Wanderlust Gene (Novelty Seeking)

Related Gene: DRD4 exon III – dopamine receptor gene, located on chromosome 11

It is believed that dopamine is what controls an animal’s exploratory behavior.

Polymorphism: There is a varying number of tandem repeats of 48 nucleotides. It can repeat from anywhere from 2-11 times. 4 repeats and 7 repeats are the most common, with 7 repeats being the polymorphism tested for causing an increase in NS.

The number of repeats is believed to affect the binding of ligands on receptors

Occurs in about 20% of the population but varies between ethnicities.

Related: ADHD, Alcohol/drug addiction – these often came up as part of DRD4 research.

DRD4 has been found to have a relationship with ADHD and has also been studied to find its relationship with alcohol and drug abuse. Many studies discussed one or both of these diseases as well as other personality traits when discussing novelty seeking.

Novelty Seeking (NS) – personality trait, tendency to pursue new experiences; thrill seeking, reward dependence, harm avoidance, risk taking

Wanderlust – a strong, innate desire to travel

Although the original focus was to find a Wanderlust gene, most of the research discussed NS. Wanderlust is caused by NS so research was done about NS since no studies discussing only wanderlust were found.

A person’s desire for novelty varies depending on age, with younger people being more novelty seeking. At older ages, novelty seeking behavior is reduced regardless of presence or absence of the gene.

Although not proven, it has been hypothesized that the gene is found more often in people with ancestors who traveled a lot in the past.

The following are summaries on different studies on DRD4.

*Study 1 – Personality Variations in Passerine Birds* – Fidler, Oers, Drent, and others

Study of 91 different Passerine Birds (Although this number is small, there are many other studies supporting its conclusion)

EEB selected birds were selected for over 4 generations. There were 29 fast EEB selected birds and 21 slow EEB birds bred.

The birds were tested for Early Exploratory Behavior (EEB). Their behavior was rated on a scale from 0-20 with 0 being no novel seeking and 20 being extreme novel seeking. There were two different tests. The first one was scaled from 0-10 and the score was based on the time a bird took to visit 4 trees. The second test was placing a novel object and seeing how the bird reacts with 0 being ignoring the object and 5 meaning the bird pecked the object. The second experiment occurred twice.

The main polymorphism being tested was at position 830 of DRD4 (DQ 006802). It is a single point mutation where there is either a C nucleotide or a T nucleotide.

A significant difference in EEB was found in the different genotypes though it was noted that some of the results could be a result of randomness. The study stated that differences could be due to cryptic population stratification.

SNP830T dominant over the C version – there is less T alleles likely due to selection against the T form (C is slow EEB while T is fast EEB)

SNP830 genotype p

Group C/C C/T T/T

Unselected .37 (34) .51(46) .12(11)

Fast EEB .28(8) .66(19) .07(2) .69

Slow EEB .90(19) .10(2) 0(0) .017

ID15 genotype

Group +/+ +/- -/-

Unselected .66(59) .33(29) .01(1)

Fast EEB .48(14) .45(13) .07(2) .15

Slow EEB .38(8) .38(8) .24(5) .024

Conclusion: DRD4 polymorphisms are associated with variation in novelty seeking behavior in vertebrates.

*Study 2* – *Novelty Seeking in Nonhuman Primate Model* – Bailey, Breidenthal, and others

DRD4 exon III (VNTR allele)

2 variants – 6 repeats (92% of monkeys, 415 monkeys)

5 repeats (8%, 37 monkeys)

P=.03

There was a 13% variance due to polymorphism

To test the monkeys NS, a large wading pool was placed in an indoor area and the time taken for the monkey to approach the pool (up to 30 minutes) was used to measure NS

Conclusion

DRD4 is associated with NS in nonhuman primates

*Study 3* – *DRD4 exon III associated with NS in 15 year old males* – K. Becker, M. Lavoht and others

The study used 144 males and 159 females, all from Germany. Everyone in the study was 15 years old.

In this particular study, it seemed only males had a change in NS due to the presence of the mutation. However, most other research suggests that gender is not a factor, although there definitely is some difference in male/female personality as noted in the study which could account for the females in the study not showing a significant difference in NS.

