FUTURE CITY LAB

GERM THEORY:
CHOLERA EPIDEMIC IN NEW YORK

MUSEUM OF THE CITY OF NEW YORK

www.mcny.org/education

DO NOW (ON HANDOUT):

Imagine you are a scientist studying disease.

You are presented with the following case:

A group cattle farmers in upstate New York report that a large amount of their cows are dying. Farmers notice that cows seem to die quickly and often without any warning.

1. Write TWO questions you want to ask.

2. Write ONE action you might take at the start of this investigation.

STUDENT QUESTIONS

PROBLEM:

How do we determine the cause of a disease?

Vocabulary today

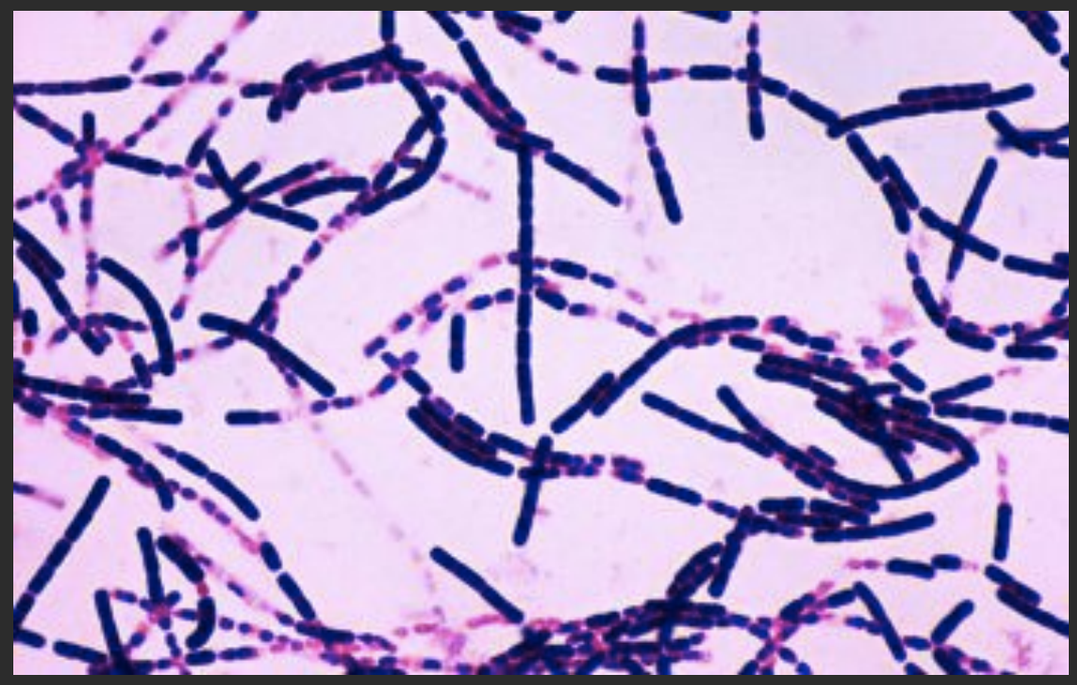
Microbe: tiny organism

Pathogen: microbe or virus that causes disease

FIRST FINDING:

In every sick cow, a bacterium has been identified: *Bacillus anthracis*.

- What is ONE reason *B. anthracis* might be the cause of the disease?
- What is ONE reason *B. anthracis* might **not** be the cause of the disease?
- What additional information do you need?



Source: CDC Health Image Library

ADDITIONAL INVESTIGATION:

- *B. anthracis* is NOT found in healthy cows. A separate bacterium, *P. ruminocola*, is found in both healthy and sick cows. Does this support the idea that *B. anthracis* is the pathogen, or not?

HEALTHY COWS	SICK COWS
Do not have *B. anthracis*	Have *B. anthracis*
Have *P. ruminocola*	Have *P. ruminocola*

CORRELATION

When two variables are associated with each other, we call it a **correlation**.

