

Fight against Malaria

Worldwide: 240 million cases; 640,000 deaths (95% in Africa)

- Two strategies
 - 1. Traditional - quinine; later vaccines
 - 2. New approach: mab's (monoclonal antibodies)

Fight against Malaria

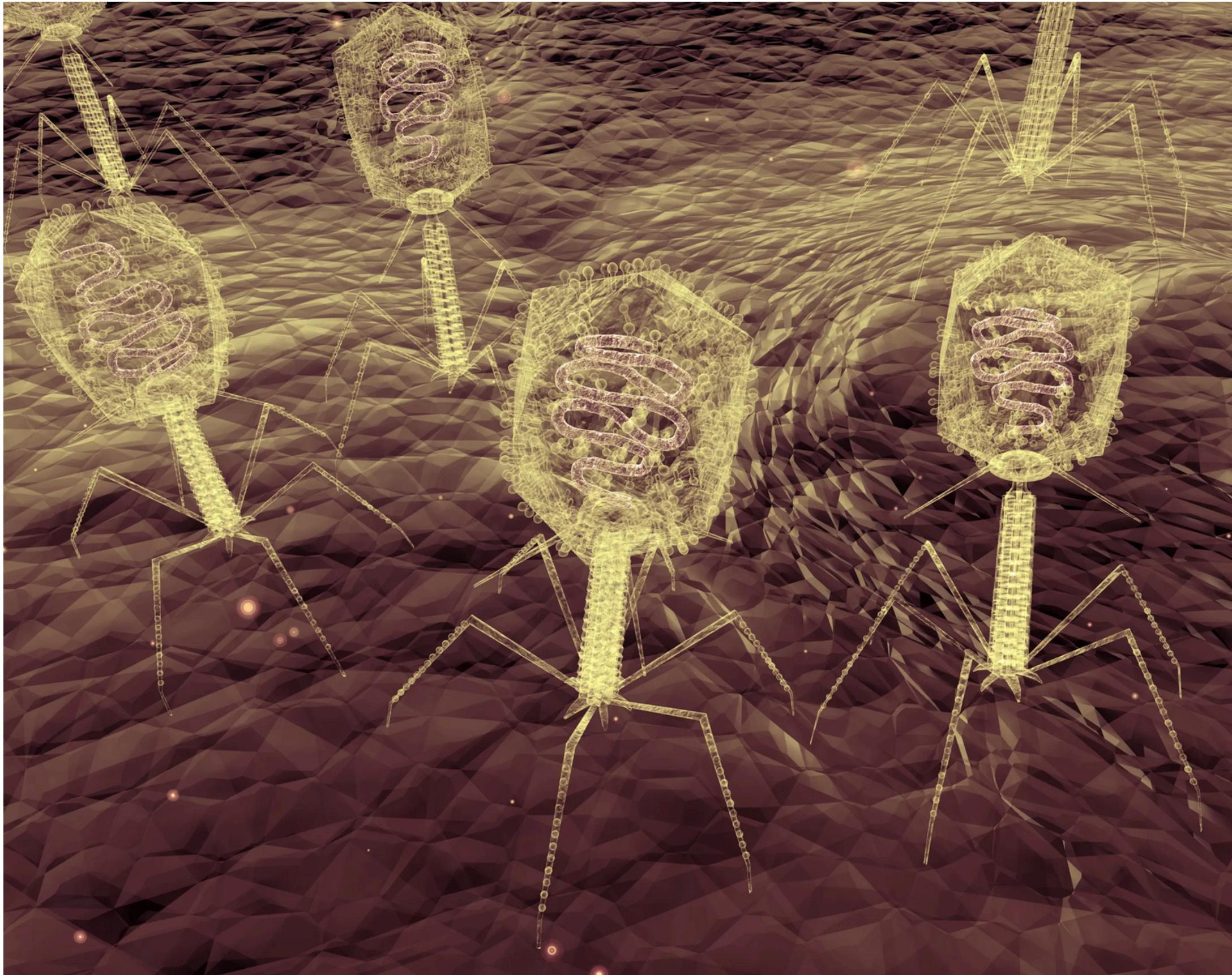
- 1. Vaccines (prompts the body to produce antibodies)
 - Usually only 30% effective in children
 - Less than 40% effective in adults

Fight against Malaria

- 2. Monoclonal antibodies (delivering antibodies directly to the body)
 - mab explicitly optimized to target certain antigens
 - New trial (healthy adults in Mali) proved 82% effective (high dose) and 75% (low dose) over 6 months
 - Not (yet) long-lasting effect (past 6 months)
 - Next 3 steps: (1) Children; (2) pregnant women; (3) going from intravenous to subcutaneous admin



Viruses, bacteria & CRISPR*



Bacteriophages

*) clustered regularly interspaced palindromic repeats

Viruses, bacteria & CRISPR*

1. Bacteriophages [phages] are viruses that attack and modify the DNA of bacteria or kill/“eat” them
2. In *nature*, bacteria use CRISPR as a defense mechanism against viruses that prey on them

Viruses, bacteria & CRISPR*

In *the lab*, researchers did the opposite:

They engineered the phages, so they could target certain bacteria and inject them with CRISPR viral DNA to make specific edits to *their* genome.

To test the concept, hey made the coli bacteria fluorescent . . . and sure enough, the bacteria glowed, indicating that the method was working.

Viruses, bacteria & CRISPR*

Practical applications

- (1) changing the resistance to antibiotics
- 2) Could the phages catch the E. coli in large “natural environments” (soil) . . . Since they could, it might be possible to change the microbiome in humans

TREES & HEALTH



PHOTOGRAPH BY KEITH LADZINSKI

It has long been known that access to nature has considerable impact on well-being and non-accidental mortality

Likewise, it is known to benefit patient with mental disorders

But how much?
Could it be quantified?

<https://www.sciencealert.com/people-in-portland-planted-trees-decades-later-a-stunning-pattern-emerged>

TREES & HEALTH

- 1) USDA/Forest in Portland, Oregon conducted a tree-planting campaign in a 30 year period between 1990 and 2019 with strict data collection *when and where* (140 census tracts @ 4,000 homes) ~50,000 trees were planted
- 2) Using data from the Oregon Health Authorities, researchers combined *non-accidental mortality data* (related to respiratory and cardio-vascular diseases) with the tree data for each census tract

TREES & HEALTH

RESULTS:

- 1) lower mortality rates in neighborhoods with more trees planted,
- 2) this negative association is statistical significant for both cardiovascular and general non-accidental mortality, especially among males and anyone above the age of 65
- 3) the association also grows stronger as trees grow taller,
 - trees planted in the prior 1-5 years (longest) were linked with a 15% percent drop in mortality
 - trees planted in the prior 11 to 15 years (oldest) were linked with a 30% drop in mortality

in other words: older, larger trees were associated with greater reductions in mortality

Morale: new trees are great, but keep the old ones

TREES & HEALTH

ECONOMY

The statistical value of an adult human life is ~\$11 million*

That means that planting 1 tree in each of Portland's 140 census tracts would generate about \$14.2 million annually in lives saved.

Maintaining those 140 trees would cost somewhere between \$3,000 and \$13,000 per year, the study's authors estimate.

*) estimated by US federal agencies