Males with DRD4-7R had higher NS (p=.002) and harm avoidance (.045)

Males in the 7r group scored much higher than those without 7r (t=-3.21,p=.002 and t=-2.03, p = .045 respectively)

Males (n=144) Females (n=159)

7 (n=61) no 7 (n=83) 7 (n=63) no 7 (n=96)

Novelty seeking 21.6 (6.4) 18.4 (5.6) 20.8 (6.3) 20.5 (6.9)

(other statitistics were included)

Testing used Junior Temperament and Character Inventory to obtain data

*Study 4 - D4 dopamine-receptor (DRD4) alleles and novelty seeking in substance-dependent, personality-disorder, and control subjects –* by Kranzler, Coccaro and others

DRD4-7R has no effect

In some racial groups, the gene was observed to have the opposite effect

The article noted that the gene may not directly contribute to NS (does not change the protein) but is instead just a marker.

Mean Age: 35.4

Control (younger): 32.6

Due to relatively high age, data may be inaccurate (See reasoning below)

D4 dopamine receptor locus

Dominant trait

Analysis of different studies:

*DRD4 is associated with NS and substance abuse: the saga continues…* - Molecular Psychiatry (2001)

This study states that conflicting research may be a result due to difference in age. Studies with subjects that are too old may have failed to find a link since older people will exhibit less NS regardless of genetics. Over 40 is considered too old, and subjects with ages close to that may be inaccurate.

In the study with the monkeys, age was also cited as a possible reason for inconsistencies in human studies.

Although there are some contradictory studies, it seems that DRD4-7R does have an impact on NS.

Next – need to find rs#, MAF, and Odds Ratio

May be possible to find using length of DRD4 since it is caused by a repeat of a 48 allele sequence

Since it’s not a single nucleotide polymorphism, I don’t think there is a rs#

*The DRD4 receptor Exon 3 VNTR and 5' SNP variants and mRNA expression in human post-mortem brain tissue.*

Simpson J1, Vetuz G, Wilson M, Brookes KJ, Kent L.7

“No statistically significant relationship between genotype and mRNA expression levels was found for these four polymorphisms although a weak trend toward the 7-repeat of the exon 3 VNTR reducing DRD4 mRNA expression was found”

Position – 15.5? 11p15.5

chr11:1,066,172-1,069,585 3,414

“Various researchers have focused on DRD4 located on chromosome 11p15.5, which contains a highly polymorphic 48 base pair variable number of tandem repeats (48 bp VNTR) sequence in exon III (Lichter et al., 1993). This polymorphism has been found to vary between 2 and 11 copies, with the 4 and 7 repeat alleles being the most common. One allele, the 7 repeat variant (7r), has been shown to mediate a blunted intracellular response to dopamine”

*DRD4 exon III associated with NS in 15 year old males* – K. Becker, M. Lavoht and others

About the Project

The project is a demonstration of the ability of genotyping to uncover facts about a person. Wanderlust and novelty seeking are interesting but not life impacting things that can be found out from genetics. However, genotyping has been shown to be able to find people’s risks for diseases.

This particular project is just for you to perhaps learn something interesting about yourself! The results are based on different studies that you can learn more about here. It should be noted that the results of this project may not be as accurate as other genotype projects since there is less research done and some research opposed the view that the found gene is related to novelty seeking (read about in Wanderlust gene) (and it was researched by an intern). Regardless, we hope to introduce you to the power of genetic testing to help you.

Wanderlust Gene

Wanderlust is a strong desire to travel. Some news articles related wanderlust to genetics. DRD4, the gene associated with the wanderlust characteristic has been shown to be related to novelty seeking (NS), which in turn connects to like of traveling.

The polymorphism (a mutation that has become widespread in the population) in the DRD4 gene is located on chromosome 11. It occurs in about 20% of the population. DRD4 regulates dopamine reception. Dopamine is believed to control an animal’s novelty seeking.

There are 48 nucleotides that have a varying number of tandem repeats. It can repeat anywhere from 2-11 times, though 4 repeats (4R) and 7R are the most common. The 7R version is the one associated with increased polymorphism and is the one being tested for.

More genetic tests at genowise.com and helix.com