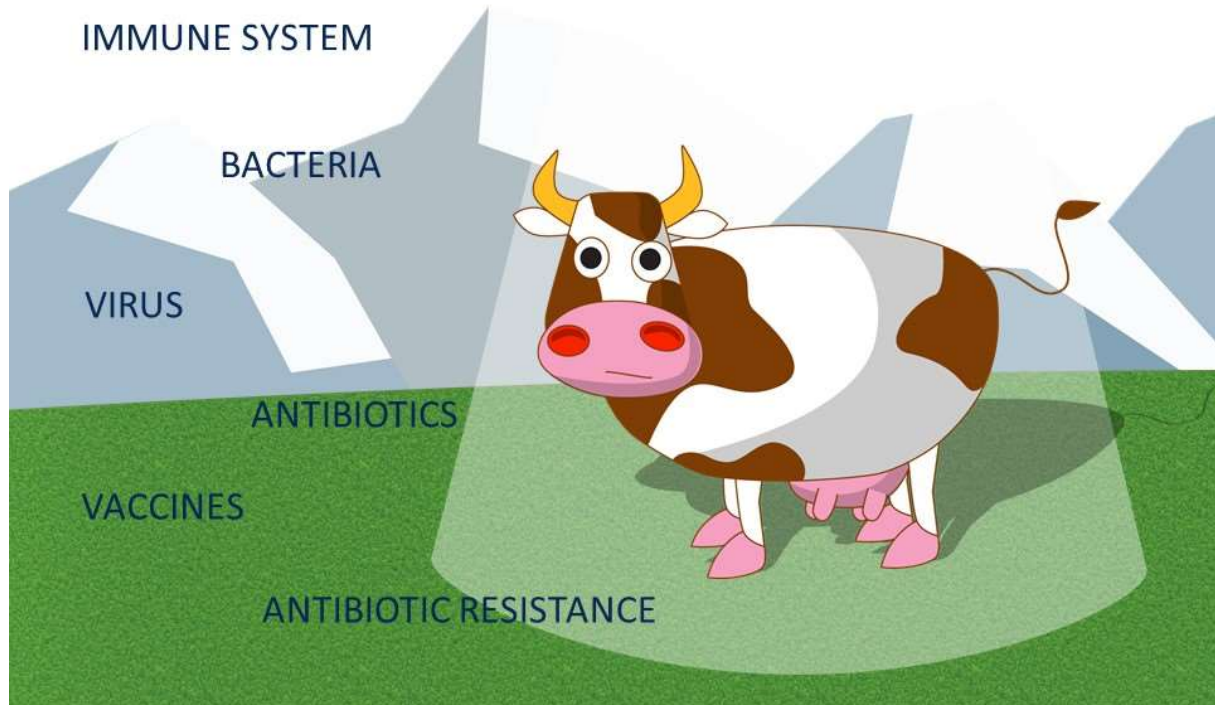


## SYNTHETIC BIOLOGY



### **Battle for Cattle - Further Background and Information**

Here is some more information about what the game is about. The links for different topics lead to Wikipedia pages - to make it easy for you to check out further details!

Biofaction KG  
battleforcattle [at] biofaction [dot] com

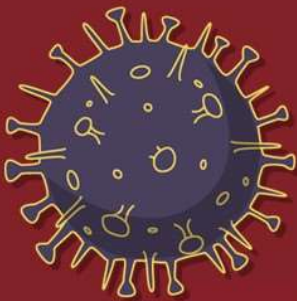
For MycoSynVac, a synthetic biology research project, which has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreements No. 634942.

