of some of the enzymes were indicative of the concentrations of the insecticides. Synergistic or antagonistic effects of combinations of pesticides were obtained by using simple techniques.

Studies on Microbial Degradation of Herbicides in Soil

By K. SRIRAMA RAJU and G. RANGASWAMI (*Department of Microbiology, University of Agricultural Sciences, Bangalore-24, India*)

The hazards due to cumulative effects of agricultural chemicals, particularly pesticides, added to cultivated soil have been a subject of investigation in recent years. In order to understand their persistence in the soil under tropical conditions, as in India, a series of studies were undertaken in the laboratory on the microbial degradation of herbicides in soil.

When four common herbicides, atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine), simazin [2-chloro-4,6-bis(ethylamino)-sym-triazine], diuron [3-(3,4-dichlorophenyl)-1,1-dimethylurea] and Tok-E25 (2,4-dichlorophenyl 4-nitrophenyl ether), were applied to the soil, there was a change in the populations of bacteria, actinomycetes and fungi in the soil. Atrazine caused the maximum change. When the soil was enriched with 1000 p.p.m. of the herbicides, several bacteria and fungi resistant to the herbicides were isolated. Some of the fungi and bacteria were able to resist the herbicides at concentrations as high as 7500 p.p.m., but the actinomycetes were not resistant. Some of the bacteria, fungi and actinomycetes were able to utilize the herbicides as a source of carbon or nitrogen, and a few were able to grow in artificial media containing the herbicides as the sole carbon and nitrogen source. The growth of the latter organisms was, however, slow in the laboratory media, indicating their low efficiency in utilizing these compounds. Of the four herbicides tested, diuron was relatively the most resistant to microbial degradation.

Seasonal Biochemical Acclimatization in *Channa punctatus*

By ASIT BARAN DAS [*Department of Biological Sciences (University of Sambalpur), V.S.S. Medical College, Burla (Sambalpur), Orissa, India*]

The seasonal biochemical changes in different tissues of the *Channa punctatus*, such as gill, brain, liver and muscle, started with a gradual rise in the total RNA/DNA ratio from a low summer value (1.2–2.0:1.0) to a peak winter value (2.1–3.2:1.0).

This was closely followed by an augmentation of the total free amino acids/DNA ratio with a summer value of 0.35–0.44:1.0 and a winter value of 0.45–0.75:1.0. The winter peaks in both RNA and amino acid concentrations in the tissues were maintained from December through to March. The peaks in total protein accumulation (protein/DNA ratio) in different tissues were found to be 13.7:1.0, 17.3:1.0, 34.7:1.0 and 158.6:1.0 in gill, brain, liver and muscle respectively towards the end of winter (February–March), and the lowest values were found to be 9.4:1.0, 10.6:1.0, 16.3:1.0 and 87.9:1.0 in gill, brain, liver and muscle respectively during the summer and the rainy season (April–July). The hepatic glycogen content was maintained relatively constant at 0.31–0.55 g/100 g of liver throughout the year, except for an abrupt increase to 2.1 g/100 g of liver during the winter. The possible significance of the concurrent cyclic variations in the different biochemical parameters and their relationships to the rhythmic fluctuations in metabolic rate and in cytological parameters of liver will be discussed.

Breeding of an Indian Carp (*Cirrhana mrigala*) under Different Environmental Temperatures

By A. K. DAS (*Kandaswami Lane, Sultan Bazaar, Hyderabad 1, India*)

The breeding season for the major Indian carps is the monsoon from the end of June to August, when the maturation of gonads usually occurs. In a representative of this group of fish, *Cirrhana mrigala*, adaptation and spawning during the hot summer was successfully carried out by supplementing the diet used by the breeders with protein-rich pulses and lowering the environmental temperature from 42°C to 27°C by cooling with artificial 'rain-drops'. There was a carry-over effect of the above treatment in the progeny, which showed a faster growth rate.

Studies on the Development of Catalysts for the Removal of Carbon Monoxide from Motor-Car Exhausts

By C. R. RAMANATHAN and M. RAVINDRAM (*Department of Chemical Engineering, Indian Institute of Science, Bangalore-12, India*)

Experimental investigations were undertaken with a view to developing stable catalysts capable of converting CO contained in motor-car exhausts into CO₂. Initially CO (in low concentrations in air) oxidation was studied in a semi-micro flow catalytic reactor in the temperature range 200–400°C over pure CuO

containing 1% of Pb. However, it was found that the catalytic activity of pure CuO was greater than that of CuO containing Pb.

