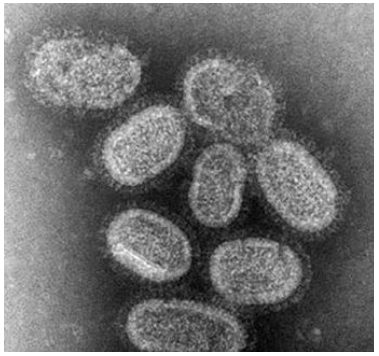
BMI 565 Research Project

Viral Respiratory Diseases: Pandemic Threat

- Example: 1918 Spanish Flu
  - H1N1 influenza virus infection
  - Pandemic lasted 2.5 years
  - 550 million were infected
  - 50 million people died
  - Most victims were healthy young adults

Viral Respiratory Diseases: *in vitro* studies

- *in vitro* experiments performed in human lung epithelial cell lines
- homogenous, concise model system for studying respiratory virus infections



1918 H1N1 virus

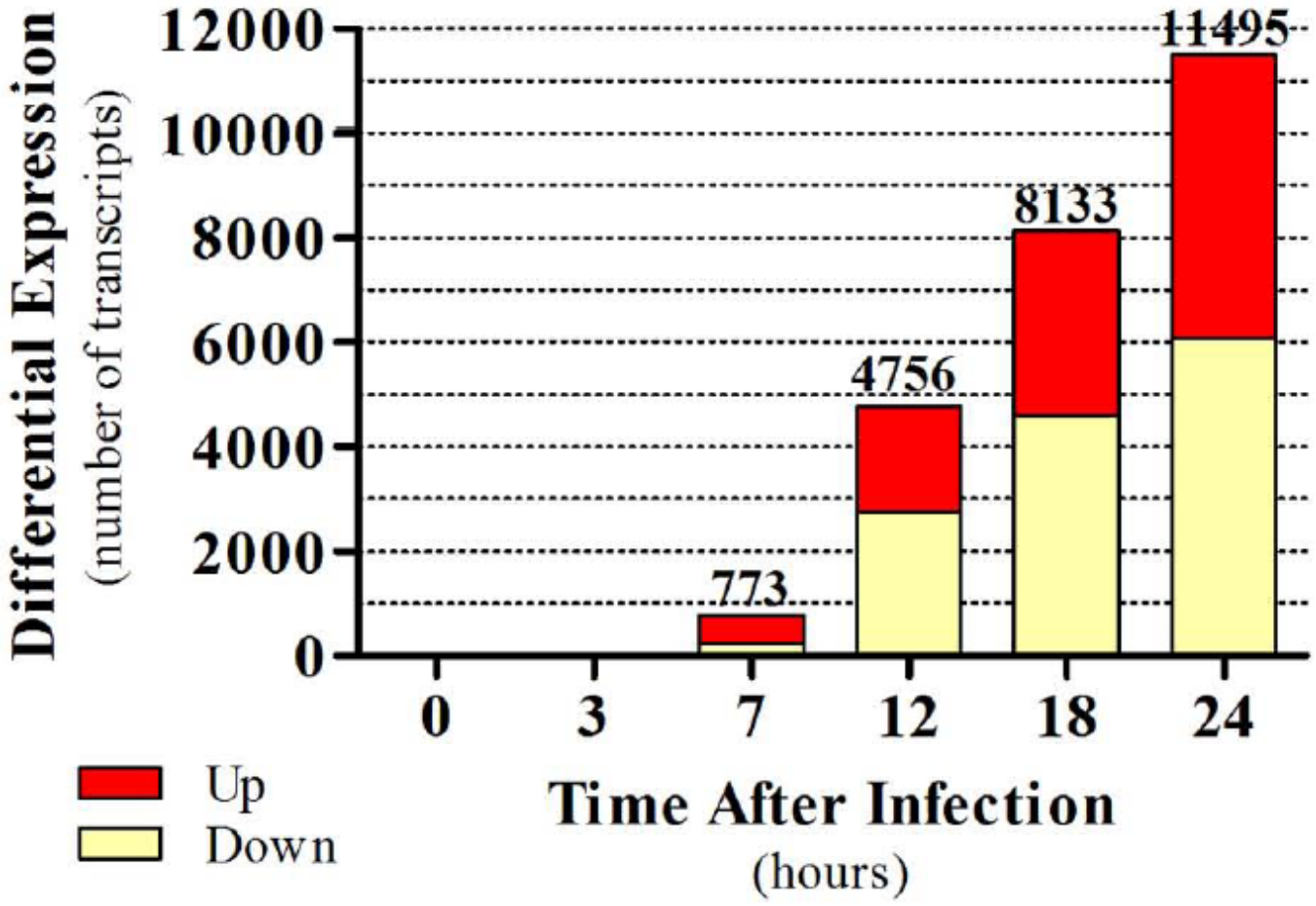
The Experiment:

- Performed infections using VN1203 H5N1 influenza virus infections on calu-3 bronchial epithelial cells
  - Biosafety Level 3 Pathogen
- Infections monitored over 24 hours and profiled using human Agilent gene expression microarrays at several different time points: 0,3,7,12,18,24hrs

All experiments performed in bio-safety level 3 conditions

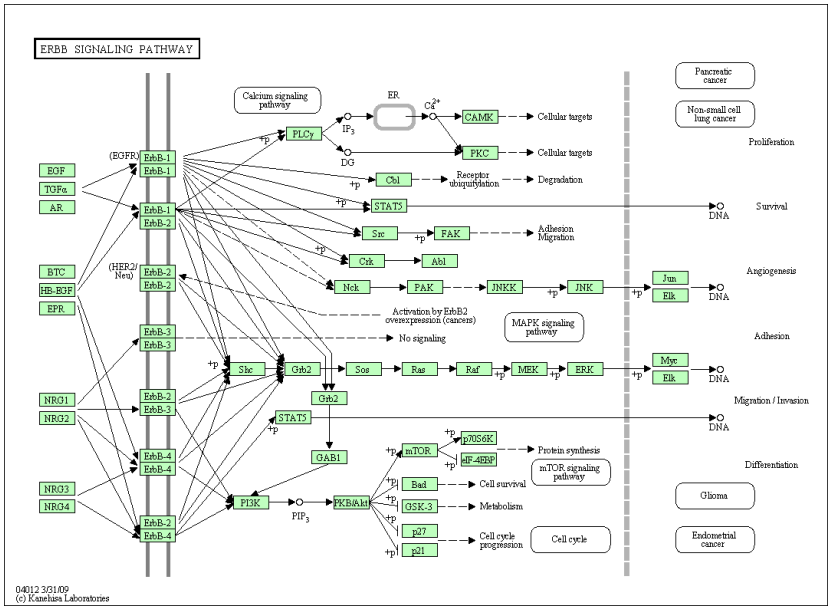
*Image source: the CDC
http://www.cdc.gov/niosh/topics/SARS/

Calu-3 transcriptional host response 24 hours after infection



Research Project: Pathways

- Pathways describe groups of gene products that interact to perform a biological function (cell cycle, apoptosis, cell-to-cell communication)
- Changes in differential expression can be mapped to known pathways to understand what processes are involved in the response to infection. We need to assess whether the number of DE genes mapped to a pathway is greater than expected by chance alone?



Odds Ratio: ratio of the odds of an event occuring in one group to the odds of it occuring in another

Odds Ratio

	DE Genes	Non-DE Genes
Target Pathway Genes	A	B
Non-Pathway Genes	C	D

$$OR = \frac{[A/(A+B)]/[B/(A+B)]}{[C/(C+D)]/[D/(C+D)]} = \frac{A/B}{C/D} = \frac{AD}{BC}$$