

An update on the potential role of endogenous and exogenous glycation on human health

Frederic J TESSIER

University of Lille, Inserm, CHU Lille, Pasteur Institute of Lille, U1167 – RID-AGE, 59000 Lille, France

Abstract

The scientific field of glycobiology comprises a broad area of research. What unites all the researchers in this field is the study of the structure, biosynthesis, and biological functions of saccharides. Of these a tremendous amount of research has been done on glycoconjugates which refers to all types of biological molecule that link to some saccharides. Among these glycoconjugates are the glycoproteins found *in vivo*. The glycosylation of proteins is an enzymatic biochemical process that attaches saccharides covalently to amino acids. It leads to post-translational modifications of proteins which are often crucial for the functionality of such glycoproteins. Another type of glycoprotein is formed by the Maillard reaction, also called glycation. In this case enzymes are not involved in the modification of proteins but rather it is random chemical reactions that are concerned. Due to their chemical properties lysine and arginine are the main targets of glycation on proteins. In mammalian tissues and cells, the main saccharides which react with amino acids are sugars with a reducing function, such as glucose, ribose and glyceraldehyde. Despite their low concentration *in vivo*, oxoaldehydes play a significant role in glycation due to their high chemical reactivity on amino groups. Endogenous glycation often disturbs not only the structure but also the function of proteins and in turn affect the functioning of organs and tissues during ageing, kidney failure and metabolic disorders. This keynote lecture will summarize the ongoing research on glycation with a specific focus on the exposure to dietary glycated proteins (exogenous glycation) and its health consequences.

Keywords: Biochemistry, Glycation

Glycation is the most general term describing the adduction of a carbohydrate to another biomolecule, such as a protein, lipid, or DNA. Glycation may occur either enzymatically or nonenzymatically. The common term for enzymatic glycation is glycosylation, for example, formation of a glycosidic bond using a sugar nucleotide donor during synthesis of glycoproteins. The terms nonenzymatic glycation, nonenzymatic glycosylation, or glycation (without a modifier) are commonly used in reference to direct chemical reactions of reducing sugars with proteins, illustrated by the reaction of glucose with lysine residues in protein to form a ketoamine (Amadori adduct). Glucation, fructation, ribation, etc. are used in reference to glycation by specific sugars.

Glycation is the covalent attachment of a sugar to a protein or lipid. Typical sugars that participate in glycation are glucose, fructose, and their derivatives. Glycation is the non-enzymatic process responsible for many complications in diabetes mellitus and is implicated in some diseases and in aging.