Prog Brain Res. 2000;126:325-41.

# Reward deficiency syndrome: genetic aspects of behavioral disorders.

Comings DE[1], Blum K.

**Author information**

## Abstract

The dopaminergic and opioidergic reward pathways of the brain are critical for survival since they provide the pleasure drives for eating, love and reproduction; these are called 'natural rewards' and involve the release of dopamine in the nucleus accumbens and frontal lobes. However, the same release of dopamine and production of sensations of pleasure can be produced by 'unnatural rewards' such as alcohol, cocaine, methamphetamine, heroin, nicotine, marijuana, and other drugs, and by compulsive activities such as gambling, eating, and sex, and by risk taking behaviors. Since only a minority of individuals become addicted to these compounds or behaviors, it is reasonable to ask what factors distinguish those who do become addicted from those who do not. It has usually been assumed that these behaviors are entirely voluntary and that environmental factors play the major role; however, since all of these behaviors have a significant genetic component, the presence of one or more variant genes presumably act as risk factors for these behaviors. Since the primary neurotransmitter of the reward pathway is dopamine, genes for dopamine synthesis, degradation, receptors, and transporters are reasonable candidates. However, serotonin, norepinephrine, GABA, opioid, and cannabinoid neurons all modify dopamine metabolism and dopamine neurons. We have proposed that defects in various combinations of the genes for these neurotransmitters result in a Reward Deficiency Syndrome (RDS) and that such individuals are at risk for abuse of the unnatural rewards. Because of its importance, the gene for the [figure: see text] dopamine D2 receptor was a major candidate gene. Studies in the past decade have shown that in various subject groups the Taq I A1 allele of the DRD2 gene is associated with alcoholism, drug abuse, smoking, obesity, compulsive gambling, and several personality traits. A range of other dopamine, opioid, cannabinoid, norepinephrine, and related genes have since been added to the list. Like other behavioral disorders, these are polygenically inherited and each gene

accounts for only a small per cent of the variance. Techniques such as the Multivariate Analysis of Associations, which simultaneously examine the contribution of multiple genes, hold promise for understanding the genetic make up of polygenic disorders.

PMID: 11105655 DOI: 10.1016/S0079-6123(00)26022-6

[Indexed for MEDLINE]

**Publication type, MeSH terms, Substances**

**LinkOut - more resources**