Chimera Encyclopedia Article

Chimera

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Chimera

A chimera is an organism that contains cell populations derived from more than one fertilized egg. The term is derived from the Greek and refers to a mythical being with the body of a goat, the tail of a serpent, and the head of a lion with nostrils belching forth fire. Chimerae may be structured of cells from one species or of several species. Chimeric mice have been produced experimentally. Fusion of early embryos is one method. Embryos whose parents differed in coat color and one or more biochemical markers are chosen for fusion. Expression of both coat colors (in patches of fur on the newborn) or biochemical markers indicate success in the operation. Embryos at the 8 to 12 cell stage are frequently chosen for fusion because the cells are sticky and the experimental combinations tend to form a single embryo. The experimental embryo is placed in a surrogate female for development to birth. A chimera formed in this manner is tetraparental, i.e., it has four parents (two for each of the embryos fused). A hexaparental mouse produced by Professor Clement Markert adorned a cover of the journal *Science* several years ago.

Does a cancer cell have the potentiality for giving rise to any kind of cell other than more cancer cells? The answer to that question was sought in an experiment with chimeras. It was judged that the interior of a early mouse embryo would have powerful biochemical substances that would guide the normal differentiation of the progeny of a malignant mouse cell. Cells from a mouse cancer, a teratocarcinoma, were introduced with a micropipette (a glass tube like a microscopic hypodermic syringe) into the interior of an early mouse embryo by Ralph Brinster in 1974. The interior of the embryo regulated the malignant cells and they gave rise to normal cell progeny that expressed the appropriate fur color after birth. The mouse chimerae refuted the notion that cancer cells can give rise only to other malignant cells. The demonstrated production of normal cell progeny must give hope that eventually in at least some kinds of cancer, patients will be treated to induce their cancers to give rise to normal cells. This would eliminate or minimize toxic chemotherapy and damaging radiation. This is an example of an interesting biological procedure, the production of chimerae, being used to answer a fundamental question in pathology.