## BACTERIA



- Single celled organism
- No nucleus
- Many bacteria are important for health
- Some are pathogenic
- Antibiotics may cure bacterial infections
- Bacteria can grow resistant to antibiotics
- Vaccines may protect from bacterial infections
- Live almost everywhere

## VIRUS



- Consist only of shell and DNA or RNA
- Pathogen
- Smaller than bacteria
- Require host cell to reproduce
- Occur in almost every ecosystem
- Vaccines may protect from viral infection

# TREATMENTS



- Antibiotics

cure only bacterial infections



- Vaccinations

may protect against bacteria and viruses

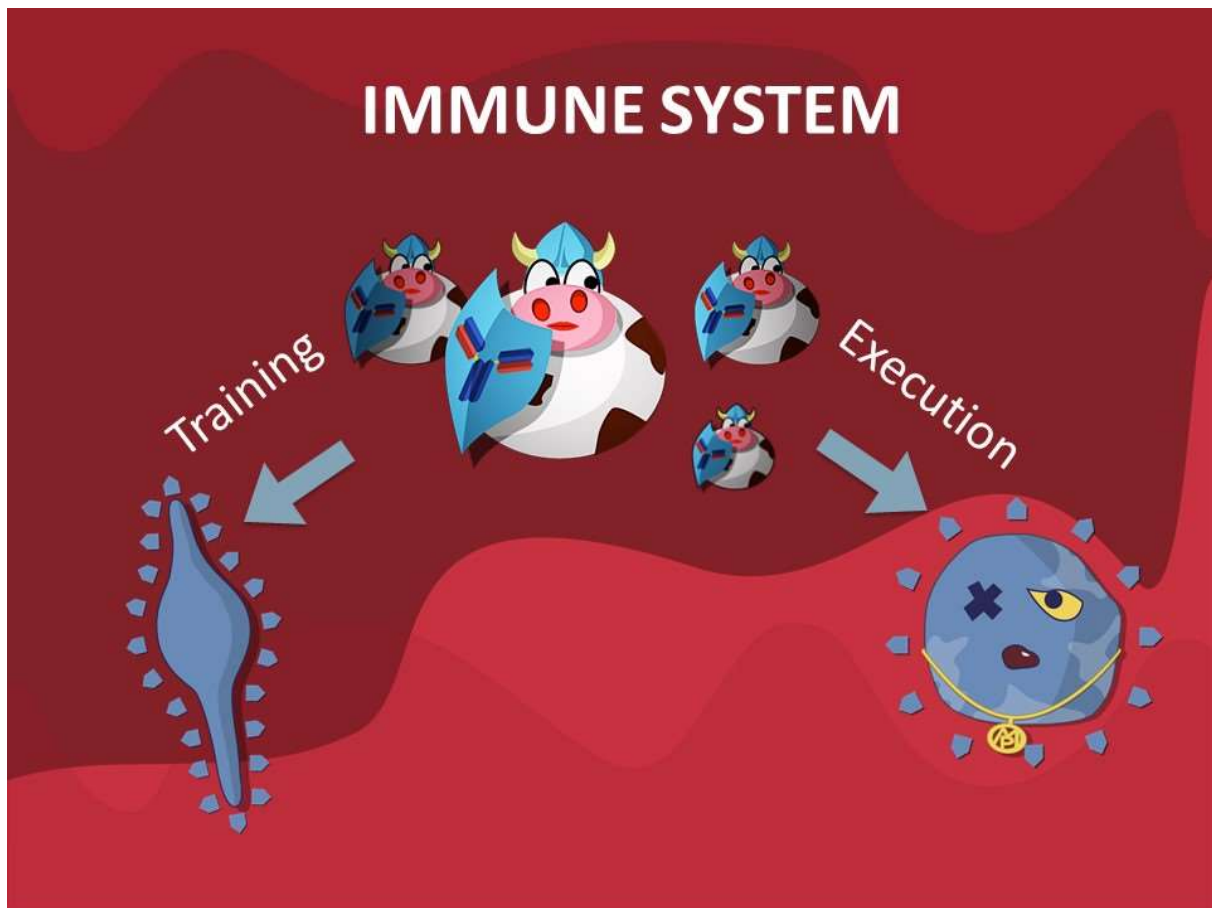


Bacteria (<https://en.wikipedia.org/wiki/Bacteria>) can normally be treated with antibiotics (<https://en.wikipedia.org/wiki/Antibiotic>), but viruses (<https://en.wikipedia.org/wiki/Virus>) cannot be treated with them.

