Glucose and alanine determination in mosquitoes

This research focuses on the method development and validation by tandem mass spectrometry to investigate the carbon metabolism in mosquito. At this stage, we are focusing on the metabolism of glucose and alanine.

Mosquito can carry many diseases, like the famous West Nile fever, especially in the hot south USA (Figure 1). Understanding how the mosquito utilizes those small molecules (i.e. carbohydrate, amino acids) in its body is interesting in fundamentals, and important in practice, because it may help control the population of mosquitoes (Figure 2). Glucose is a famous molecule called “fuel molecule”, because it provides energy to organisms and is involved in many critical metabolic pathways. So studying how glucose metabolized in mosquito is especially important.

A Map of West Nile Virus Cases for 2003

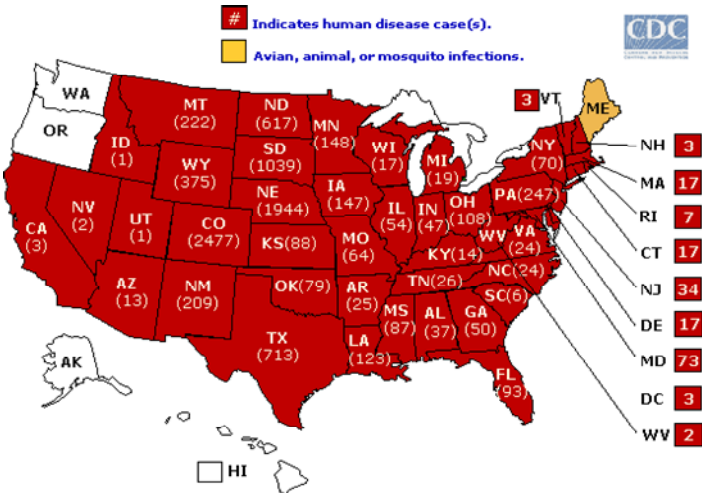

Figure 1

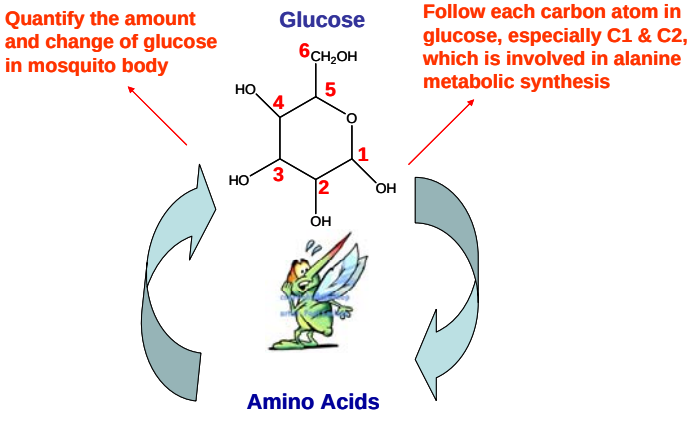

Figure 2

Our goal here is to follow each carbon atom in glucose and monitor where it is going in mosquito bodies, taking advantage of the fast speed, high accuracy, low detection limit of mass spectrometry. We developed a derivatization method that allows the mass spectrometer to monitor C1 and C2 by multiple reaction monitor (MRM) in tandem mass spectrometry (Figure 3), because the derivatized ^{13}C labeled glucose show distinct MSMS spectra.

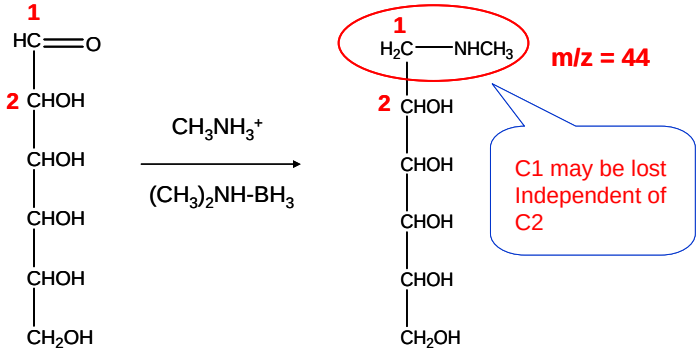

Figure 3

In terms of the mechanism, the derivatization successfully makes the C-C bond between C1 and C2 vulnerable to be cleaved in CID (Figure 4). After a complete survey of standard compounds, we will feed the mosquito with ^{13}C labeled compounds and monitor what is going on in mosquito bodies.

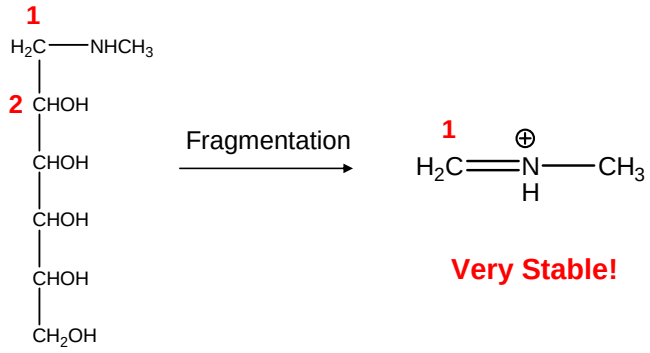

Figure 4

We would also like to explore some fundamental questions as chemists, for example, isotope effect, molecular conformations in gas phase, and etc. The research project involves application of triple quad mass spectrometer, biological techniques, molecular simulations and MORE!