LETTERS TO THE EDITORS

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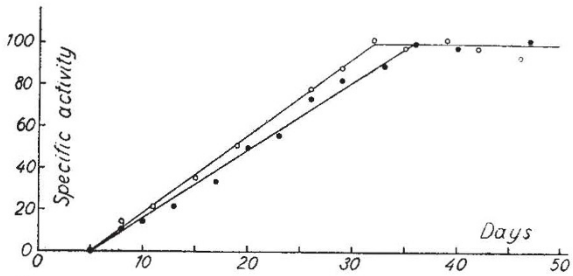
Life-Cycle of the Red Corpuscles of the Hen

THE life-cycle of the mammalian red corpuscles is not known with certainty. Values varying between 30 and 200 days are recorded. One would expect the problem to be easily solved by making use of an isotopic indicator, that is, by labelling the corpuscles. In trying to find a suitable indicator, great difficulties are encountered due to the fact that almost every compound present in the corpuscles is renewed at a comparatively rapid rate. Only such labelled molecules which have a longer life-time than the red corpuscles in which they are located can be used as indicators. Iron atoms incorporated with hæmoglobin molecules remain unchanged during the life-time of the red corpuscles[1]. Hahn and his colleagues[2], however, found that the iron atoms contained in the debris of the hæmoglobin of decayed corpuscles are preferentially used in the formation of new corpuscles. This fact makes radioactive iron unsuitable for the determination of the life-cycle of the red corpuscles.

We found desoxyribose nucleic acid phosphorus to be a suitable indicator for the determination of the life-cycle of nucleated corpuscles. In contradistinction to desoxyribose nucleic acid molecules present in various organs, those found in the red corpuscles of the hen are not renewed at an appreciable rate. In experiments *in vitro*, in which hen blood was shaken in an oxygen atmosphere in the presence of labelled sodium phosphate, no active desoxyribose nucleic acid was found to be formed, in contradistinction to other active phosphorus compounds. Furthermore, activity was absent in the desoxyribose nucleic acid present in the circulating red corpuscles of the hen up to five days after administration of radioactive phosphate.

Hen corpuscles, labelled by their active desoxyribose nucleic acid content, can be used in two different ways. We can administer, for example, labelled phosphate to the hen, and after the lapse of a week replace part of the corpuscles of a second hen by labelled corpuscles of the first one. When taking blood samples at intervals, we can determine what percentage of the transfused corpuscles is still present in the circulation of the hen. In a note to be published later, we shall communicate the results obtained in such experiments. In this note we shall describe another method in which, by avoidance of blood transfusion, the uncertainty about the equality of the life-time of the transfused corpuscles and the endogenous corpuscles can be eliminated.

In the latter method, labelled phosphate is administered twice a day to the hen in such quantities that the plasma phosphate is kept at a constant or almost constant level of activity. The active phosphate penetrates into the marrow and participates in the formation of the nucleic acid of the corpuscles, which thus become labelled. The percentage of labelled corpuscles will increase with time, and finally the circulation will contain labelled corpuscles only; thus the activity of 1 mgm. corpuscle desoxyribose nucleic acid phosphorus will be equal to the activity of 1 mgm. marrow phosphorus and 1 mgm. plasma phosphorus respectively.



LIFE-CYCLE OF THE RED CORPUSCLES OF TWO HENS. ABSCISSÆ: DAYS AFTER START OF EXPERIMENT; ORDINATES: SPECIFIC ACTIVITY OF DESOXYRIBOSE NUCLEIC ACID PHOSPHORUS EXTRACTED FROM THE CORPUSCLES SECURED AT DIFFERENT DATES.

The results of such experiments are shown in the accompanying graph, which makes it clear that in the first five days the nucleic acid present in the corpuscles is inactive. This may be interpreted by assuming that, in the first phase of the experiment, corpuscles containing inactive nucleic acid reach the circulation, and that it is about five days before corpuscles containing labelled nucleic acid are given off by the sinusoids to the circulation. The maturing of the corpuscles in the marrow thus takes about five days. The graph also shows that, after the lapse of about thirty-three days, the maximum value of the activity of the desoxyribose nucleic acid is reached. Taking into account that in the first five days no labelled corpuscles intrude into the circulation, the life-time of the red corpuscles will be 28 days. It is of interest finally to note that the results obtained indicate that all or almost all corpuscles present in the circulation have a similar life-time.

We wish to express our cordial thanks to Prof. Niels Bohr, director of this Institute, and to Prof. August Krogh and Dr. Albert Fischer in whose laboratories the investigation was continued while the Institute of Theoretical Physics was under enemy occupation.

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[1] Hahn, P. F., Bale, W. F., Ross, J. F., Hettig, R. A., and Whipple, G. H., *Science*, **92**, 131 (1940).
[2] Hahn, P. F., Bale, W. F., and Balfour, W. M., *Amer. J. Physiol.*, **135**, 800 (1941–42).

Departure of Long-Wave Solar Radiation from Black-Body Intensity

IN some recent experiments of great interest and importance, both Reber[1] and Southworth[2] have succeeded in detecting and measuring solar radiation in the short-wave end of the radio spectrum. The wave-length employed by Reber was 187 cm., while the three wave-lengths used by Southworth, although not precisely specified, were of the order of 10 cm. and less. In both series of experiments it was found that the intensity of solar radiation approximately conformed to that emitted by a black body at a temperature of 6,000° K. In another series of experiments of somewhat allied character, Jansky is reported to have been unable to detect solar radiation using a longer wave-length of 14·6 metres, although his apparatus was sufficiently sensitive to detect the electromagnetic radiation, which he discovered in 1931, coming from the vicinity of the Milky Way.