The numerical value of the slope is thus only 12 per cent lower than the expected value of 1·0. From eqv. (1):

$$2 \text{ (log nuclear surface area)} = 1{\cdot}33 \text{ (log nuclear volume)} = 5{\cdot}88 - 1{\cdot}09 \log \text{dose} \quad (4)$$

The value of the slope in (4) is also lower—by 9 per cent—than the expected value of 1·0. When considering the very small numbers of experimental observations and considering that the deviations are both in the same direction and of the same magnitude, the agreement is remarkably good.

For the 23 species, Sparrow and Miksche found:

$$\log \text{nuclear volume} = 4{\cdot}07 - 0{\cdot}73 \log \text{dose} \quad (5)$$

from which we obtain:

$$2 \text{ (log nuclear surface area)} = 5{\cdot}41 - 0{\cdot}97 \log \text{dose} \quad (6)$$

where the value of the slope is as near the theoretical value of 1·0 as can be expected. This demonstrates that the product of log surface area and log dose is constant, and indicates that each zone is equally sensitive towards radiation and implies that each (diploid) interphase nucleus for the greater part of this period carries a DNA-charge of $2 \times 2n$.

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Effect of Radiation on the Electrophoretic Mobility of Ehrlich Ascites Tumour Cells

STEIN *et al.*[1] have shown that low doses of radiation cause a small increase in the negative electrophoretic mobility of Ehrlich ascites tumour cells.

In the course of our investigations of the effect of X-irradiation on Ehrlich ascites tumour cells we have measured the electrophoretic mobility of tumour cells withdrawn from *C3H* mice (for source, see ref. 2). Nine days after implantation of the tumour the animals were given a whole-body dose of 1,400 rads at a rate of 350 rads/min and killed 24 h later. After withdrawal from the mouse, the tumour cells were washed three times in 0·145 N sodium chloride, prior to a determination of the electrophoretic mobility (for method, see ref. 3).

An experiment involved determining the mobility of tumour cells removed from one irradiated mouse and one control mouse (that is, not irradiated). The electrophoretic mobility of cells withdrawn from the same mouse was reproducible but considerable variation of mobility was shown with cells from different mice. Bangham *et al.*[4] have commented upon the range of mobility values observed for tumour cells from non-irradiated mice.

The negative electrophoretic mobility of tumour cells from irradiated mice and control mice is 1·39 ± 0·03 (*S.E.*) μ/sec/V/cm and 1·41 ± 0·04 (*S.E.*) μ/sec/V/cm respectively; the quoted mobilities are mean values obtained from the results of 19 experiments. Applying Student's *t* test to the distribution of results indicates that there is no significant difference between the two mean values. Hence, we must conclude that the radiation has no measurable effect on the electrophoretic mobility of the tumour cells.

A different source of tumour material giving rise to a different electrophoretic pattern may be the cause of the disparity between the results of our experiments and the observations previously reported[1].

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Dependence of Radiation Diarrhœa on the Presence of Bile in the Intestine

SYMPTOMS after exposure of the abdominal region of rats to X-radiation doses of 1,000 r., or greater, almost invariably include diarrhœa beginning at 3 days after X-ray irrespective of the dose. If death does not occur within the next 3 or 4 days there is a rapid improvement and the diarrhœa stops. Both the early onset and rapid improvement are usually attributed to the short turnover-time of the epithelial cells of the intestine. However, when the biliary flow was interrupted by ligation or cannulation of the common bile duct the incidental observation was made that diarrhœa did not occur[1,2].

Albino male rats weighing about 300 g were prepared by placing polythene cannulæ in the proximal duodenum and when necessary in the common bile duct. Then 2 days later the abdomina of these rats were exposed to 1,000 r of 250 kV X-rays. When the bile was diverted from the lumen of the intestine by cannulation of the bile duct, diarrhœa did not develop even when a volume of isotonic saline equal to the volume of bile (15 ml./day) was administered intraduodenally (Table 1). However, in irradiated cannulated rats diarrhœa occurred, as in unoperated controls, when bile was injected daily into the duodenum in quantities comparable to the normal daily output of bile. This occurred whether the bile had been collected from irradiated or non-irradiated rats. Diarrhœa also followed daily intraduodenal injections of bile salts (50 mg taurocholate or taroglycocholate or 6 mg deoxycholate, each in 15 ml. of 0·9 per cent sodium chloride).

Table 1. INFLUENCE OF BILE ON DIARRHŒA INDUCED BY EXPOSURE OF THE ABDOMEN TO 1,000 R. OF X-RADIATION

Bile duct cannula	Injection into duodenum	Initial	No. of rats Diarrhœa at 3 and 4 days	Deaths at 7 days
No	Saline	10	10	8
Yes	Saline	19	1	16
Yes	Rat bile	8	8	7
Yes	Saline + bile salts	14	14	12

It is apparent from these results that the bile and, more specifically, the bile salts, are intimately involved in the development of radiation-induced diarrhœa, and that the diarrhœa cannot be due merely to a radiation-induced defect in the cellular turnover of the intestinal epithelium. Full details of these and other experiments to elucidate the