the need for better European coverage of Japanese R&D in applied microbiology.

From their citation and co-citation mapping, the Aston researchers claim that some "hot specialisms" in molecular biology are developing three or four times more quickly than the rest of science. "However," they say, "there is evidence of an overall slowing down in the growth rates of biochemistry and microbiology, although they are still growing more rapidly than science as a whole."

Rothman and Ashton advise their EEC sponsors of the importance of continuous monitoring of strategically important R&D sectors. "The availability of appropriate science and technology indicators for the Community would facilitate this task," they report. "Further, the use of literature-based models of research fields for strategic planning of Community R&D should be examined."

—Bernard Dixon

BIOMASS CONVERSION

USING ACTINOMYCETES TO TAP INTO D-XYLANS

MANCHESTER, U.K.—Paul Broda and his colleagues at the University of Manchester Institute of Science and Technology have described several thermophilic actinomycetes that have considerable potential in biotechnological processes designed to break down D-xylans in plant biomass. These organisms produce high extracellular xylanase activity, and the enzymes seem sufficiently stable at 70°C to be harnessed in processes from which volatile products can be recovered directly.

For the past three years, along with Kent Kirk at the U.S. Department of Agriculture's Forest Products Laboratory, Broda has been working on cloning the ligninase gene from white rot fungi. Paper-makers and companies concerned with flax, compost, and related materials are keenly interested in the possibility of exploiting ligninase to attack the lignin in wood. But while hydrolysis of the second component in plant biomass, cellulose, has received attention, the third component, hemicellulose, has been comparatively neglected.

Broda's work with strains of *Thermomonospora* now suggests that D-xylans, the most widely distributed hemicelluloses, might be exploited as a source of the industrially useful sugar, D-xylose. Particularly abundant in grasses—some of which contain as much hemicellulose as cellulose (40 percent w/w)—D-xylans are linear chains of β-(1,4)-linked xylose residues with smaller amounts of other sugars as side chains. As reported in a paper scheduled for publication in *Applied Microbiology and Biotechnology*, each of some 37 thermophilic actinomycetes broke down oat spelt xylan into shorter-chained products. In the case of *T. fusca* and *T. curvata*, prolonged incubation then resulted in complete breakdown to xylose.

One strain of *T. curvata* was particularly active, liberating xylose even from milled wheat straw (in yields reaching approximately 10 percent of those obtained from the oat spelt xylan). Lignification is responsible for this reduction, but Broda and his group have found that they can more than double the quantity of sugar released by ball-milling the straw and thus increasing the surface area exposed to enzyme attack. The Manchester team is now characterizing the enzyme complex and hopes to identify and manipulate the genes concerned.

—Bernard Dixon

NEW STUDY

CURBING ANTIBIOTIC RESISTANCE

LONDON—Pharmaceutical companies and public health experts alike will be encouraged by evidence strongly suggesting that withdrawal of medically important antibiotics from routine inclusion in animal feedstuffs leads to a decline in antibiotic-resistance among intestinal bacteria. The evidence—the first ever published—comes from a survey carried out by H. Williams Smith and M. A. Lovell at Houghton Poultry Research Station (Huntingdon, U.K.). It indicates that a ban on the application to farm animals of drugs such as growth-promoting tetracyclines—and their replacement by alternative, non-therapeutic antibiotics not required in clinical or veterinary medicine—does reduce the dangers to human health caused by the proliferation of insensitive strains.

The British government ended the routine use of therapeutic antibiotics in chickens, pigs, and other livestock following the Swann Report in 1969. Although there were indications of continuing resistance in *Escherichia coli* (which, because it is plasmid-mediated, can be transferred to pathogens such as *Salmonella typhimurium*), Williams Smith and his colleague decided to investigate this trend. They compared *E. coli* strains isolated at the beginning and end of the decade following the ban. The results, pub-