is insoluble in lipid solvents, even after heat denaturation. It is extracted rapidly by 1*N*.HCl, formic acid, and ammonia solutions down to 5 percent, but it is stable in neutral aqueous media with the exception of strong oxidizing and reducing agents, which cause fading. Generally, these reactions suggest an ommochrome or related substance (*5*). Tests on paraffin sections, however, show no redox-reversible color change such as the changes that characterize many (but not all) ommochromes. Fluorescence tests have not been carried out. The extract in HCl is stable and shows a single absorption maximum at 465 to 470 mμ. It may be noted that ommochromes occur in the eyes of planktonic crustacea on which *Nanomia* feeds. Orange-and-red pigment is often seen in food undergoing digestion and in waste matter ejected from the palpons, and it is possible that the pigment in the chromatophores is derived from that in the food.

The ecological significance of the chromatophores is uncertain. *Nanomia* is bioluminescent, and the regions emitting light are distributed in the nectophores and possibly elsewhere in a pattern resembling the color pattern by day. However, there is no evidence of functional connection between the two systems. It can be shown that *Nanomia* is phototropic, responding to light by swimming, but again the distribution of photosensitive areas involved in the swimming response does not follow chromatophore distribution. Whatever the significance of the color change itself, the distribution of the patches of pigment strongly suggests a form of disruptive coloration. When the chromatophores are dispersed the outline of the siphonophore is broken up into scattered pinpoints and patches of color, resembling a cloud of plankton. At night, the scattered sites of light emission give the same effect, at any rate to the human eye (*6*).

G. O. MACKIE

Department of Zoology, University of Alberta, Edmonton, Canada

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Bovine Thyroid Iodine-131 Concentrations Subsequent to Soviet Nuclear Weapon Tests

Abstract. The iodine-131 concentration in thyroids of cattle slaughtered in Reno, Nevada, was measured during and following recent atmospheric nuclear weapon tests by the U.S.S.R. The iodine-131 concentration rose rapidly to a maximum and then declined with an apparent half-life of 7 days after conclusion of the test series. The average dose to bovine thyroids from this test series was estimated to be 17 rads.

The accumulation of iodine-131 in the thyroid gland of domestic ruminants has been reported subsequent to previous atmospheric nuclear weapon tests (*1*) and nuclear reactor accidents (*2*). Van Middlesworth (*1*) has enumerated the unknown factors determining the maximum uptake of I^{131} by cattle thyroid glands subsequent to nuclear weapon tests. Because I^{131} has a relatively short half-life (8 days), an increase in concentration should indicate recent releases of fission products and interpretation should be uncomplicated by older fallout debris as are measurements of fission products of longer half-life. Although major emphasis has been on long-lived fallout contaminants such as strontium-90 and cesium-137, increased attention has recently been focused on short half-life fallout, particularly I^{131} (*3*).

For our study thyroid glands were removed at slaughter from cattle in a commercial meat packing plant (*4*). The only selection practiced was that we did not sample very young animals. Although individual animal histories were not obtained, it is estimated that at least 90 percent of the animals sampled spent the last 60 days within 100 miles of Reno, Nevada, and in the rain shadow of the Sierra Nevada mountains. Measurements of the I^{131} content of a 4.0 ± 0.1 g sample of thyroid tissue, dissected free of extraneous tissue, was made as previously described (*1, 5*). All samples were counted by use of two separate counting systems and the results were averaged. All samples collected on a given day (four to

