Parabiosis Encyclopedia Article

Parabiosis

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Parabiosis

Twins born with their bodies fused or joined together, known as Siamese twins, are a form of naturally occurring parabiosis. The area of fusion may be slight or extensive in these rare births and sometimes the twins may be successfully separated by extraordinarily skillful surgery. The term parabiosis refers to any two organisms that are cojoined and the term is frequently used to describe experimental parabiosis.

Sometimes it is desirable to produce parabiotic animals for research purposes. Parabiosis as an experimental procedure dates back to the end of the last century. Amphibians have often been the animals of choice for such experimentation. Peter Volpe (1980) used the procedure extensively in an elegant series of studies concerning transplantation immunity. Volpe chose the common leopard frog, *Rana pipiens*, as an experimental animal because the well known reproductive biology of the species permits ease in obtaining many embryos which develop outside of their mother's body. In Volpe's experiments, a portion of ectoderm is removed from the gill forming areas of two embryos. This surgery is performed under a dissecting microscope. The operated embryos are snugly held together in an operating dish and healing occurs in three to five hours. The choice of the gill area as the site of fusion is to insure that blood will intermingle in the parabiotic twins. Ordinarily, the parabiotic embryos remain attached through metamorphosis or beyond. Unrelated frogs usually reject transplanted tissue just as humans would do with transplanted tissue not protected with a immune suppressing drug. Unrelated frogs, joined in parabiosis, do not reject each others' grafted tissue. This shows that immune tolerance can be induced during embryonic development by means of shared blood resulting from parabiosis.

The technique has been used in studying, in addition to the development of immune tolerance, the migration of primordial germ cells, the migration of malignant cancer cells, the characterization of the stability of the differentiated stage, and many other problems. As long as there are experimenters with a steady hand and a creative mind, parabiosis will be one procedure that may serve to produce new understanding.