When should scientists keep their mouths shut?

Tina Liu – Censorship in the past: recombinant DNA research

Ann Fiegen – Censorship today: A dangerous flu virus created? How and why.

Kevin Bonham – Weighing the risks: how do we proceed?

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Part II: A dangerous flu virus created? How and Why.

- Influenza virus: parts and life cycle
- Lock and Key: Cellular and Viral Receptors
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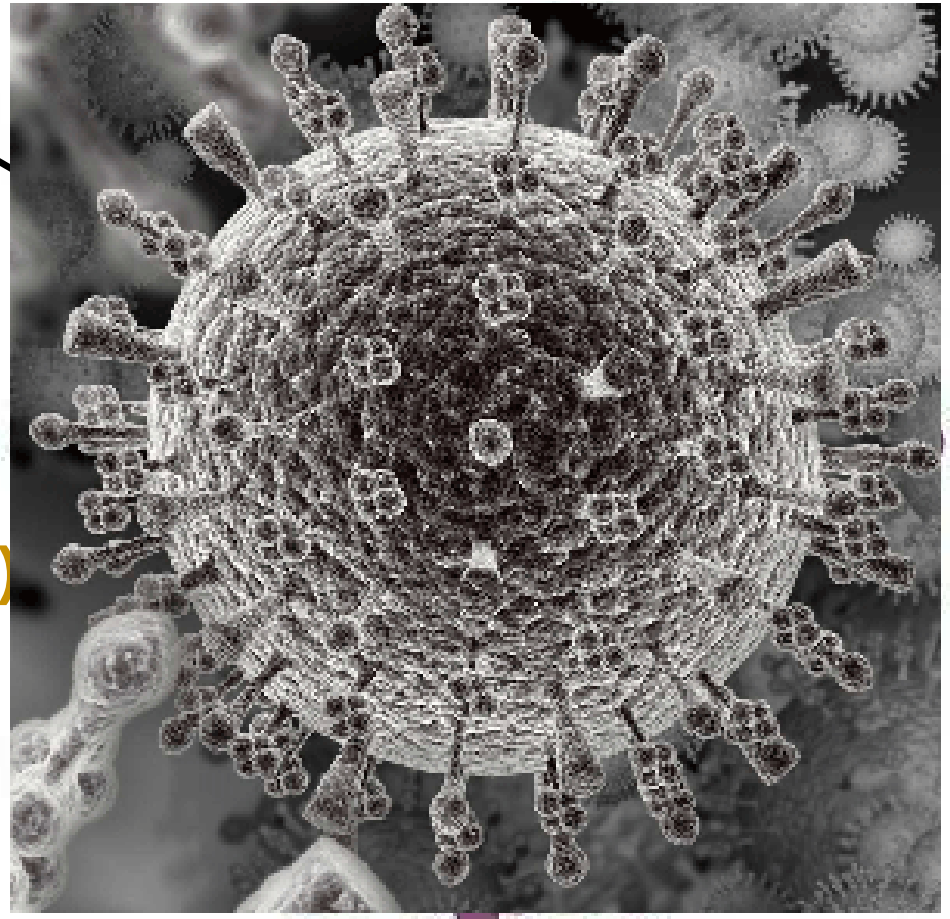
Influenza Virus: Parts of a virus

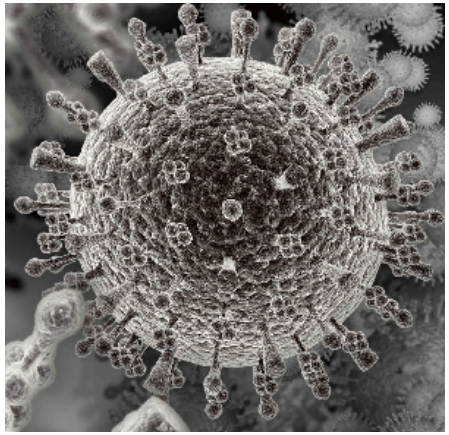
Genome (RNA)

Surface Proteins:

Hemaglutinin (H)

Neuraminidase (N)





PRNewsFoto Zygote Media Group, TWIV.tv

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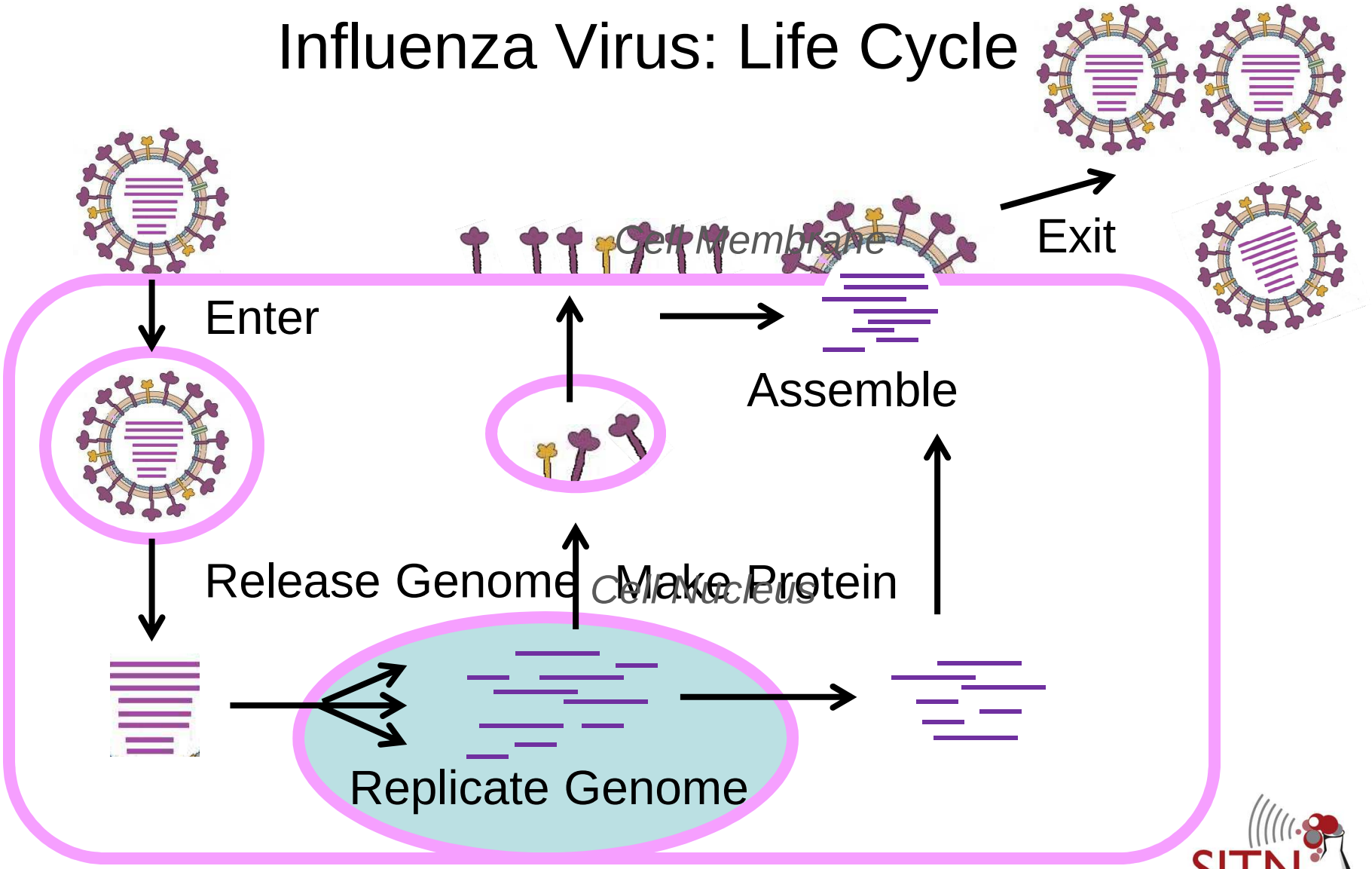
Influenza Virus: Life Cycle