The lower activity of the catalyst containing Pb

may be due to the blocking of the pores by the deposition of Pb, which forms a diffusion barrier preventing the reacting substances from reaching the active catalyst surface.

COMMUNICATIONS

Aortic Lipolytic Enzymes in Atherosclerosis

By A. N. HOWARD, J. PATELSKI, D. E. BOWYER and G. A. GRESHAM (*Departments of Investigative Medicine and Pathology, University of Cambridge, Cambridge CB2 1QN, U.K.*)

The mechanism by which cholesteryl esters accumulate in the arterial wall has not so far been elucidated. Previous work has shown that in atherosclerotic rabbit aorta there is increased esterification of cholesterol, especially with respect to oleate, increased lipase activity and decreased cholesteryl ester hydrolase activity (Patelski *et al.*, 1970). All these factors would favour the accumulation of cholesteryl esters. It has also been suggested that the deposition of esterified rather than free cholesterol is more damaging to the arterial wall (Howard, 1968), since free, but not esterified, cholesterol is easily transported across cell membranes (Rothblat *et al.*, 1967).

In a continuation of these studies, groups of baboons were made atherosclerotic by feeding them on a hypercholesterolaemic diet for 6 months and giving them five injections of bovine serum albumin (250 mg/kg body wt.) at 2-week intervals, so as to produce immunological injury. All eight animals showed aortic atherosclerosis with a mean percentage area affected of 46.3 ± 12.5 . Aortic lipase activity was increased by 80%, but cholesteryl ester hydrolase activity was unchanged. Compared with animals on a control diet, oleate and arachidonate were increased and linoleate was decreased in the cholesteryl esters; arachidonate was increased and linoleate was decreased in phosphatidylcholine (lecithin). The increased arachidonate could be attributed to dietary egg-yolk lipids.

An intravenous injection of polyunsaturated phosphatidylcholine (Lipostabil; Nattermann, Cologne, Germany) (250 mg/kg body wt.) was given thrice weekly to another group of animals treated similarly to those above. The mean percentage area of aortic atherosclerosis was decreased to 9.5 ± 4.4 . Aortic lipase activity was normal, but cholesteryl ester hydrolase activity was increased by 50%. The elevated plasma concentration of cholesterol (Lipostabil-treated: 226 ± 123.3 mg/100 ml; saline-treated: 245 ± 15.6 mg/100 ml; control: 116 ± 7.5 mg/100 ml), the concentration of phospholipids and the fatty compositions of cholesteryl esters and phosphatidyl-

choline were unchanged. These results are consistent with the view that lipolysis is an important mechanism for the removal of cholesteryl esters in the early atherosclerotic lesion and that Lipostabil decreased aortic lipid deposition by its effect on lipolytic enzymes.

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Hypocholesterolaemic and Hypolipidaemic Role of 3-Hydroxy-3-methylglutarate in Rabbits Fed on an Atherogenic Diet

By AHAD N. KHAN, SAJID UMAR, S. Y. KHAN and MAJID SIDDIQI (*Division of Biochemistry, Department of Chemistry, Aligarh Muslim University, Aligarh, U.P., India*)

The hypolipidaemic role of 3-hydroxy-3-methylglutarate in normal as well as in hypercholesterolaemic rats has already been established in this laboratory (Beg & Siddiqi, 1967, 1968). Similar results were obtained with normal rabbits (Khan *et al.*, 1970). Experiments were performed to study the effect of 3-hydroxy-3-methylglutarate in resisting the elevation of plasma lipid concentrations in rabbits fed on an atherogenic diet (Kritchevsky *et al.*, 1961). The rise in concentrations of serum cholesterol and phospholipids after 1 week of 3-hydroxy-3-methylglutarate treatment was 10% less than that of the control group. During the second week of treatment this rise was 25% less. After 2 weeks the concentration of serum triglycerides was 35% lower than that of the control group.

After 5 weeks of feeding of the rabbits on the same atherogenic diet 3-hydroxy-3-methylglutarate was very effective in lowering the serum lipid concentrations. A detailed comparative study of the distribution pattern of lipids in serum, liver and aorta of the