

## GAMMA-RAY EFFECTS ON THE REJECTION OF TRANSPLANTED MELANOPHORES IN THE MEDAKA

S. Kikuchi<sup>1</sup> and N. Egami<sup>2</sup>

<sup>1</sup>Department of Biology, Faculty of Science, Chiba University, Chiba 260 and <sup>2</sup>Zoological Institute, Faculty of Science, University of Tokyo, Tokyo 113

Transplantation immunity in fish has been studied in a limited number of species by the method of scale or fin-transplantation. Cooper (1964) investigated the rejection of allografts using melanophores in the transplanted scales of *Fundulus*. The rejection of allografts in fish was found to be suppressed by low temperature, X-irradiation and other factors (Cooper, 1964; Kukita and Egami, 1969; Egami and Kukita, 1969). However, secondary responses were not fully examined. The present work deals with gamma-ray effects on the rejection of allografts in the medaka, *Oryzias latipes*, in the first and the second transplantation.

Orange-red and wild-types of the adult medaka, *Oryzias latipes* were used as materials. In most cases, scales of the dorsum of the wild-type were transplanted to the ventral side of the orange-red variety. There were 15 to 40 well developed melanophores on each scale

and three scales were transplanted into each individual (Fig. 1). To examine the secondary response, a second transplantation was carried

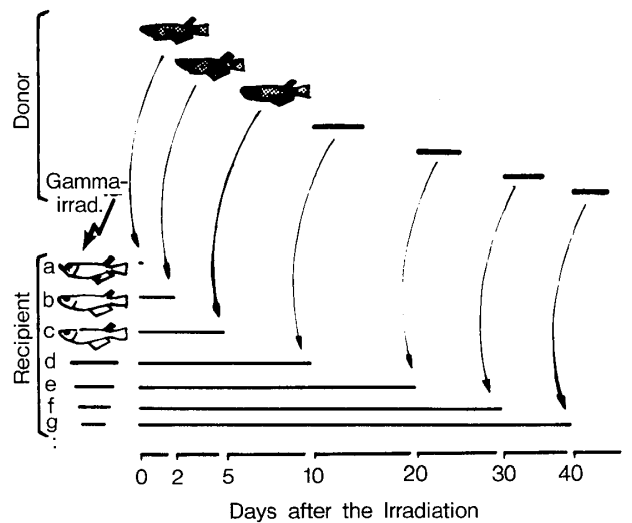


Fig. 1. Scheme of the transplantation. Three scales of the donor were transplanted after gamma-irradiation of the recipient.