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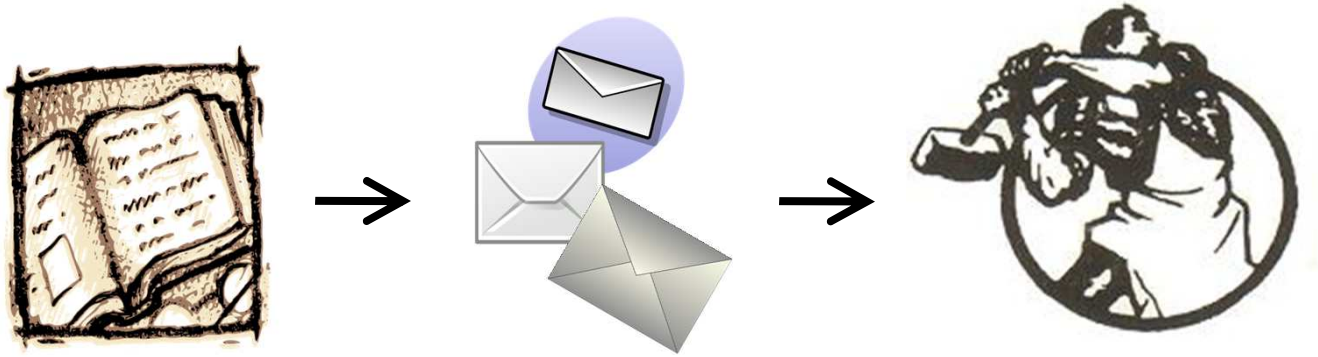
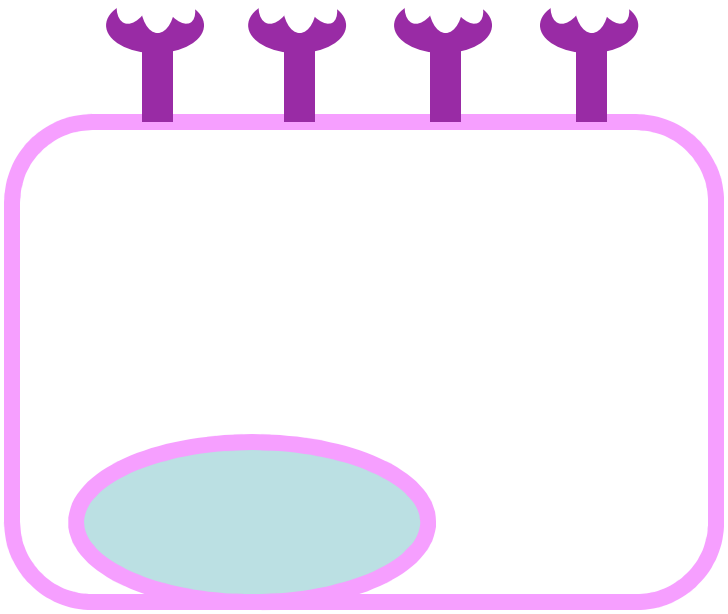
Cells have many proteins