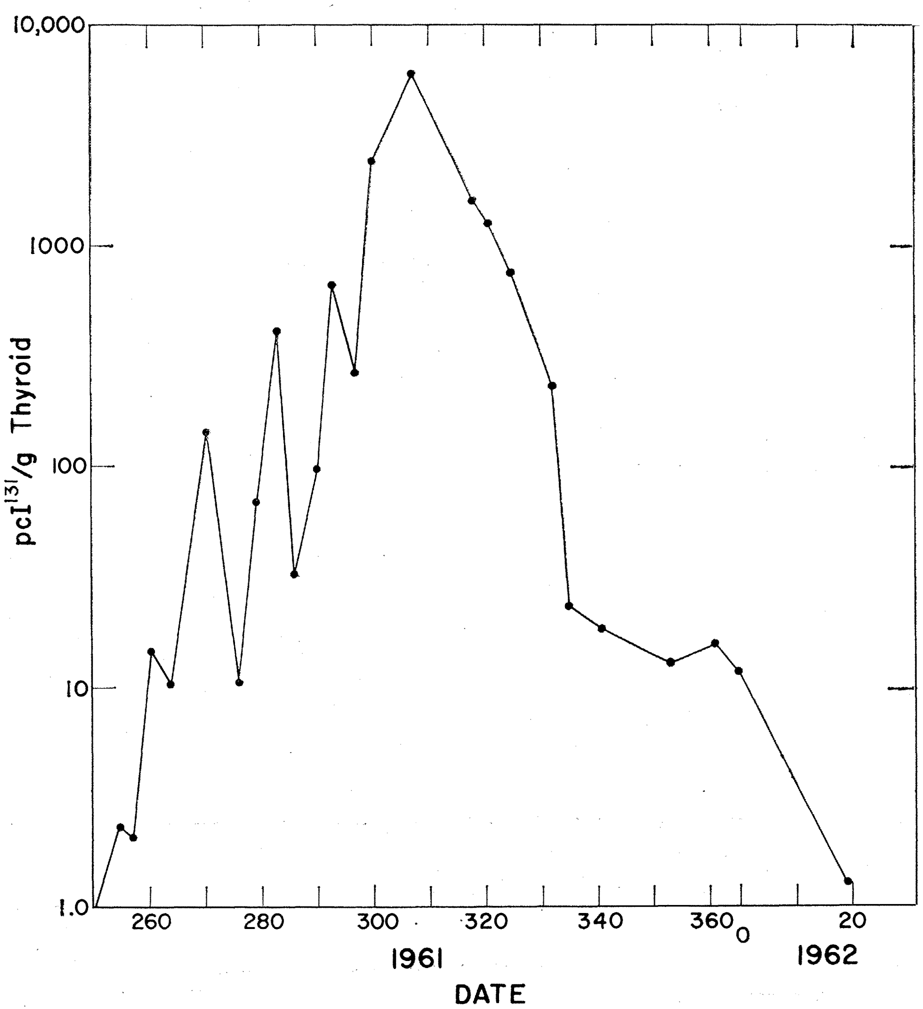

Fig. 1. Bovine thyroid I^{131} concentrations from 7 September 1961 to 20 January 1962 The date is indicated as the serially numbered day of the year.

six) were corrected for decay to the day of slaughter and averaged.

Nuclear weapon tests were conducted in the atmosphere by the U.S.S.R. during September and October 1961. Samplings of thyroids of Reno cattle were made approximately twice weekly during this time and on a slightly less frequent schedule until 30 January 1962. These data are presented in Fig. 1. A noticeable rise in concentration occurred on 12 September (day 255), 11 days after the first announced atmospheric detonation. The thyroid I^{131} level continued to rise until 3 November (day 307), after which it decreased rapidly, and reached the pre-testing level around the end of January 1962. A large variation in thyroid I^{131} concentration of animals sampled the same day has been reported (*1*). In the present study, on 8 of 24 sampling dates the maximum concentration in an individual gland was more than 10 times the minimum concentration. Greater uniformity was observed as the concentration was increasing rather than decreasing. No correlation was found between the day of the week and the I^{131} concentration, indicating that the management practices of the slaughter establishment did not influence the data.

The data appear reasonably linear as a semilogarithmic plot. This type of graphical representation has been used previously for similar data (*1*). A regression (log of concentration versus time) equation was fitted separately to the rising and falling portions of the curve. The rise to the maximum is characterized by a doubling time of 5.7 days. The decline shows a half-period of 6.6 days which is very similar to that previously reported for sheep (*6*). The rate of rise would be primarily a function of the test schedule (time and fission yield) and atmospheric conditions whereas the rate of decline would reflect primarily the rate of deposition (fallout), physical decay of I^{131}, and turnover of I^{131} by cattle.

