

RURAL RESEARCH PROJECTS – SPRING 2013

Project: *Evaluating buprenorphine metabolism in opiate-addicted mothers and fetal tissue as a predictor of neonatal abstinence syndrome in rural Appalachia.*

Resident: Ally Roy, MD PGY-1

Mentors: David Chaffin, MD; Lauren Waugh, PhD; Richard Egleton, PhD

Both West Virginia and Kentucky are two of the leading states in rates of opiate-addicted mothers. The high rate of opiate-addicted mothers in this area increases the chances of newborns to experience neonatal abstinence syndrome (NAS). A correlation between maternal buprenorphine dose and incidence and severity of NAS has not been found. By studying varying phase I enzymes in both the mother and neonate, we hope to determine which mothers may be at higher risk for delivering an infant that will undergo NAS, and to also determine if certain infants are themselves more prone to experience withdrawal symptoms due to their own metabolism. This would be beneficial to both obstetricians and neonatologists in our rural area, as both opiate-addicted mothers and NAS are commonly encountered in our patient population.

Project: *Urban and Rural Differences in Prenatal Exposure to Metals and Polycyclic Aromatic Hydrocarbons.*

Resident: Jesse Cottrell, MD PGY-2

Mentors: Brenda Dawley, MD and Monica Valentovic, PhD

Children born in regions of high mining activity have higher incidences of birth defects involving the central nervous system, musculoskeletal, urogenital, circulatory, and respiratory problems compared to the rest of the population. The reason for the higher birth defects is not known. Individuals in mining communities are exposed to many environmental chemicals such as metals and organic compounds that could contribute to the higher incidence of birth defects. Polycyclic aromatic hydrocarbons (PAH) are a component of cigarette smoke but are also products of incomplete combustion of coal, diesel fuel or gasoline. **The overall hypothesis of this Pilot Project is that newborns from rural areas are exposed to higher levels of metals and PAH than their urban counterparts.** The hypothesis for this study will be tested through the two Specific Aims. The first aim of this study is to evaluate whether newborns are exposed to more metals and at higher levels if they reside in rural compared to urban areas. The second aim is to evaluate whether exposure to higher levels of PAH occurs in babies residing in rural compared to urban areas. PAH exposure will be quantitated using PAH-DNA adducts isolated from white blood cells contained in umbilical cord blood. Heavy metals will be analyzed in umbilical cord blood and categorized based on zip code of home address. For controls as well as additional data the umbilical cord blood will also be tested for cotinine, vitamin D levels, and thyroid function. This project has considerable significance as there have been no studies conducted to examine changes in metals and PAH exposure in umbilical cord blood differentiating between urban and rural individuals.

Project: *Making Strides-Stepping to Fitness*

Student/Resident: Rebecca Hayes, MS IV, Lauren Thompson, PGY-2

Mentor: Isabel Pino, MD

The purpose of this study is to determine if the addition of brief periods of exercise during the school day can improve elementary school students' fitness, behavior and academic performance. Approximately 500 students from rural Wayne County schools and 500 urban Cabell County students will participate as the

study group. 300 students from Cabell County will serve as the control. The schools have agreed to allow for 6 minutes of structured, additional exercise during each school day. Students will also track their weekly steps using pedometers and participate in a "Walk Across West Virginia" incentive program. Measurements of fitness and teacher behavioral surveys will be administered three times during the school year by Marshall University Joan C. Edward Medical School representatives. Measurements of fitness include resting and post-exercise heart rate and respiratory rate, and time needed to complete a "shuttle run." West test scores before and after our study period will also be compared.

Project: *Compliance of Diabetic Patients with Personal Contact Follow-up*

Student/Resident: Kate Proffitt, MS III, Regina Guzzo, MD, PGY-1

Mentor: Kevin McCann, MD

Improved glucose control improves hard outcomes in diabetics such as blindness and kidney failure. This was established in type II diabetics in the UKPDS (1993). We will use the principle of random reinforcement to help increase the chance that a patient will adhere to their treatment plan. This study will evaluate the effect of randomly following up with patients via phone call between office visits. If during an office visit, a diabetic patient is determined to be uncontrolled or sub-optimally controlled (based on having a HgA1C >8) and they agree to participate in the study, then they will be informed that at some time before their next office visit they may be randomly called. When called they will be asked about the frequency of their blood sugar monitoring and the values to determine glucose control. The idea being that the unknown element of when they will be called and a desire to please will increase their diligence, through reinforcement, to adhere to the treatment plan. We will quantify how much change occurs in glucose values after patients are called between office visits. If this strategy proves successful then it could lead to larger trials in order to verify the results. Positive outcomes in a larger trial could lead to a change in the treatment of diabetes.