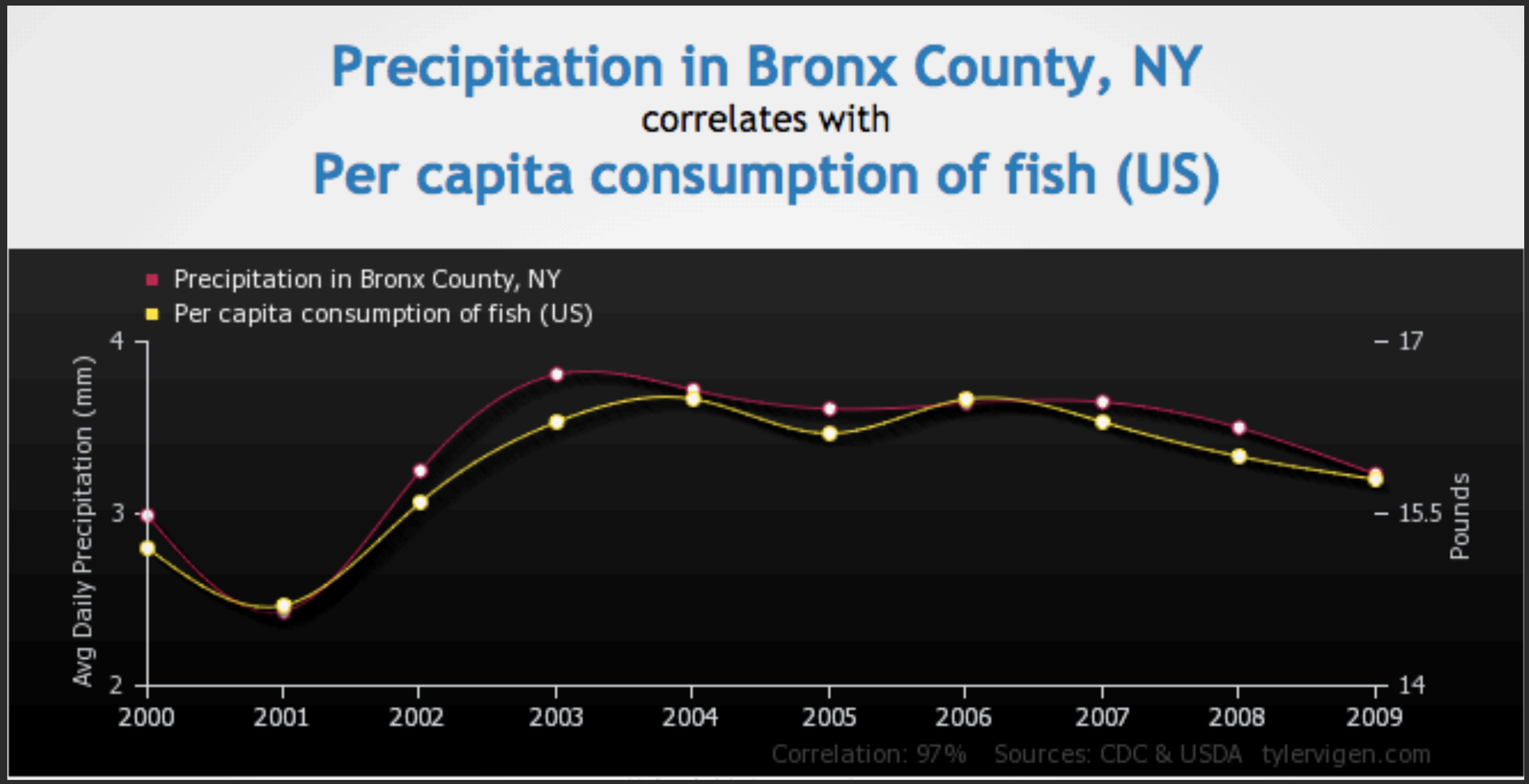
What are the two variables that are correlated?

Disease and *B. anthracis*

Sick	**Not sick**
B. anthracis present	*B. anthracis* **not** present

"CORRELATION DOES NOT IMPLY CAUSATION"

Just because two things happen at the same time does NOT mean one causes the other.



Source: Spurious Connections, www.tylervigen.com

NEXT STEP: ESTABLISH CAUSATION

With your table partner(s), plan an experiment:

- What would the next step be to show *B. anthracis* causes the disease?
- What might be a suitable control?

