AVPR2 Gene

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arginine vasopressin receptor 2

genes

1. Normal Function

The *AVPR2* gene provides instructions for making a protein known as the vasopressin V2 receptor. This receptor works together with a hormone called vasopressin or antidiuretic hormone (ADH) in the kidneys. The vasopressin V2 receptor is found in structures called collecting ducts, which are a series of small tubes that reabsorb water from the kidneys into the bloodstream.

The interaction between ADH and the vasopressin V2 receptor triggers chemical reactions that control the body's water balance. When a person's fluid intake is low or when a lot of fluid is lost (for example, through sweating), the body produces more ADH. This hormone attaches (binds) to the vasopressin V2 receptor and directs the kidneys to concentrate urine by reabsorbing some of the water back into the bloodstream. When fluid intake is adequate, less ADH is available to interact with the vasopressin V2 receptor. At these times, less water is reabsorbed into the bloodstream and the urine is more dilute.

2. Health Conditions Related to Genetic Changes

2.1. Nephrogenic Diabetes Insipidus

More than 200 mutations in the *AVPR2* gene have been identified in people with nephrogenic diabetes insipidus. Most of these mutations cause the vasopressin V2 receptor protein to be misfolded into an incorrect 3-dimensional shape. The misfolded protein is trapped within the cell, where it is unable to reach the cell surface to interact with ADH. Less common mutations in the *AVPR2* gene prevent the production of any vasopressin V2 receptor protein or lead to a version of the protein that reaches the cell surface but cannot partner with ADH.

Without functional vasopressin V2 receptors, the kidneys are unable to respond to signals from ADH. As a result, collecting ducts do not reabsorb water as they should, and the body makes excessive amounts of urine. These problems with water balance are characteristic of nephrogenic diabetes insipidus.

2.2. Other Disorders

At least two mutations in the *AVPR2* gene have been found to cause another kidney disorder known as nephrogenic syndrome of inappropriate antidiuresis (NSIAD). This condition is characterized by low levels of salt in the blood (hyponatremia), which can lead to brain swelling and other serious complications. NSIAD also causes the blood to be abnormally dilute (serum hypo-osmolality).

The two *AVPR2* gene mutations associated with NSIAD each change a single protein building block (amino acid) at position 137 in the vasopressin V2 receptor protein. One of these mutations replaces the amino acid arginine with the amino acid cysteine (written as Arg137Cys or R137C); the other mutation replaces arginine with the amino acid leucine (written as Arg137Leu or R137L). These mutations lead to a receptor protein that is constantly turned on (constitutively activated), even in the absence of ADH. As a result, large amounts of water are reabsorbed into the bloodstream regardless of fluid intake, and the urine is highly concentrated. These abnormalities disrupt the body's water balance, causing hyponatremia and serum hypo-osmolality.

3. Other Names for This Gene

- ADHR
- antidiuretic hormone receptor
- AVPR V2
- DI1
- DIR
- DIR3
- MGC126533
- MGC138386
- NDI
- renal-type arginine vasopressin receptor
- V2R
- V2R_HUMAN
- vasopressin V2 receptor

References

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