olive oil. Palmitic acid had a very slight effect, whereas hydrogenated soybean oil had no effect. The absorption of oleic acid was much lower than that of palmitic acid, corn oil or olive oil, perhaps due to the formation of the lipid. The significance of the fecal lipid is discussed.

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Life Span of the Duck and Chicken Erythrocyte as Determined with C^{14}. (22561)

KIRKLAND C. BRACE AND PAUL D. ALTLAND.

National Cancer Institute and National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Department of Health, Education and Welfare.

Carbon 14 labeled glycine has been widely used to determine the life span of the non-nucleated erythrocytes of man(1), and several of the lower mammals(2-4) but apparently has not been used to study the life span of the nucleated erythrocytes of the bird. Shemin(5) using N^{15} and Hevesy *et al.*(6) using P^{32} found the life span of the chicken erythrocyte to be 28 days. McConnell *et al.* (7) using Se^{75} to label the cells, determined the life span of the duck erythrocyte to be 11.7 days. This present study was undertaken to provide additional information on the erythrocyte life span of these 2 species by the use of C^{14} and to evaluate the applicability of this material in the measurement of the life span of nucleated erythrocytes.

Methods. Glycine-2-C^{14} was injected intravenously into the wing vein of the birds. Two adult female chickens were given 17 μc per kilo of body weight and 2 adult male ducks were given 35 μc per kilo. Two additional ducks were given the same dose intraperitoneally for studies of the rate of uptake. One half ml of blood was obtained at regular intervals after the initial injection. Samples containing 0.1 ml of packed cells were prepared by washing the cells 3 times with saline and precipitating the protein with 10% trichloroacetic acid. The precipitate was washed and plated onto a 1 inch copper planchet and counted in a gas flow proportional counter.

Results. The radioactivity of the red cell protein of the duck and chicken is shown as a function of time in Fig. 1. There was an unusually rapid uptake of the labeled carbon into the protein of the duck cells. This response was independent of the method of injection because the rapid uptake was also observed following intraperitoneal injection of the glycine. The character of the uptake curve and the double hump noted at the peak of the curve suggested that approximately 10% of the glycine α-carbon incorporation was in the red cells already in the peripheral circulation. The sigmoidal decay was typical of that observed in man and the mammals where only a relatively homogenous age group of cells forming in the marrow are labeled. We therefore assumed that the lower plateau and decay curve represent the labeling of the more or less homogenous age group forming in the marrow at the time of injection. An analysis of the curves gave a value of 44 days from the initial labeling until 50% of the cells were destroyed with half of the labeled cells destroyed in the interval $\pm$ 5 days. The mean survival time, which represents the average time during which a given cell may exist in the peripheral circulation, is ordinarily computed as the interval between the appearance and disappearance of 50% of the labeling. If we ignored the unusually rapid uptake the value was 42 days. If we assumed that the

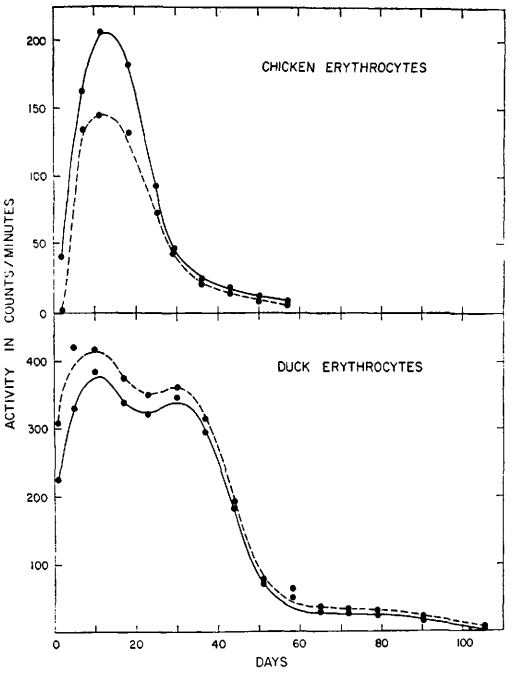

FIG. 1. Change in radioactivity of red cell protein after intravenous inj. of glycine-2-C^{14} in duck and chicken. Solid and broken lines represent individual animals.

uptake of C^{14} by the cells in the duck marrow was similar to that found in the chicken, the mean survival time of the red cells of the duck was reduced to about 39 days.

The slow uptake of the glycine α-carbon into the protein of the chicken erythrocyte suggested that the labeling of the cells other than those forming in the marrow contributed relatively little to the total activity. The absence of a well defined plateau was due principally to an apparent shorter life span. Fifty per cent of the cells were destroyed 25 days after injection with half of the cells destroyed in the interval $\pm$ 4 days. The mean survival was reduced to 20 days by the prolonged period of uptake.

