In the final lecture Mr G. S. Wilson, chief safety inspector of the Ministry of Agriculture, gave an overall picture of the present situation and of proposed measures to improve it. He stressed, however, that most accidents are caused by ignorance, carelessness and "sheer human folly" and would not be prevented by legislation. Adequate training is the only sure safeguard.

VITAMIN FUNCTION

Vitamin K and Prothrombin

from our Medical Biochemistry Correspondent

ALTHOUGH vitamin *K* has been known to be essential for the coagulation of blood for about thirty years, there is still no satisfactory explanation of how it functions. It has recently been suggested that vitamin *K* is necessary in protein synthesis and that prothrombin and the other coagulation factors which are decreased in the absence of the vitamin are the first to show the deficiency because of their relatively short half-lives. It is therefore of some interest that Hill and co-workers (*J. Biol. Chem.*, **243**, 3930; 1968) have now shown that vitamin *K* deficiency has no significant effect on protein synthesis in general, but that vitamin *K* is necessary for a relatively late step in the synthesis of prothrombin.

The authors have measured prothrombin in isolated rat liver microsomes and have shown that no prothrombin can be found in the microsomes from animals deficient in vitamin *K* or treated with dicoumarol. Injection of 10–20 μg of vitamin K_1 caused prothrombin to appear in the microsomes within two hours, however, and the concentration approached that in normal microsomes within three hours of vitamin *K* injection. This rapid response to vitamin *K* injection seems not to be due to any general effect on protein synthesis, for the incorporation of labelled amino-acids into protein in the heart, spleen, kidney, liver and plasma is the same for *K*-deficient and normal animals. Similarly, isolated liver microsomes incubated with *p*H 5 enzymes were equally active in protein synthesis, whether they came from *K*-deficient or normal animals, and vitamin *K* deficiency was found not to affect the production of tryptophan pyrrolase in the presence of tryptophan in intact or adrenalectomized animals.

Further evidence that protein synthesis is not directly affected comes from the observation that injection of vitamin *K* will stimulate the appearance of prothrombin in microsomes from deficient animals and those treated with coumarin even though the animals have been treated in advance with actinomycin *D*. Because actinomycin *D* blocks the synthesis of messenger RNA, this implies that the step requiring vitamin *K* must be later than the synthesis of messenger RNA. Cycloheximide appeared to inhibit peptide bond formation, but did not prevent vitamin *K* from releasing prothrombin. By contrast, puromycin almost totally abolished the response of the whole animal to vitamin *K*. Puromycin acts as an analogue of amino-acylated transfer RNA, becomes incorporated at the end of the peptide chain and prevents further elongation of the chain. It also breaks down polysomes into smaller subunits. If vitamin *K* and puromycin were given together, some prothrombin appeared in the liver microsomes but, if puromycin was given first, no prothrombin was detectable in the liver microsomes after vitamin *K* administration.

It seems that vitamin *K* is necessary for a very late stage in the synthesis of prothrombin and the other coagulation factors which are decreased in its absence. Hill and his colleagues suggest that vitamin *K* or some compound derived from it is involved in folding the polypeptide chains to form the prothrombin molecule. If this can be proved, it will be the first time that the clinical symptoms of a vitamin deficiency have been explained in terms of biochemical function.

GAS CHROMATOGRAPHY

Columns Further Refined

from a Correspondent

THE Gas Chromatography Discussion Group held its autumn informal symposium at the University College of Swansea on September 13. Dr J. R. Conder of Swansea, speaking on finite concentration gas chromatography, showed how by alternate switching of carrier gas and carrier gas containing a fairly high concentration of solute, gas–liquid and gas–solid interactions at dilutions other than infinite can be studied. The three methods in use all depend on measuring the retention volume of a solute zone the concentration of which remains constant as it passes through the column. The technique is interesting and probably valuable for interaction studies. Its use for analysis, however, requires a considerable amount of background work to establish feasibility and accuracy.

"The Determination of Vicinal Diketones and *a*-Keto acids by Gas Chromatography using an Electron Capture Detector" by G. A. F. Harrison of A. Guinness, Son and Co., Dublin, described a very elegant use of the selective properties of the electron capture detector to determine vicinal diketones and *a*-keto-acids when present as trace components (down to 0·1 p.p.m.). Dr F. R. Cropper of ICI Dyestuffs Division, Manchester, spoke on the determination of total organic carbon in aqueous effluents. Although this was not strictly a paper on chromatography, everything was there but the column. Carbon compounds are passed over heated copper oxide and converted to carbon dioxide, which is then reduced over a nickel catalyst to methane. The final estimation is done with a flame ionization detector. The "blank" on the apparatus is 1–2 p.p.m., which sets a lower limit of about 2 p.p.m. for volatile carbon compounds. Non-volatile material can be pre-concentrated and very much lower amounts estimated.

Dr S. W. Willmott (Mullard Research Laboratories, Redhill) described an application of the Curie point pyrolyser for the determination of polyolefins. This device gives such reproducible pyrograms that not only can copolymers be distinguished from homopolymers, but a great deal can be deduced about the microstructure of polymers. The addition of a micro-hydrogenator after the chromatographic column enabled olefinic fragments to be identified. Dr K. Jones of Petrocarbon Developments, Manchester, discussed direct digital control of the processing of gas chromatographic data. His chief point was that any routine laboratory with more than 10 chromatographs should now seriously consider a complete computer data