



California Science Center
CALIFORNIA STATE SCIENCE FAIR
2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.) Justin M Lerman	Science Fair Use Only S1399
Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) Effects of Methylphenidate on Smooth Cardiac Myocytes	Division _ Junior (6-8) <u>X</u> Senior (9-12)
Preferred Category (See page 5 for descriptions.) 13 - Pharmacology / Toxicology	
Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.) Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.	
<p>Methylphenidate (Ritalin#) is the prescription drug of choice for several behavioral disorders, principally attention deficit disorder syndromes. However, its major drawback is its side effect profile related to effects on the heart, principally arrhythmia and associated disorders. The amphetamine like structure of methylphenidate may have a stimulatory effect on the heart, which may be the cause of these side effects. A neonatal rat myocyte preparation, which is a culture of smooth muscle cardiac cells, was used to study the effects of the drug directly on the heart muscle. These cells are known to maintain a complete metabolism equivalent to intact smooth cardiac muscle cells, and are known to have intact neuromuscular junction receptors. This cell preparation beats spontaneously and this function can be observed under a microscope (200X). Serial dilutions of methylphenidate, along with two neurotransmitter controls (acetylcholine and norepinephrine) were investigated for their effect on myocytes. Norepinephrine (10mM) demonstrated an immediate and significant stimulatory effect (+140%) on the cells. Methylphenidate (.19mM) had a stimulatory effect at 25 min (+45%), but onset was delayed until 10 min. This experiment demonstrates that both norepinephrine and methylphenidate have a stimulatory effect on smooth cardiac muscle cells, but the mode of action is different. Norepinephrine is known to have a direct interaction with neuromuscular receptors. The delay in response with methylphenidate suggests a direct effect on the receptor inside the cell. Cocaine also has an amphetamine-like structure, which may suggest similar mode of action and its long-term consequences: a direct effect on cellular proteins.</p>	
Summary Statement (In one sentence, state what your project is about.) The effects of the drug Ritalin on cells from the heart.	
Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4. Parents helped with board and project write up, Dr. Paul Goddard got me the cells, Dr. George Miljanich supervised the procedure, Maile Skomp prepared the culture, project done at Elan Pharmaceuticals in Menlo Park	