However, we can become immune

([https://en.wikipedia.org/wiki/Immune\\_system](https://en.wikipedia.org/wiki/Immune_system)) to a virus after we've been infected once, or after we've been vaccinated

(<https://en.wikipedia.org/wiki/Vaccine>) for that specific virus.

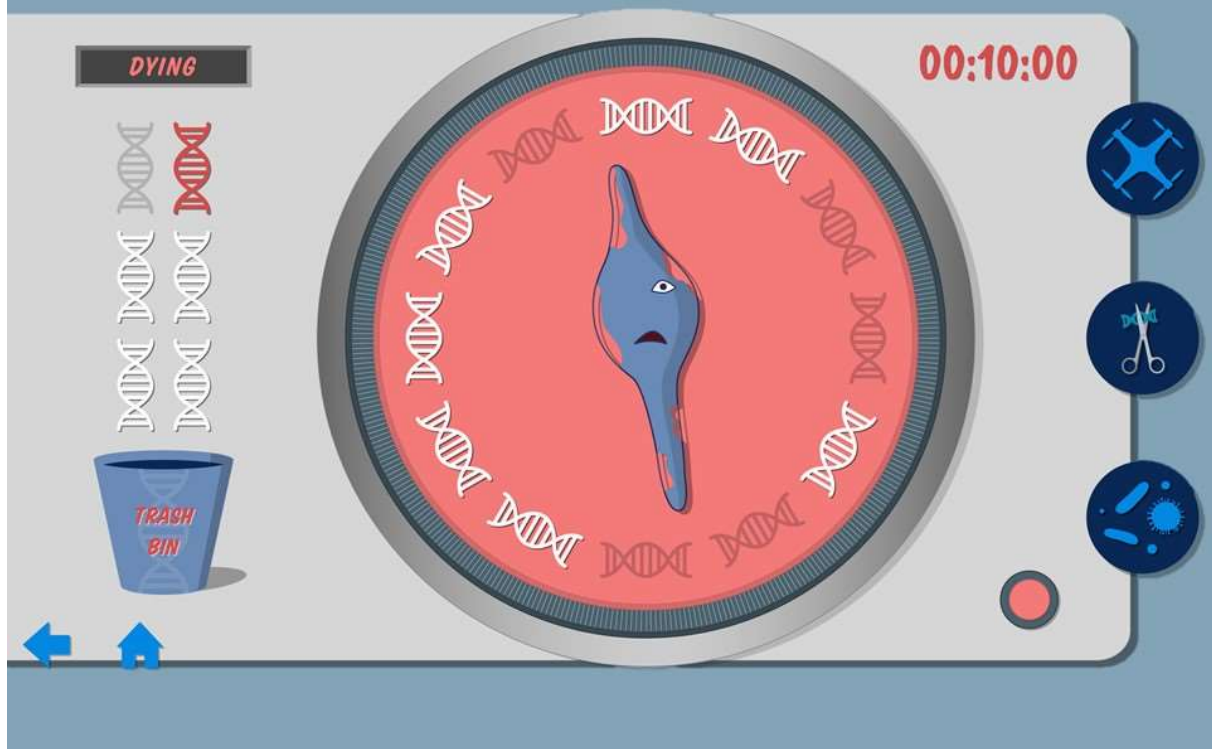


In this game, you deal with *Mycoplasma* (<https://en.wikipedia.org/wiki/Mycoplasma>), a specific type of bacteria that, unlike most, does not have a cell wall. Many antibiotics destroy the cell wall of bacteria and thereby kill them. This is not possible with *Mycoplasma*, as it does not have one. That's why antibiotics are not effective against it.

