

# REN Gene

Subjects: **Genetics & Heredity**

Contributor: Karina Chen

renin

genes

## 1. Normal Function

The *REN* gene provides instructions for making a protein called renin, which is produced in the kidneys. This protein is part of the renin-angiotensin system, which regulates blood pressure and the balance of fluids and salts in the body. In the first step of this process, renin converts a protein called angiotensinogen into angiotensin I. Through an additional step, angiotensin I is converted to angiotensin II. Angiotensin II causes blood vessels to narrow (constrict), which results in increased blood pressure. Angiotensin II also stimulates production of the hormone aldosterone, which triggers the absorption of water and salt by the kidneys. The increased amount of fluid in the body also increases blood pressure. Proper blood pressure during fetal growth, which delivers oxygen to the developing tissues, is required for normal development of the kidneys, particularly of structures called the proximal tubules, and other tissues. In addition, angiotensin II may play a more direct role in kidney development, perhaps by affecting growth factors involved in development of kidney structures.

## 2. Health Conditions Related to Genetic Changes

### 2.1. REN-related kidney disease

At least four mutations in the *REN* gene have been found to cause *REN*-related kidney disease, a condition in which the kidneys become less able to filter fluids and waste products from the body, resulting in kidney failure. Individuals with this condition have one mutated copy and one normal copy of the *REN* gene in each cell. The mutations involved in *REN*-related kidney disease either change or remove a protein building block (amino acid) in the renin protein. These changes occur in a region of the protein known as the signal sequence, and they impair normal processing of renin. The abnormal protein is toxic to the kidney cells that normally produce renin. The renin-producing cells gradually die off, which disrupts the renin-angiotensin system and causes progressive kidney disease.

### 2.2. Renal tubular dysgenesis

At least 11 mutations in the *REN* gene have been found to cause a severe kidney disorder called renal tubular dysgenesis. This condition is characterized by abnormal kidney development before birth, the inability to produce urine (anuria), and severe low blood pressure (hypotension). These problems result in a reduction of amniotic fluid (oligohydramnios), which leads to a set of birth defects known as the Potter sequence.

Renal tubular dysgenesis can be caused by mutations in both copies of any of the genes involved in the renin-angiotensin system. Most *REN* gene mutations that cause this disorder prevent the production of any renin protein, which results in a nonfunctional renin-angiotensin system. Without this system, the kidneys cannot control blood pressure. Because of low blood pressure, the flow of blood is reduced (hypoperfusion), and the body does not get enough oxygen during fetal development. As a result, kidney development is impaired, leading to the features of renal tubular dysgenesis.

### 3. Other Names for This Gene

- angiotensin-forming enzyme
- angiotensinogenase
- FLJ10761
- HNFJ2
- RENI\_HUMAN
- renin precursor, renal
- renin preproprotein

### References

1. Beck BB, Trachtman H, Gitman M, Miller I, Sayer JA, Pannes A, Baasner A, Hildebrandt F, Wolf MT. Autosomal dominant mutation in the signal peptide of renin in a kindred with anemia, hyperuricemia, and CKD. *Am J Kidney Dis.* 2011 Nov;58(5):821-5. doi: 10.1053/j.ajkd.2011.06.029.
2. Bleyer AJ, Zivná M, Hulková H, Hodanová K, Vyletal P, Sikora J, Zivný J, Sovová J, Hart TC, Adams JN, Elleder M, Kapp K, Haws R, Cornell LD, Kmoch S, Hart PS. Clinical and molecular characterization of a family with a dominant renin gene mutation and response to treatment with fludrocortisone. *Clin Nephrol.* 2010 Dec;74(6):411-22.

3. Gribouval O, Gonzales M, Neuhaus T, Aziza J, Bieth E, Laurent N, Bouton JM, Feuillet F, Makni S, Ben Amar H, Laube G, Delezoide AL, Bouvier R, Dijoud F, Ollagnon-Roman E, Roume J, Joubert M, Antignac C, Gubler MC. Mutations in genes in the renin-angiotensin system are associated with autosomal recessive renal tubular dysgenesis. *Nat Genet.* 2005 Sep;37(9):964-8.
4. Gribouval O, Morinière V, Pawtowski A, Arrondel C, Sallinen SL, Saloranta C, Clericuzio C, Viot G, Tantau J, Blesson S, Cloarec S, Machet MC, Chitayat D, Thauvin C, Laurent N, Sampson JR, Bernstein JA, Clemenson A, Prieur F, Daniel L, Levy-Mozziconacci A, Lachlan K, Alessandri JL, Cartault F, Rivière JP, Picard N, Baumann C, Delezoide AL, Belar Ortega M, Chassaing N, Labrune P, Yu S, Firth H, Wellesley D, Bitzan M, Alfares A, Braverman N, Krogh L, Tolmie J, Gaspar H, Doray B, Majore S, Bonneau D, Triaud S, Loirat C, David A, Bartholdi D, Peleg A, Brackman D, Stone R, DeBerardinis R, Corvol P, Michaud A, Antignac C, Gubler MC. Spectrum of mutations in the renin-angiotensin system genes in autosomal recessive renal tubular dysgenesis. *Hum Mutat.* 2012 Feb;33(2):316-26. doi:10.1002/humu.21661.
5. Gubler MC, Antignac C. Renin-angiotensin system in kidney development: renal tubular dysgenesis. *Kidney Int.* 2010 Mar;77(5):400-6. doi: 10.1038/ki.2009.423.
6. Wolf G. Angiotensin II and tubular development. *Nephrol Dial Transplant.* 2002;17 Suppl 9:48-51. Review.
7. Zivná M, Hůlková H, Matignon M, Hodanová K, Vylet' al P, Kalbáčová M, Baresová V, Sikora J, Blazková H, Zivný J, Ivánek R, Stránecký V, Sovová J, Claes K, Lerut E, Fryns JP, Hart PS, Hart TC, Adams JN, Pawtowski A, Clemessy M, Gasc JM, Gubler MC, Antignac C, Elleder M, Kapp K, Grimbart P, Bleyer AJ, Kmoch S. Dominant renin gene mutations associated with early-onset hyperuricemia, anemia, and chronic kidney failure. *Am J Hum Genet.* 2009 Aug;85(2):204-13. doi:10.1016/j.ajhg.2009.07.010.

Retrieved from <https://encyclopedia.pub/entry/history/show/12832>