but all were dead at the time of this writing. The extended period of early development of the fourth larva in contrast to that of the others may have resulted from adverse effects of extra handling, ether anesthesia, application of oxygen, or a combination of these factors.

It is possible that direct application of moisture is necessary for successful hatching of cuterebrid larvae from the egg, as indicated by the erratic hatching observed in this work. In nature, eggs laid on vegetation would be subject to the influence of dew. Further, they may be ingested by mice in connection with lapping of dew or ingestion of vegetation and may hatch in the mouth or esophagus. On the other hand, larvae may be stimulated to hatch by the action of the tongue alone or through application of moisture by the tongue. Finally, Gregson (*8*) has suggested that the mechanical stimulus of a host brushing past the eggs may be a factor in hatching.

It is interesting to note that all four experimentally introduced larvae reappeared and settled beneath the skin of the inguinal region for development, two on the left side, two on the right. In nature, at least 80 percent of the larvae are seen in the inguinal region, equally divided between the right and left sides. Possibly significant physiological and biochemical differences in the environment beneath the skin of various regions of the body may be factors in this striking regional preference, causing some larvae to reappear beneath the skin close to their point of entrance (perhaps as a result of it), others to migrate a short distance, and most to reappear in the groin. Perhaps many larvae, no matter how they gain entrance to the host, are influenced in their early movements beneath the skin by sensory cues derived from the movements of the body muscles of the host and, in this way, are guided to the inguinal region.

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References and Notes

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Fate of Frog Embryos Implanted into Forelimbs of Adults

Abstract. No teratoma formation and very little growth and differentiation followed implantation of late gastrula-stage frog embryos into forelimbs of adults. This is attributed to poor blood supply and rigid walls of muscle and bone surrounding the implants. The fate of embryos in nonamputated limbs is compared with that of regeneration-promoting implants in amputated limbs.

Several investigators reported formation of tumors following implantation of embryonic material into adult amphibians. Allison (*1*) observed uncoordinated masses of growing tissue which developed from embryonic transplants to the coelom or orbit of larvae or adults, with metastases and infiltrating growth in larval hosts but none in adults. Fankhauser and Stonesifer (*2*) produced teratomas by implanting newt embryos under the skin of the lower jaws of adults. It has been reported that embryonic implants into adult limbs are capable of promoting regeneration of these limbs following their amputation (*3*). The present study deals with the fate of embryos implanted into adult limbs which were not subsequently amputated.

Ten adult *Rana pipiens* served as hosts. Late gastrula-stage *R. clamitans* embryos served as donors. The adults were anesthetized with ether, and longitudinal incisions on the dorsal surface of the left forelimbs were made. The radioulnas and associated arteries and nerves were exposed. Muscles and skin were retracted with small hooks, and donor embryos were placed in these artificially created pockets. The embryos had been denuded of their jelly capsules and vitelline membranes prior to amputation. The wounds were closed with silk. Aseptic technique was used throughout. The wounds healed within 2 or 3 days without complications. The stitches were removed as soon as primary healing took place. The animals were killed at various intervals for histological examination, the last one 3 months postoperatively.

No inflammatory reaction was observed around the implants. The operative wounds healed by primary intention with a minimal amount of scarring. The implanted embryos were clearly distinct in all specimens. Embryonic differentiation and resorption were almost entirely absent up to 3 months following implantation. The only attempts at differentiation noted were formation of a cavity lined by cells, resembling ependymal cells, and a few muscle fibers within the implants. No differentiated nervous elements, notochord, digestive tract, or cartilage were present in any sections. The epidermal covering was lost soon after transplantation. The embryos did not increase in size. The implants were composed mainly of numerous strongly basophilic yolk granules and large round cells with vesicular nuclei. There was no clean and obvious line of demarcation around the implants, and it was impossible to ascertain which cells arose from the implants and which from the host. There was no foreign-body reaction in the host. No invasive growth was observed in any of the implants.

The fate of embryo and larval implants was considerably different in amputated limbs (*3*). Implants remained viable for a prolonged length of time, contributed cells to the regenerating limb bud, and finally blended with the host tissues. The blood supply to the regenerating stump was very good. No neoplastic change was observed in any of these implants.

Very little differentiation and no invasive growth or teratoma formation were observed in the embryos implanted into adult frog limbs. This could be explained by the unusual site of implantation. The embryos were surrounded by rigid walls composed of muscle and bone, which gave them little or no opportunity to expand. In contrast to the situation with amputated limbs, the blood supply to the areas of implantation was exceedingly poor. This of itself could account for the retardation in growth and development of the implants. It is suggested that the embryos received enough oxygen and nutrient materials by diffusion to keep them alive but that the amounts were grossly inadequate for further growth and differentiation.

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