

The Anthrax Toxin

Bálint Miklós

Geometric Computations in Molecular Biology
May 16th, 2007 - ETH Zurich

Anthrax, the disease

- Infectious disease, mostly animals
- One documented case for domestic pets in the USA for the last 15 years
- First anthrax vaccine in 1881

Anthrax, the danger

- Fatal in 95% of cases even if treated
- 100 kg of anthrax sprayed on a major city could kill more than 3,000,000 people
- First-year college knowledge + minimal equipment = anthrax spores

The quarantined island



Image courtesy of www.hgstump.de

2001 anthrax attacks

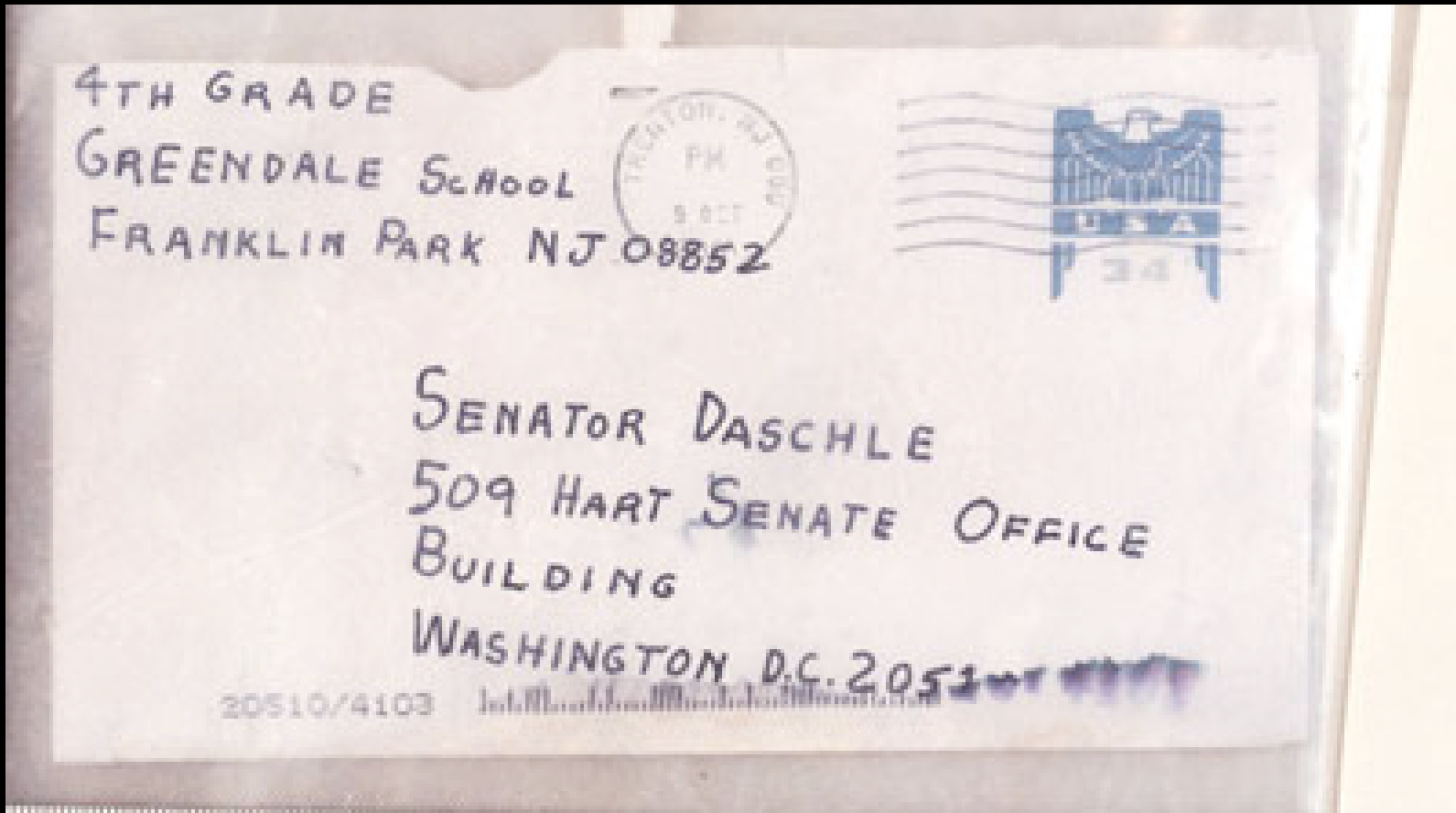
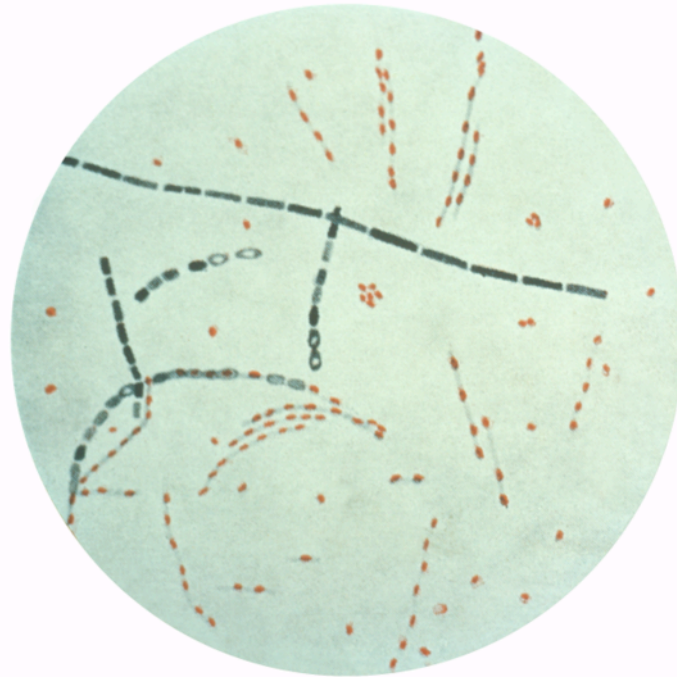


