However, pentobarbital evidently does have an inhibitory effect on the acetylation system when small amounts of Co A are used, in the presence of preformed ATP. The lessening of inhibition when more Co A is added strongly suggests that pentobarbital has a direct effect on the acetylation system and that any effect on ATP synthesis may be in addition to its effect on the coenzyme A-apoenzyme complex or the formation thereof. It is possible that the lack of inhibition noted by Johnson and Quastel in the unaged pigeon liver system may be due to a large excess of Co A in the system. The failure of Co A to be irreversibly broken down in their preparation may be due to the presence of fluoride or the instability of the catabolic enzyme (*5*). In the case of the coupled rat brain-pigeon liver system of Johnson and Quastel, one must postulate a lower level of Co A, since ATP is effective in reducing the inhibitions described. This is borne out by the assays of Co A in tissues reported by Kaplan and Lipmann (*5*).

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Depigmentation of Hair as a Biological Radiation Dosimeter

Jack Moshman and Arthur C. Upton

Mathematics Panel and Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Exposure of large numbers of mice to graded doses of whole-body ionizing radiation at the Eniwetok weapon tests in 1951 gave an opportunity to evaluate radiation-induced depigmentation of fur as a biological dosimeter. The feasibility of such a study was indicated by earlier experiments in which decolorization of hair had been correlated with the dosage of x-radiation (*1–3*).

As early as 3 mo postirradiation graying of fur was detected in many of the more heavily irradiated LAf_1 mice; their normal coat is brown over the entire body. As the animals were genetically uniform males and females of approximately the same age, irradiated simultaneously, the degree of depigmentation appeared to be correlated with the dose of radiation. Accordingly, random samples from a colony of over 3000 mice exposed at 16 dose levels, were examined and the pattern of graying recorded as follows. The coat of each mouse was divided into 6 regions: (1) top of head (scalp), (2) nuchal region, (3) supraclavicular area, (4) anterior chest and abdomen, (5) scapular area, and (6) lumbo-sacral region. Each area was observed grossly for coat color, and the degree of depigmentation was graded on an integral scale from 0 to 4, zero indicated no change from the normal brown color, and 4 designated pure white, or complete depigmentation. Repeated examinations of the same mice, made at intervals of 2 mo, revealed that the decolorization progressed during the passage of time. Therefore, an attempt was made to fit a linear function to the date, which would best relate the depigmentation of the 6 regions specified to the dose at a given time postirradiation.

The function postulated assumed the form

$$d = \lambda_0 + \lambda_1 p_1 + \lambda_2 p_2 + \lambda_3 p_3 + \lambda_4 p_4 + \lambda_5 p_5 + \lambda_6 p_6,$$

where p_i is the degree of depigmentation at region i ($i = 1, 2, \cdots, 6$) and λ_i is a fitted, constant coefficient, so chosen as to maximize the ratio of the differences between means of the dose groups to the variation within each group. The procedure followed considered each region separately, then all combinations of 2 regions, then 3, and so forth, until the variation about the line or plane was not significantly reduced by the addition of another variable.

Representative data, covering the examinations made 7 and 17 mo postirradiation, are presented. Two hundred and thirty-nine mice, exposed at 16 dose levels, including nonexposed controls, were surveyed at 7 mo. At 17 mo the surviving 174 mice of this sample were re-examined. In each case the top of the head (scalp) was the region of the least variation about the fitted line. However, this function was not completely satisfactory, because those animals receiving high doses of radiation were uniformly white over the top of the head ($p_1 = 4$) and those exposed to low doses did not exhibit evidence of depigmentation ($p_1 = 0$). The animals in the extreme dose groups were, therefore, omitted and the procedure was repeated for the 138 and 116 mice examined at 7 and 17 mo, respectively. They received between 287 and 687 r. The radiation was a mixture of gamma rays and neutrons of varying energies, predominantly the former. Again a significant decrease in the variation resulted from consideration of the top of the head alone. The 2 resulting equations are of the form

$$d = \lambda_0 + \lambda_1 p_1,$$

where λ_1 represents the average increase in the dose per unit increase in depigmentation and λ_0 may be interpreted as the upper bound for the dose received when there is no depigmentation. The parameters estimated from the data are summarized in Table 1 and the lines are exhibited graphically in Fig. 1. The slopes, or λ_1's, of the lines do not differ statistically, but there is a definite significant statistical difference between the intercepts, or λ_0's.

