Biochemical characterization of Mimivirus L143 enzyme: the first pyruvyl transferase from a virus

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Pyruvylation consists in the transfer of a pyruvate moiety to the monosaccharide target in enol or ketal form, where the ketal-pyruvylation, the most widespread in nature, is found in bacteria, yeasts, and algae [1]. Interestingly, the chemical characterization of the mimivirus glycans [2] has extended this type of sugar modification to the viral glycans. Indeed, in one of the two polysaccharides covering mimivirus fibrils, the repeating unit is an N-acetyl-glucosamine modified with a pyruvic acid linked as a ketal to the hydroxy function 4 and 6. Since the sugar pyruvylation is absent in amoeba, the host of mimivirus, it is likely that mimivirus encodes its own pyruvyl transferase enzyme. Bioinformatic studies have identified L143 as a good candidate [3] and the object of this work was to assess the function of L143 enzyme by chemical and spectroscopic studies. Biochemical assays identified the phosphoenolpyruvate as a donor of the pyruvic acid, for which the enzyme presents a high affinity (Km < 1). Therefore, we demonstrated that the substrate of this reaction is the N-acetyl-glucosamine monosaccharide (Figure 1), the enzyme being unable to work at the level of the nucleotide sugar (UDP-N-acetyl-glucosamine). These results suggested that *in vivo* the reaction substrate could be the full polysaccharide or the disaccharide precursor of the repeating unit, prior the assembly of the polysaccharide.

Sugar pyruvylation plays key biological functions [1], and in the case of mimivirus could be involved in the adhesion process on the amoeba host membrane.

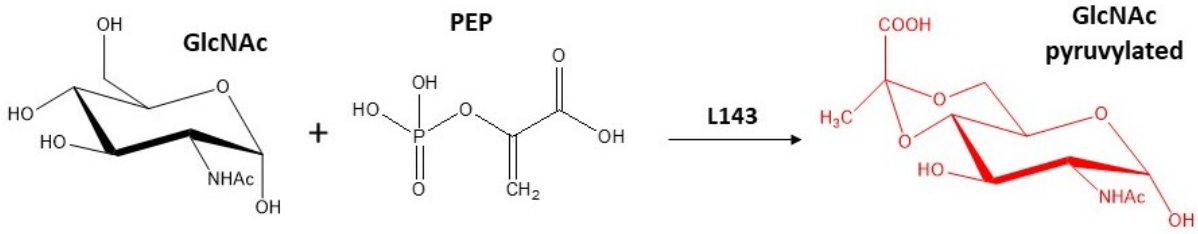

Figure 1. L143 enzyme is the viral pyruvyl transferase that links a pyruvic acid as a ketal to the hydroxyl functions 4 and 6 of GlcNAc.

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