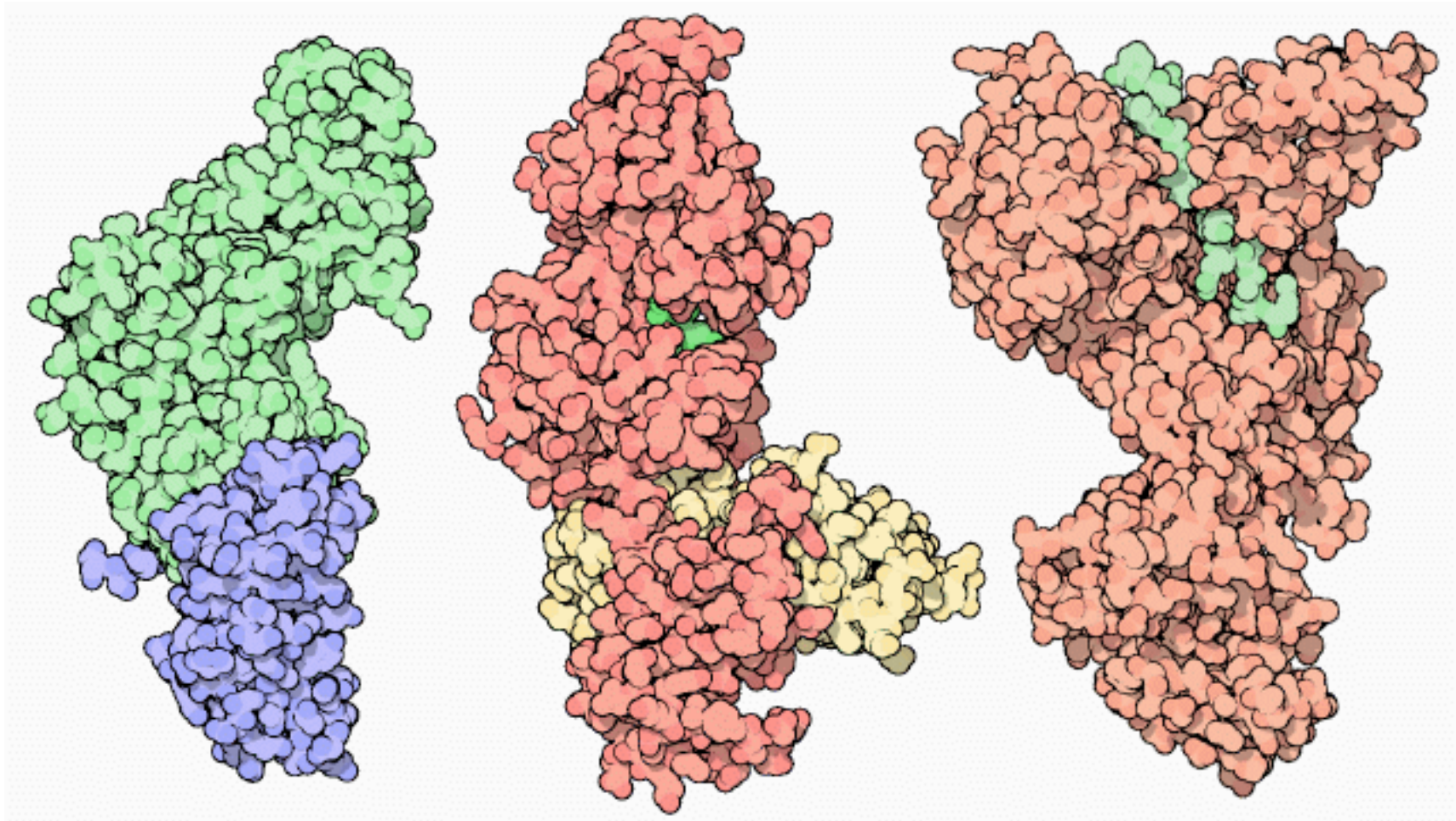
Image courtesy of www.wikipedia.com

How does it work?



