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The Bunsen-Roscoe Law Tested for Roentgen Rays on Mammalian Lymphoid Cells.

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A study has been made of the intensity factor in radiation using mammalian lymphoid cells in tissue culture as the test object. No previous data have been published using this material on the question involved.

Laser¹ found no difference in the growth rate of cultures of fibroblasts (avian) where the same dose was given at different rates. Canti² using cultures of chick fibroblasts found that higher intensities were more effective in suppressing mitotic rate. Cox³ found the same effect on mitotic rate and also that the greater intensities and shorter time were more effective, judging by length of survival of cultures after radiation. Spear⁴ studied both suppression of mitotic rate and length of survival in cultures of chick fibroblasts and found higher intensities more effective with the same dose. More recently, however, Faber⁵ studying the growth rate of chick fibroblasts failed to find any difference when applying a given dose at different rates.

Fragments of the mesenteric lymph node of adult rabbits were planted in clots composed of one part heparinized rabbit plasma and 3 parts extract of 6-day chick embryos made with rabbit serum. This extract has been found to produce more vigorous, denser and more regular migration of lymphoid cells (King⁶).

Fragments were suspended in serum extract in carrel flasks and radiated before planting. This prevents the migration of cells into the clot before they have received the specified amount of radiation.

Fragments are radiated at 37.5°C.; control cultures are kept in the same thermostat protected with lead. Thirty-six cultures are prepared from one animal. These are arranged in 3 groups, control and 2 groups for radiation.

The maximal width of the migration zone at 24 hours is taken as index of the effect. The readings recorded are ocular micrometer units (114 = 1 mm.).

¹ Laser, H., *Strahlentherapie*, 1930, **38**, 391.

² Canti, R. G., *Acta Radiol.*, 1929, **10**, 320.

³ Cox, S. F., *Brit. J. Radiol.*, 1931, **4**, 111.

⁴ Spear, F. G., *Brit. J. Radiol.*, 1931, **4**, 146.

⁵ Faber, Borge., *Acta Radiol.*, 1935, Supplement xxi.

⁶ King, Joseph T., *Am. J. Physiol.*, 1935, **113**, 81.

As a preliminary experiment, 2 series (30-36 cultures in a series) were run, giving the same dose in the same time to each experimental group in the series. Each group was radiated for 4 min. at 150 r/min. Radiation data: voltage 200 KV; current 30 Ma.; filter 2 mm. Al.; distance 50 cm. Half value layer 0.32 mm. cu.

The following results were obtained:

Control	4 Min.	4 Min.
149 (10)	100 (10)	101 (10)
147 (10)	101 (10)	98 (10)

Each figure represents the average of the cultures in the group. The number of cultures is given in parenthesis.

Four series were then run in which the same dose was given at 2 different rates. The rate was altered by changing the distance from 50 cm. to 119 cm.

The following results were obtained:

Control	4 Min.	22.7 Min.
162 (10)	101 (10)	103 (10)
154 (10)	99 (10)	101 (10)
136 (12)	82 (12)	79 (12)
148 (12)	93 (12)	81 (12)

This group of 4 series, when averaged, show values control 150; 4 min., 93.7; 22.7 min., 91.

Another group of 4 series were then run using a one mm. copper filter in addition to one mm. aluminum. The same distances were used, increasing the time to give the same dose.

Control	15.5 Min.	87.4 Min.
143 (10)	86 (10)	89 (10)
150 (10)	99 (10)	101 (10)
171 (10)	115 (10)	116 (10)
135 (10)	83 (10)	80 (10)

Averages for the 4 series—Control 149.7; 15.5 min. 95.7; 87.4 min. 96.5.

It should be noted that in a series (*i. e.*, cultures from a given animal) the migration rate may be faster or slower as compared with another series. When the radiated cultures are compared with their own controls the result is relatively constant.

When the 4 series in each group are averaged it is found on statistical analysis that there is no significant difference when the same dose is given at different rates. In a single series there was a difference of 12 units. The other series were all remarkably uniform.

Conclusion. Within the limits studied the Bunsen-Roscoe Law applied.