Discussion. The longevity of the erythrocytes of the chicken and duck obtained by the use of C^{14} differs from the values obtained by other methods. The lower value of 20 days for the chicken as determined with C^{14} contrasts with the 28 days obtained with N^{15} and P^{32}(5,6). The higher value may be due to the fact that the uptake of the labeling material in their study extended over a period of several days and depended upon the absence of or a correction for the metabolism of cells in the circulating blood. Our data suggest that the glycine α-carbon metabolism of the circulating cells was insignificant in the chicken and therefore our values represent a more direct determination.

The value of 39 days for the longevity of the duck erythrocyte obtained with C^{14} is in marked contrast to that of 11.7 days obtained with Se^{75} by McConnell *et al.*(1). These investigators transfused cells labeled with a toxic material, a technic which provides only a minimum value for the life span. The mean life span was probably nearer the value obtained with C^{14}. The very rapid uptake of C^{14} during the first 2 days after injection in our study suggested that possibly some of the isotope was incorporated into the protein of the cells already in the peripheral circulation. *In vitro* studies(8) have shown that glycine is utilized in the synthesis of hemoglobin in the circulating duck cells. Extensive studies on the turnover of the α-carbon glycine in the mammal indicate, however, that reutilization of the labeled carbon from hemoglobin is very small, and the long decay curve can be ascribed to the utilization of labeled glycine from the body pool for the formation of new cells(9). It is of interest to contrast the relatively short life span of the nucleated bird erythrocytes with the long life span of more than 11 months obtained for the nucleated erythrocytes of the turtle(10) by the use of the same method. The definitive life span of the turtle erythrocyte and other cold blooded animals remains to be delineated.

Summary. Measurements of the life span of the erythrocyte with glycine-2-C^{14} give a value of 20 days for mean survival time for the chicken and 39 days for the duck. The uptake of the α-carbon of glycine into the cell proteins in the chicken was similar to that observed in the mammals. The shape of the decay curve was typical of that observed when a homogeneous group of red cells are labeled in the marrow, and gave little evidence of reutilization of the labeled carbon. The utilization of glycine α-carbon by the duck cells was

similar to that observed in the chicken except for the rapid uptake which gave some evidence of uptake by the cells in the peripheral circulation.

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Effect of Chlorpromazine and Dibenzyline on Bacterial Toxins. (22562)

HOWARD E. NOYES, JAY P. SANFORD* AND RUSSELL M. NELSON.†
(With technical assistance of Edward B. Phillips.) (Introduced by R. W. Clarke.)
Department of Experimental Surgery, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D. C.

Various bacterial toxins, particularly the endotoxins from "coliform" bacteria and the exotoxin of *Clostridium perfringens,* have been considered important factors in the pathogenesis of the decompensated phase of prolonged hypotension (irreversible shock) (1-3). Premedication with a number of pharmacologic agents particularly chlorpromazine and dibenzyline, has been shown to decrease the mortality in the shock syndrome, whereas the same treatment initiated after the onset of shock has been ineffective(4-6). The mechanism of protection has not been elucidated. Chlorpromazine recently has also been reported to offer protection against "endotoxemia" in man and experimental animals and to be useful in the management of tetanus (7-10). The effect of either chlorpromazine or dibenzyline in attenuating lethal shock might be the result of direct action on bacterial toxins or alteration of the host response to them. A study of the effects of chlorpromazine and dibenzyline in animals injected with a variety of bacterial toxins, including those which may play a role in the pathogenesis of irreversible shock, was undertaken and is the basis of this report.

Methods and materials. White Swiss mice, Bagg Strain, each weighing 16-18 g were used. Food and water were readily available to the animals throughout the experiments. The characteristics of the toxins used are listed in Table I. Dosages of the various toxins to range from an LD_{40} to an LD_{70} were estimated by preliminary titrations. All toxins were diluted in 0.9% NaCl solution and, if not sterile, sterilized by filtration through sintered glass. The intravenous route of administration was used with the toxin from *S. dysenteriae,* the subcutaneous route with the tetanus toxin, and the intraperitoneal route with the other toxins. Chlorpromazine and dibenzyline‡ were obtained as sterile solutions. The therapeutic regimens generally corresponded to those reported to be effective in the shock syndrome. The dose of chlorpromazine was 33.5 μg per injection (2 mg/kg) while that of dibenzyline was

* Present address: Duke University School of Medicine, N. C.

† Present address: University of Utah College of Medicine, Salt Lake City.

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