DNA RNA Protein



<u>Inside the cell:</u>
Building
Transporting

<u>Outside the cell:</u>
Hold the cell in place
Detect chemical signals

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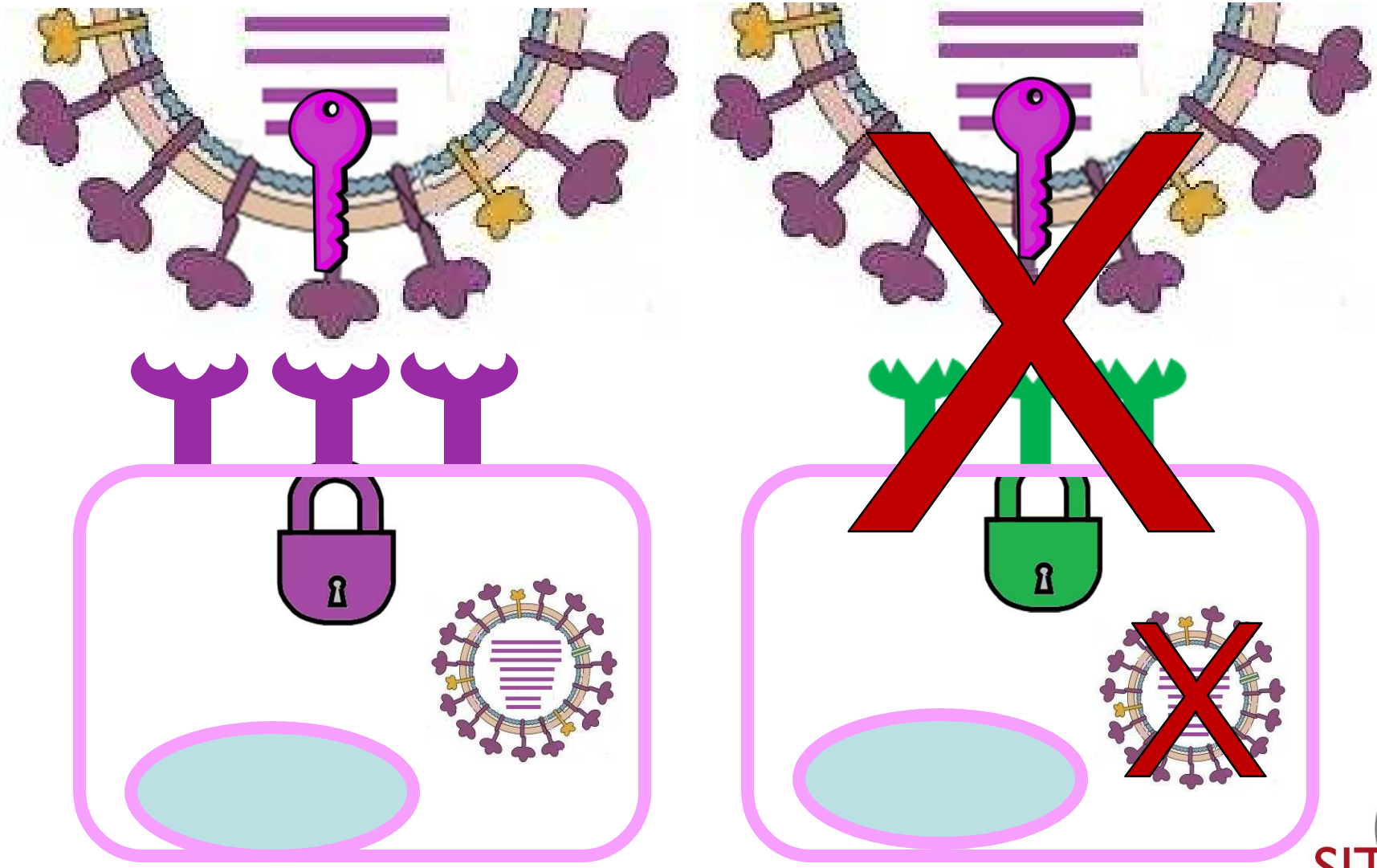
Which cells does Influenza virus infect?



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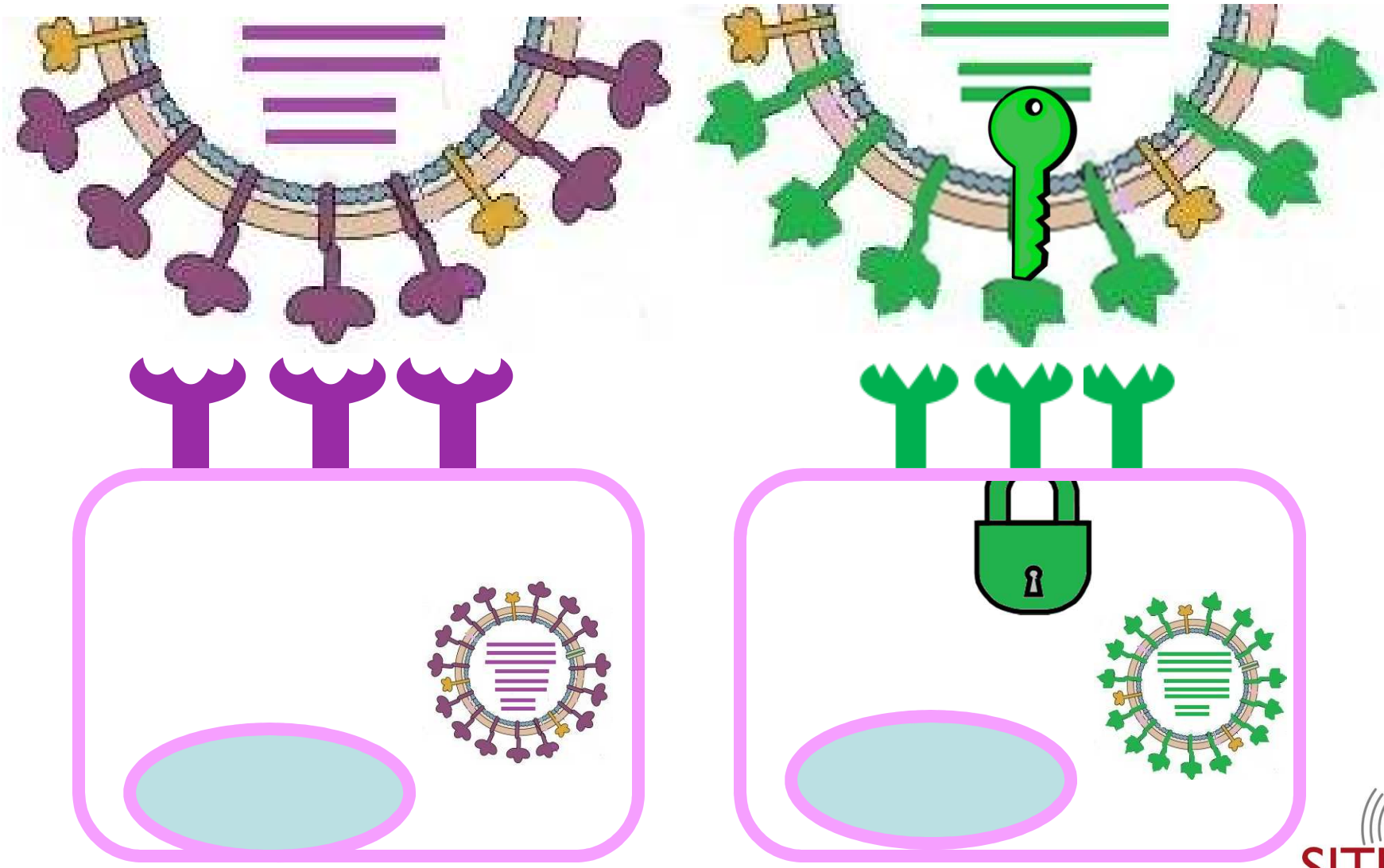

