

Cytochrome p450

Enzymes produced from the cytochrome P450 genes are involved in the formation (synthesis) and breakdown (metabolism) of various molecules and chemicals within cells. Cytochrome P450 enzymes play a role in the synthesis of many molecules including steroid hormones, certain fats (cholesterol and other fatty acids), and acids used to digest fats (bile acids). Additional cytochrome P450 enzymes metabolize external substances, such as medications that are ingested, and internal substances, such as toxins that are formed within cells. There are approximately 60 cytochrome P450 genes in humans.

Cytochrome P450 enzymes are primarily found in liver cells but are also located in cells throughout the body. Within cells, cytochrome P450 enzymes are located in a structure involved in protein processing and transport (endoplasmic reticulum) and the energy-producing centers of cells (mitochondria). The enzymes found in mitochondria are generally involved in the synthesis and metabolism of internal substances, while enzymes in the endoplasmic reticulum usually metabolize external substances, primarily medications and environmental pollutants.

Common variations (polymorphisms) in cytochrome P450 genes can affect the function of the enzymes. The effects of polymorphisms are most prominently seen in the breakdown of medications. Depending on the gene and the polymorphism, drugs can be metabolized quickly or slowly. If a cytochrome P450 enzyme metabolizes a drug slowly, the drug stays active longer and less is needed to get the desired effect. A drug that is quickly metabolized is broken down sooner and a higher dose might be needed to be effective. Cytochrome P450 enzymes account for 70 percent to 80 percent of enzymes involved in drug metabolism.

Each cytochrome P450 gene is named with CYP, indicating that it is part of the cytochrome P450 gene group. The gene is also given a number associated with a specific group within the gene group, a letter representing the gene's subgroup, and a number assigned to the specific gene within the subgroup. For example, the cytochrome P450 gene that is in group 27, subgroup A, gene 1 is written as [CYP27A1](#).

Diseases caused by mutations in cytochrome P450 genes typically involve the buildup of substances in the body that are harmful in large amounts or that prevent other necessary molecules from being produced.

Examples of genes in this gene group: [CYP1B1](#), [CYP2C9](#), [CYP2C19](#), [CYP2R1](#), [CYP4V2](#), [CYP7B1](#), [CYP11B1](#), [CYP11B2](#), [CYP17A1](#), [CYP19A1](#), [CYP21A2](#), [CYP24A1](#), [CYP27A1](#), [CYP27B1](#), [TBXAS1](#)

The HUGO Gene Nomenclature Committee (HGNC) provides an [index of gene groups](#)  and their member genes.

References

Guengerich FP. Cytochrome p450 and chemical toxicology. *Chem Res Toxicol*. 2008 Jan;21(1):70-83. Epub 2007 Dec 6. Review. PubMed: [18052394](#).

Hannemann F, Bichet A, Ewen KM, Bernhardt R. Cytochrome P450 systems--biological variations of electron transport chains. *Biochim Biophys Acta*. 2007 Mar;1770(3):330-44. Epub 2006 Aug 2. Review. PubMed [16978787](#).

Ingelman-Sundberg M, Sim SC, Gomez A, Rodriguez-Antona C. Influence of cytochrome P450 polymorphisms on drug therapies: pharmacogenetic, pharmacoeigenetic and clinical aspects. *Pharmacol Ther*. 2007 Dec;116(3):496-526. Epub 2007 Oct 9. Review. PubMed: [18001838](#).

Lynch T, Price A. The effect of cytochrome P450 metabolism on drug response, interactions, and adverse effects. *Am Fam Physician*. 2007 Aug 1;76(3):391-6. Review. PubMed [17708140](#).

Nebert DW, Russell DW. Clinical importance of the cytochromes P450. *Lancet*. 2002 Oct 12;360(9340):1155-62. Review. PubMed: [12387968](#).

Wijnen PA, Op den Buijsch RA, Drent M, Kuijpers PM, Neef C, Bast A, Bekers O, Koek GH. Review article: The prevalence and clinical relevance of cytochrome P450 polymorphisms. *Aliment Pharmacol Ther*. 2007 Dec;26 Suppl 2:211-9. doi 10.1111/j.1365-2036.2007.03490.x. Review. Erratum in: *Aliment Pharmacol Ther*. 2009 Feb 1;29(3):350. Kuipers, P M J C [corrected to Kuijpers, P M J C]. PubMed: [18081664](#).

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