Oxygen Deficiency and Radiation Damage in the Insect *Rhodnius*

Reduction in radiation damage under conditions of low oxygen tension during the exposure has been demonstrated in a number of plant and animal tissues[1]. This report deals with similar effects in the insect *Rhodnius prolixus*. Latent radiation damage in 'resting' cells of the epidermis of *Rhodnius* is expressed as a burn at delayed moulting following a blood meal[2]. In these studies, the delay in moulting and the size of the burns have been utilized as convenient indices of the oxygen effect during X-irradiation.

Unfed 4th instar nymphs were irradiated on the dorsal surface of the abdomen through a hole, 1·6 mm. diam., drilled in a lead shield 5 cm. in thickness[2]. During exposure (at 16 cm. from the target of a 2 MeV. X-ray machine; dose-rate 6,000 r. per min. as measured in air without the shield) the insects were enclosed in a small chamber through which either air or nitrogen was circulated at a rate of 3 litres per min., after bubbling through water at room temperature. *Rhodnius* can be held in nitrogen for periods of 45 min. without injury; however, the insects are completely immobilized after 1½ min. The nymphs were held in either air or nitrogen for 10 min. prior to irradiation. After exposure they were fed and returned to an incubator at a constant temperature of 25° C. and a relative humidity of 75 per cent.

Throughout the dose-range employed in these experiments, and for both criteria of damage, the effect inflicted by irradiation in air was two to three times that produced when the same dose was delivered in nitrogen (Fig. 1). The delay in moulting following irradiation at the lowest dose in nitrogen was barely perceptible (controls moult in 14 days), but was large after an equal dose in air. Burns did not develop after exposure in nitrogen at doses below 120 kr., but they were invariably present with doses as low as 60 kr. in air.

Thus, oxygen deficiency produces a considerable amount of protection from X-irradiation in the epidermal cell layer in *Rhodnius*. As indicated previously, and confirmed by unpublished cytological studies, the delay in moulting is due to mitotic inhibition in the epidermis prior to moulting. The inhibition of division is particularly striking in this organism because the epidermal cells enter division synchronously at a fixed time after a meal of blood. The ratio between the dose in air and the dose in nitrogen that produces equal effects is between 2·5 and 2·6, a value that agrees with those given by Evans *et al.*[3] for mitotic delay.

Further details of these experiments will be published elsewhere.

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[2] Baldwin, W. F., and Salthouse, T. N., *Rad. Res.* (in the press).
[3] Evans, J., Neary, G. J., and Tonkinson, S. M., *Nature*, **181**, 1083 (1958).

Effects of Kinetin, Gibberellic Acid and Certain Auxins on the Development of Shoot Buds on the Protonema of *Pohlia nutans*

During recent investigations[1] on the effects of light of various wave-lengths on the development of the protonema and the formation of shoot buds in *Pohlia nutans* (Hedw.) Lindb., it was discovered that buds were formed only in light which included the red region of the spectrum. Furthermore, experiments on the supply of various concentrations of sucrose or glucose to the protonema suggested that the effect of red light was not merely a trophic one, but that a specific formative stimulus was probably involved. Since several authors have found that certain of the physiological responses of various flowering plants to kinetin or gibberellic acid are similar to those induced by red light, for example the expansion of leaf tissue and the onset of germination in certain dormant seeds, it seemed that it might be of interest to study the effects of these two physiologically active substances on the development of the protonema and the initiation of shoot buds in *Pohlia nutans*.

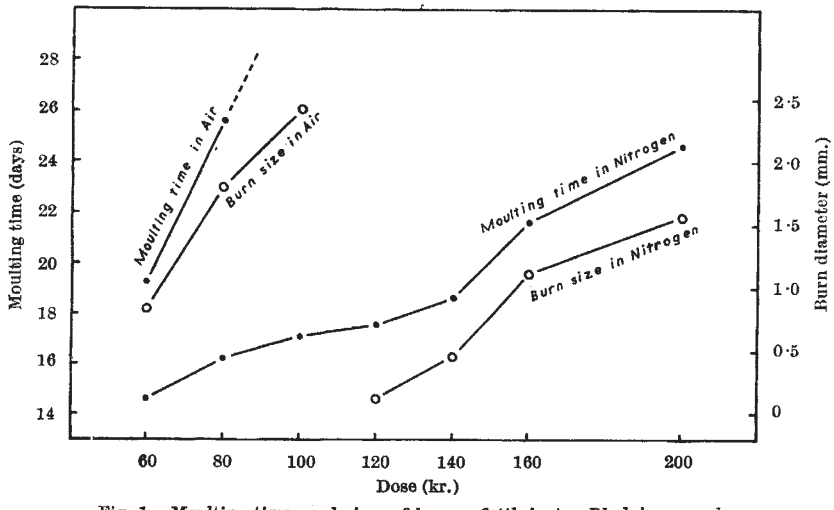

Fig. 1. Moulting times and sizes of burns of 4th instar *Rhodnius* nymphs irradiated in air and in nitrogen. Each point represents the mean from the results with five individuals. Two insects died during ecdysis after exposure to 100 kr. in air (moulting time indicated by dotted line); the burns were measured after death. The moulting time after feeding for unirradiated controls under similar conditions of temperature and humidity was 14 days

Aseptic cultures were prepared from small protonema inocula on a standard Knop's agar, with addition of various concentrations of kinetin, kinetin + 0·1 mgm./l. indoleacetic acid, gibberellic acid and, for comparison, 0·1 mgm./l. indoleacetic acid. The cultures were grown under artificial light from fluorescent tubes ('Natural') giving 375 foot candles at the level of the cultures. The temperature was regulated at 22–24° C. Another series of cultures was grown with addition of vari-