To combat *Mycoplasma*, the MycoSynVac research project (<https://www.mycosynvac.eu/>) wants to develop a 'synthetic vaccine'.

Normally, vaccines are based on weak or dead viruses to train your immune system for when the real virus strikes. The immune system learns to recognize the virus by recognizing 'receptors' (more specifically, so-called 'epitopes') on the surface of the virus.

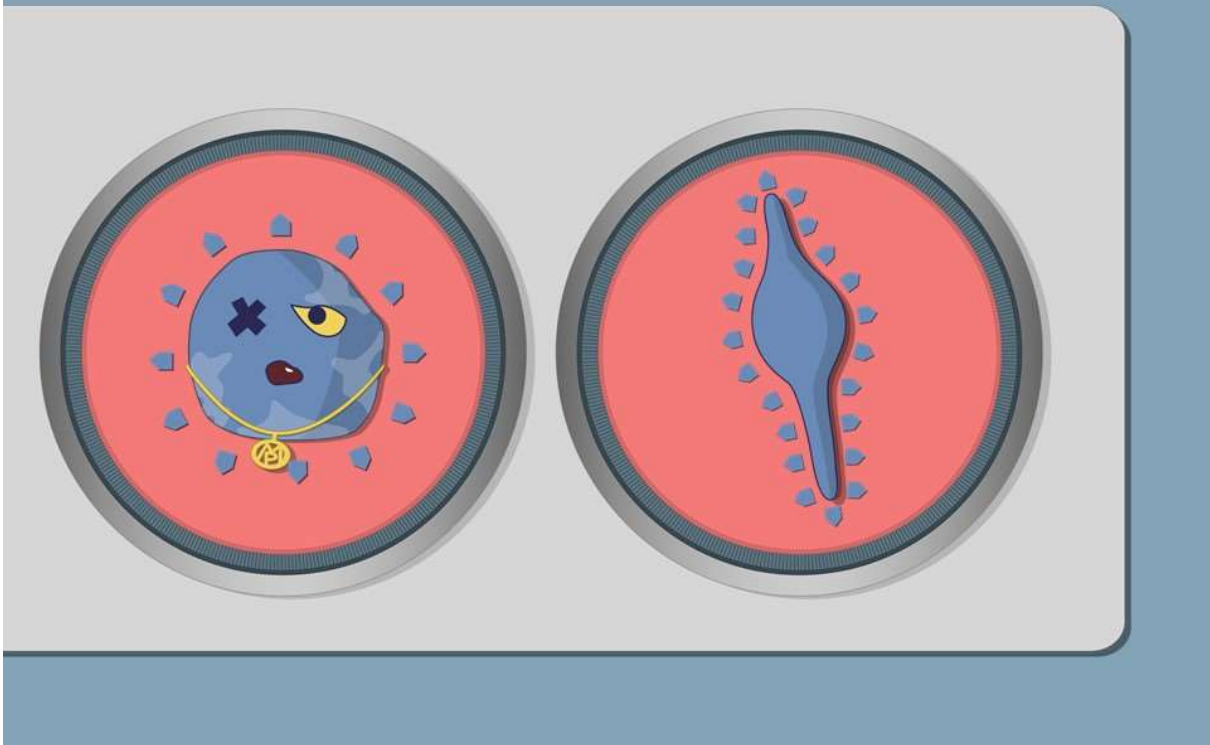
# SYNTHETIC BIOLOGY VACCINES



In the case of the MycoSynVac synthetic vaccine, scientists want to design a harmless vaccine chassis (a sort of undercarriage) based on *Mycoplasma pneumoniae* ([https://en.wikipedia.org/wiki/Mycoplasma\\_pneumoniae](https://en.wikipedia.org/wiki/Mycoplasma_pneumoniae)). Usually, this bacteria is also harmful, but by deleting some parts of its genetic material (DNA <https://en.wikipedia.org/wiki/DNA>) *Mycoplasma pneumoniae* can be converted to a minimal organism and used as a chassis for a vaccine.

