Florida Institute of Technology

Scholarship Repository @ Florida Tech

Ocean Engineering and Marine Sciences Student Publications

Department of Ocean Engineering and Marine Sciences

2015

Mass Spectrometry Analysis of Fatty Acid Binding to Albumin

Carolina Nascimento

Follow this and additional works at: https://repository.fit.edu/oems_student

Mass Spectrometry Analysis of Fatty Acid Binding to Albumin

Student: Carolina Nascimento

Faculty Advisor: Shaohua Xu, Dept of Biological Sciences, Florida Institute of Technology

Matrix assisted laser desorption/ionization time of flight mass spectrometry (MALDI-ToF-MS) is a powerful technique for the analysis of molecular mass. It works by exposing the analyte-matrix crystal to laser radiation followed by time of flight analysis. It has the ability to ionize small and large molecules while keeping them intact. For that reason, it is a useful tool to analyze proteins and the interacting ligands. This enables studies of biological fluid such as serum and cerebral spinal fluid for diagnostic screening. In this project, I examined the potential of using MALTI-ToF-MS for the analysis of palmitic acid binding to bovine serum albumin (BSA).

Introduction

Albumin is responsible for the transportation of numerous amphipathic molecules including fatty acids in our blood. The number of fatty acids bound to each albumin fluctuates under physiologic and pathologic conditions (2). Current biochemical methods used for the analysis of the interaction requires the use of radioactive isotope (3) and/or enzymatic methods (1) which are unable to specify the type of fatty acids bound to albumin. MALDI-ToF-MS is a powerful tool capable of analysis of small and large biomolecules. Here we examine the potential of MALDI-ToF-MS in analyzing fatty acid binding to albumin.

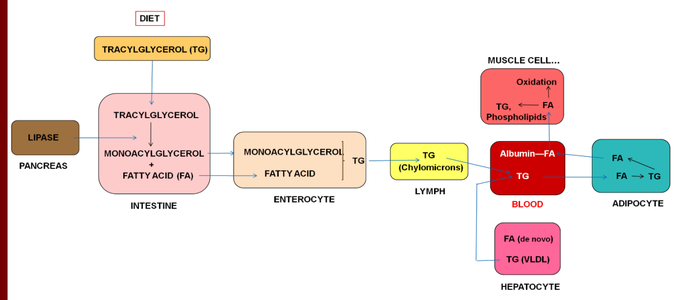

Figure 1. Fatty acid flow in the human body.

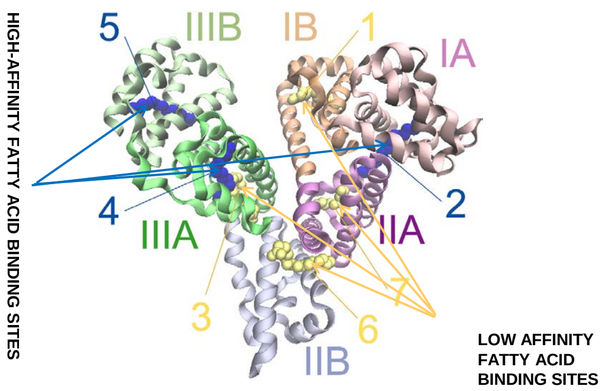

Figure 2. Human serum albumin - Palmitic acid complex derived from x-ray crystallography. Palmitic acids are represented in blue and yellow.(4)

Methodology

- Palmitic Acid and BSA were incubated at 37C.
- Size exclusion chromatography column.
- Micro plate reader.
- MALDI

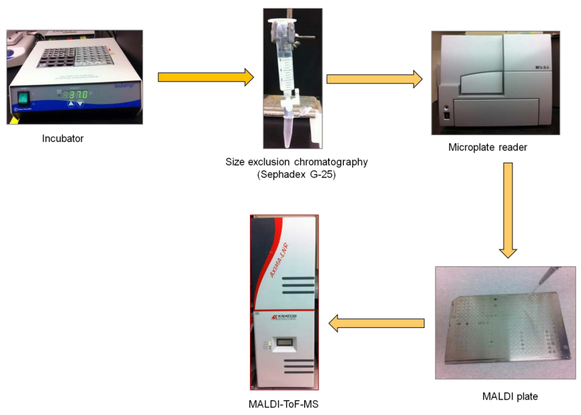

Figure 3. Experiment approach.

MALDI-ToF-MS was used to detect BSA and Palmitic acid binding .

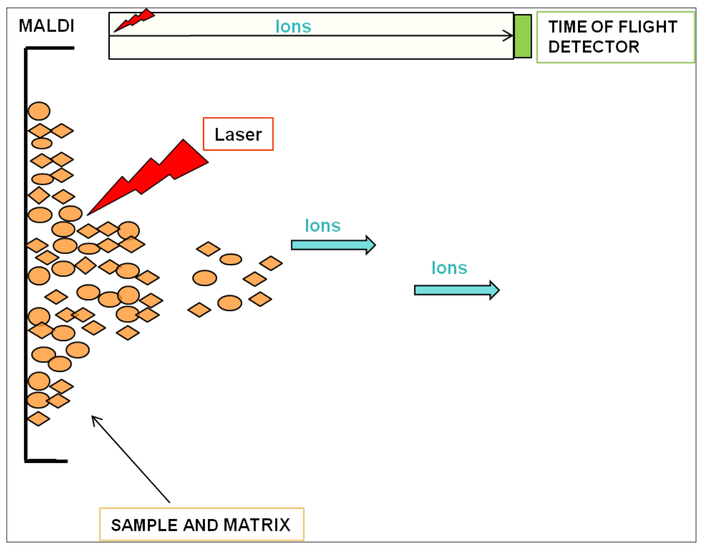

Figure 4. MALDI time of Flight

Results

The peaks of BSA and Palmitic acid are shown below in two different spectrum.

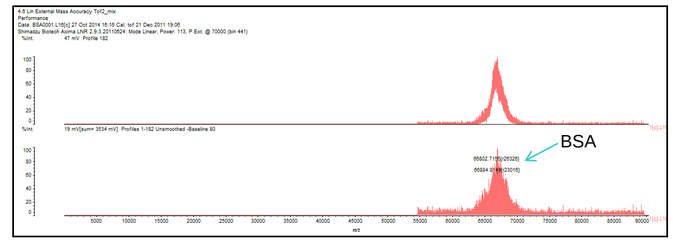

Figure 5. Bovine serum albumin spectra.

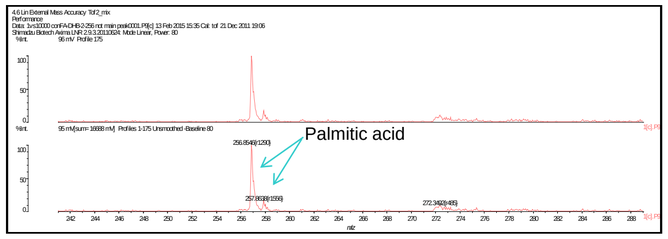

Figure 6. Palimitic acid spectra.

Conclusion

- MALDI can be used to analyze albumin and fatty acid binding.
- Potential to study the fatty acid binding to albumin ratio.

References

1. Annals Biochem. 98, 341-343, 1979
2. Biochimica et Biophysica Acta 1830 (2013) 5427–5434
3. J. Clin. Invest. Volume 87, 1431-1441, 1991
4. J. Mol. Biol. 361 (2006) 336–35
5. S.R. Ellis et al. 52 (2013) 329–353.

NORTHROP GRUMMAN

Engineering & Science
Student Design Showcase
at Florida Institute of Technology