

# PIK3CD Gene

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Contributor: Lily Guo

phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit delta

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## 1. Introduction

The *PIK3CD* gene provides instructions for making the p110 delta (p110δ) protein, which is one piece (subunit) of an enzyme called phosphatidylinositol 3-kinase (PI3K). The version of PI3K containing the p110δ subunit, called PI3K-delta, is specifically found in white blood cells, including immune system cells (lymphocytes) called B cells and T cells. These cells recognize and attack foreign invaders, such as viruses and bacteria, to prevent infection.

Like other kinases, PI3K-delta adds a cluster of oxygen and phosphorus atoms (a phosphate group) to other proteins through a process called phosphorylation. PI3K-delta phosphorylates certain signaling molecules, which triggers a series of additional reactions that transmit chemical signals within cells. In lymphocytes, PI3K-delta signaling is important for many cell activities, including cell growth and division (proliferation) and maturation (differentiation). PI3K-delta helps direct B cells and T cells to differentiate into different types, each of which has a distinct function in the immune system.

## 2. Health Conditions Related to Genetic Changes

### 2.1. Activated PI3K-delta syndrome

At least four mutations in the *PIK3CD* gene have been found to cause a form of immunodeficiency called activated PI3K-delta syndrome. Immunodeficiencies are conditions in which the immune system is not able to protect the body effectively from foreign invaders such as bacteria and viruses. People with activated PI3K-delta syndrome typically have recurrent bacterial infections of the respiratory tract and chronic viral infections.

The *PIK3CD* gene mutations involved in activated PI3K-delta syndrome change single protein building blocks (amino acids) in the p110δ protein; the most common mutation replaces the amino acid glutamic acid with the amino acid lysine at position 1021 of the protein (written as Glu1021Lys or E1021K). A PI3K-delta enzyme containing the altered p110δ subunit is abnormally turned on (activated). Studies indicate that this overactive signaling causes T cells to mature and die too quickly. The excess signaling also blocks maturation of B cells at an early stage; the immature B cells cannot respond to foreign invaders and likely self-destruct. Lack of T cells and B cells makes it difficult for people with this disorder to fight off bacterial and viral infections. Overactivation of PI3K-delta signaling can also stimulate abnormal proliferation of lymphocytes, and accumulation of these cells can lead to enlarged lymph nodes (lymphadenopathy). Activated PI3K-delta syndrome also increases the risk of developing a form of cancer called B-cell lymphoma.

## 3. Other Names for This Gene

- APDS
- IMD14
- p110D
- P110DELTA
- phosphatidylinositol 4,5-bisphosphate 3-kinase catalytic subunit delta isoform
- phosphatidylinositol-4,5-bisphosphate 3-kinase 110 kDa catalytic subunit delta
- phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit delta isoform
- phosphatidylinositol-4,5-bisphosphate 3-kinase, catalytic subunit delta
- phosphoinositide-3-kinase C
- phosphoinositide-3-kinase, catalytic, delta polypeptide variant p37delta

- PI3-kinase p110 subunit delta
- PI3K
- PI3Kdelta
- ptdIns-3-kinase subunit p110-delta

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