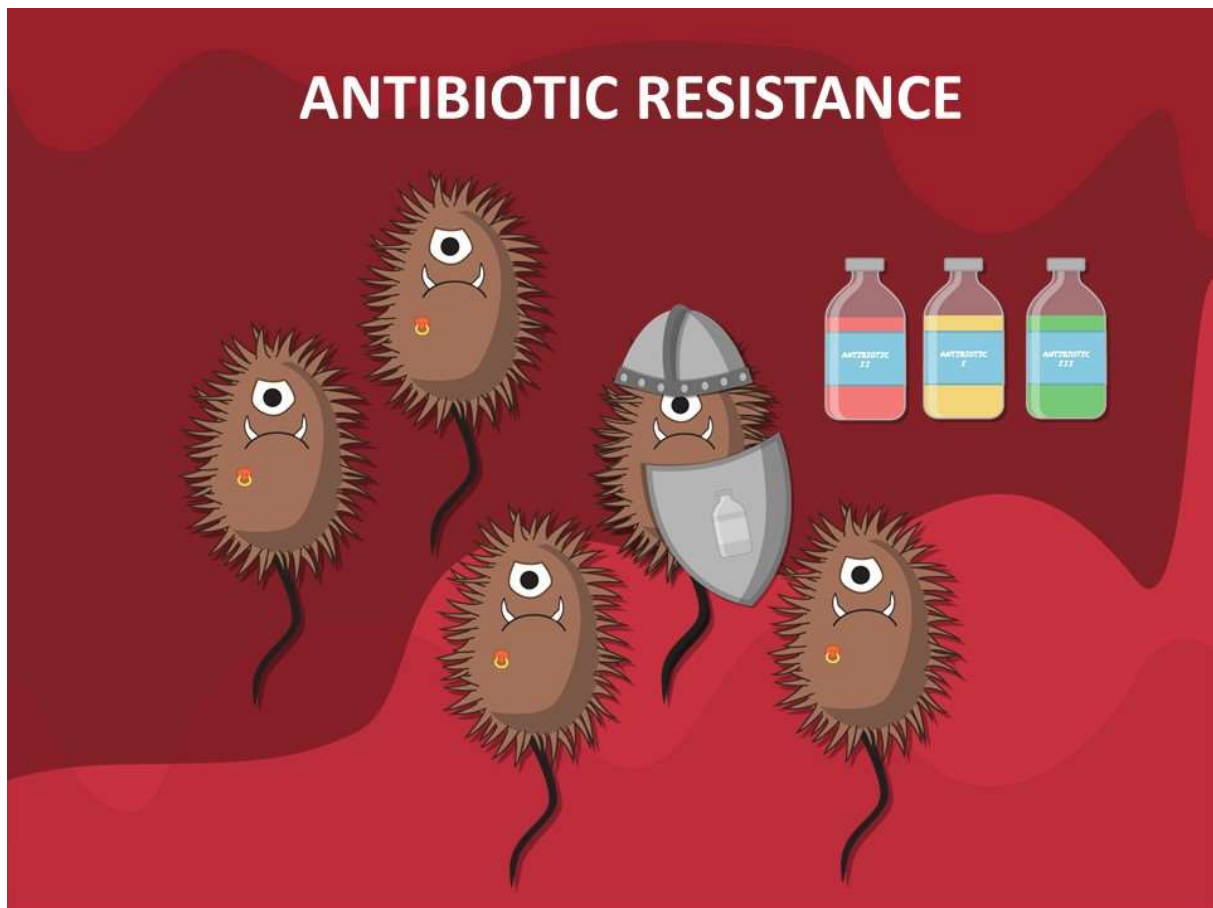


## SYNTHETIC BIOLOGY VACCINES



Next, the scientists take the DNA that codes for the receptors from *Mycoplasma bovis* ([https://en.wikipedia.org/wiki/Mycoplasma\\_bovis](https://en.wikipedia.org/wiki/Mycoplasma_bovis)), a bacteria that infects cows and isn't easily treated by antibiotics. This DNA is placed into the chassis. That means that the chassis (formerly known as *Mycoplasma pneumoniae*) gets the same receptors.

