fatty acids in the liver of a child dying from propionicacidaemia and have now established that the C_{17:1} fatty acid is heptadec-9-enoic acid.

The fatty acid patterns of the total lipid fraction, triglycerides, cholesterol esters, free fatty acids, phosphatidylcholine and phosphatidylethanolamine were analysed by g.l.c.; the amount of heptadecanoic acid varied from 1.6% in the free fatty acids to 3.25% in phosphatidylethanolamine. The proportion of heptadecenoic acid also varied between the major classes, being 1.0% in phosphatidylethanolamine and 4.0% in the free fatty acids. The C_{17:0} and C_{17:1} fatty acid ratio correlates well with the ratio of the amounts of palmitic acid and oleic acid present in each lipid class.

After digestion of isolated phosphatidylcholine with phospholipase A₂, the C_{17:0}/C_{17:1} fatty acid ratio in the 1-position was found to be 5.1:1 and in the 2-position was 0.2:1. The C₁₇ fatty acids therefore reflect the one saturated:two unsaturated distribution of fatty acids present in naturally occurring lecithins. The fatty acid composition of the 2-position was also compared with the fatty acids from the 2-position of the triglycerides after digestion with pancreatic lipase. The results indicate that when the only difference between two fatty acids, present in the same concentration, is a single double bond, highly specific esterification patterns are retained.

- Abou-Issa, H. M. & Cleland, W. W. (1969). *Biochim. biophys. Acta*, **176**, 692.
 Gompertz, D., Storrs, C. N., Bau, D. C. K., Peters, T. J. & Hughes, E. A. (1970). *Lancet*, **i**, 1140.
 Howling, D., Morris, L. J. & James, A. T. (1968). *Biochim. biophys. Acta*, **152**, 224.
 Paulsrud, J. R., Stewart, S. E., Graff, G. & Holman, R. T. (1970). *Lipids*, **5**, 611.
 Sanchez de Jimenez, E. & Cleland, W. W. (1969). *Biochim. biophys. Acta*, **176**, 685.

The Occurrence of 6-Deoxy-L-altrose in the Lipopolysaccharide of *Yersinia enterocolitica*

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The organism *Yersinia enterocolitica* has been isolated from hares, chinchillas and dogs. This organism has also been isolated from human patients suffering from infections of the mid-gut (Carlsson, Ryd & Sternby, 1964; Wauters & Mollaret, 1965; Winblad, Nilehn & Jonsson, 1966). No serological cross-reaction with this organism was observed with antiserum raised against a wide range of *Escherichia coli*, *Shigella*, *Salmonella* and *Pasteurella pseudotuberculosis* strains.

We have investigated the lipopolysaccharide

composition of a strain of this organism isolated from a human patient. The lipopolysaccharide was extracted with 45% phenol from dried whole bacteria by the technique of Westphal, Lüderitz & Bister (1952). The lipopolysaccharide was hydrolysed with 0.5M-H₂SO₄ for 16h at 100°C, the hydrolysate neutralized with Ba(OH)₂ and the precipitate of BaSO₄ removed by centrifugation. The hydrolysate was subjected to paper chromatography with ethyl acetate-pyridine-water-acetic acid (5:5:3:1, by vol.) as the solvent. Several sugar spots were observed when the chromatograms were sprayed with *p*-anisidine-HCl or the vanillin-perchloric acid reagents. The fastest-running sugar gave the characteristic colours of 6-deoxyhexoses with these reagents.

This fast-running sugar was isolated from a large-scale hydrolysis (100mg of lipopolysaccharide) by using the techniques described above. The isolated material was a slightly yellowish gum that could not be crystallized: it had $[\alpha]_D^{25} -16.1 \pm 2^\circ$ (*c* 1.0 in water). In the Dische & Shettles (1948) colour test it gave the characteristic colour for 6-deoxyhexoses and gave acetaldehyde on periodate oxidation.

A comparison was made between the unknown 6-deoxy sugar and the authentic 6-deoxyhexoses available to us (i.e. rhamnose, fucose, 6-deoxy-L-talose, kindly supplied by Dr A. P. MacLennan, and 6-deoxyaltrose, kindly supplied by Professor T. Reichstein) by using paper chromatography and t.l.c. techniques that allow the differentiation of the eight possible 6-deoxyhexoses described by Krauss, Jäger, Schindler & Reichstein (1960) and Kaufmann, Mühlradt & Reichstein (1967). In all the solvent systems used the unknown 6-deoxyhexose co-chromatographed with 6-deoxyaltrose.

6-Deoxy-L-altrose is an amorphous material that does not crystallize and has $[\alpha]_D^{20} -18^\circ$ (Freundenberg & Raschig, 1929). It follows that the sugar isolated from the lipopolysaccharide of *Y. enterocolitica* is 6-deoxy-L-altrose, a sugar that has not previously been identified as a component of bacterial polysaccharides.

- Carlsson, M. G., Ryd, H. & Sternby, N. H. (1964). *Acta path. microbiol. scand.* **62**, 128.
 Dische, Z. & Shettles, L. B. (1948). *J. biol. Chem.* **175**, 595.
 Freundenberg, K. & Raschig, K. (1929). *Chem. Ber.* **62**, 373.
 Kaufmann, H., Mühlradt, P. & Reichstein, T. (1967). *Helv. chim. Acta*, **50**, 2287.
 Krauss, M. T., Jäger, H., Schindler, O. & Reichstein, T. (1960). *J. Chromat.* **3**, 63.
 Wauters, G. & Mollaret, H. H. (1965). *Rev. belg. Path.* **31**, 328.
 Westphal, O., Lüderitz, O. & Bister, F. (1952). *Z. Naturf.* **7B**, 148.
 Winblad, S., Nilehn, B. & Jonsson, M. (1966). *Acta path. microbiol. scand.* **67**, 537.