

insulin, causing the hepatic reserves of glycogen to be mobilized and stored in the periphery, thus preparing the liver for the uptake of the newly absorbed glucose." Here, then, is the possibility that our knowledge of

man's utilization of carbohydrate will be enhanced when we learn more about the "newest" of the hormones—glucagon.

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### *Life in a Test Tube?*

From time to time there appear articles in scientific journals that stir the imagination, not alone by their scientific ingenuity but by their deeper and more profound philosophical implications. One such brief report (Miller, S. L.: A production of amino acids under possible primitive earth conditions, *Science* 117: 528, May 15, 1953) has the touch of simplicity often found in significant contributions.

It has been suggested previously that the organic compounds "that serve as the basis of life" were formed when the earth had an atmosphere of water, hydrogen, ammonia, and methane—instead of carbon dioxide, nitrogen, oxygen, and water, as it has at present. Since electrical discharge may have also played a significant role in the formation of compounds in the primitive atmosphere, Miller (at the University of Chicago) prepared a simple apparatus which circulated methane, ammonia, hydrogen gases in the presence of water and water vapor past electrodes, which, it was hoped, would form free radicals. Water was boiled, mixed with the gases, circulated past the electrodes, and condensed, to empty back into the boiling flask. It was noted by the end of the week of slow circulation by this method that the aqueous solution became red and turbid. The turbidity was due to colloidal silica

from the glass and the red color due to organic compounds absorbed on the silica.

By paper chromatography it was shown that a number of amino acids were now present in the solution. On this basis, glycine, alpha-alanine, and beta-alanine were identified. The amino acids were not due to living organisms because growth was prevented by the boiling water during the run and by the presence of certain chemicals such as mercuric chloride, barium hydroxide, and sulfuric acid used during the analysis. It was also noted that it was possible that aspartic acid and various other amino acids, which have not as yet been identified, may have been present in smaller concentration.

As the author mentions, this apparatus was an attempt to duplicate the primitive atmosphere of the earth and not to obtain optimum conditions for the formation of amino acids. Nevertheless, it is conceivable that by modification of this system a higher and different yield of amino acids may be accomplished.

If this finding can be substantiated it will not only open up new fields for research but may present a hint as to those momentous events when the earth was cooling many eons ago, events which led to the development of the greatest enigma of all—life.

