after incubation with the amine oxidase the resultant aldehyde had approximately the same activity as serotonin. Peroxide formation in 3.0 mg of pure methyl linolenate emulsified with a detergent and incubated with cytochrome *c*, was completely inhibited by 10 μg/ml of serotonin.

Fig. 2 shows the effect of several concentrations of serotonin on peroxide formation in liver mitochondria, catalyzed by ascorbic acid, and the similar effect of a homogenate of rat intestinal mucosa diluted 1 to 80. The anti-oxidant activity of the mucosa cannot be entirely accounted for by its serotonin content since the concentration in the intestine would have to be 250 μg/g, which is much higher than the values given by ERSPAMER[9]. Preliminary studies have shown that the main anti-oxidant in the mucosa is non-dialyzable and acid-labile; apparently a large molecule may be acting as a chelating agent or as a carrier of an active compound.

It is not possible to state that the anti-oxidant activity of serotonin explains any of its physiological actions. It might be of some importance in the radiation protection given by serotonin when it is injected immediately before exposure[10]. Other hydroxy-indoles may prove to be more active protective agents.

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Received October 23rd, 1956

A convenient method for the esterification of amino acids and their derivatives

During the study of the biochemistry of the proteolytic enzymes the need often arises for the methyl esters of amino acids as artificial substrates. However, in a laboratory where preparative organic chemistry is not regularly practised, the Fischer-Speier method may be difficult and time-consuming, especially in the maintenance of the apparatus for producing dry hydrogen chloride and in using it as a catalyst in the reaction. We have found that the reaction may be carried out more easily when a strong cation-exchange resin, *e.g.* Amberlite IR-120(H) or Zeo-Karb 225(H) is substituted as catalyst.

The resin was prepared by treating it with 2 to 4 bed-volumes of 2 *N* HCl, washing with distilled water until free from acid and drying it over $CaCl_2$ *in vacuo*. The esterification of hippuric acid, for example, is carried out as follows. 10 g hippuric acid, 10 g of the resin and 300 ml of dry methanol are refluxed for three hours with constant stirring. The resin is then removed by filtration and washed with methanol. The combined filtrate and washings are then concentrated to a syrup *in vacuo* and the residue shaken with aqueous sodium carbonate. In some instances the ester crystallises out at this point, but whether this happens or not the mixture is extracted three times with 50 ml of ether. The extract is dried over anhydrous sodium sulphate and the ether removed *in vacuo*. On cooling, the ester crystallises and our preparations had a melting point of 75–77° before and after two recrystallisations from 50:50 ethanol:water. HERZIG AND LANDSTEINER[1] report 75° for the melting point of the methyl ester of hippuric acid. The average yield of ester is 70%. It should be noted that once the resin has been prepared for use it may be stored almost indefinitely in a tightly stoppered container.

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Received November 12th, 1956

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