

TSI: TEEN SCIENCE INVESTIGATIONS

On the case, with winners of the 2009 Intel ISEF Addiction Science Awards

Do human corpses found intact in the desert hold clues about the dangers of methamphetamine abuse? Can the residue from burning tobacco cause genetic mutations in flies?

These questions led three 17-year-olds to create award-winning science research projects.

With their curiosity sparked by some unusual facts they came across, Daniel Martin, Jada

Dalley, and Sehar Salman became detectives on the trails of mysteries. They searched for answers using the scientific method, and their resulting research projects earned all of them a 2009 Intel International Science and Engineering Fair (ISEF) Addiction Science Award. Read on to learn about their remarkable teen science investigations.

Magnifying glass and fingerprints: © i-Stockphoto.

POISON FLESH

PROJECT: THE EFFECT OF METHAMPHETAMINE ON CARNIVORE SCAVENGING

DANIEL JEFFREY MARTIN, 17 YEARS OLD, PHOENIX, ARIZONA



● Mystery: Daniel already knew that methamphetamine, a powerfully addictive stimulant drug, is highly toxic to the brain and body of a drug abuser. But a conversation with his mother made Daniel curious about whether the drug's effects on the body last even after death. His mother, who works with the medical examiner's office identifying bodies and determining causes of death, told Daniel that sometimes bodies remain in the deserts around Phoenix for a period of time before being discovered. Carnivorous animals searching for food often scavenge the remains. But, she added, if a person abused methamphetamine, scavenging animals stay away from the body.

Daniel decided to investigate. He came up with a testable hypothesis to

see if what his mother said was true. He hypothesized that as the level of methamphetamine in a deceased person's body increased, the amount of the body eaten by carnivorous scavengers would decrease.

● Evidence Trail: To test his hypothesis, Daniel scoured 97 case records in the medical examiner's office that included toxicology results of how much (if any) methamphetamine was in the body when it was discovered. He studied forensic photographs taken of the bodies and calculated the amount of scavenging on each body. To rule out the effect of other factors, Daniel also tracked other data on the deceased person, such as age, weight, and gender.

● Drawing a Conclusion: Daniel's data supported his hypothesis. It showed that there was an association between the amount of methamphetamine identified in the toxicology report and the amount of scavenging on a body—the more methamphetamine detected, the less the scavenging.

"Even just a little bit of methamphetamine in the body meant that there was a massive reduction in carnivore scavenging," he says. "I was surprised by how extreme the results were."

Daniel says the findings of his project highlight how dangerous a drug like methamphetamine must be if its effects can be seen even after death.

"Even animals know that this is a poison to your body," he says.

Project's full title: "The Effect of Human Methamphetamine Usage on Carnivore Scavenging"

HIGH-RISK RESIDUE

PROJECT: "THIRD-HAND SMOKE" CAUSES MUTATIONS IN FRUIT FLIES

JADA NICOLE DALLEY, 17 YEARS OLD, SAN ANTONIO, TEXAS

SEHAR ANJUM SALMAN, 17 YEARS OLD, SAN ANTONIO, TEXAS



Mystery: Sehar and Jada already knew about the health risks posed by second-hand smoke—the combination of exhaled smoke and the stream of smoke from a lit tobacco product. But Sehar was surprised to learn through a news article about another potential smoking hazard. She read that third-hand smoke—the invisible residue of gases and particles left behind on clothing and furniture when tobacco is burned—could also be dangerous. Jada and Sehar had recently completed a research project showing that exposure to second-hand smoke caused an increase in the number of genetic mutations in *Drosophila melanogaster* (fruit flies). Now Jada and Sehar became interested in a new question.

"We wanted to find out if third-hand smoke had the same effects," says Jada. They set up an experiment to test their new hypothesis: Third-hand smoke would cause mutations in fruit flies similar to those produced by second-hand smoke.

Evidence Trail: For their experiment, Jada and Sehar exposed a tube containing food and a piece of foam to cigarette smoke. Fruit fly larvae, or young, were placed in the tube after the cigarette was removed and the smoke had settled. Two weeks later, Jada and Sehar observed the flies under microscopes to look for genetic mutations, such as curly or spread-out wings and changes in eye color.

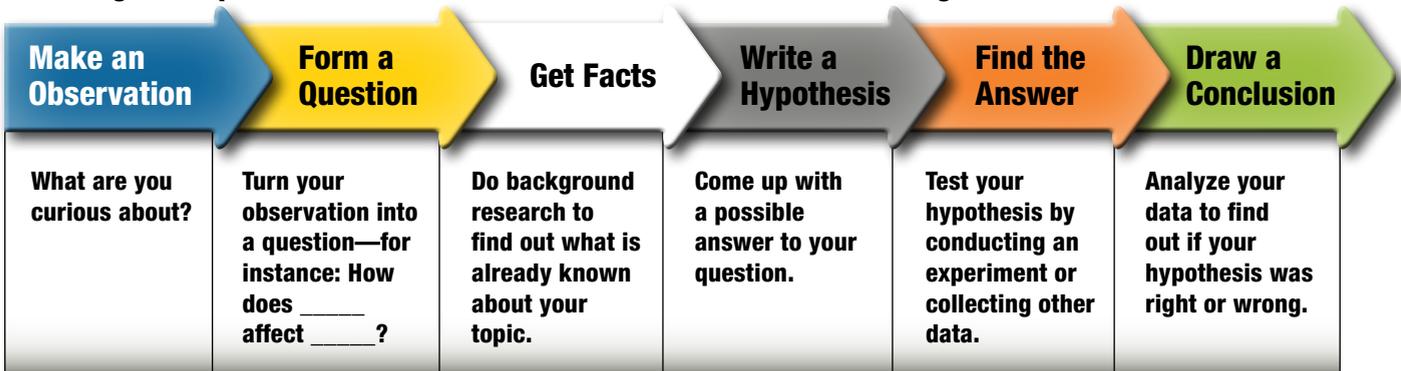
Drawing a Conclusion: Jada and Sehar detected a surprising number of genetic mutations in the flies exposed to third-hand smoke. In fact, Sehar and Jada's conclusion was that their hypothesis was correct. The number of mutations caused by third-hand smoke was just as high as the number found when flies were exposed to second-hand smoke. Sehar says their research shows that tobacco poses more risks than most people are aware of.

"If you smoke, you can harm not just yourself or people who are around you," says Sehar. "You can even harm the next person who walks in the room."

Project's full title: "A Cytogenic Analysis of Genetic Mutation Induced by Cigarette Smoke in *Drosophila Melanogaster*"

CONDUCT YOUR OWN INVESTIGATION

Following the steps of the scientific method can lead to a successful investigation.



For more information about the Intel ISEF Addiction Science Awards, visit www.drugabuse.gov/sciencefair.