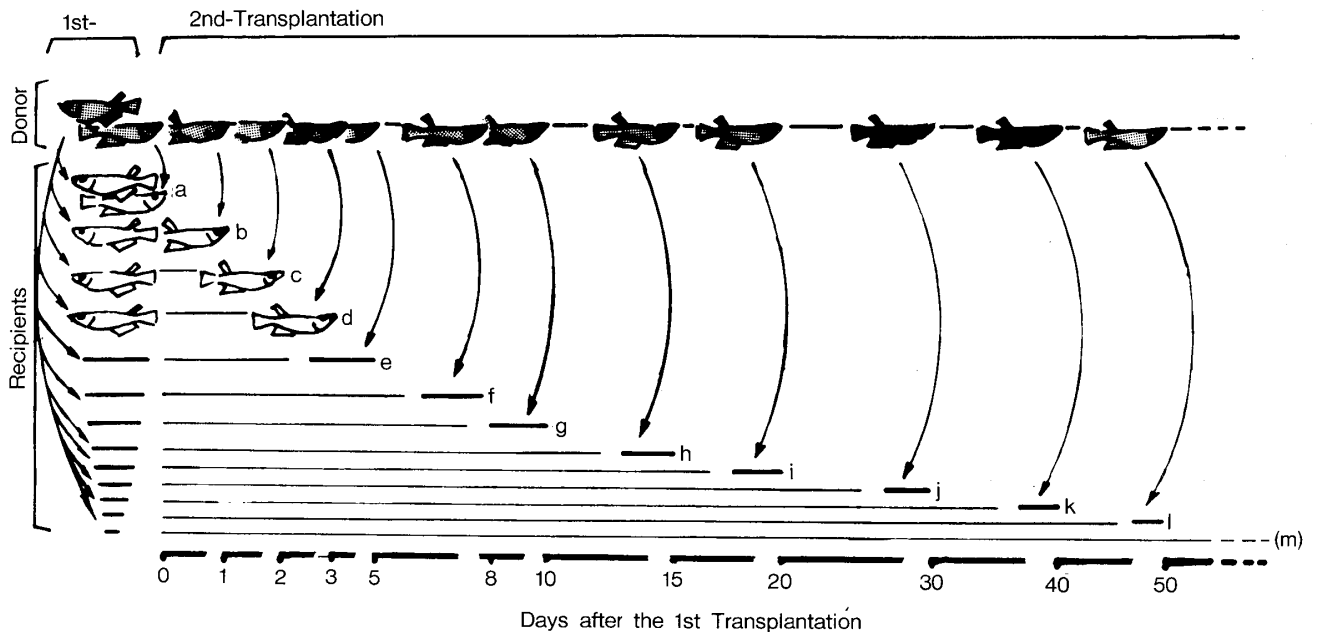


Fig. 2. Scheme of the first and the second transplantations for the experiments of the secondary response.

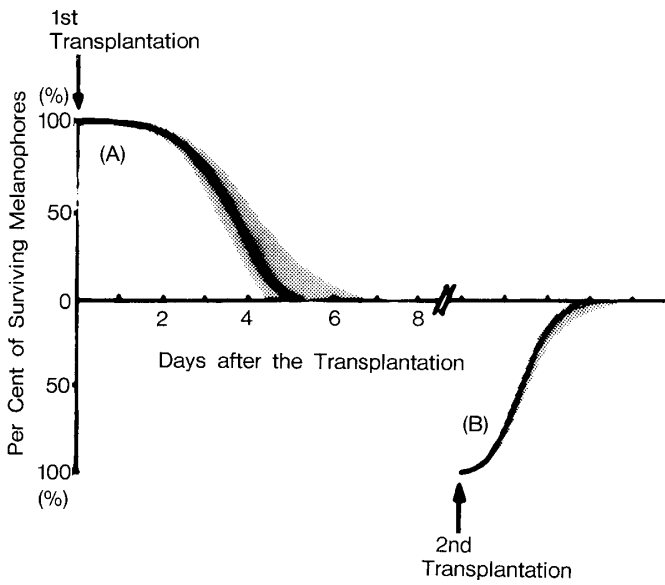


Fig. 3. Decrease in per cent of surviving melanophores in the primary (A) and the secondary (B) responses of allografts. Per cent of surviving melanophores was calculated as follows : Number of surviving melanophores/Number of melanophores in the graft at the time of the transplantation x 100.

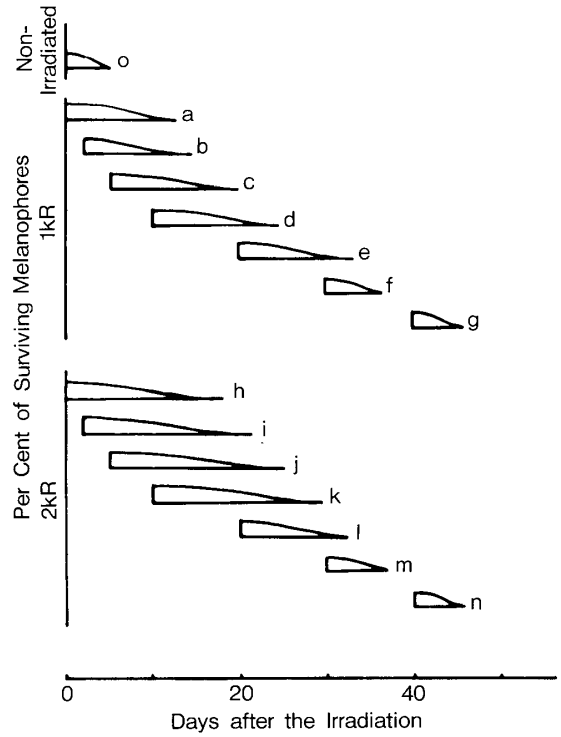


Fig. 4. Effects of pre gamma-irradiation of the donor on the rejection of the first grafts. Groups a-g : 1kR. Groups h-n : 2kR. Group o : Non-irradiated.