Bacillus anthracis produces 3 different toxins

Lethal combination

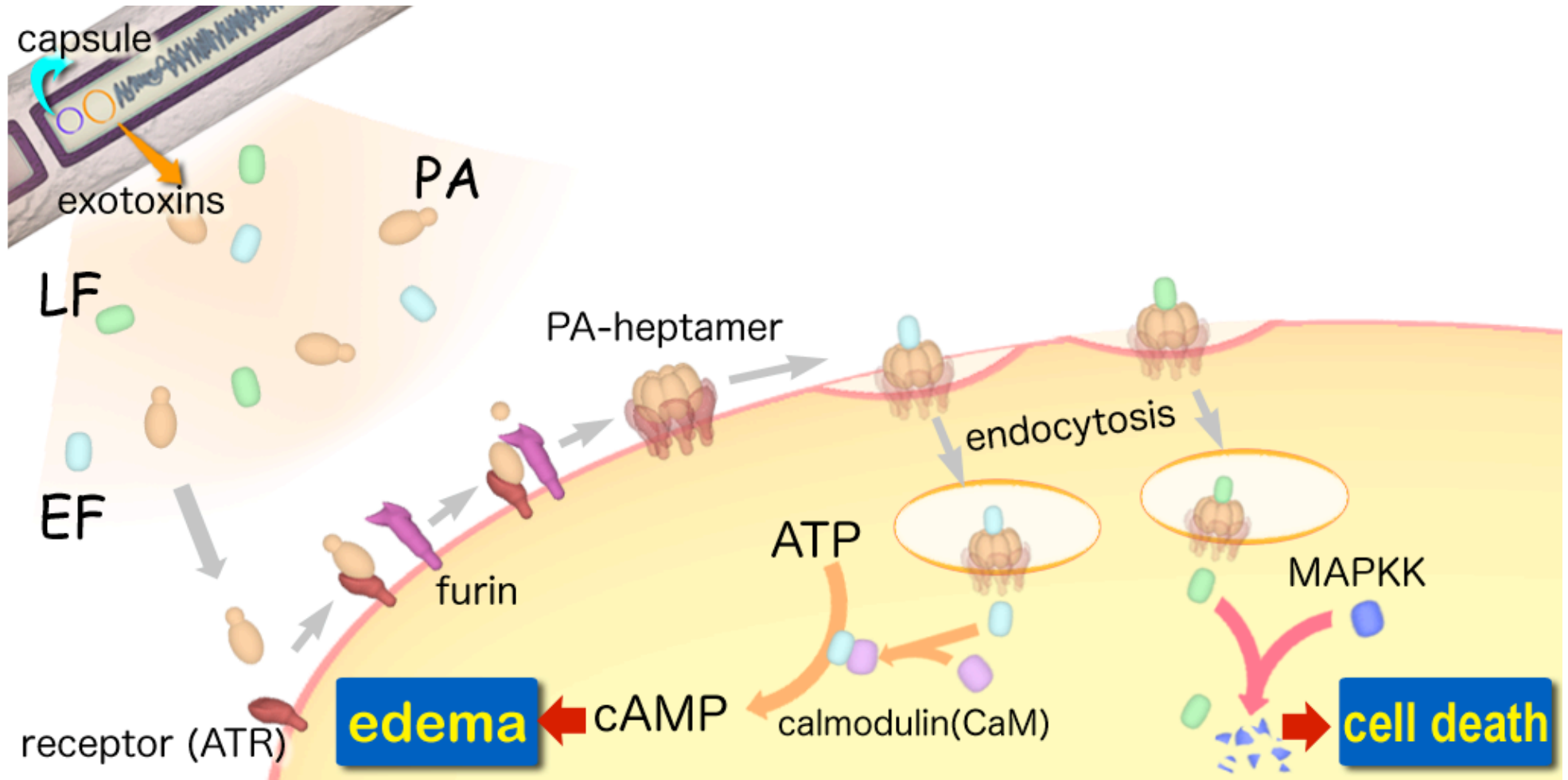


Protective antigen

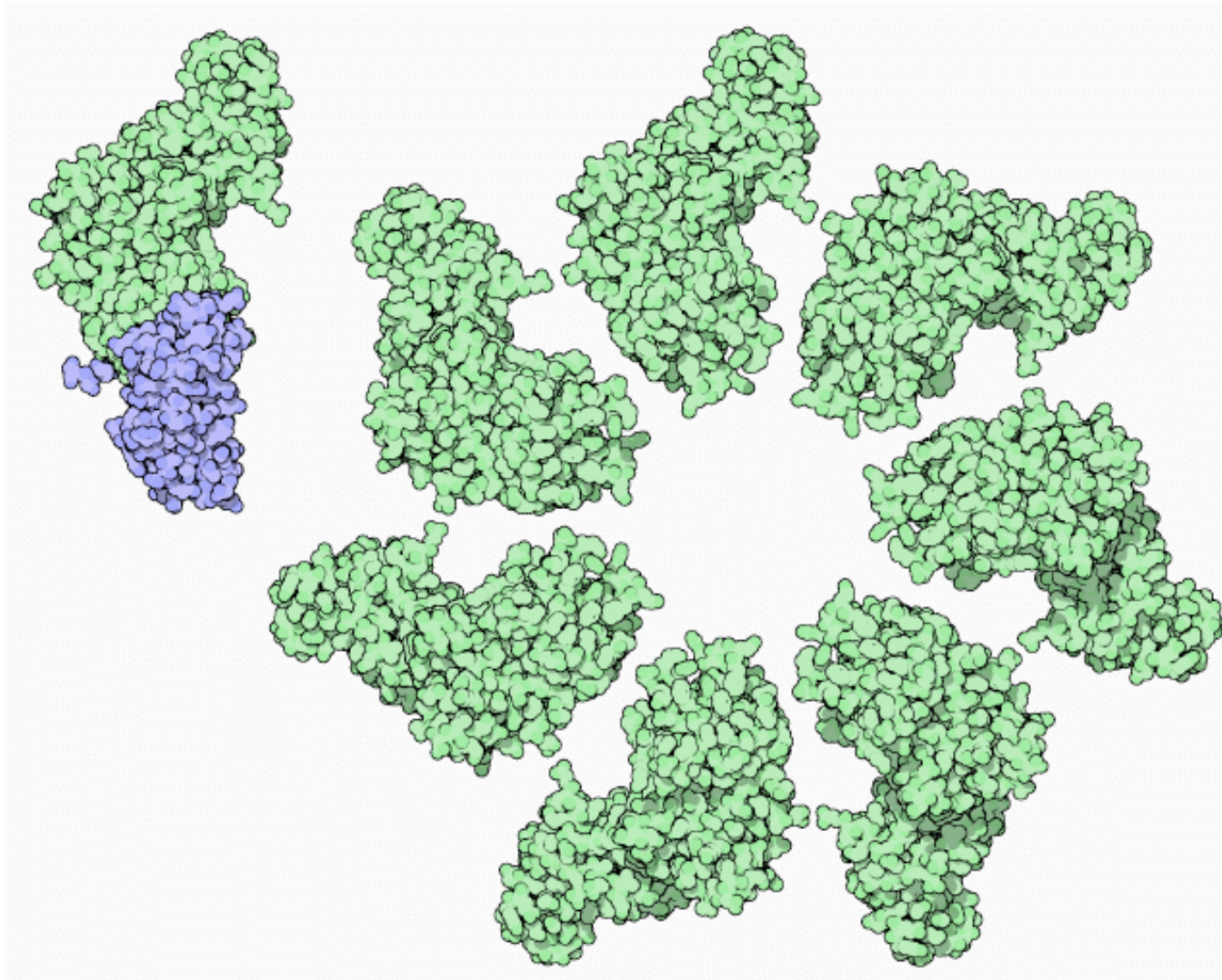
Edema factor

Lethal factor

