

**MEDICAL STUDENT RESEARCH PROPOSAL**  
(Please type in Arial Font size 10)

Faculty Sponsor(s): \_\_\_\_\_

Department: \_\_\_\_\_ Telephone: \_\_\_\_\_

Address: \_\_\_\_\_ E-mail: \_\_\_\_\_

Proposal Title: \_\_\_\_\_

**\*Please organize your proposal into the following 4 sections and address the points as outlined below (1 page maximum). See the attached sample.**

**RESEARCH PROBLEM:**

Brief background on proposed problem.

Preliminary data collected by Mentors laboratory.

Goal of the project.

**OBJECTIVE:**

Clearly stated hypothesis to be tested by the experiments outlined.

**EXPERIMENTAL PROTOCOL:**

Proposed experimental design to analyze the problem presented

Details of the procedures and techniques to be used for collecting data

Data analysis and statistical analysis of data, where appropriate.

**MEDICAL STUDENTS ROLE:**

The procedures to be performed by the student.

Role of the Mentor or other identified personnel in the laboratory.

Student's role in other department activities.

## Sample Clinical Research Proposal (informational purposes only)

### MEDICAL STUDENT RESEARCH PROPOSAL

Faculty Sponsor: Hanes Swingle, M.D., M.Ph., and Jose` Martinez, M.D.  
Department: Pediatrics  
Telephone: 415-8623  
Address: 1700 Center Street  
Proposal Title: Clinical significance of chromosomal microduplications and microdeletions among children with developmental disabilities

**RESEARCH PROBLEM:** Genetic testing is recommended for children with global developmental delay, intellectual disabilities (formerly referred to as mental retardation), and autism spectrum disorders. Microarray comparative genomic hybridization (CGH), a relatively new technology that is being widely used to evaluate individuals with developmental disabilities, is extremely sensitive and frequently identifies chromosomal microdeletions and microduplications, many of which have not been reported to be associated with human disease. Because these genomic alterations can be found in healthy individuals, when an unreported copy number change or genetic change is identified in an individual with a disease or a developmental disability, the clinical significance of this finding may be difficult to establish. Population-based studies are necessary to determine if an individual deletion or duplication occurs more frequently with a given disease or condition. However, if these apparent genomic imbalances are associated with more severe disease or greater developmental disability, this would be presumptive evidence that these copy number variants have clinical significance and, therefore, warrant further investigation. The USA Autism Diagnostic Clinic has obtained microarray CGH analysis on more than 150 children with autism spectrum disorders and/or global developmental delay during the past three years; microdeletions or microduplications have been identified in 25 of these children.

**OBJECTIVE:** Children with global developmental delay, intellectual disabilities, and/or autism spectrum disorders who have micro deletions or duplications identified by microarray CGH will be more severely affected than children with global developmental delay, intellectual disabilities, and/or autism who do not have deletions or duplications.

**EXPERIMENTAL PROTOCOL:** A case-control study will be conducted among children with cognitive impairments and/or autism spectrum disorders. Children with global developmental delay, intellectual disability, and/or autism who have microdeletions or microduplications will be compared with a control group of children from the same clinic population who also have global developmental delay, intellectual disability, and/or autism. Cases and controls will be compared for differences in their cognitive abilities, language scores, Autism Diagnostic Observation Schedule (ADOS) scores, fine motor skills, sensory issues, dysmorphic physical features and family history of neurodevelopmental or psychiatric abnormalities. Two controls with negative microarray CGHs will be identified for each case. Statistical analysis will be conducted in consultation with a biostatistician.

**MEDICAL STUDENT'S ROLE:** The medical student will extract test results and clinical data from the charts of children with microdeletions or microduplications and from the controls, formatting the data into an Excel spreadsheet. The student will participate in the data analysis. The student will observe the technique of microarray analysis, which is performed in the USA Genetics Laboratory. In addition to submitting an abstract and presenting on Research Day, the student will be expected to submit her or his findings to the Southern Society of Pediatric Research.

