Pentose phosphate pathway

The Pentose Phosphate Pathway (PPP), also known as the hexose monophosphate shunt, is a metabolic pathway in cells that primarily serves two important functions:

Production of NADPH (Nicotinamide Adenine Dinucleotide Phosphate): The PPP generates NADPH, which is essential for various biosynthetic reactions and serves as a reducing agent in various cellular processes, including fatty acid and cholesterol synthesis and maintenance of cellular redox balance.

Production of Ribose-5-Phosphate: The PPP also produces ribose-5-phosphate, a precursor for the synthesis of nucleotides (the building blocks of DNA and RNA), as well as other important biomolecules.

The pathway can be divided into two main phases:

Oxidative Phase: In this phase, glucose-6-phosphate is converted into ribulose-5-phosphate through a series of reactions, producing NADPH in the process.

Non-Oxidative Phase (also called the Reversible Phase): Ribulose-5-phosphate can be converted back into intermediates that can feed into the glycolytic pathway or continue in the PPP, depending on the cell's needs.

The PPP is crucial for maintaining cellular homeostasis, particularly in situations where cells require an increased supply of NADPH for biosynthesis or to counteract oxidative stress. It plays a critical role in various physiological processes, including the production of fatty acids, nucleotides, and the detoxification of reactive oxygen species (ROS).