



## Astrogenetix Vaccine Development Platform

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Since 2005 governmental entities have been able to conduct research on board the International Space Station (ISS). These research flights will continue to launch on each available space shuttle mission until the shuttle is retired. Astrogenetix, a subsidiary of SPACEHAB, Inc., sponsors The National Laboratory Pathfinder – Vaccine missions. The initiative joins industry with academia and government in the development of Astrogenetix's first commercial product, a vaccine for salmonella.

### Development History of Salmonella Vaccine for Humans

March 2008: Launch of Space Shuttle Endeavor STS-123; Astrogenetix tested the feasibility of identifying knock-out gene targets associated with enhanced salmonella virulence in space; paved the way for use of the ISS National Laboratory.

May 2008: Launch of Space Shuttle Discovery STS-124; Astrogenetix enhanced the model platform development for validation of bacterial knock-out gene targets; the model used an *in situ* virulence assay, whereby genetically altered forms of bacteria were grown in microgravity, mixed with host *Caenorhabditis elegans*, fixed in orbit and returned to Earth for determination of microbial virulence; post-flight analyses examined strains not demonstrating enhanced virulence due to the knock-outs of specific genes.

November 2008: Launch of Space Shuttle Endeavor STS-126; verification and validation of knock-out gene targets by identifying genes associated with microgravity-enhanced bacterial virulence, as the basis for formulation of attenuated vaccine.

First Quarter 2009: Consult with industry representatives for viable vaccine formulation(s); development of Institutional Review Board application; Investigational New Drug (IND) planning; addition of potential pharma/biotech commercial partners.

### STS-119 February 2009

The *Salmonella enterica* vaccine represents the first in a series of potential immuno therapeutic products partly developed in microgravity. Moving forward, the following microorganisms will be sent into space on STS-119 in February, 2009 to survey virulence: *Staphylococcus aureus* (MRSA), *Streptococcus pneumonia*, *Candida albicans*, *Proteus mirabilis*, *Klebsiella pneumonia*, *Enterococcus faecalis*, *Listeria monocytogenes* and *Pseudomonas aeruginosa*.

The approach Astrogenetix will use on this mission should elucidate targets including genes and proteins that can be used for therapeutic development. This will include vaccines and also antimicrobials/antibiotics, growth-inhibiting factors that could be regulated at the gene level and also at the protein level.