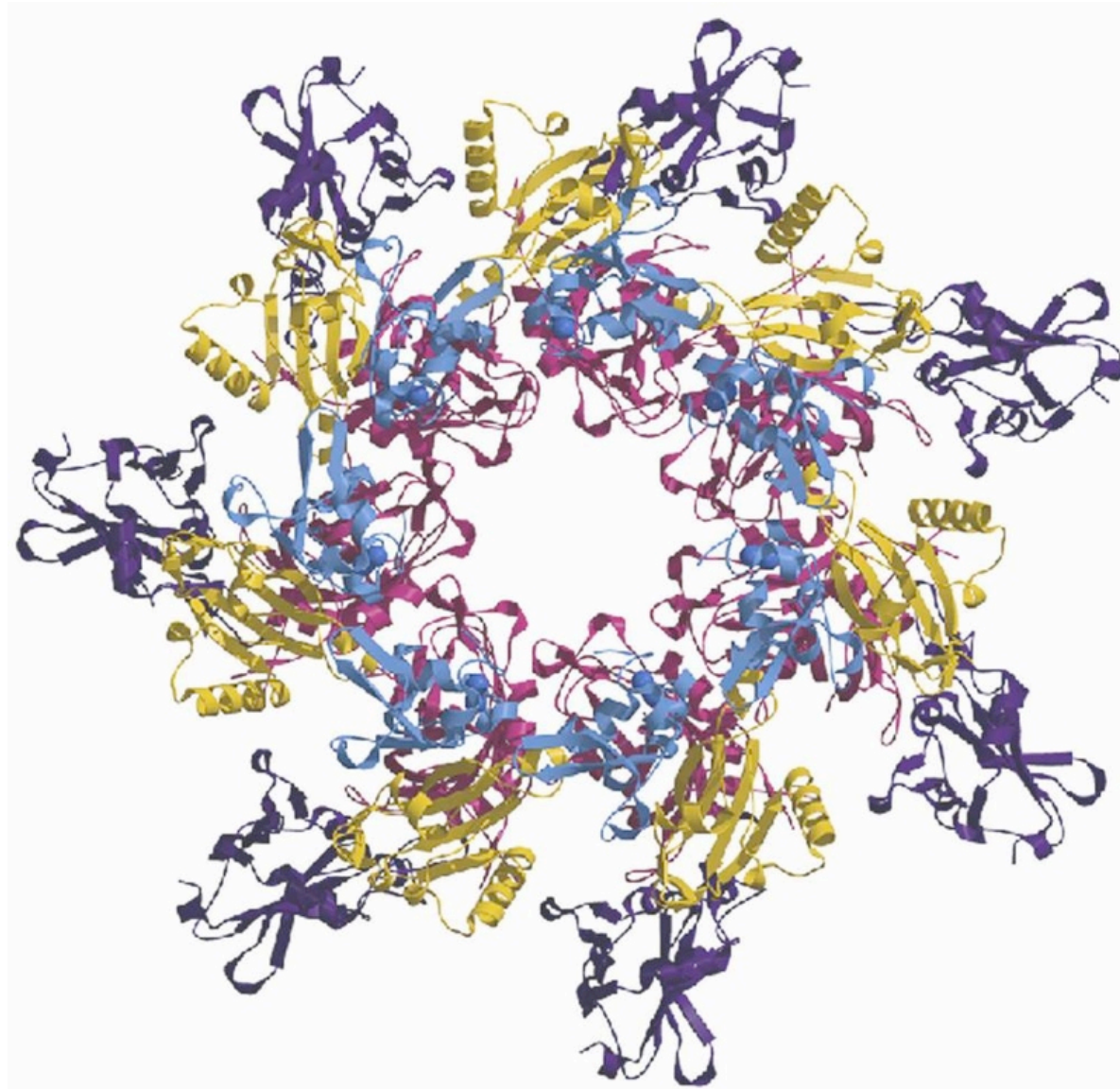
The killing machine



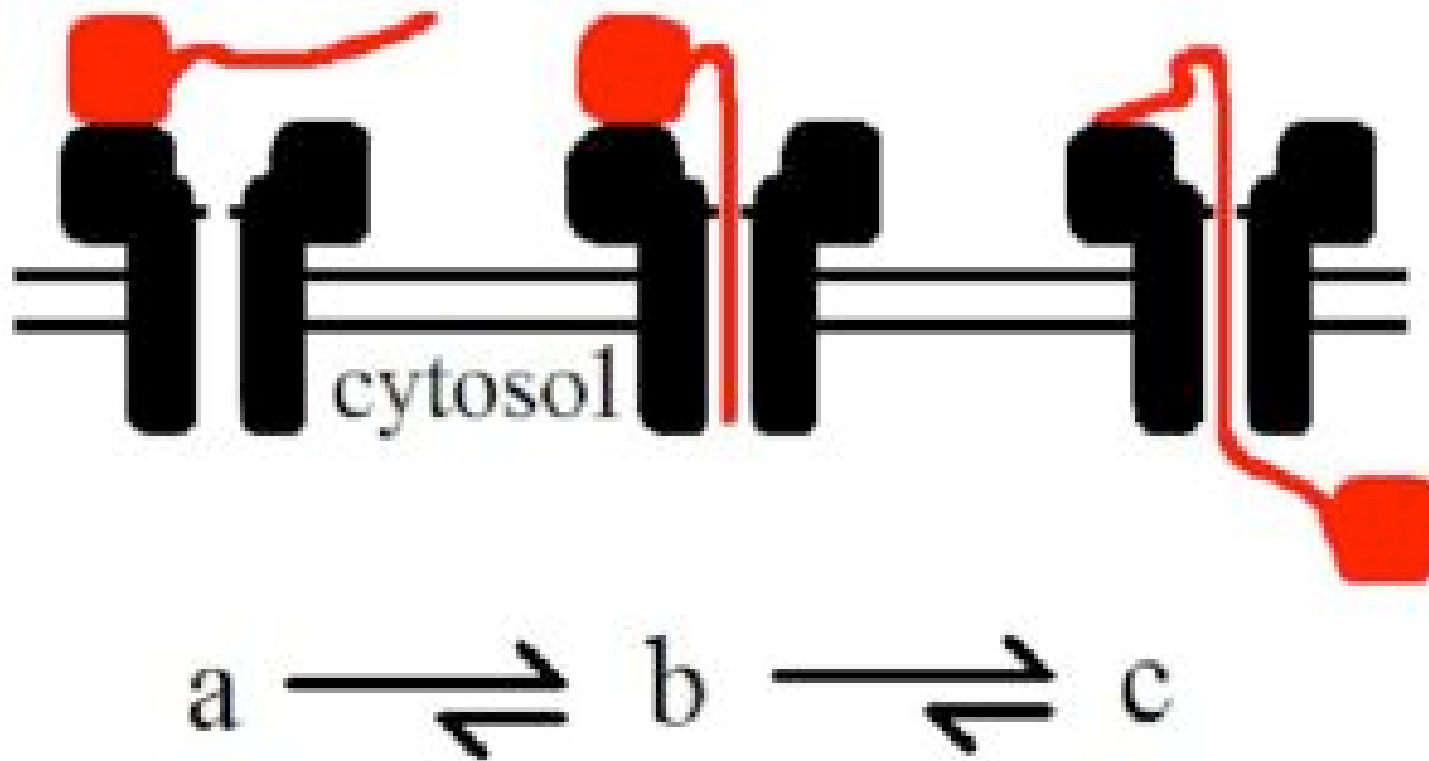
Protective antigen



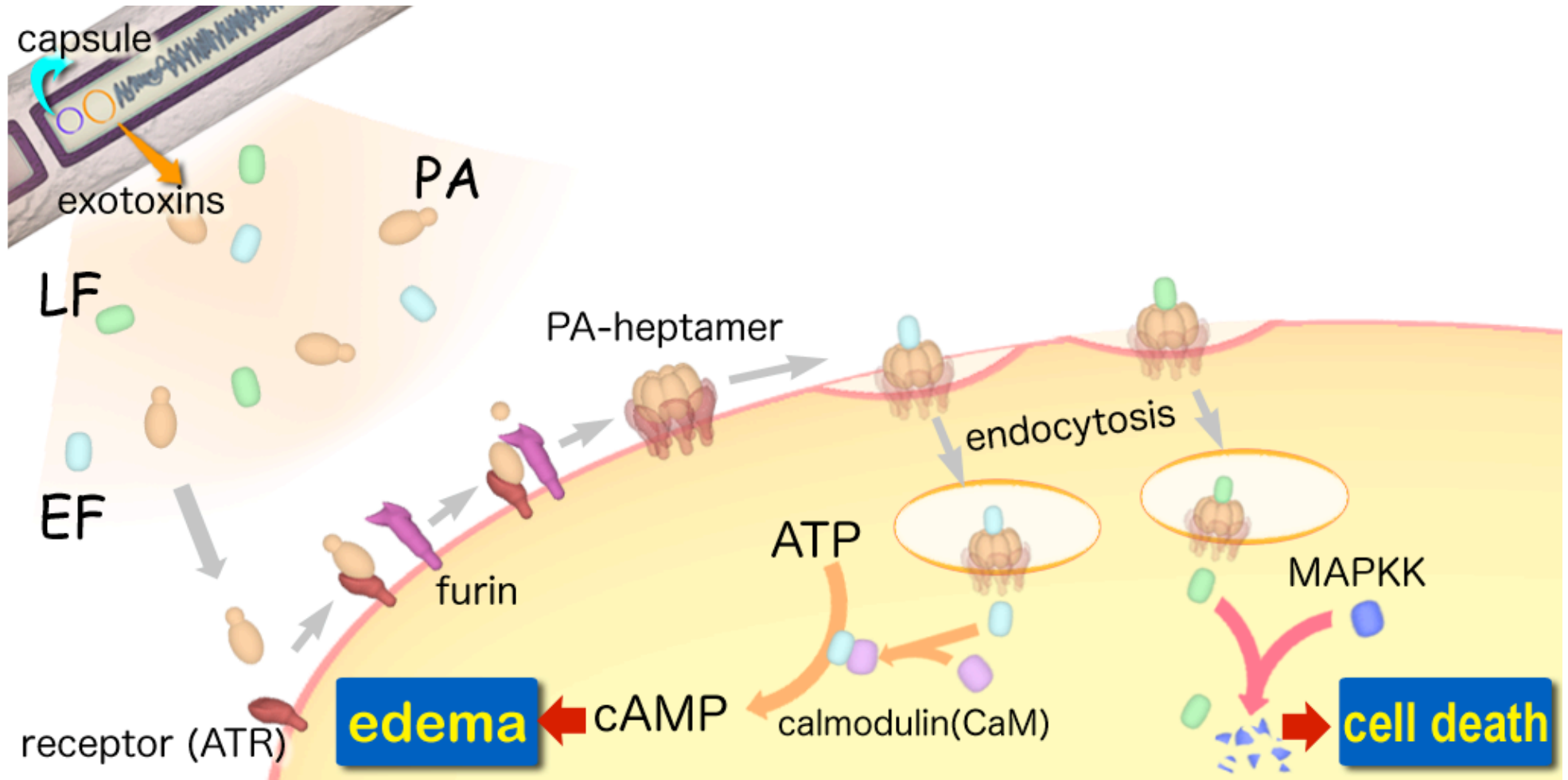
Protective antigen



