**UNIVERSITY OF NAIROBI**

**SCHOOL OF MEDICINE**

**DEPARTMENT OF PSYCHIATRY**

**Tuesday 9th March, 2010 Dr. Maathai M**

**GENETICS AND BEHAVIOR**

**Introduction**

* Can genetics explain why we behave the way we do?
* Why some prefer football and others cycling
* Can they explain why some are good at languages
* Can they explain why some prefer blue clothes to green the same way they explain eye colour, height and skin colour
* Is our potential predetermined at conception?
* Are we powerless to control our thoughts and actions?
* Will our children turn out a certain way no matter how you raise them
* The study of genetics is still new hence has to be explored
* Behavioral genetics is of particular interest in psychiatry in as far as it contributes to an understanding of abnormal behavior
* The role of behavioral genetics; in mental disease, personality, intelligence remain controversial
* In the past, research in behavioral genetics has been used to support hateful prejudice

**Genes and Behavior: The Link**

* Human variation in behavior and susceptibility to mental illness, risk taking and performance on intelligence tests and other traits can partly be answered by behavioral genetics
* Studies seem to indicate a connection between genes and particular behaviors
* This link does not mean you perform better but rather based on exposing
* Genes cannot make you act in a particular way, they just modify the physiology in response to the environment
* Genes are inherited but behavior is not inherited; behavior depends on the context of life
* Genes relate to behavior in an indirect way to the internal and external environment

**Environment**

* These are influences other than inherited factors
* External environment; family and friends etc
* Internal environment; uterine life etc

**Gene environment interaction**

* This is a complex exchange of reciprocating influences that goes beyond nature vs nurture
* The same genotype in different environments may lead to similar or different phenotypes
* Heritability is the proportion of phenotypic variation in a population that is due to genetic variation

**Gene environment correlation**

* This is a gene/environment correlation occurs when individuals endowed with certain hereditary traits live in environments that support expression of the trait e.g. growing up next to a swimming pool environment and you end up being a swimmer

**Sibling Differences in behavior**

* Biological siblings are half genetically similar while identical twins are fully similar but there still are differences in behavior
* The shared environment e.g. parents socioeconomic status may make them similar while the non shared environment; illness, friends, teachers etc may make them different

**Environmental impact; The Bees**

* In any honeybee colony, there is only one queen, much larger etc but the genetic make-up is the same with the worker bee

**Research in behavioral genetics**

* Behavioral genetics study traits and try to determine the roles of both the environment and genes
* In a family study there is the key subject; the **proband** who posseses of the trai to be studied
* The trait is sought in;
* 1st degree relatives; parents, siblings and children
* 2nd degree relatives; aunts, uncles, grandchildren, grandparents, nephews and nieces

**Twin Studies**

* Twin studies can be done in identical/monozygotic twins (MZ), fraternal/dizygotic twins (DZ), twins reared apart or together
* Twin studies rely on the fact that MZ twins have essentially the same set of genes while DZ twins have a half identical set
* Basic assumption is that the twins are rared together and have equal environmental opportunity
* What makes the identical twins more alike on a certain trait compared to fraternal twins is their great genetic similarity.
* Genetic influence is indicated when the concordance rate or correlation coefficient for identical twins exceeds that for fraternal twins
* Shared environmental influences are indicated when the similarity for both types of twins are quite close
* Non shared environmental influences are indicated when identical twins are dissimilar for a trait

**Adoption Studies – Twins**

* Adoption studies look at biologically related people who have been reared apart
* MZ twins separated at birth for adoption are compared
* It is assumed that the different environments shape them differently so that similarities in traits can be attributed at least in part to genetic effects

**Adoption Studies – Children to Parents**

* Children adopted at birth are compared to both their biological and adoptive parents
* Evidence for partial genetic influence on a trait is indicated when adoptees are more similar for the trait to their biological parents than to the adoptive parents
* Evidence for some environmental influence is found when the adoptee is more like his or her adoptive parents than the biological parents

**Adoptive Studies – Children to other siblings**

* Adopted children are compared to

**Genome research**

* The more recent method of research

**Simple gene defects**

* One alteration in a gene is sufficient to produce some medical disorders
* Such genes are relatively easy to find

**Polygenic involvements**

* The vast majority of mental disorders are believed to be polygenic
* Most mental disorders
* A polygenic disorder results only when all of the pertinent genetic and environmental factors are in place and the extent of disorder depends on when those factors occur and how they affect each other

**Psychotic Disorders**

* Schizophrenia and bipolar mood disorders are example of a polygenic disorders, related to impaired neurotransmitter production and functions
* The 1st degree relatives of schizophrenia have 10 times greater risk of schizophrenia as the general population
* The concordance rate of schizophrenia are higher in MZ as in DZ twins
* The relative influence of the environment to genetic influence is not clear – but indicated by the existence of substantial discordance

**Alcohol Dependence**

* It is estimated that 40-60% of the variance of risk of alcohol dependence is explained by genetic influence
* The risk of alcohol dependence is 3 times to 4 times higher in close relatives of alcohol dependants

**Impulsive and Novelty Seeking**

* Impulsivity a behavioral feature found in several psychiatric disorders like Attention Deficit Hyperactive Disorder (ADHD), intermittent explosive disorder (the loss of control over impulse to steal unneeded objects), pyromania (the impulse to set objects on fire) and antisocial personality disorder, has been closely related to novelty seekers; people who thrive on new experiences and heightened sensations. Like skydiving,
* It is presumed that the similar groups of genes working through NT pathways are responsible for impulsive disorders and novelty seeking
* The expression of the genes into socially acceptable or unacceptable behavior depending on environmental factors and context
* Such as living in deprived urban neighborhoods may become thugs

**Intelligence and Behavioral Genetics**

* Intelligence is a complex general capacity of the brain; the ability to reason, to think abstractly, to draw conclusions, to solve problems, to learn from experience and to remember what has been learned
* It also has to do with how the mind makes use of sensory information and how it takes cues from emotions (our own and others)
* Intelligence very clearly correlates
* A theory of multiple intelligences has been proposed
* Howard Gardner in 1983 holds that humans have eight forms of intelligence;
* Linguistic
* A great many quantitative studies have shown that IQ correlation increases as genetic similarity increases
* Quantitative studies also provide evidence of environmental influences on intelligence
* Most quantitative
* This means that highly intelligent people have multiple superior genes for general cognitive abilities
* They may also

**Conclusion**

* Based on your genes no one can say what kind og human being you will turn out to be or what you will do in life