You have:

Cows

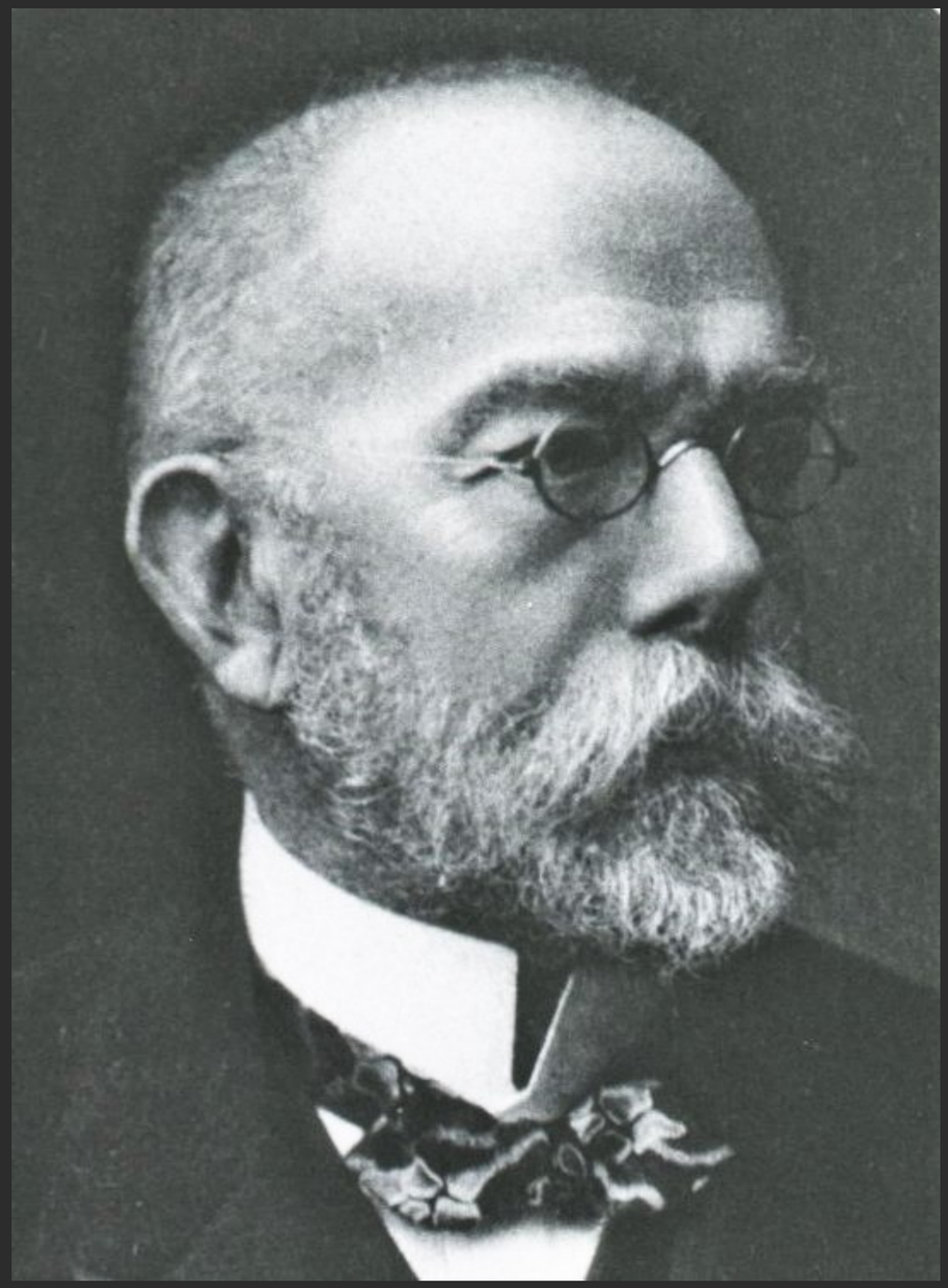
B. *anthracis*

P. ruminicola

Source: www.flickr.com/yvoeri

ROBERT KOCH (1843–1910)

- First gained fame for establishing *Bacillus anthracis* as the cause of the disease **anthrax** in cows.
- Established a system for determining which microbe causes a disease



Source: http://nobelprize.org

KOCH'S POSTULATES

Establish Correlation

1. Microbe must be found in sick individuals but NOT in healthy ones.
2. Microbe is cultured from sick individuals

Show Evidence of Cause

3. Microbe should cause disease when introduced to healthy individuals.

Double-check Correlation

4. Exact same microbe is cultured from newly sick individuals.

SUMMARY TASK

- On page 3, answer questions **independently.**
- When finished, detach and hand in page 3.