RADIOBIOLOGY

Reduction of the Radioactive Content of Milk by a Feeding Procedure

A METHOD for reducing the fall-out content of milk has been investigated. This is a preliminary report on the results obtained in a short-term study in this area. There are to-day commercially available 'grass incubators' which hydroponically germinate various grains to be used as a substitute for fresh pasturage. It is claimed that the product of these incubators fed to cattle on dry lot maintains the cows in a high production of superior-quality milk to an extent which makes the purchase of such incubators economically desirable. The increased use of these feeding systems in this area raised the question to us concerning the effect this substituted diet may have on the radioactive content of milk.

In the experimental work a total of twenty dairy cows was used, all of which had been under the same conditions for several weeks prior to the experiment. The cows were divided into two groups of ten animals each; the control group was kept on natural pasture during the experiment while the experimental group was confined in dry lot and had only incubator-germinated oats as their source of green pasturage. These oats were allowed to germinate for 6 days in the incubators under hydroponic culture and then were fed as intact mats of seed and shoot to the cows. Cultivation was according to the manufacturer's directions (Buckeye Incubator Co., Springfield, Ohio). Each cow in the experimental group was fed 20 lb. of incubator feed daily. Both groups were fed their usual hay and grain diet. Equal aliquots of milk were taken from each cow at each milking and pooled into a weekly sample for each group. Thus the analyses for radioactive content were made on weekly aliquots of pooled samples from each of the two groups. The total volume of each sample was measured and a 4-l. aliquot evaporated to 2 l. in a sand-bath. The residual liquid was counted for cæsium-137 and potassium-40 content. The counting was performed with an 8 in. × 4 in. sodium iodide (Tl) crystal feeding into a 256 channel analyser (Vanderbilt University Low Level Whole Body Counting Facility supported by: United States Atomic Energy Commission Grant No. *AT* (40–1)–240 and Contract No. *DA*-49-007-*MD*-995 with the Army Medical Research and Development Command). The samples were counted for 1 hr., which made possible net counts for cæsium-137 and potassium-40 in the range 500–3,000 counts. The results are given in Table 1 as net counts which are the gross counts less background. Background was run on a solution of 12·5 gm. potassium chloride in 2,200 ml. distilled water, to approximate the potassium content of milk.

The cæsium-137 counts in all of the seven weekly groups were significantly lower (more than twice the standard error of the difference) than the controls, with an average reduction of 38 per cent. The potassium-40 counts were significantly different only in the first and third weekly samples and fail to show a consistent trend.

The differences in the cæsium-137 counts between the control and the experimental groups becomes more significant when we consider that the substituted incubator feed comprises only a part of the total diet. A more detailed study is proposed.

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Radiosensitivity of the Pre-irradiated Yoshida Sarcoma

ACQUIRED radioresistance of cancer has been discussed clinically and experimentally by several authors[1–5]. The various opinions concerning its mechanism may be summarized as follows: (1) selection of cancer cells; (2) induction of mutation and its adaptation; (3) connective tissue response or tumour bed response. Experimental confirmations are less pronounced than clinical observations. One[1,2] of the recent experiments showed development of radioresistance using repeated frequent X-ray irradiations of intramuscular implantation of Ehrlich carcinoma, whereas others[3] noticed no change of radiosensitivity following frequent whole-body γ-ray irradiations of mice bearing Ehrlich ascites carcinoma. The results of the latter may be due to insufficient dose to develop a radioresistance.

It seemed, therefore, of interest to conduct an experimental study of radiosensitivity on the hypothesis that the most suitable way to induce radioresistance is to expose tumour cells to such a dose of irradiation that only a few cells could survive. By repeating this procedure to successive generations radioresistance might be obtained.

Table 1

Sample (weeks)	Cæsium-137 counts				Potassium-40 counts			
	Experimental	Control	Difference	Change (per cent)	Experimental	Control	Difference	Change (per cent)
0*	721 ± 99	732 ± 99	11 ± 140	1·5 ± 19	1,881 ± 84	1,868 ± 84	−13 ± 117	−0·7 ± 6
1	375 ± 97	930 ± 100	555 ± 139	60 ± 15	1,719 ± 83	2,175 ± 85	456 ± 119	21 ± 6
2	377 ± 97	713 ± 99	336 ± 139	47 ± 20	1,640 ± 82	1,664 ± 82	24 ± 116	1 ± 7
3	735 ± 99	1,060 ± 101	325 ± 141	31 ± 13	2,365 ± 86	2,059 ± 84	−306 ± 121	−13 ± 5
4	778 ± 99	1,158 ± 101	380 ± 141	33 ± 12	1,579 ± 80	1,569 ± 80	−10 ± 112	−0·8 ± 7
5	1,069 ± 101	1,667 ± 108	598 ± 147	36 ± 9	2,155 ± 86	1,841 ± 84	−314 ± 119	−15 ± 6
6	1,052 ± 100	1,499 ± 105	447 ± 145	30 ± 10	1,770 ± 83	1,995 ± 85	225 ± 118	11 ± 6
7	818 ± 99	1,117 ± 103	299 ± 143	27 ± 13	1,951 ± 85	1,811 ± 89	−140 ± 118	−7 ± 6
Average 1–7	743 ± 105	1,163 ± 111	420 ± 154	38 ± 14	1,883 ± 89	1,873 ± 89	−10 ± 126	−0·4 ± 7

* This sample was taken before the experimental animals were removed from pasture grass. These values were not included in the calculation of averages.