## Sample Basic Sciences Research Proposal (informational purposes only)

### MEDICAL STUDENT RESEARCH PROPOSAL

Faculty Sponsor: Petra Rocic, Ph.D.  
Department: Biochemistry and Molecular Biology  
Telephone: 460-6139; 460-6848  
Address: Medical Sciences Building, Room 2194  
Proposal Title: Regulation of vascular smooth phenotype in coronary collateral growth

**RESEARCH PROBLEM:** A non-invasive alternative to percutaneous transluminal coronary angioplasty (PTCA) or coronary artery bypass grafting (CABG) is coronary collateral growth (CCG), a process of enlargement of pre-existing small arterioles into larger conduit arteries capable of supplying adequate tissue perfusion in the region of the myocardium distal to coronary occlusion. Transient, repetitive ischemia (RI), which mimics stable angina pectoris, is a natural stimulus for CCG. However, CCG is impaired in obesity, diabetes, insulin resistance and hypertension, or their combined phenotype, the metabolic syndrome. A unique feature of smooth muscle (SM) is phenotypic plasticity, or the ability to transition from the fully differentiated contractile phenotype, characterized by expression of SM-specific contractile proteins, increased extracellular matrix production, and increased proliferation and migration. Collateral growth is characterized by VSMC de-differentiation in the early stages and VSMC re-differentiation in the later stages. Our previous results demonstrate that CCG is severely impaired in the rat model of the metabolic syndrome, the JCR rat, compared to the normal rat (SD). Our preliminary data show a significantly decreased expression of SM-specific contractile proteins in the JCR animals.

**OBJECTIVE:** Decreased SM-specific contractile protein expression correlates with impaired CCG in the metabolic syndrome.

**EXPERIMENTAL PROTOCOL:** Left thoracotomy is performed and a pneumatic occluder is implanted over the left anterior descending coronary artery (LAD) in the JCR and SD rats. The correct position of the occluder and the success of LAD occlusion are monitored by blanching (ischemia) of the LV free wall upon occluder inflation and reactive hyperemia (reperfusion) upon occluder deflation. Rats are allowed to recover for 2 days before the start of the RI protocol. The RI protocol for rat consists of: 8 40 sec occlusions, every 20 min, repeated every 8 hours for 3, 6 or 9 days. The extent of CCG is evaluated at days 0 and 9 of RI using: microspheres to measure coronary blood flow in the LAD-dependent (ischemic) and the normal zones, and 2) M-mode echocardiography to assess cardiac function (LV free wall motion). The expression of SM-specific contractile proteins (SM-myosin heavy chain, SM- $\alpha$ -actin, calponin, caldesmin and smoothelin) and a SM-specific gene regulator, myocardin will be determined by Western blot (whole heart tissue) and immunohistochemistry (IHC) at days 3, 6 and 9 of RI, i.e. at the time points where VSMC start to proliferate and migrate, collaterals begin to form and collaterals are fully formed.

**MEDICAL STUDENT'S ROLE:** Occluder implantation and achieving consistent levels of LAD occlusion, which are critical to interpretation of the results, involves a complicated surgical procedure, which requires significant practice to master. Since the medical student's research time will be limited, we anticipate that the surgical procedure will be performed by the PI and/or one of the Research Technologists in the lab, and cardiac tissue will be harvested and processed by the student for analysis. If the student, however, wishes to attempt to perform surgery, he/she will be assisted in doing so. The student will learn a variety of techniques, including protein isolation from tissue, Western blotting and IHC. Furthermore, the student will perform echocardiograms with help from the Research Technologist in the lab. In addition, the student will analyze and interpret all of the results with PI's assistance, and prepare them for presentation. The PI will be available to provide direct supervision of this student project. The student will be expected to interact with other members of the lab as well as faculty in the Departments of Biochemistry & Molecular Biology and Physiology and attend seminars, journal clubs and lab meetings as scheduled.