**Catalase** was not noticed until 1818 when [Louis Jacques Thénard](https://en.wikipedia.org/wiki/Louis_Jacques_Th%C3%A9nard), who discovered H2O2 ([hydrogen peroxide](https://en.wikipedia.org/wiki/Hydrogen_peroxide)), suggested its breakdown is caused by an unknown substance. In 1900, [Oscar Loew](https://en.wikipedia.org/wiki/Oscar_Loew) was the first to give it the name catalase, and found it in many plants and animals. In 1969, the [amino acid](https://en.wikipedia.org/wiki/Amino_acid) sequence of [bovine](https://en.wikipedia.org/wiki/Bovine) catalase was discovered. Then in 1981, the three-dimensional structure of the protein was revealed.

Catalase is a common [**enzyme**](https://en.wikipedia.org/wiki/Enzyme) found in nearly all living organisms exposed to oxygen (such as bacteria, plants, and animals). It [**catalyzes**](https://en.wikipedia.org/wiki/Catalyst) the decomposition of [hydrogen peroxide](https://en.wikipedia.org/wiki/Hydrogen_peroxide) to [water](https://en.wikipedia.org/wiki/Water) and [oxygen](https://en.wikipedia.org/wiki/Oxygen). The large majority of known organisms use catalase in every [**organ**](https://en.wikipedia.org/wiki/Organ_%28anatomy%29), with particularly high concentrations occurring in the [liver](https://en.wikipedia.org/wiki/Liver). It is a very important enzyme in protecting the cell from [oxidative damage](https://en.wikipedia.org/wiki/Oxidative_stress) by [reactive oxygen species](https://en.wikipedia.org/wiki/Reactive_oxygen_species) (ROS). Likewise, catalase has one of the highest [**turnover numbers**](https://en.wikipedia.org/wiki/Turnover_number)of all enzymes; one catalase molecule can convert millions of hydrogen peroxide molecules to water and oxygen each second.

Catalase is a [tetramer](https://en.wikipedia.org/wiki/Tetrameric_protein) of four **polypeptide** chains, each over 500 [**amino acids**](https://en.wikipedia.org/wiki/Amino_acid) long. It contains four [**heme**](https://en.wikipedia.org/wiki/Heme) (iron) groups that allow the enzyme to react with the hydrogen peroxide. The optimum [pH](https://en.wikipedia.org/wiki/PH) for human catalase is approximately 7, and has a fairly broad maximum. The pH optimum for catalases in other organisms varies between 4 and 11 depending on the **species**. The optimum temperature also varies by species.

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The reaction of catalase in the decomposition of hydrogen peroxide in living tissue is very [**exothermic**](https://en.wikipedia.org/wiki/Exothermic)and is written as follows:

**2 H2O2 → 2 H2O + O2**

The presence of catalase in a **microbial** or **tissue** sample can be tested by adding a volume of [hydrogen peroxide](https://en.wikipedia.org/wiki/Hydrogen_peroxide) and observing the reaction. The formation of bubbles, [oxygen](https://en.wikipedia.org/wiki/Oxygen), indicates a positive result. This easy [assay](https://en.wikipedia.org/wiki/Assay), which can be seen with the naked eye, without the aid of instruments, is possible because catalase has a very high [specific activity](https://en.wikipedia.org/wiki/Enzyme_assay#Specific_activity), which produces a detectable response.

Hydrogen peroxide is a harmful byproduct of many normal [**metabolic**](https://en.wikipedia.org/wiki/Metabolism) processes; to prevent damage to cells and tissues, it must be quickly converted into other, less dangerous substances. To this end, catalase is frequently used by cells to rapidly catalyze the [**decomposition**](https://en.wikipedia.org/wiki/Chemical_decomposition) of hydrogen peroxide into less-reactive [gaseous](https://en.wikipedia.org/wiki/Gas) [oxygen](https://en.wikipedia.org/wiki/Oxygen) and water molecules. Catalase is usually located in a cellular [**organelle**](https://en.wikipedia.org/wiki/Organelle) called the [**peroxisome**](https://en.wikipedia.org/wiki/Peroxisome). Hydrogen peroxide is used as a potent **antimicrobial** agent when cells are infected with a **pathogen**

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