treated meat was maintained for each rat fed irradiated meat; both were killed at the same time.

In the present report, based on six separate experiments, the following observations have been made: Irradiation produced no lethal effect on the larvae nor did it affect their power of developing to the adult stage. Irradiation showed increased and variable deleterious effects on the reproductive cells of the adult female worms with increased dosage. In four experiments in which meat was continuously irradiated for 4 days it was estimated that 12 to 86% of the female worms were sterile, i.e., the embryos failed to complete their development (Fig. 1b). The remainder of the female worms showed embryos in the uterus. Irradiation for 5 days resulted in the sterility of about 43 to 100% of the adult females. Irradiation for 6 days resulted in the sterility of about 60 to 100% of the female worms. In two other experiments in which meat was irradiated for 4–6 days, presence of sterile female worms was observed but the percentage affected was not determined.

Female parasites, not made sterile as a result of irradiation, produced embryos which were able to invade the musculature of the host and become infective. Of six rats receiving meat irradiated for 6 days, and killed 30 days later, four showed no larvae in the musculature.

In addition to affecting the reproductive tissue, irradiation produced abnormality in the form of irregular elevations or vesiculations of the body wall of the parasite (Fig. 1c). This condition was evident along the posterior half of the female worm and was found to be more prevalent as the period of irradiation increased.

These results show that gamma radiation at the dose, intensity, and temperature applied is not lethal to trichinae larvae encysted in meat, but under proper dosage renders the female worms sterile and unable to complete their life cycle. Experiments are in progress to determine, among other things, the effects of larger dosages applied for a shorter time from a more intense source.

References

1. Dunn, C. G., *et al.* *J. appl. Phys.*, 1948, **19**, 605.
2. Sawitz, Willi. *Publ. Hlth. Rep.*, 1938, **53**, 365.
3. Trump, J. C. *J. appl. Phys.*, 1948, **19**, 599.

Effect of Temperature on the Mutual Adhesiveness of Epithelial Cells[1]

Irving Zeidman

Department of Pathology, University of Pennsylvania Medical School, Philadelphia

Previous work in our laboratory has demonstrated that an important physical characteristic of cancer cells is decreased mutual adhesiveness, and that this property is apparently due to a low calcium content of such cells (*1*, *3*, *4*). These observations have stimulated investigation of other factors which might affect normal cell adhesiveness and have led to the finding that adhesiveness is greatly affected by temperature.

[1] Aided by a grant from the Donner Foundation.

The method used has been described previously (*1*), and only a summary will be given here. Attached pairs of human buccal epithelial cells were used. The force required to separate each pair by micromanipulation was measured. This force, calculated in milligrams, was determined by measuring the bend produced in a previously calibrated microneedle as it was moved in a direction tending to separate one member of a pair of cells from the other. During micromanipulation, the cells were kept immersed in a balanced salt solution. A constant high temperature was maintained by a warm box surrounding the micromanipulator; and a low temperature, by the use of a refrigerated room.

Adhesiveness of the epithelial cells was determined at three different temperatures. At room temperature of $22.5 \pm 1°$ C the mean force required to separate 100 pairs of cells was 1.53 mg, with a standard error of ± 0.067. When the epithelial cells were separated at $37 \pm 1°$ C, their adhesiveness was found to have decreased; the mean value for 50 pairs of cells was now 0.88 mg, with a standard error of ± 0.070. This value was significantly lower than that obtained at room temperature, for the difference in means was 6.7 times the standard error of their difference. Thus, it is concluded, an increase in temperature produced a decrease in adhesiveness of buccal epithelial cells.

When epithelial cells were separated at a low temperature ($11 \pm 1°$ C), the mean value of adhesiveness for 100 pairs of cells was 1.91 mg, with a standard error of ± 0.100. This value was significantly higher than the room temperature value (1.53 mg), as the difference in means was 3.16 times the standard error of the difference. It is concluded, therefore, that a decrease in temperature produced an increase in adhesiveness of epithelial cells.

These results demonstrate that changes in temperature can significantly alter the adhesiveness of cells to each other. While quantitative measurements of most biological and biochemical processes change in the same direction as does the environmental temperature, the property of adhesiveness changes inversely as the temperature. Alterations in adhesiveness produced by changes in temperature may be of no great significance in homoiothermic animals, where body temperature remains approximately constant. However, such alterations are probably of importance in cold-blooded animals. Thus, Lucké and Schlumberger (*2*) have demonstrated that renal carcinoma of the leopard frog metastasizes more extensively when the environmental temperature is increased. Conceivably, increase in temperature may further reduce the already decreased adhesiveness of cancer cells, thereby leading to greater invasiveness and enhancing the chances for vascular dissemination.

References

1. Coman, D. R. *Cancer Res.*, 1944, **4**, 625.
2. Lucké, B., and Schlumberger, H. *J. exp. Med.*, 1949, **89**, 269.
3. McCutcheon, M., Coman, D. R., and Moore, F. B. *Cancer*, 1948, **1**, 460.
4. Zeidman, I. *Cancer Res.*, 1947, **7**, 386.