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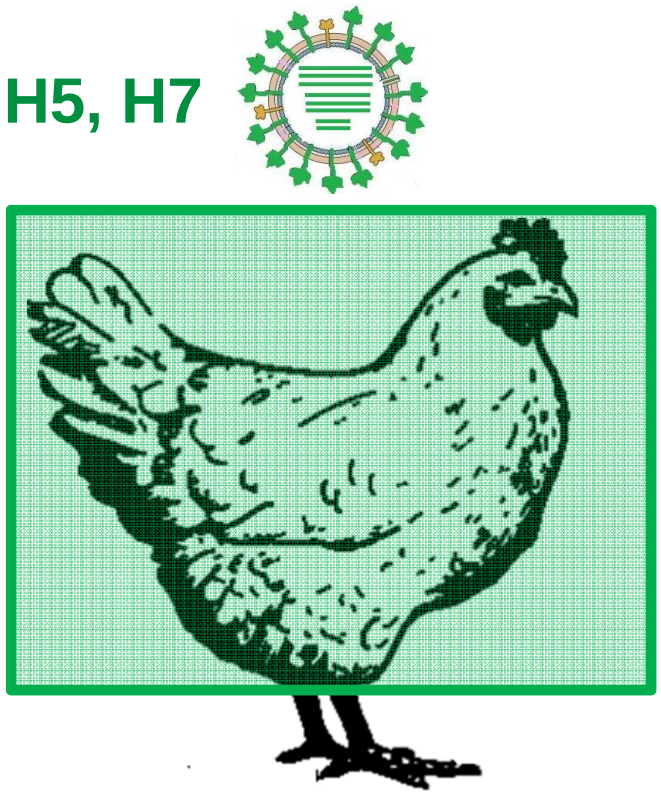
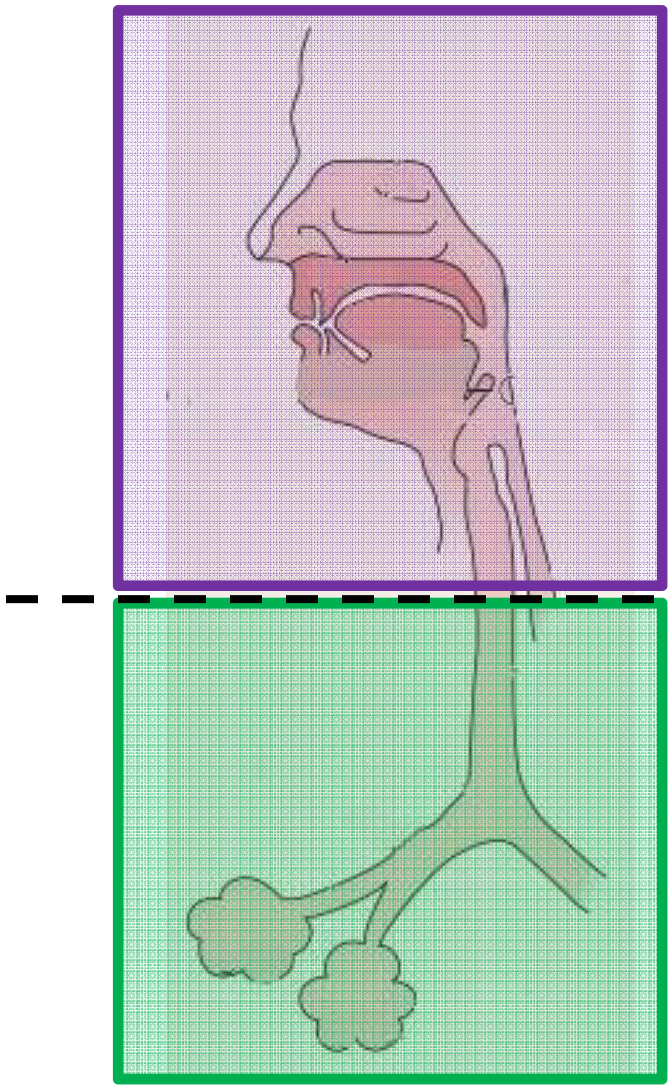
Which cells does Influenza virus infect?

H5, H7

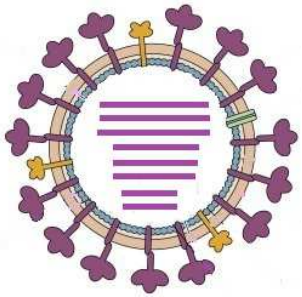




H1, H2, H3

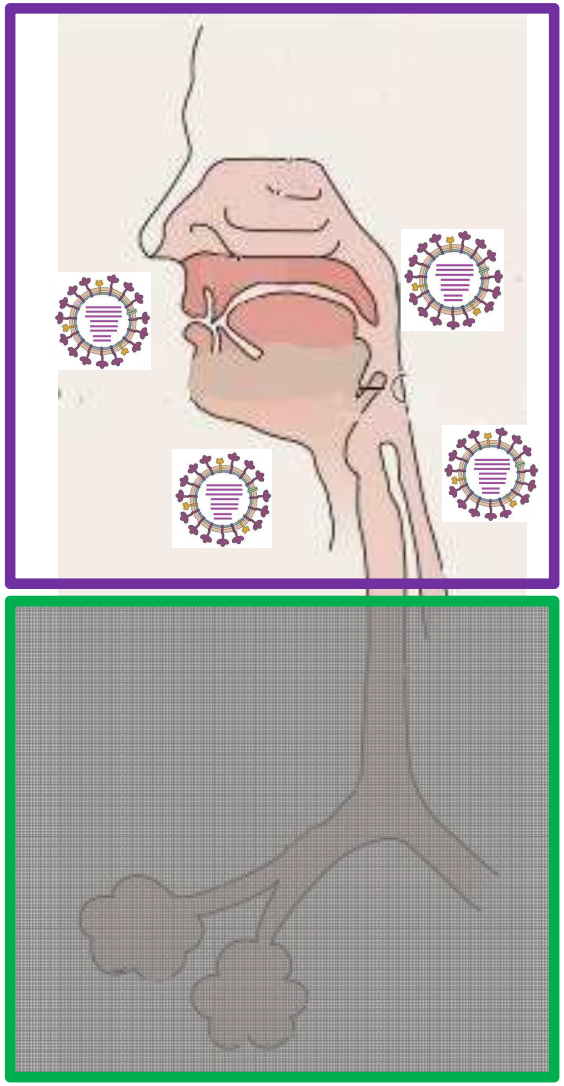
H5, H7

Seasonal Flu – easy come, easy go

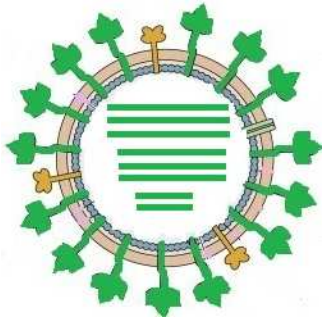


“Seasonal Flu” (H1, H2, H3)

- Infects upper respiratory tract
- Excellent airborne transmission
- No lung infection – not severe



