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Letter to the Editor

BLINDNESS INCREASES LIFE SPAN OF MALE RATS: PINEAL EFFECT ON LONGEVITY

IN THE past decade, there has been a great revision in our concept of the pineal's role. Once considered a gland, it is now believed to be a neuroendocrine transducer, with major responsibility for synchronizing endogenous rhythms with the day-night cycle through translation of neural impulses to hormonal release. Melatonin, the main pineal hormone, has significant regulatory effects on LH, FSH and other tropic hormones [1].

I now report my preliminary finding that blinding increases significantly the life span of male rats, which may be the result of a pineal effect upon longevity.

In this experiment, F 344 rats (ARS Sprague–Dawley, Madison, Wisconsin) were used. Nine male rats were blinded by bilateral enucleation. Eleven normal male rats served as controls. The animals were 25–30 days of age at the time of enucleation. Rats were housed in individual cages in the same room. The first normal male died at 35 days of age, the only blinded male died at 617 days of age. To 748 days of age, the blinded rats survived significantly longer than the normal rats ($chi^2 = 3.89$, $df = 1$, $p < 0.05$, log rank test) (Fig. 1). The survival of the normal rats is quite similar to that reported for male F 344 rats by Chesky [2] (50% survival at 659 days for 572 animals).

Moreover, the increased survival of the blinded rats is comparable to an effect already noted in humans. In a study of survivorship and causes of death among the blind in Massachusetts, Rogot reported that blind persons under 65 with retrolental fibroplasia had a significantly better survivorship than other blind individuals [3]. Two-hundred and twenty-two blind males under 65 with retrolental fibroplasia had a 96% observed 10 yr survival. The expected survival of the general population in the same age group, calculated from state life tables, was 98%. One-hundred and fifteen blind males in the category with the next closest observed survivorship, affections of the cornea, had 76%

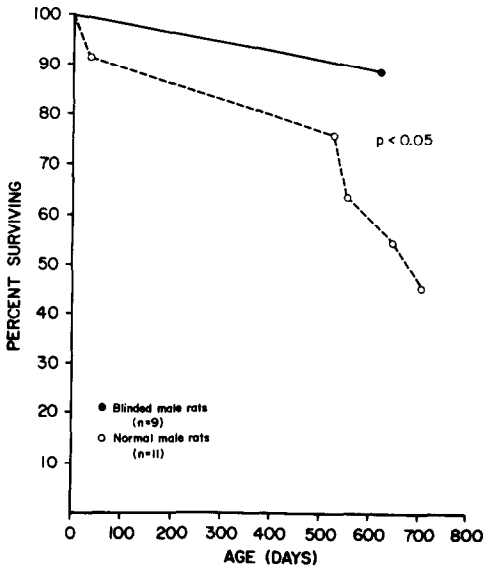

Fig. 1.

observed as opposed to 86% expected survival. The difference between the survival of the retrolental fibroplasia group and the corneal affections group was highly significant ($chi^2 = 16.81$, $df = 2$, $p < 0.005$).

Blind persons have long been known to have substantially poorer survival rates than sighted persons at all ages up to 75. For besides suffering the complications of systemic diseases, such as diabetes, which often lead to loss of vision, the blind are especially prone to accidents. However, in retrolental fibroplasia and affections of the cornea, there is no significant association of life-shortening systemic diseases. And although both forms of blindness would seem to have the same risk of death from accidents, the retrolental fibroplasia group still had a significantly better survivorship. I proposed that the 45% incidence of absent light perception in retrolental fibroplasia, compared to a 3% incidence in other forms of blindness, was the reason for the increased survivorship in retrolental fibroplasia [4]. There are two reasons for believing that a pineal effect may be responsible for the increased survivorship associated with absent light perception.

First, blindness and absence of light stimulation are known to affect markedly both pineal morphology and function. The weight of the pineal is increased in rats reared in darkness. The blinding of rodents causes gonadal atrophy on account of pineal stimulation; and the chemistry of the pineal is altered by blindness. Moreover, the pineal, through its photoreceptor, the eye, is extremely sensitive to light. As little as 0.5 $\mu W/cm^2$ of full spectrum white light, about 10 times the intensity of full moonlight, can inhibit the usual dark-time rise in pineal N-acetyltransferase activity [5, 6].

Second, injection of pineal polypeptide extracts was recently shown to extend the lifespan of female rats [7]. The extracts were produced from bovine pineal glands and injected into rats daily beginning at the age of $3\frac{1}{2}$ months. When 0.1 mg extract was administered, survival time increased by 10%, whereas the administration of 0.5 mg extract increased survival time by 25%. In addition, tumor incidence in the control group was much higher than in the groups of animals treated with pineal extract in each age group (e.g. 700, 800 or 900 days). This finding may explain the lower cancer mortality of blind men and women noted in the Massachusetts study. Further, it supports the hypothesis that diminished function of the pineal gland may promote the development of breast cancer [8].

A pineal effect on longevity may also explain the increase in life span associated with castration of rats, cats, and humans [9, 10, 11]. For gonadectomy is known to cause pineal stimulation quite analogous to that produced by blinding [12].

In summary, 9 male F 344 rats blinded by bilateral enucleation lived significantly longer ($p < 0.05$) than 11 normal male F 344 rats. This extension of life span by absent light perception corresponds to an effect noted in humans and may be the result of a pineal effect on longevity.

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