It has been demonstrated in several mammalian species that I^{131} is absorbed only through the gastrointestinal tract (*6, 7*). Thus the thyroid I^{131} levels in cattle reflect only the I^{131} content of their feed and water modified by the rather slow turnover of I^{131} in cattle. The level of I^{131} in cattle thyroids should, therefore, be a very sensitive indicator of the maximum fallout of I^{131} available in the biosphere.

The radiation dose occurring in the thyroid gland of cattle from this test series was computed by the method of Dunning (*8*). The maximum and average doses were, respectively, 1.1 and 0.55 rads per gram of fresh thyroid tissue. Assuming a mean thyroid weight of 34 g (*8*), the mean dose to cattle in Reno from the test series was estimated to be 19 rads and the estimated maximum was 37 rads. These dosages are considerably greater than those reported for cattle during the 1955–56 nuclear tests (*1*). Although no radiation protection standards have been promulgated for cattle, certain comparisons may be made with protection standards for humans. The weights of human and cattle thyroid glands are similar (*9, 10*). The "Radiation Protection Guide" for human thyroids is 1.5 rem per year for individuals and 0.5 rem per year for the population (*11*). The doses computed for Reno cattle resulting from the U.S.S.R. test series were 25 to 40 times greater than these guide figures. Human thyroid I^{131} concentrations have been reported to be only 1/500 as great as those found in cattle (*12*).

The data presented here serve to reemphasize the suggestion (*13*) that continuous monitoring of thyroid glands from slaughter cattle provides a good index of the biological concentration of airborne radioactive fallout (*14*).

CLIFTON BLINCOE
V. R. BOHMAN

Departments of Agricultural Chemistry and Animal Husbandry, University of Nevada, Reno

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Genetic Differences among White Leghorn Chicks in Requirements of Arginine

Abstract. Among three strains of the one breed, and among sire families within each strain, there were highly significant differences in ability of chicks to tolerate a deficiency of arginine at ages up to 4 weeks. One of these strains required about 25 percent more arginine than another for maximum growth to that age.

Extreme variability in growth rate of chicks fed diets deficient in arginine has been reported by several investigators (*1, 2*). Hegsted (*3*) found that White Leghorn chicks differ from Barred Plymouth Rocks in quantitative requirement of arginine. The study reported in this paper shows that there are significant differences in the requirement of that amino acid between strains of White Leghorn chickens and among sire families within those strains.

Pedigreed, wing-banded, male chicks from three strains of White Leghorns were grown to 4 weeks of age on diets deficient in arginine. At the end of the experiment, chicks were weighed individually, and average weights were determined for the three strains and for sire families.

The arginine-deficient diet consisted of the following ingredients (in grams per 100 g): casein, 25.00; glucose, 59.75; cellulose, 3.00; corn oil, 4.00; glycine, 1.00; DL-methionine, 0.40; vitamin mixture, 1.22; mineral mixture, 5.63. The vitamin and mineral mixtures were the same as those used by Nesheim *et al.* (*4*).

Twenty unpedigreed male chicks from each strain were placed on a control diet identical to the one just given except that it contained 0.81 percent L-arginine added as L-arginine·HCl to the 0.9 percent already in the casein.

Differences among the three strains at 4 weeks of age were remarkable (Table 1). Chicks of strains A and C did not differ significantly in weights of controls, in reduction of weight on the deficient diet, or in mortality. In striking contrast, among chicks on the deficient diet, mortality was higher and growth poorer in strain B than in both the other strains.

An analysis of variance showed that the differences among the strains in weights at 4 weeks on the deficient diet were highly significant ($P = <.01$). Similarly, comparisons of the number that died in strain B with those dying in strains A and C (using actual numbers in contingency tables rather than the percentages given in Table 1) showed