Project: *Endothelial dysfunction in diabetes.*

Resident: Arifa Khokar, MD, PGY-1

Mentors: Ryan Stone, MD; Anne Silvis, PhD

With the epidemic of obesity in Appalachia on the rise, an increase in comorbidities, including insulin insensitivity and diabetes, have been noted in the pregnant population. Gestational diabetes and type II diabetes have been characterized by insulin resistance, hyperglycemia, and endothelial dysfunction. Endothelial dysfunction can lead to vascular abnormalities and these vascular abnormalities can be associated with abnormal placentation. **We hypothesize that endothelial function is associated with diabetes in pregnancy and that currently accepted treatment modalities to lower blood glucose levels will improve endothelial function.** Endothelial function will be evaluated in patients pre- and post- treatment using the EndoPAT device. We will also assess endothelial progenitor cell (EPC) cell number, anti-angiogenic, inflammatory, and vasodilation markers as indicators of endothelial function. Additionally, umbilical cord blood will be collected at the time of delivery to correlate maternal glycemic control and neonatal inflammation.

Project: *“Know Your Numbers” to Lower Cardiac Risk*

Resident: David Francke, MD

Mentor: Ellen Thompson, MD

Cardiovascular disease and its risk factors are more prevalent in rural West Virginia than in most of the country. The reason is not clear. We hypothesize that there are additional contributors to this fact than the standard cardiac risk factors. Our long-term goal is to identify these different contributors to cardiovascular risk in our rural population. The research question is “Do novel risk factors contribute to the higher prevalence of cardiovascular disease in rural West Virginia?” A secondary goal of the project is to educate and raise awareness of cholesterol and other risk factors for cardiovascular disease in Logan, West Virginia.

Project: *Peripheral Arterial Screening in a Rural West Virginia Population*

Resident: Faisal Hayat, MD

Mentors: Robert Touchon, MD, Melissa Lester, MD

This is an epidemiologic study in a population with an unknown prevalence of preclinical obstructive peripheral vascular disease. Recommendations from the Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults indicate a global risk score should be obtained in all asymptomatic adults and Family history of CVD should be obtained for Cardiovascular risk assessment in all asymptomatic adults. Measurement of ankle-brachial index is reasonable for cardiovascular risk assessment in asymptomatic adults at intermediate risk. The targeted area is the population served by the Larry Joe Harless Community Health Center in Gilbert, West Virginia. This is a rural area that leads the state in obesity, cardiovascular disease, asthma and arthritis. Restricted access to sub-specialty care, poor chronic disease management and lack of health education impacts these and other issues. The PI and Co-PI make regular visits to the Community Health Center in Gilbert. Health screenings will be conducted including the determination of ankle-brachial index (ABI). Smoking history, blood pressure determination and blood samples for fasting blood sugar, lipids, homocysteine, lipoprotein (a), and vitamin D plus screening biomarkers will be obtained. This data will be entered into a spreadsheet format for later biostatistical analysis.

Project: *The effect of vitamin D supplementation on the endothelial health of pregnant women in rural WV*

Resident: Kelly Cummings, MD

Mentor: Ryan Stone, MD

Vitamin D is a fat-soluble vitamin that serves a number of important purposes in the human body. We hypothesize that endothelial function will be improved with vitamin D supplementation in pregnant woman regardless of BMI. We will evaluate several biomarkers as predictors of development of preeclampsia in obese Appalachian gravida women. Also we will study the effectiveness of vitamin D3 supplementation, at a dose of 5400 IU daily, in obese and morbidly obese women is adequate to maintain sufficient maternal vitamin D serum levels. The data will be reviewed to determine the presence of any significant predictors for the development of vascular dysfunction and preeclampsia. We hope to determine the biomarkers, and blood tests that will enable screening for the development of endothelial dysfunction and preeclampsia. A further reaching goal is to use these markers to assess the effectiveness of future therapeutic strategies including vitamin D supplementation for the prevention of preeclampsia.