Avian Influenza – damage in the deep



H5N1 “Avian Flu”

- Difficult to catch because air

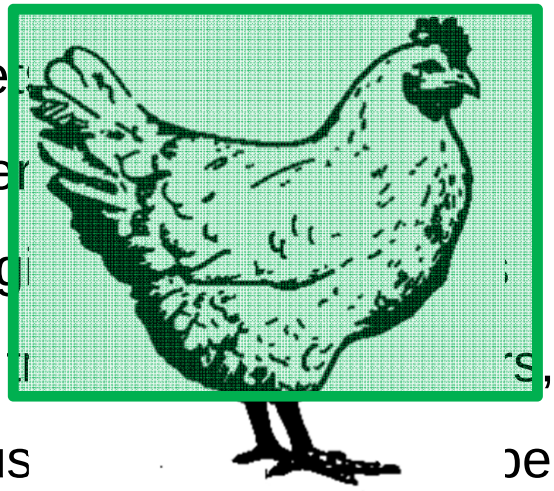
droplet

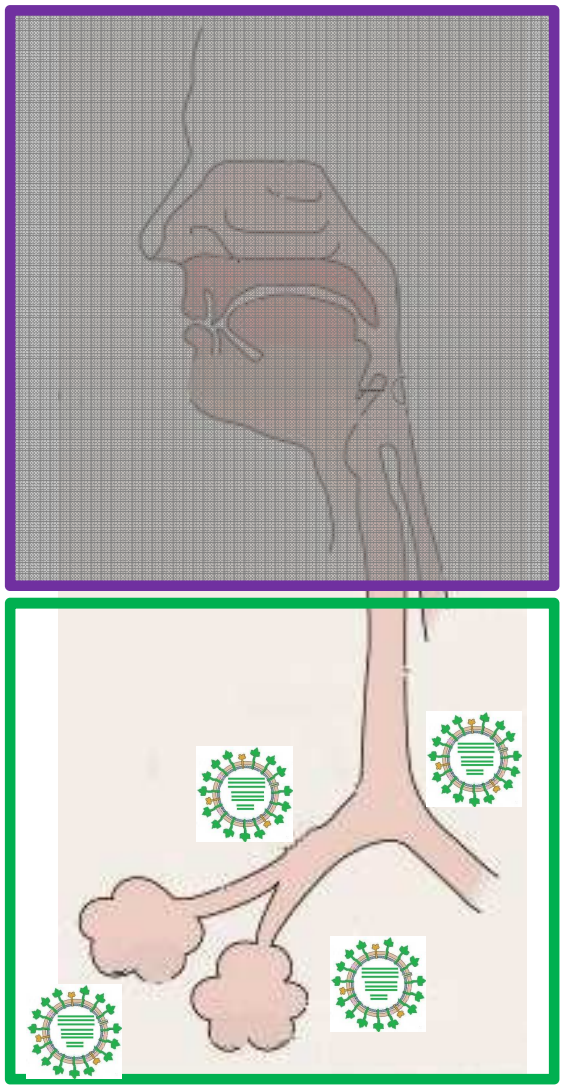
- Sever

damag

- Not t s,

becaus pe lungs





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Questions?

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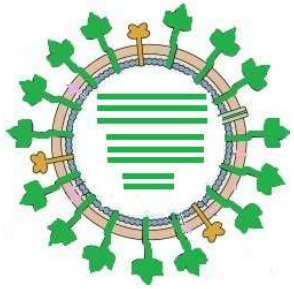
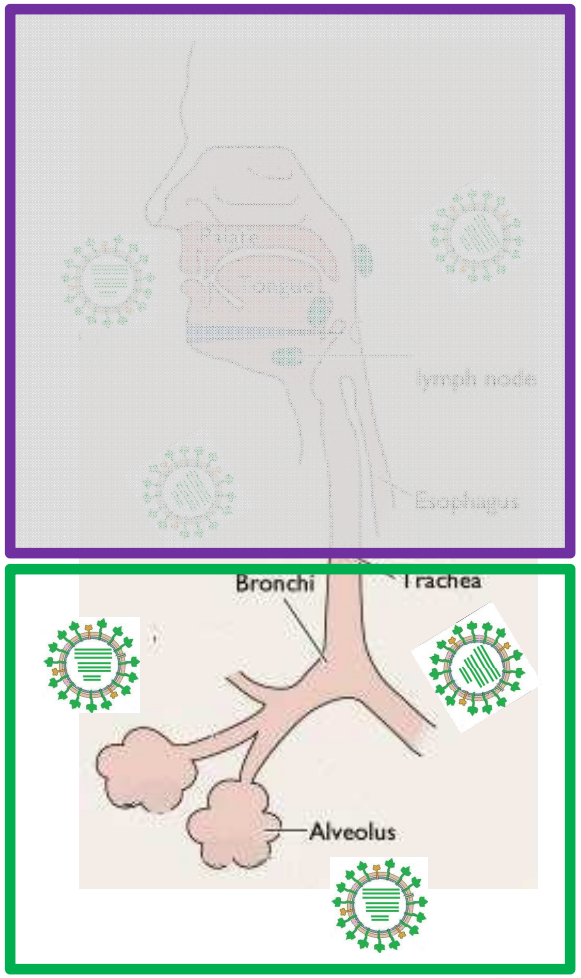
Avian Influenza – the fear of change



H5N1 “Avian Flu”

- Not transmissible between humans
- Severe symptoms

Q: How might Avian Flu change, to gain airborne transmission in humans?



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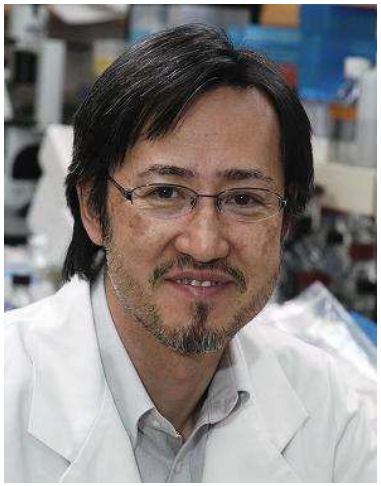
H5N1 Studies: The Goal

"… to understand what it takes for flu to go airborne [in humans]." – Ron Fouchier, Erasmus Medical Center

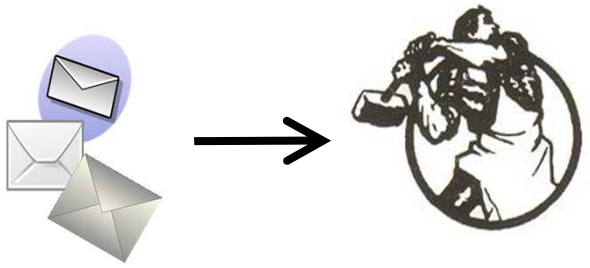
"To identify novel mutations in avian H5… that confer human-type receptor-binding preference."