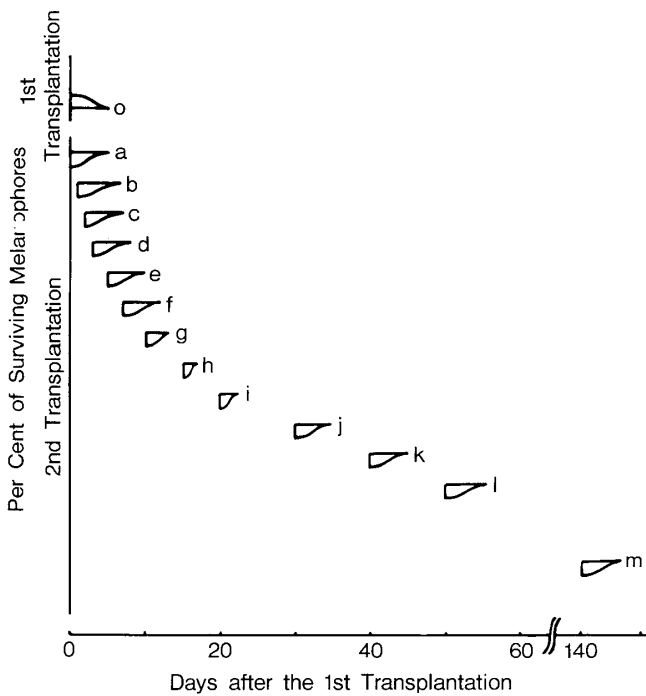


Fig. 5. The secondary response at various times after the first transplantation. Groups a-m : Rejection of the second transplantation, each group corresponded to the time of the second transplantation.

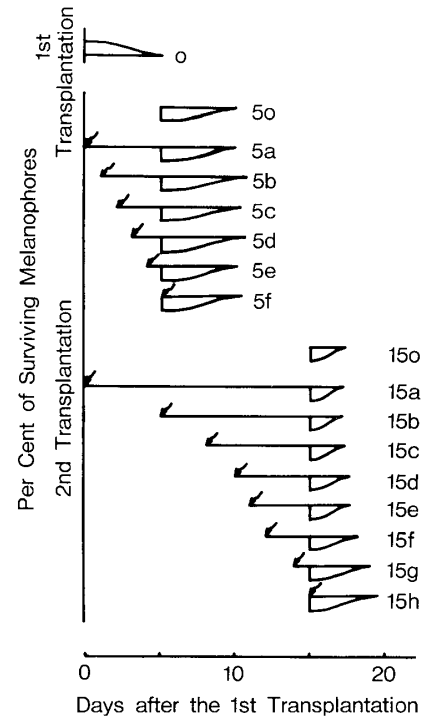


Fig. 6. Effects of 2kR of gamma-irradiation on the secondary response. Groups 5o-5f : On the 5th day after the first transplantation, the second transplantation was carried out. Groups 15o-15h : On the 15th day after the first transplantation, the second transplantation was carried out. On a different day before the second transplantation, fish were irradiated (arrows). Groups 5o and 15o : Non-irradiated fish. o : Rejection in the primary response.

out, using the same pair of donors and recipients as in the first transplantation (Fig. 2). For discrimination, the second transplantation was carried out on another site in the recipient. The transplantation was done from male to male, or female to female. Ten recipients of each group were maintained at  $25^{\circ} \pm 2^{\circ}\text{C}$  and fed with Tetra-min (Tetra Werke, West Germany) every day. In most cases each experimental series consisted of three groups. Some of the recipients were irradiated with 1 or 2kR of  $^{137}\text{Cs}$  gamma-rays (exposure rate, 100R/min) at various days before transplantation; the irradiation was performed at the Research Center for Nuclear Science and Engineering in the University of Tokyo. Rejection was expressed as a decrease in the percentage of surviving melanophores in the grafts (Fig. 3).

From preliminary experiments, it was known that autografts survived more than half a year but allografts were rejected within 7 days by non-irradiated recipients (groups o in Figs. 4, 5 and 6). However, the rejection was suppressed in the allografts. The effect of gamma-ray radiation (both 1 and 2kR) on the rejection disappeared after 30 to 40 days. (groups f, g, m and n in Fig. 4).

When the second transplantation was carried

out 10 to 20 days after the first operation, the grafts were rejected within 3 days (groups g, h and i in Fig. 5). Thirty days after the first transplantation, the secondary response became weaker (groups j, k and l in Fig. 5). From these results, it seems that in the medaka the effect of the first transplantation disappeared within a comparatively short period of time as compared with that of mammals.

Fig. 6 shows the effects of gamma-irradiation on the secondary response. In these experiments, fish were irradiated with 2kR at various times before the second transplantation. Clear suppressive effects were observed only in cases when the irradiation was given just before the second transplantation (groups 15g and 15h in Fig. 6).

In conclusion, these experiments demonstrate that gamma-rays suppress the first and second rejection of the allograft in the medaka.

## References

- Cooper, E. L. (1964) *Transplantation*, 2, 2.  
 Egami, N. and Y. Kukita (1969) *Transplantation*, 8, 300.  
 Kukita, Y. and N. Egami (1969) *Zool. Mag.*, 78, 112.