barriers to the transfer of molecules, but this mechanism has not been worked out satisfactorily.

The function of the normal and the abnormal placenta needs a great deal more study. Virtually nothing is known of the correlation between abnormalities in the placenta and abnormalities in the fetus. The site of origin of plasma cells and the production of antibodies in the human placenta as determined by biopsy, examination of delivered placentas, or by extrapolation from animal models, have yet to be ascertained.

One of the most promising animal models for human congenital malformations is the baboon. The gross structure of its placenta is comparable to the human. The production of phocomelia with thalidomide in doses similar to that recorded for human beings suggests that some functional aspects of embryogenesis may also be very comparable. The menstrual cycle has been well studied and precise dating of ovulation is relatively easy. Data are accumulating on normal embryogenesis in the baboon with descriptions of all stages from the blastocyst on. During the first 39 days of gestation the embryo appears identical to the human. While a healthy pregnant captive baboon is a relatively expensive, not to say large, experimental animal its disadvantages may well be offset by the possibility of extrapolating to man and by the confidence with which the pathology can be assessed.

DNA viruses may cause congenital abnormality through chromosome damage, such as breakage, rearrangement, nondisjunction or polymerization, in the gamete, in the zygote, and in the fetal somatic cells. This damage appears to begin with loss of contact inhibition of division followed, in a week or two in tissue culture, by a tremendous variation of the genome. None of these alterations are specific to viruses. Furthermore, many chromosomal aberrations appear to be of little moment. A dead skin cell sloughs, most abnormal sperm fail to fertilize, and only the chromosomal abnormalities in the ovum, perhaps, give rise to abnormalities.

Reproductive abnormalities are often best recognized epidemiologically. Using retrospective analyses testing and generating hypotheses, mitotic nondisjunction appears to be one possible common characteristic relating maternal age, increased risk of abortion, Down's syndrome and childhood leukemia. Sophisticated statistical techniques permit the evaluation of the significance of observed clusters of disease in time and in space. Simultaneous occurrence of diseases can suggest common etiologies. It can also permit observation of the onset and development of a disease such as leukemia through the identification of high-risk groups.

In considering any etiologic agent of congenital malformations one must look at the other manifestations of reproductive wastage, abortion, fetal death, and fetal infection. These may occur in the absence of direct fetal involvement, for instance, in response to change in placental function.

In the face of the hundreds of presently known viruses, potentially capable of producing teratogenic effects, precise identification of the genetic, chemical or physical mode of action of known viral teratogens would greatly assist in the identification of high-risk agents for epidemiologic and laboratory investigations. It is apparent that many different disciplines must contribute information and that new methods must be developed in seemingly unrelated fields before there will be any real breakthroughs in identifying and understanding viral etiologies of congenital malformations.

SHIELA C. MITCHELL
National Heart Institute, Bethesda, Maryland

GILBERT L. WOODSIDE
National Institute of Child Health and Human Development, Bethesda

Calendar of Events

Courses

Modern Developments in Low Speed Aerodynamics with application to VTOL, Tullahoma, Tenn., 25 Sept.–6 Oct. Fee: $300. *Deadline*: 18 Sept. (Director, Continuing Education, Univ. of Tennessee Space Institute, Tullahoma, Tenn. 37388)

Applied Transducer Workshop. Hopatcong, N.J., 30 Oct.–3 Nov. Instruction in instrumentation and process transducer performance, design, and application. Fee: $200. (Dr. S. D. Black, Center for Professional Advancement, P.O. Box 66, Hopatcong 07843)

Research and Development Management, Columbus (1st week) and Athens (2nd week), Ohio, 24 Sept.–6 Oct. For scientists and engineers with managerial responsibilties. Limited to 65 participants. (Director, Center for Management Development, College of Business Administration, Ohio University, Athens 45701)