– Yoshihiro Kawaoka, UW-Madison

Ron Fouchier



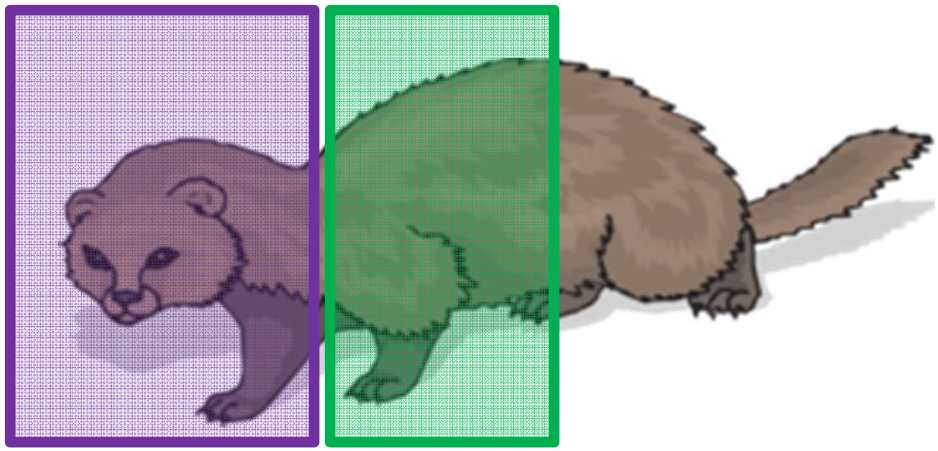
Yoshihiro Kawaoka

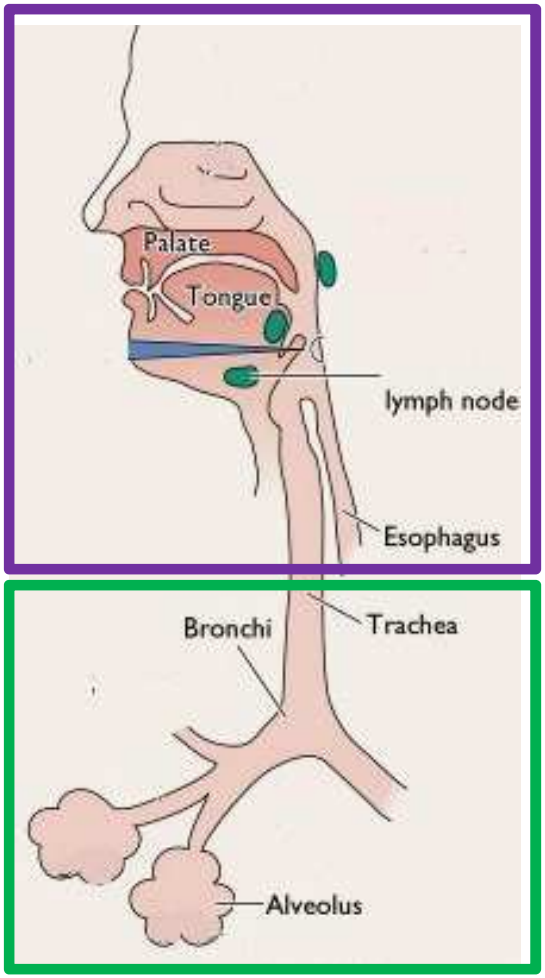


Dirk-Jan Visser, ScienceInsider

Michael Forster Rothbart, UW-Madison

H5N1 Studies: Ferrets as a model





Ferret infections similar to human infection

Similar cellular receptors as humans

Similar symptoms of infection

Better than mice or monkeys

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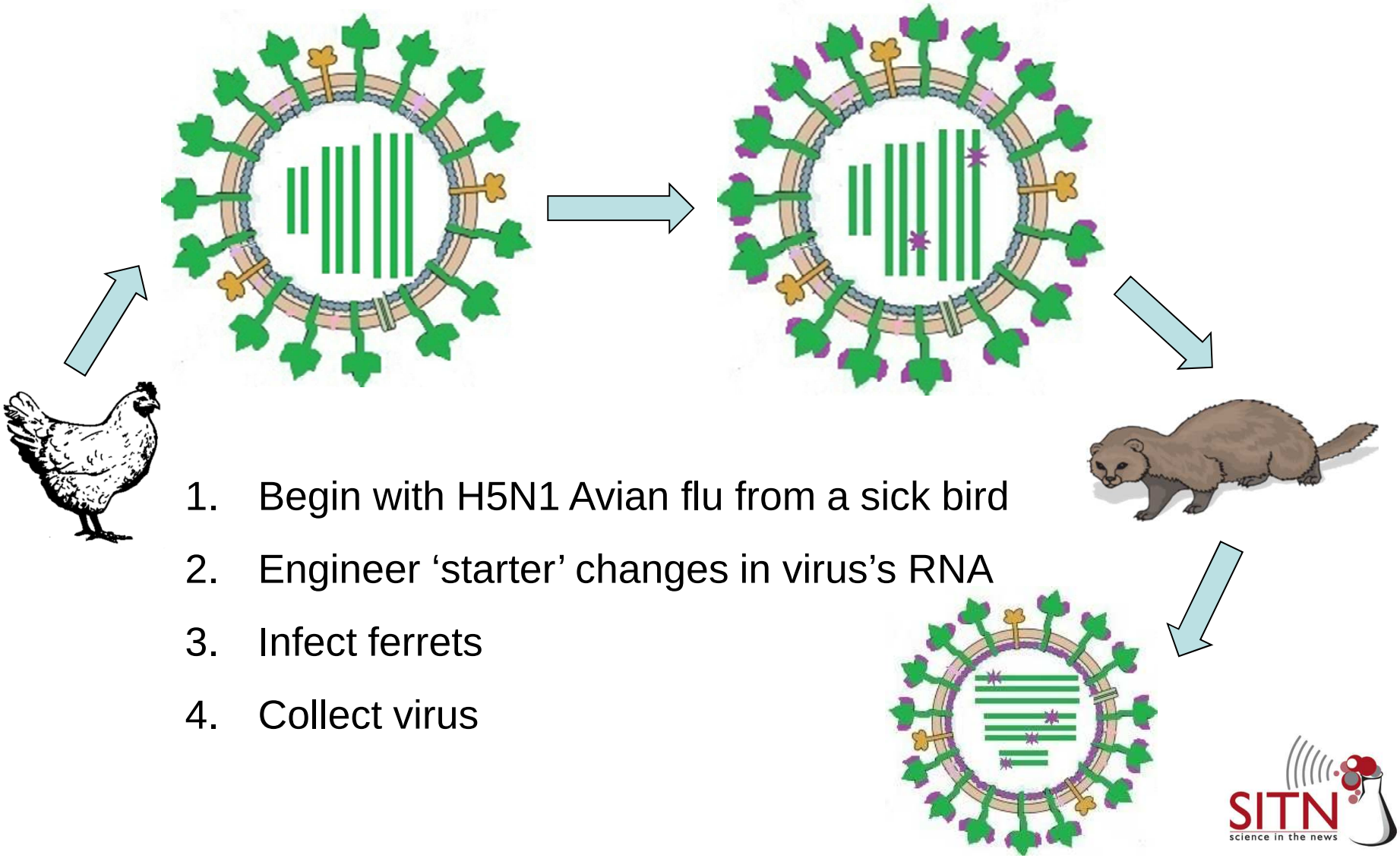
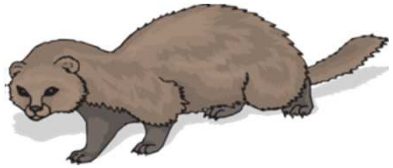
H5N1 Studies: The Experiments

