lipase and diglyceride lipase of synaptosomes had apparent K_m values approx. 1.5 and 0.5mM respectively.

Triglyceride lipase activity in osmotically ruptured synaptosomes was stimulated 49% ($P < 0.001$) by 1.0mM-noradrenaline and 24% ($P < 0.001$) by 1.0mM-5-hydroxytryptamine. Noradrenaline (1.0mM) was without effect on the triglyceride of microsomal material and depressed slightly (11%; $P < 0.02$) the triglyceride lipase activity of mitochondria. Diglyceride lipase activity was stimulated 35% ($P < 0.001$) by noradrenaline (1.0mM) and 21% ($P < 0.001$) by 5-hydroxytryptamine (1.0mM). Monoglyceride lipase activity was unaffected by either noradrenaline or 5-hydroxytryptamine. Since nerve endings of brain contain noradrenaline and 5-hydroxytryptamine (Michaelson & Whittaker, 1963; Michaelson *et al.*, 1963; Zieher & De Robertis, 1963; Levi & Maynert, 1964) bound to synaptic vesicles (Michaelson *et al.*, 1963; Maynert *et al.*, 1964), similar changes may take place with endogenous glycerides *in vivo* during synaptic transmission.

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- Eichberg, J., Whittaker, V. P. & Dawson, R. M. C. (1964) *Biochem. J.* **92**, 91
Levi, R. & Maynert, E. W. (1964) *Biochem. Pharmacol.* **13**, 615
Maynert, E. W., Levi, R. & Lorenzo, A. J. D. (1964) *J. Pharmacol. Exp. Ther.* **144**, 385
Michaelson, I. A. & Whittaker, V. P. (1963) *Biochem. Pharmacol.* **12**, 203
Michaelson, I. A., Whittaker, V. P., Laverty, R. & Sharman, D. F. (1963) *Biochem. Pharmacol.* **12**, 1450
Whittaker, V. P., Michaelson, I. A. & Kirkland, R. J. A. (1964) *Biochem. J.* **90**, 293
Zieher, M. H. & De Robertis, E. (1963) *Biochem. Pharmacol.* **12**, 596

The Synthesis of Mercapturic Acids from Allyl Compounds in the Rat

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In previous investigations (Clapp *et al.*, 1969; Kaye & Young, 1970) the presence of mercapturic acids in the urine of rats dosed with a number of allyl compounds was demonstrated. It appeared that allyl halides and esters of allyl alcohol derived from strong acids give rise to the excretion of allylmercapturic acid and 3-hydroxypropylmercapturic acid, i.e. *N*-acetyl-*S*-allyl-L-cysteine and *N*-acetyl-*S*-(3-hydroxypropyl)-L-cysteine, in the urine of the dosed animals. On the other hand, allyl alcohol and its esters with weak acids were found to give rise to

the formation of 3-hydroxypropylmercapturic acid, but not to allylmercapturic acid.

In the present work further support for this pattern in the metabolism of allyl compounds has been obtained. After the administration of allyl formate or allyl propionate to rats no allylmercapturic acid was detected in the urine, but it was possible to isolate 3-hydroxypropylmercapturic acid, as its dicyclohexylammonium salt, in amounts representing 6.8 and 9.1% respectively of the administered ester. Further, diallyl phthalate and allyl nitrite were found to give rise to the formation of 3-hydroxypropylmercapturic acid, but not to allylmercapturic acid. Administration of an ester of allyl alcohol derived from a strong acid, however, namely allyl nitrate, led to the isolation of both allylmercapturic acid and 3-hydroxypropylmercapturic acid, the latter as its dicyclohexylammonium salt, from the urine of the dosed rats in amounts corresponding to 5.9 and 2.6% respectively of the injected ester.

Two other allyl compounds, allylamine and allyl cyanide, were shown to lead to the excretion of 3-hydroxypropylmercapturic acid, but not allylmercapturic acid, in the urine of the dosed rats.

Gray & Barnsley (1971) have suggested that the metabolic formation of 3-hydroxy-1-methylpropylmercapturic acid from crotyl alcohol occurs with the formation of crotonaldehyde as an intermediate. In the present work, 3-hydroxypropylmercapturic acid, as its dicyclohexylammonium salt, was isolated in 10.5% yield from the urine of rats dosed with acrolein, and there are therefore grounds for believing that this aldehyde may be an intermediate in the metabolic conversion of allyl alcohol into a mercapturic acid. No evidence was found for the excretion of allylmercapturic acid by rats dosed with acrolein.

The metabolic pathway for the formation of mercapturic acids from allyl compounds was discussed.

- Clapp, J. J., Kaye, C. M. & Young, L. (1969) *Biochem. J.* **114**, 6P

- Gray, J. M. & Barnsley, E. A. (1971) *Xenobiotica* **1**, 55-67
Kaye, C. M. & Young, L. (1970) *Biochem. J.* **119**, 53P

A New Micro Method for the Determination of Acid Glycosaminoglycans in Urine

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Procedures currently available for the determination of total urinary glycosaminoglycans tend to be lengthy and complicated. Methods include precipitation with quaternary ammonium salts, which is the most widely used (Di Ferrante & Rich, 1956; Teller