

# THE COMMUNITY FAMILY AND TWIN STUDIES

University of Colorado

Summer 2002

Volume 3

## DNA: From Collection to Analysis



More than 2000 families in Colorado have already participated in this community study of environment and genetics. During the interview process, which lasts between 2-4 hours, we collect many types of data. Your answers to questionnaires, interviews and a DNA sample are all important parts of our visit. When we arrive back at the lab, interview and questionnaire booklets are coded and entered into a computer, where researchers can access this information and do statistical analysis. A similar process happens with DNA, but first several steps need to occur before DNA information and patterns can be analyzed.



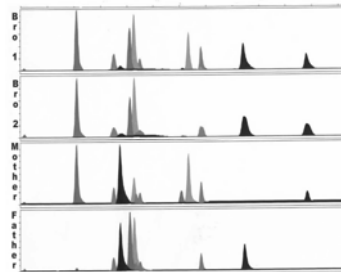
A young subject collects DNA cells from her mouth with a cotton swab.

The process begins when we visit your home and collect a sample of your DNA. DNA is present in every cell in the body, and we collect cells from the mouth by using cotton swabs to scrape them from the inside of your cheeks.

The swabs are then placed in a soapy solution to preserve the DNA. When the sample arrives back at the lab, researchers add chemicals to the solution and then place this new solution in an instrument called a centrifuge, which separates the DNA from the solution.

After the DNA is separated, it is dropped onto gels and placed in a machine that codes the unique patterns of every individual's DNA. This machine, called a DNA sequencer, uses light waves to record each individual's

unique pattern of DNA. This information is then transferred onto a computer which allows researchers to analyze the data. The graph below shows a readout of DNA from 4 individuals, 2 brothers on top and a mother and father on the bottom. Researchers look at the height and location of the spikes to determine DNA structure. It is possible to see which segments of DNA the brothers inherited from each parent by looking at the spikes. These spikes represent characteristics that are passed on genetically, such as eye color, height and even behavioral characteristics like shyness. The function of many of these DNA structures, and how they interact with one another to create a unique individual, are things researchers are discovering thanks to information we receive from you.



Throughout this process your DNA is labeled only by number and is kept secure at the University of Colorado. The information we obtain from your DNA is held in strict confidence and is protected by a certificate of confidentiality issued by the National Institutes of Health. Your DNA will be used only for the research that you have consented to.

Thank you again for your participation in this important research project. If you have any questions or comments please contact us at the addresses on the back.

### DNA

- DNA stands for Deoxyribonucleic acid.
- DNA is found in all living creatures and carries the instructions necessary to create an organism.
- For much more information on DNA visit <http://www.dnaftb.org>

### What Next?

Over the next several years researchers at CU will begin looking for patterns in DNA that correspond with answers on questionnaires and interviews. The purpose of this is to find how DNA influences certain behaviors and characteristics. You may be contacted in the next 5-10 years for a follow up interview in order to confirm these findings. Your voluntary participation is greatly appreciated.

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Several research divisions at the University of Colorado are involved with this project. These include the Institute for Behavioral Genetics, the Department of Molecular, Cellular and Developmental Biology, and the Division of Substance Dependence at the University of Colorado Health Sciences Center. Each department plays a unique and important role in the collection, analysis, and security of the data.

If you have any questions or comments about your participation in this research project, or about the general nature of our work, please call or email us at the addresses to the left. Also, you can visit our website for more in-depth information. Thank you again for your contribution to our understanding of genetics and behavior.

## Researchers Find Shared Link Among Behavioral Problems

Conduct Disorder (CD) and Attention Deficit Hyperactivity Disorder (ADHD) are two common disorders which affect many adolescents and their families. Adolescents with CD have problems with authority, get into fights often, and participate in socially unacceptable behavior that gets them into trouble. Adolescents with ADHD have trouble sitting still or concentrating, problems with talking too much, and difficulty organizing things. Prior research has shown that these disorders often occur together, and can increase the risks for problems in adulthood such as drug and alcohol addiction. In this study, researchers at the University of Colorado looked at data from the community studies to try and understand the connection between ADHD, CD, and substance problems.

Data were analyzed from 334 pairs of twins participating in this community based study. Identical twins have the exact same patterns of DNA, whereas fraternal twins have only about 50% the same. If a characteristic is highly influenced by DNA, it will appear in identical twins more often and with more strength than in fraternal twins. The twin data were used to look at genetic inheritance and environmental contributions to CD and ADHD

In this study, CD, ADHD, substance experimentation, and novelty seeking (seeking out new experiences) were found to be highly connected with one another. Individuals who expressed one of these characteristics often had the others, and identical twins

with these problems showed a greater overlap than did fraternal twins, suggesting a strong genetic influence. Researchers coined a new term to describe this set of problem behaviors: *behavioral disinhibition*. They proposed that one underlying genetic characteristic may be responsible for many of these behaviors. The common link between these individuals was that they reported an inability to resist doing bad things, and negative consequences did not influence their behaviors. It is believed that individuals with the *behavioral disinhibition* characteristic continue to engage in problem behaviors despite the type or severity of punishments they receive.

Researchers coined a new term to describe this set of problem behaviors: ***behavioral disinhibition***.

This study is one of the first to explore behavioral disinhibition. More research needs to be done in order to understand its effects on behavior. This new idea may be influential in shaping the ways we help individuals with problems like ADHD, CD, and substance abuse disorders.

Young, S. E., Stallings, M. C., Corley, R. P., Krauter, K. S., & Hewitt, J. K. (2000) Genetic and Environmental Influences on Behavioral Disinhibition. *Neuropsychiatric Genetics*, 96, 684-695.

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