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*A Study of the Effect of Physical Sports Injury on the Glycosylation Patterns of Alpha-1-Acid Glycoprotein.*

**Abstract**

Alpha-1-acid glycoprotein (AGP) is a 43kDa glycoprotein, so called due to the post-translational addition of carbohydrate units to the main protein. AGP is the second most abundant protein found within the serum of humans at normal physiological conditions, and is a positive acute phase protein produced by hepatocytes within the liver. As AGP is a positive acute phase protein, the concentration of AGP has been found to increase when a person is experiencing an acute phase response (APR); this is the bodies first line of defence against stressful stimuli, such as bacterial and viral infections, strenuous exercise, and physical injury.

As a result of the APR, it has been found that the structure of the carbohydrates units attached to the protein backbone can be altered. During a normal physiological state, 12-20 glycoforms of AGP can exist, however, this number can increase during the APR. A single molecule possesses five branching sites along the protein backbone, where the monosaccharide units bond to the AGP molecule in the form of branches; these branches can either be bi, tri, or tetra-sialylated arrangements. It is this attribute of AGP that is the focus of this research within this project. Previous studies have shown that the altered glycosylation of AGP has the potential to differentiate between different types of liver diseases and breast cancers. While it has been shown that the APR can be induced by physical injury, no studies have been carried out to determine whether or not a physical injury induced APR can alter the glycosylation patterns of AGP.

Physical injury samples for the project were collected via venepuncture from volunteers who were injured while taking part in the sport of downhill mountain biking; a sport chosen due it’s inherent dangers and the potential for injury. A two fold analysis of these samples was then carried out, by analysing the monosaccharide composition of the physical injury samples, before analysing the oligosaccharide structure of these samples, both being achieved through high pH anion exchange chromatography. The collected injury samples were then compared against collected normal blood samples, healed samples from previously injured volunteers while one sample remained unknown for the duration of the project.

Of the collected samples, it was seen that physical injury does have an effect on the glycosylation patterns of AGP. Furthermore, it was seen throughout the study that different injury types can produce different effects on the glycosylation patterns of AGP. Finally, the diagnostic potential of AGP was explored by comparing the monosaccharide and oligosaccharide compositions of the unknown injury sample against the compositions of the known injury samples. Once comparisons had been completed, it was found that the unknown shared a great deal of homology with known fracture injuries, before the unknown was confirmed as a fracture injury itself.

In conclusion, the aim of the project was to determine whether or not physical injury induced APR can affect the glycosylation patterns of AGP. This project has confirmed that physical injuries can affect the glycosylation patterns of AGP. Further research within this area can then be carried out, such as studying the changes in glycosylation patterns throughout the recovery process.