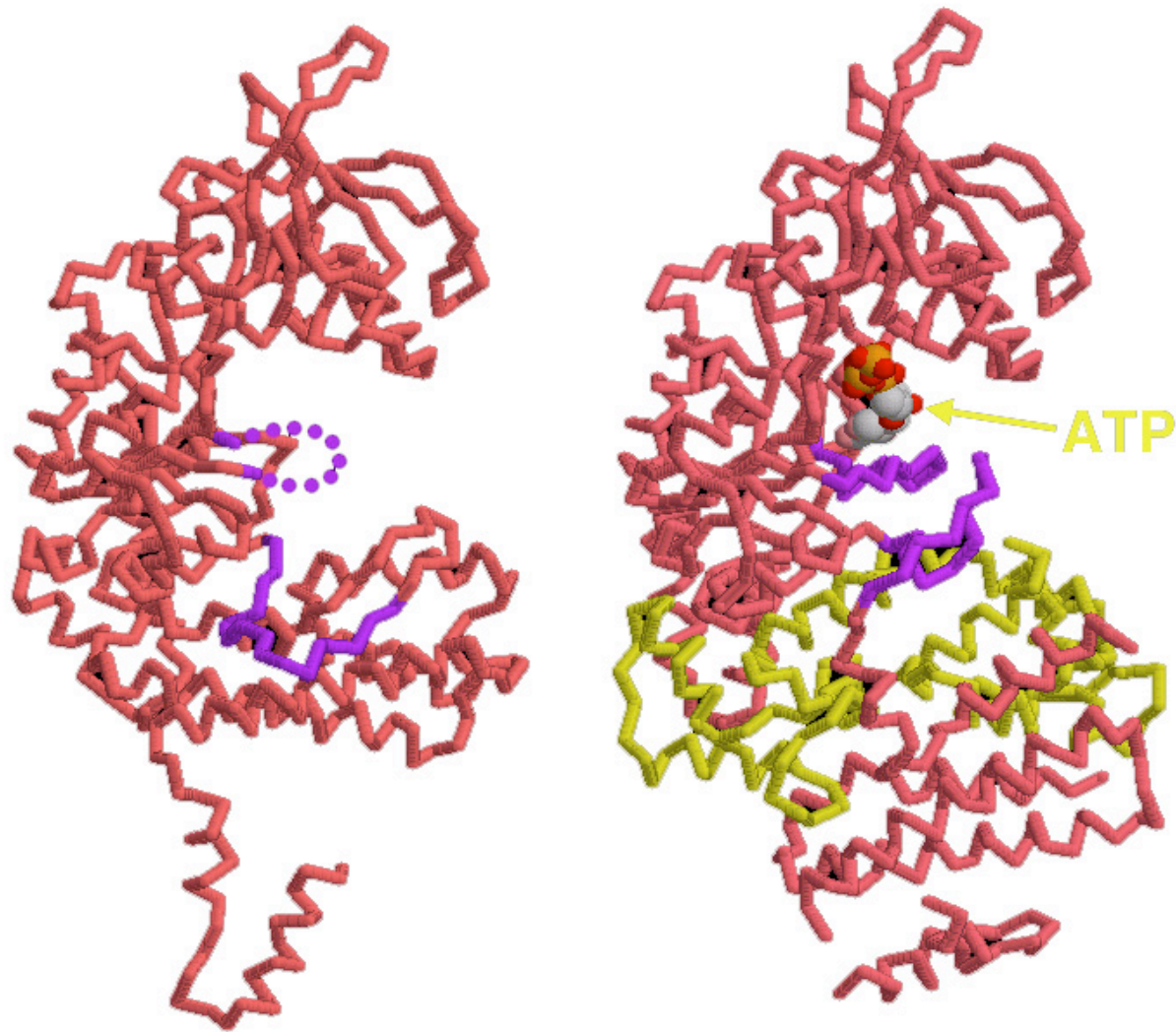
Intrusion



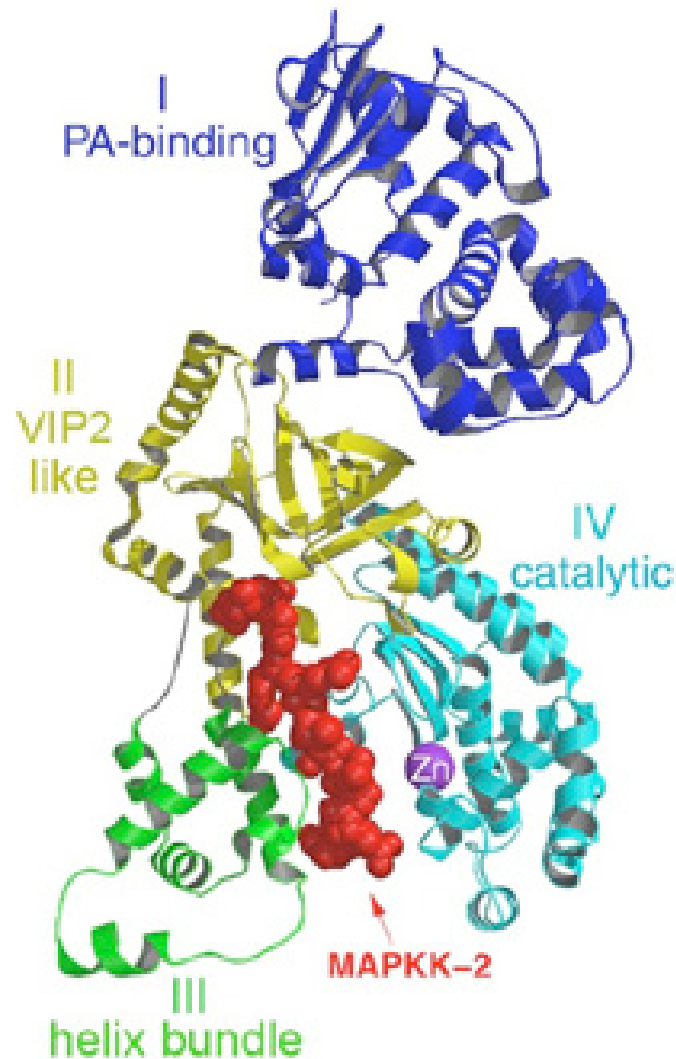
The killing machine



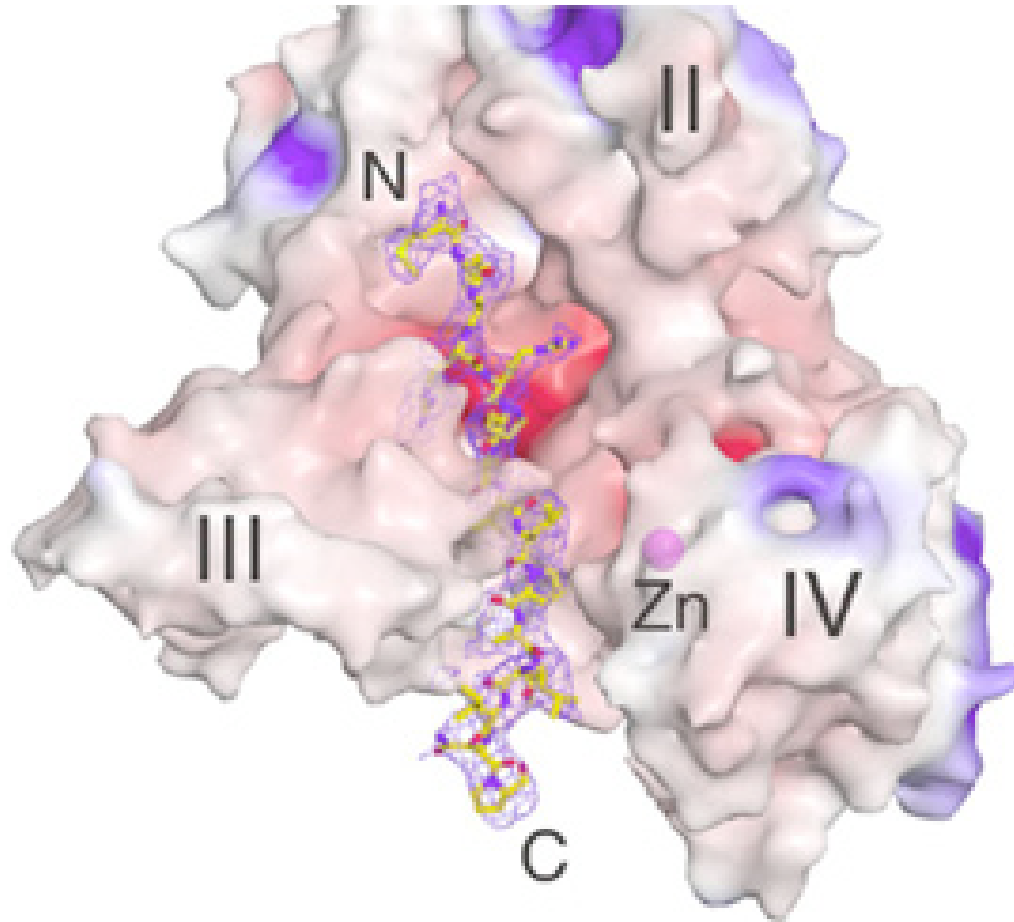
The distruction, part one



The distruction, part two



The distruction, part two



In the end

- There are open questions:
 - refolding after translocation
 - does LF target other molecules
- But it is clear, it is a very effective killing machine

Should we be afraid?

- More than 15,000 anthrax hoaxes between September 2001 and August 2002
- The U.S. Postal Service delivers 107 billion pieces of First Class mail to 240 million adults.
- One known case of mailing 5-7 letters containing pathogenic *Bacillus anthracis*

Happy end

- Statistically the odds of your next mail to contain anthrax is virtually zero.