result in progress in understanding, preventing and controlling graft and tumor rejection. It is necessary to know whether similar mechanisms are operating in the body, if the placenta is to be a viable experimental model for immune mechanisms. Immunologically, however, the reasons the placenta and fetus are not rejected continue to be fundamental and important. Thus, efforts are being made to resolve these and other questions concerning molecular transport and relationships between hormonal and immunological factors as they influence biological function.

Aging

In the study of aging, the placenta is also playing an important role. Aging is a complex process, difficult to investigate because of its many aspects. Causes of aging must be differentiated between changes that can be attributed to age itself and changes due to extraneous influences. In other words, to what extent is the aging process genetically preprogrammed and to what extent is it the result of accumulating influences over time? Either way, cause and effect may not necessarily occur in the same tissue; and neither aging processes nor their control can be studied as a whole because of their complexity and interactions with so many variables. However, many aspects of aging, and their control, can be studied in the placenta, as it is a complete, functionally differentiated organ with a finite life span. Animal models have been used, particularly those animal species with relatively short life spans. But any animal is subject to age-related diseases. These effects are very difficult to separate from those due solely to aging. The primary advantages of the placenta as a vehicle for the study of aging are its availability, its short, well-defined life, the fact that it is not subject to age-related disease processes, and that it can be manipulated experimentally in ways that whole animals cannot. Two major assumptions, however, are that we are able to define and describe the aging process and that the placenta *does* actually age during its short period of functional activity. This latter premise is widely accepted; the placenta does appear to decline structurally and functionally as pregnancy progresses to term, although criteria for the recognition of aging at the organ or cell level have not been well defined. Some researchers take the view that the placenta does not age but only matures. This viewpoint enhances the placenta as a research model by gerontologists, as the ideal for a healthy life is not the usual decline we associate with aging, but rather the continuation of

good health until death.

The placenta may be this model, since it matures and remains in optimal condition until it stops functioning.

Placental tissue is also being studied in terms of the relationship between cellular aging and malignancy. The basic question is whether tumors are part of an aging syndrome or only accompany it occasionally. For higher mammals, there is no definite evidence that malignancy forms part of an aging syndrome; its features are more like those of an acquired disorder, as aged cells seem more susceptible to carcinogenesis.

Conclusion

As research results become available, answers to these and other questions should be forthcoming. At this point, however, the placenta, both human and animal, seems to be an exceptionally promising experimental tool for comprehensive studies in the disciplines discussed briefly here. In addition, it may be seen as an ideal organ model that can replace whole animals in many studies and research areas that have proven to be inconclusive.

It is reasonable to predict that the development of new alternatives to existing animal models, as well as the further refinement of those already discovered, will lead to the continued reduction and replacement of animals used in basic research, drug development and cancer detection and therapy. The ultimate goal, of course, is to lower the perceived need for animals to the point where no non-human species is seen as a viable test system.

The hope is that alternative methods will totally eliminate the use of animals in the study of human disease, human cell mechanisms, and treatment for human disorders.

BIBLIOGRAPHY

A selected bibliography follows as an aid to those who wish to study further the issue of animal experimentation and alternatives.

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