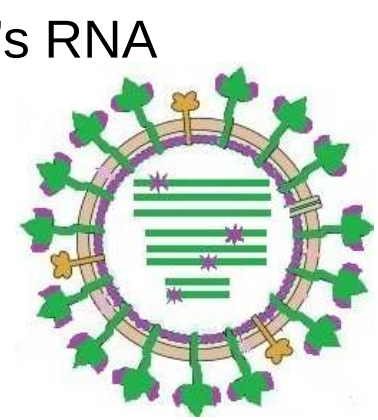


1. Begin with H5N1 Avian flu from a sick bird
2. Engineer ‘starter’ changes in virus’s RNA
3. Infect ferrets
4. Collect virus

H5N1 Studies: The Experiments



1. Begin with H5N1 Avian flu from a sick bird
2. Engineer ‘starter’ changes in virus’s RNA
3. Infect ferrets
4. Collect virus
   - check airborne transmission
   - check virulence



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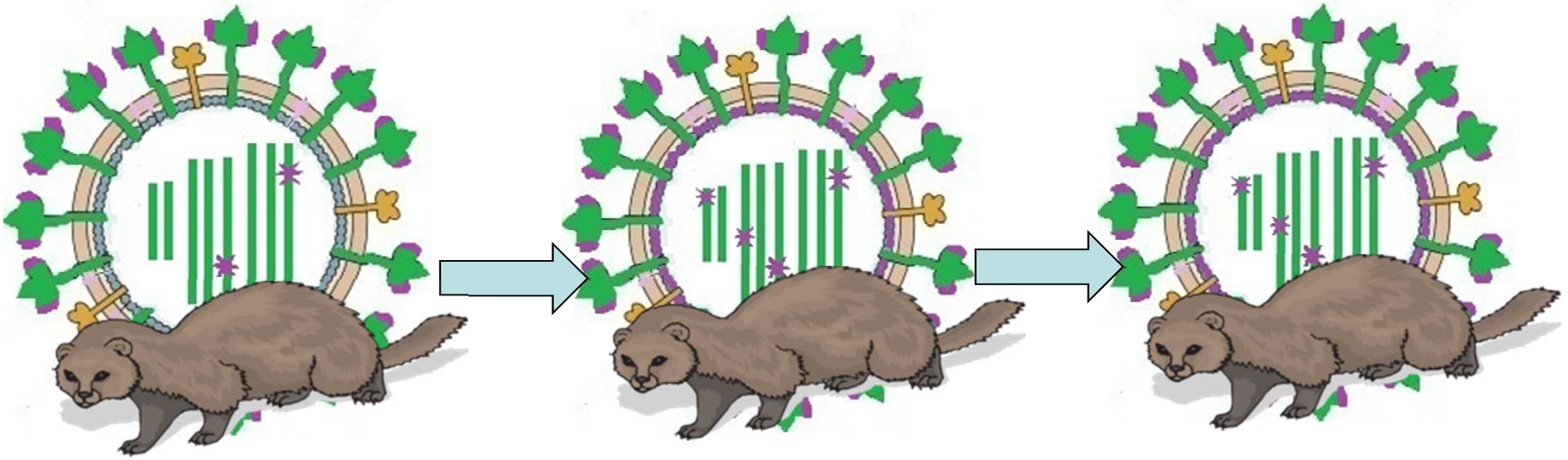

