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Prolongation of the Life Span in Rats

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ABSTRACT: To test the effect of RNA-DNA in preventing the deleterious effects of old age, an experiment was conducted that involved 10 rats with a normal life span of 800-900 days. All were fed the same diet; 5 rats were not treated, and 5 were given weekly injections of DNA + RNA. After twelve weeks the difference in appearance, weight and alertness was remarkable. The 5 untreated rats died before 900 days. Of the treated rats, 4 died at ages of 1600-1900 days, and 1 at 2250 days. A parallel cannot be drawn with aging in human beings fed RNA-DNA, but the findings on rats may have some application to cellular studies on cancer.

Several theories have been proposed concerning the role of DNA and RNA in aging (1-5). Certain qualitative changes occur in DNA with aging (6), and also changes in RNA synthesis and metabolism (7, 8). The conflicting results of many investigations (9-13) challenge as well as support these theories.

The link between RNA synthesis and vitamin A (14), and the hormonal influence over RNA synthesis (15), further indicate the complexity of the processes active in aging.

The effect of RNA supplementation on the memory and well-being of old people has been the subject of many conflicting findings. It has been reported (16, 17) that supplementation of elderly patients' meals with exogenous RNA (measured in grams) for a relatively long period (measured in months) enhances well-being and, if continued, improves memory. These conclusions are supported by the results of work with rats (18). However, the results of another study (19) in which old people were given RNA daily (measured in milligrams) for shorter periods (measured in weeks) indicate no improvement.

RNA is metabolized and enters the bloodstream in physiologically significant amounts when ingested after food intake (20). It is specific in restoring nucleic protein synthesis in isolated cell nuclei (21).

The foregoing observations led to a consideration of the possible role in aging of the accumulated cellular insult from repeated virus infections incurred over a lifetime, and the prevention of these deleterious effects in rats by weekly injections of exogenous DNA and RNA.

MATERIAL AND METHODS

Ten rats of a strain in which the life span varies between 800 and 900 days, were selected for the experiment when they were each 750 days old. They were given the same diet.

Group A, the controls, were not treated.

Group B received weekly injections of DNA solution in water saturated with chloroform (3 mg per ml) plus ordinary RNA.

All necessary determinations such as temperature and weight were made. The charts were compared every day. After twelve weeks of injections, Group B rats looked younger, were very lively, and had gained weight (1.5-2.3 gm). Group A rats looked old, moved slowly, did not eat much, and had lost weight. The difference was remarkable.

All the untreated rats died before 900 days. Of the treated rats, 4 died aged between 1600 and 1900 days. One rat lived 2250 days.

DISCUSSION

Many of the tissues of aged persons have characteristics which seem to have stemmed from a process of cell replication that alters slowly but surely over the years. Nevertheless, the aging process at the cellular level can vary so remarkably between individuals that it is not always possible for pathologists to grade unidentified tissue specimens according to age.

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If a virus takes over the cells, the production of protein is changed and the cell begins to die slowly. Evidence of the original virus infection can be carried over into daughter cells through mitotic division (22).

Possibly one of the characteristics of cells in aging is the accumulation of viral debris as imprints of prior viral infection, regardless of how trivial or how serious the effect of the original infection on the well-being of the host.

If such be the case, it is reasonable to assume that protein synthesis by DNA and RNA for cell renewal is somehow interfered with by such viral debris. On the other hand, exogenous RNA greatly improves the life span of C3H/HEJ mice challenged by a syngeneic tumor, when given after the tumor challenge and preceded by immunization. The mechanism by which yeast RNA influences this process is unknown (23).

The life span of laboratory rats is normally 800-900 days, although it varies slightly in different countries. The results of the present investigation on 5 untreated and 5 treated rats show that, with weekly injections of DNA and RNA, the life span of 4 rats was doubled on the average, and the life span of the fifth rat was more than trebled.

Although it is tempting to think in terms of the possibility of an equivalent prolongation of the life span of human beings accomplished by injections of DNA and RNA, it should be emphasized that the parallels between aging in rats and aging in humans are not only unknown but are entirely outside the scope of this experiment.

Postmortem results must still be evaluated by the electron microscope, and will form the basis of another paper. There is one question to be answered. Can supplementary exogenous DNA and RNA strengthen cellular resistance to the invasion of viruses implicated in the etiology of cancer? Cancer researchers should consider experiments along these lines.

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