

# Can Mass Spectrometry Detect Viral Infectivity?

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### Environmental Issue

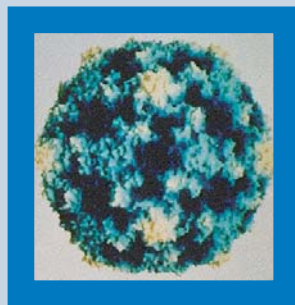
- Viral contamination of drinking water is a problem.
- Viruses (e.g., coxsackie) are now listed on the U. S. EPA 1998 Contaminant Candidate List as needing additional research on analytical methods, occurrence, treatment and health effects.
- Coxsackievirus causes diarrhea and fever and can cause more severe complications such as diabetes mellitus and myocarditis.

### Coxsackievirus

#### Components of Coxsackieviruses

- Ribonucleic acid surrounded by a capsid
- Capsids contain multiple copies of 4 proteins: VP1, VP2, VP3, and VP4

Coxsackieviruses B3, B5, B6 and A20 strains were studied by Mass Spectrometry

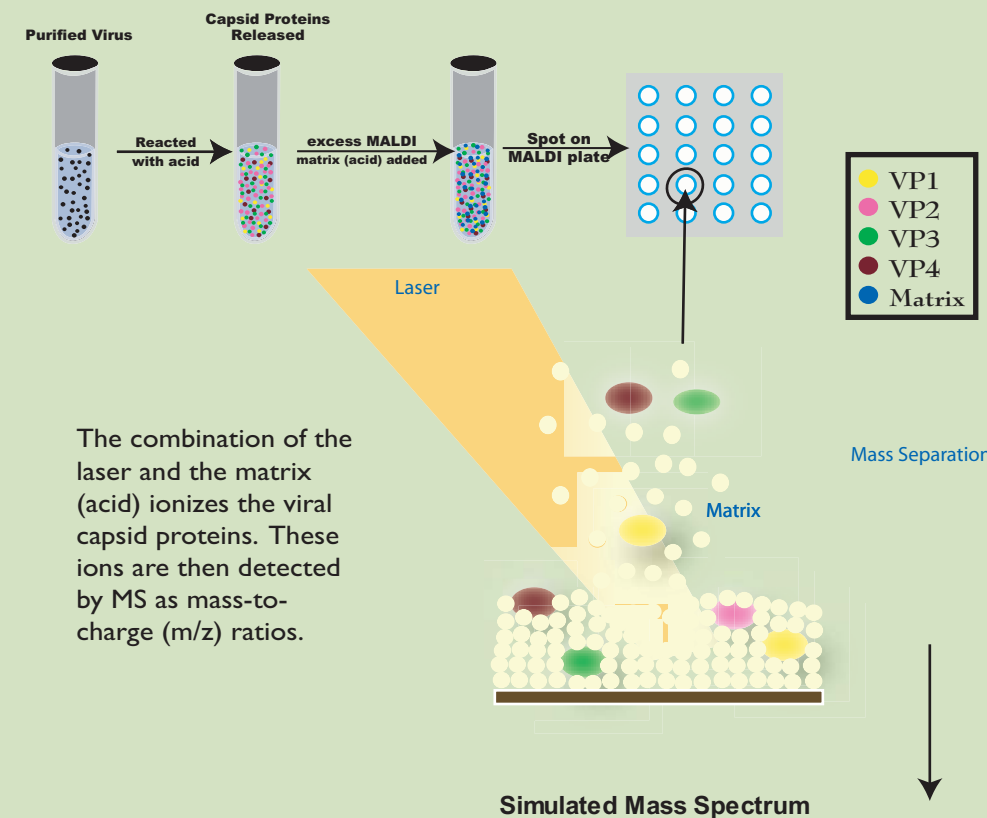


Electron Microscope picture of Coxsackievirus B3  
from <http://www.neubert.net/BUCKmins.html>

### Mass Spectrometric (MS) Approach

The study of proteins using mass spectrometry is an emerging technique that can provide valuable information about the proteins/peptides present in microbiological organisms.

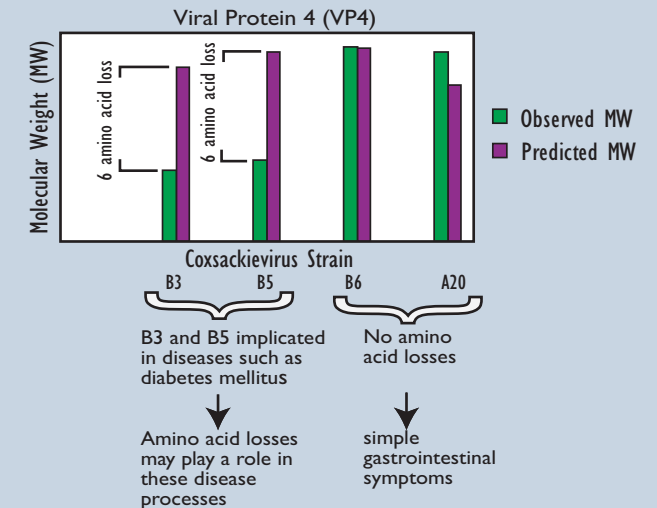
Matrix assisted laser desorption ionization-mass spectrometry (MALDI-MS) is used to create characteristic mass fingerprints of the viral capsid proteins.



The combination of the laser and the matrix (acid) ionizes the viral capsid proteins. These ions are then detected by MS as mass-to-charge (m/z) ratios.

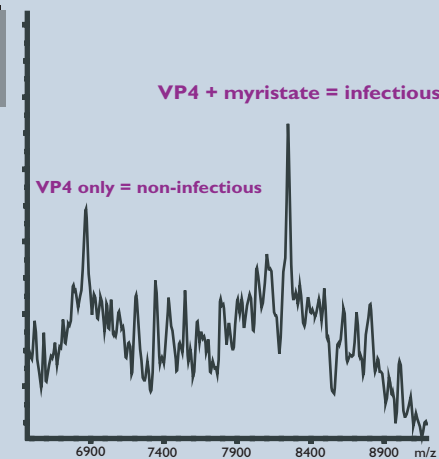
The MS produces a mass fingerprint of the 4 capsid proteins. This fingerprint is characteristic of the coxsackievirus.

### Results



#### Mass Spectrum of Coxsackievirus B5

Myristate is a long fatty acid chain that is attached to VP4 in infectious coxsackieviruses



### Impact of Research

- Mass spectrometry is an emerging tool in the study of viruses
- First time a biomarker of infectivity has been tentatively identified by MS
- MS can provide information regarding specific proteins contained within infective/viable microorganisms
- This information can be used to develop more rapid, sensitive methods for microorganisms in drinking water

