

silica gel. They used this new technique to effect a separation of the various acetyl amino acids. They successfully applied these techniques to the study of the amino acid composition of proteins like gelatin and polypeptide bactericidal substances, gramicidine and tyrocidine.

In 1944, considering the limitations of the above technique for the separation of free amino acids, Dr. Martin in collaboration with Dr. Consden and Dr. A. H. Gordon developed a very ingenious modification of partition chromatography, which has found enormous application since its introduction and has become the most valuable of all chromatographic techniques. For this technique, the silica gel column is replaced by filter-paper as the inert support. The great popularity of this new technique, known as paper-partition chromatography,

as an analytical tool is a tribute to the originality and ingenuity of Dr. Martin and it has led to one of the most remarkable advances on record in analytical technique.

There is an intimate connection between the researches of Dr. Martin and Dr. Synge. On the one hand, the earlier work of Dr. Synge on the partition coefficients of acetyl derivatives of amino acids formed the basis of the scheme of separation of amino acids by him, in close collaboration with Dr. Martin. On the other hand, it is the work of Dr. Martin who working in Dunn Nutritional Laboratory, Cambridge, constructed the counter current extraction machine for vitamin purification, which brought the two chemists together to evolve new techniques in partition chromatography.

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ELECTRONIC STERILISATION OF PHARMACEUTICAL PRODUCTS

THE possibility of using high velocity electrons for killing bacteria and other micro-organisms on a commercial scale has been investigated in the United States of America for several years, particularly regarding potential applications in the food and pharmaceutical industries. More recent developments have been concerned with the use of the radiations from radio-active atomic fission products, the waste products from atomic energy projects. The main advantage of the process is that sterilisation of a wide variety of products is possible, within severe practical limits, without the extensive damage associated with heat or chemical sterilisation. Small amounts of chemical side-effects occur which are frequently objectionable, but these can be reduced by suitable choice of technique. A certain amount of work has also been carried out by the Food Investigation Organization of the D.S.I.R., England.

The use of high velocity electrons and gamma rays has been studied by various workers. The former were obtained from electron accelerators with effective anode voltages usually upto 2 or 3 million volts; upto 15 million volts had been used, however. Gamma rays were obtained from radio-active sources; Cobalt 60, which was being used experimentally, gave radiation with an energy of about 1 Mev. It is important to note that these energies are insufficient to induce radio-activity in irradiated products.

The biological effects of these radiations have

been studied intensively and the ability to kill bacteria has been proved, the general principle being that large organisms are more easily killed than small. The most extensive and reliable figures available had been published by the Department of Food Technology of the Massachusetts Institute of Technology. Their observed sterilisation doses were approximately:

Insects	100,000 rep.
Vegetative Bacteria	500,000 rep.
Moulds and Yeasts	1,000,000 rep.
Bacterial Spores	2,000,000 rep.

the "rep" being a very small unit based on the number of ions produced by the radiation. 1,000,000 rep. gave a temperature rise of approximately 2° C. in water under adiabatic conditions. For the present, the general principle should be to determine the sterilisation dose for any given product by direct experiment. In some cases an incomplete kill might be accepted, with a considerable reduction in the dose necessary, but this possibility should be regarded with reserve until the subject has been more fully explored. Viruses usually required larger doses for their destruction, upto 5,000,000 rep. and enzymes even larger, upto 10,000,000 rep. or more, depending on their size. Toxins, etc., would in general be even more resistant. The advantages of the process are: (a) The sterilisation of heat sensitive materials would be possible. (b) Almost any type of sealed container could be used. (c) In some cases new products might be prepared, e.g., new vaccines.