These findings represent a shift of the line downward and to the right during the 10 intervening mo. This is interpreted as indicating a uniform increase in degree of depigmentation among dose groups dur-

TABLE 1. Parameter estimates and standard errors of depigmentation dosimetry equation.

Months after irradiation	Number of mice	λ_0	λ_1	Standard error of λ_1	Standard error of estimate about line
7	138	313.22	85.97	2.71	51.42
17	116	253.75	92.30	4.05	62.80

ing this period. The same increment in expected dosage per unit of increase in depigmentation existed at both times, but at 17 mo the threshold was 254 r (reading from the line), whereas at 7 mo there was no discernible graying below 313 r.

The correlation between dose and depigmentation varied markedly with different regions of the coat, and occasionally gave rise to a mottled appearance of the fur. Sharply demarcated areas of brown (grade 0) and white (grade 4) hair were at times in juxtaposition to one another. This is best explained by postulating the existence of differences in the radiosensitivity of hair follicles of various areas at the time of irradiation. Chase has shown that the susceptibility of individual hairs to graying varies markedly, and depends upon such factors as the stage of the growth cycle and the type of the hair follicle (*4*). No attempts were made to characterize the development of the hair follicles of LAf_1 mice or to determine by microscopic count the anatomical distribution of the various types of follicles, but the observed pattern of depigmentation suggests the contours of the moulting patterns described by Dry (*5*). As the mice of this experiment were irradiated at the age when moulting was presumably in progress, it is logical to attribute regional variations in degree of depigmentation, as observed, to differences in radiosensitivity of hair follicles due to moulting.

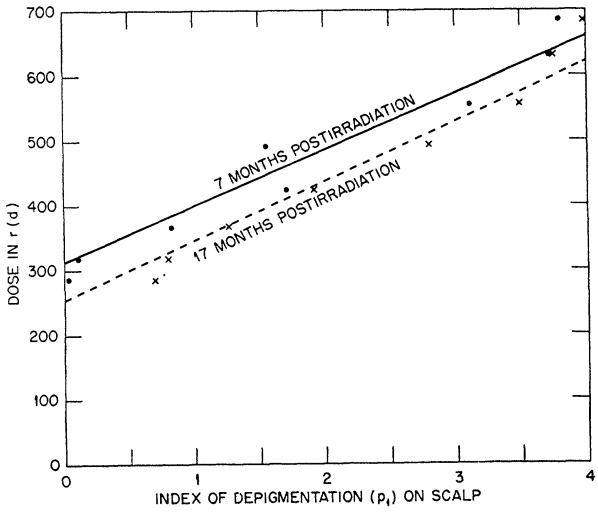

FIG. 1. Estimated dose as a function of depigmentation.

It may be concluded that the degree of depigmentation of fur of mice of the LAf_1 strain is closely enough correlated with the dose of radiation to constitute a convenient biologic dosimeter. This correlation, however, varies markedly with different regions of the coat, and for the mice studied it is more constant for the fur of the top of the head than for that of other areas examined. The greater constancy for the top of the head is attributed to the tendency of all hair follicles in this region to be resting during the age at which the mice were exposed (*2, 5*). The progression of depigmentation of various areas probably resulted from gradual replacement of old colored club hairs by postirradiation depigmented hairs, as several hair generations are usually represented in each follicle at any given time (*2, 5*).

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Nitrate Formation by a Soil Fungus[1]

Edwin L. Schmidt

Department of Bacteriology and Immunology, University of Minnesota, Minneapolis

Nitrification in soil is a biological process of paramount importance to the nutrition of green plants, for the nitrate nitrogen that is the end product of this process serves as the principal form in which nitrogen is used by photosynthetic plants. Ever since the classical researches of Winogradsky around 1890, the process of nitrification has been attributed to the activity of a few genera of highly specific, strictly autotrophic soil bacteria which oxidize ammonium nitrogen to nitrate in a two-step reaction. In recent years evidence has suggested that certain heterotrophic microorganisms isolated from soil may participate in the first stage of nitrification, the production of nitrite nitrogen. Quastel *et al.* (*1*) reported the isolation of three species of soil bacteria capable of oxidizing pyruvic acid oxime and the oximes of certain other alpha-keto acids to nitrite. Jensen (*2*) found isolates of two additional genera of soil bacteria, and numerous isolates of the actinomycete species *Nocardia corallina* capable of producing nitrite from pyruvic oxime. The oxidation of ammonium nitrogen to nitrite has been observed also for a soil actinomycete of the genus *Streptomyces* (*3*), various unidentified heterotrophic

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