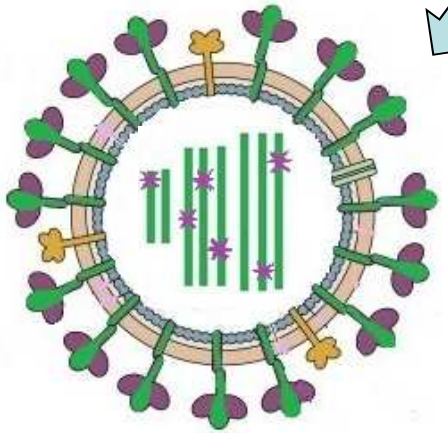

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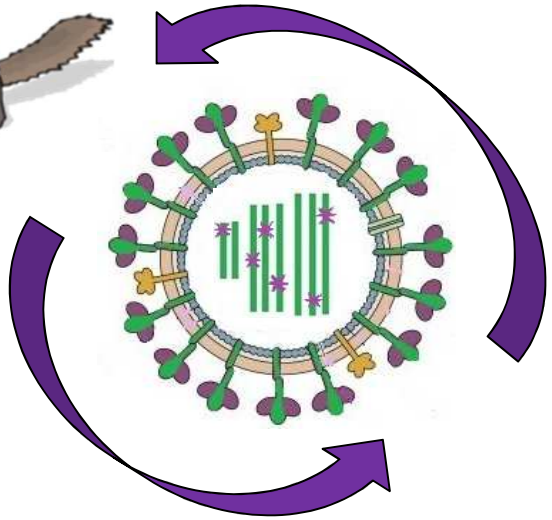
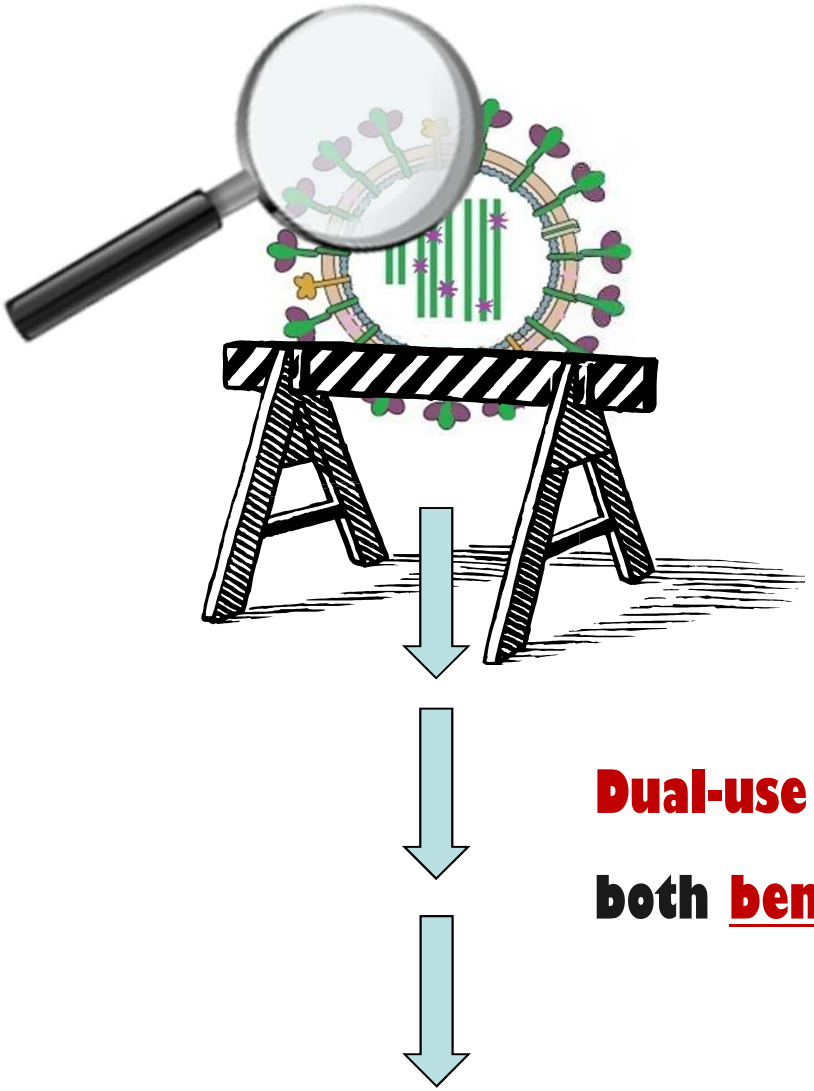
H5N1 Studies: The Results – "Doomsday" virus?



"Four [mutations] in H5 …confer efficient respiratory droplet transmission in ferrets to a virus possessing an H5 HA in a 2009 pandemic H1N1 backbone."

H5N1 Studies: Benefits



- Surveillance
- Pandemic control
- Virus evolution
- Vaccines
- Drugs

Dual-use Research: "..with the potential for both benevolent and malevolent applications..."

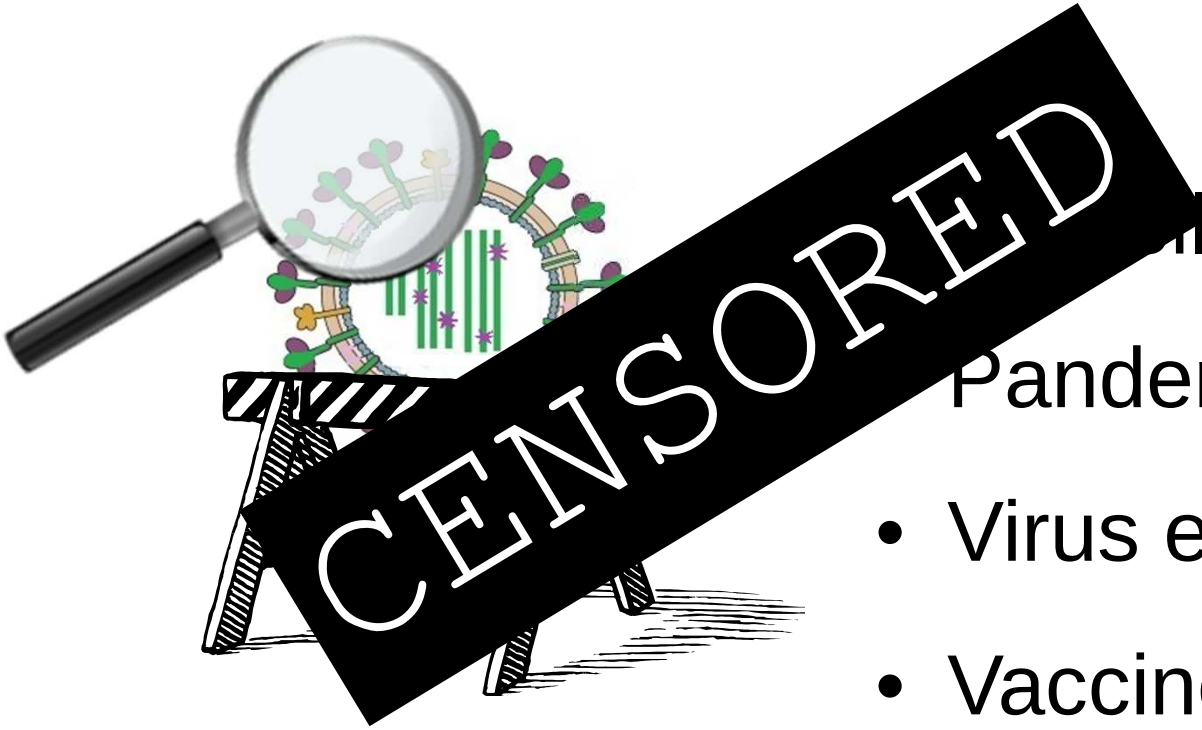
H5N1 Studies: NSABB Censorship

National Science Advisory Board for Biosecurity (NSABB)

- "...the NSABB recommended that the manuscripts not include the methodological...details that could enable replication of the experiments by those who would seek to do harm."

Microbeworld.tumblr.com

H5N1 Studies: Benefits



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