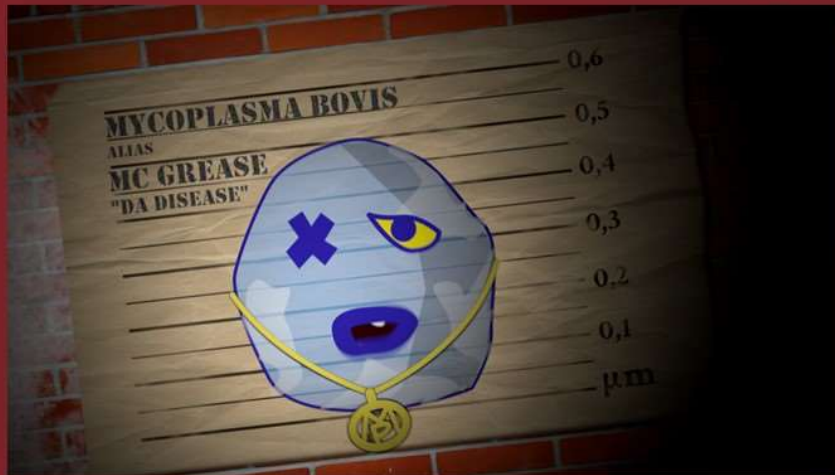
This harmless chassis with the receptors of the pathogen can be used to train the immune systems of the cows.



In 'Battle for Cattle', you also encounter what happens when antibiotics are overused. All bacteria can grow resistant against any antibiotic, thereby making the antibiotic useless ([https://en.wikipedia.org/wiki/Antimicrobial\\_resistance](https://en.wikipedia.org/wiki/Antimicrobial_resistance)). This often happens when antibiotics are not used correctly or are used too often.

The research done by MycoSynVac should allow scientists to make vaccines for any kind of bacteria, thereby partly solving the problem of antibiotic resistance.

# MC GREASE DA DISEASE



If you'd like to have a look at a hilarious music video that further discusses these issues – specifically from the perspective of *Mycoplasma bovis*, nicknamed MC Grease Da Disease – check it out here:

<https://www.youtube.com/watch?v=uY60ijZZX1o>

Finally, here's a list of all the links we used in the text:

Bacteria: <https://en.wikipedia.org/wiki/Bacteria>

Antibiotic: <https://en.wikipedia.org/wiki/Antibiotic>

Viruses: <https://en.wikipedia.org/wiki/Virus>

Immune system: [https://en.wikipedia.org/wiki/Immune\\_system](https://en.wikipedia.org/wiki/Immune_system)

Vaccine: <https://en.wikipedia.org/wiki/Vaccine>

*Mycoplasma*: <https://en.wikipedia.org/wiki/Mycoplasma>

*Mycoplasma pneumoniae*:

[https://en.wikipedia.org/wiki/Mycoplasma\\_pneumoniae](https://en.wikipedia.org/wiki/Mycoplasma_pneumoniae)

DNA: <https://en.wikipedia.org/wiki/DNA>

*Mycoplasma bovis*: [https://en.wikipedia.org/wiki/Mycoplasma\\_bovis](https://en.wikipedia.org/wiki/Mycoplasma_bovis)

Antibiotic resistance: [https://en.wikipedia.org/wiki/Antimicrobial\\_resistance](https://en.wikipedia.org/wiki/Antimicrobial_resistance)

MycoSynVac project: <https://www.mycosynvac.eu/>