

Strengthening the Case against Pregnancy and Smoking

Each year in the United States, an estimated 36,000 infants are born with a heart defect. During the first year of life, approximately one in four of these infants require invasive medical and/or surgical treatment, and one in eight will die. Maternal smoking is known to increase the risk of prematurity, low birth weight, and cleft palate. At ACHRI, a pediatric cardiologist and public health specialist, Dr. Sadia Malik, MD, MPH, is investigating the association between congenital heart defects and maternal smoking and/or exposure to passive smoking.

Under a two-year grant (R03) from the National Institute of Child Health and Human Development (NICHD), Dr. Malik is examining nicotine levels in the hair of 50 mothers with infants with congenital heart defects and 50 mothers of infants with no birth defects. "The heart forms in the first trimester," she says, "and mothers may be smoking or exposed to cigarette smoke before they know they're pregnant."



Bettye Flowers, RN, Research Nursing Supervisor for the Arkansas Center for Birth Defects Research and Prevention, collects a hair sample from a non-smoking mother of a child with a heart defect participating in Dr. Malik's study.

For most human studies it is neither efficient nor possible to measure exposure to nicotine during the early periods of pregnancy before the outcome of the pregnancy is known. Limited research resources do not allow for the enrollment of thousands of women prior to conception and for the necessary follow-up required to identify those that will have an adverse pregnancy outcome. Therefore, novel approaches are needed to measure exposures during early stages of pregnancy and embryogenesis that may be associated with adverse reproductive outcomes such as heart defects. To measure exposure to nicotine during the period corresponding to the first trimester of pregnancy, participants in Dr. Malik's R03 study are providing 10 centimeters of hair after their infants are born. In collaboration with researchers in California and New Zealand, hair samples are analyzed in such a way as to determine the exact timing of exposure to nicotine. The hair shaft provides a "journal" of nicotine exposure during pregnancy. If hair nicotine levels corresponding to key periods of heart development are higher in mothers of infants with congenital heart disease, this will provide evidence that tobacco exposure may be causally related to congenital heart disease.

The majority of congenital heart defects require only a visit to the pediatric cardiologist for diagnostic tests, such as an echocardiogram, and medication. However, some heart defects will require multiple surgeries and may result in lifelong limitations in daily activities or even in death. Heart defects range from simple problems, such as "holes" between the chambers of the heart, to severe malformations, such as a very small heart chambers or valves. "I want to help find a cure for the cause of this so other families don't have to go through what we're going through," says Amanda, a non-smoking mother of a child with a heart defect participating in Dr. Malik's study. Getting her hair clipped for the study, Amanda adds, "I want to get the word out about what causes these problems."

It is important to make physicians and patients aware of all the detrimental effects of maternal smoking on the developing fetus so women can make informed lifestyle decisions prior to becoming pregnant. Twenty-eight percent of Arkansas women smoke and 20% continue to smoke during pregnancy; nationally, 25% of women smoke and 12% continue while pregnant. The results of Dr. Malik's study may provide evidence that will compel some women to stop smoking during their reproductive years.

Dr. Malik's NICHD R03 complements her other research funded by the Arkansas Biosciences Institute, the major research component of the Tobacco Settlement Proceeds Act of 2000. She also receives funding from the American Heart Association's Heartland Affiliate Beginning Grant-in-Aid Program, which promotes the independent status of promising new scientists in research related to cardiovascular function and disease. Since joining the UAMS faculty in 2002, Dr. Malik has received support from the Arkansas Center for Birth Defects Research and Prevention, one of nine cooperative research centers funded by the Centers for Disease Control and Prevention to increase the understanding of the causes and potential preventions of birth defects.



Established in 1989, Arkansas Children's Hospital Research Institute provides an on-site research environment for faculty of the University of Arkansas for Medical Sciences working on the Arkansas Children's Hospital campus. Over 120 pediatric researchers with expertise and experience that span the breadth of medical disciplines comprise ACHRI's roster of investigators who work to fulfill its mission to improve children's health, development, and well-being through high quality research. For more information, visit <http://achri.archildrens.org>.