

Koch's Postulates

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Robert Koch

- Robert Koch, a German scientist born in 1843, is considered by many to be the founder of bacteriology.
- As the District Medical Officer, one of Koch's primary concerns was the prevalent occurrence of anthrax among farm animals in his area.
- After converting his 4-room home into his own medical laboratory stocked only with a single microscope, Koch set to determining the cause of this virulent disease.



Robert Koch

- Koch hypothesized that *anthrax bacillus*, a gram positive bacterium, was the cause of the anthrax disease.
- Koch proved his hypothesis correct by infecting mice with the bacillus strains taken from the spleens of animals who died from the disease.
 - When the infected mice showed identical symptoms, Koch proved his hypothesis correct.
- Koch then sought to prove that anthrax that had no prior contact with animals could cause the same disease when introduced to an animal host.
 - Koch grew the bacilli in pure cultures over several generations; he then showed that they could still cause anthrax in later generations.



Robert Koch

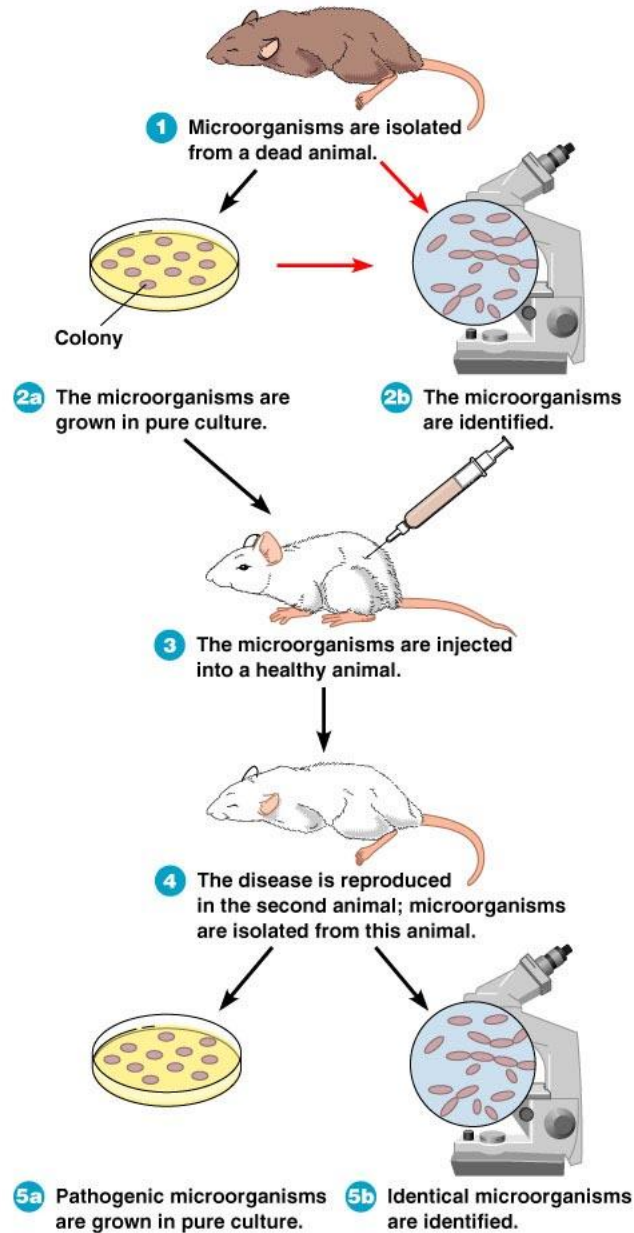
- Koch perfected his methods of diagnostics and expanded on the work of others.
 - Koch invented the method of cultivating bacteria on nutrient mediums, using potatoes as his source of nutrients for bacteria, and created a medium that could be stored in dishes created by his colleague Petri.
- Koch's work on diseases and diagnostics culminated with the creation of what are now known as Koch's Postulates.
 - Koch's Postulates are the 4 steps necessary to confirm if a suspected pathogen is indeed the cause of a disease.
- Koch's postulates are (*next slide*):



Koch's Postulates

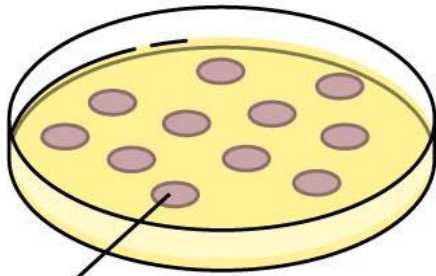
1. Microorganisms are isolated from dead animals
2. Microorganisms are grown in pure culture
 - 2b. Microorganisms are identified
3. Microorganisms are injected into healthy animals
4. Disease is reproduced in second animal
5. Microorganisms are grown in pure culture
 - 5b. Identification of identical microorganism.





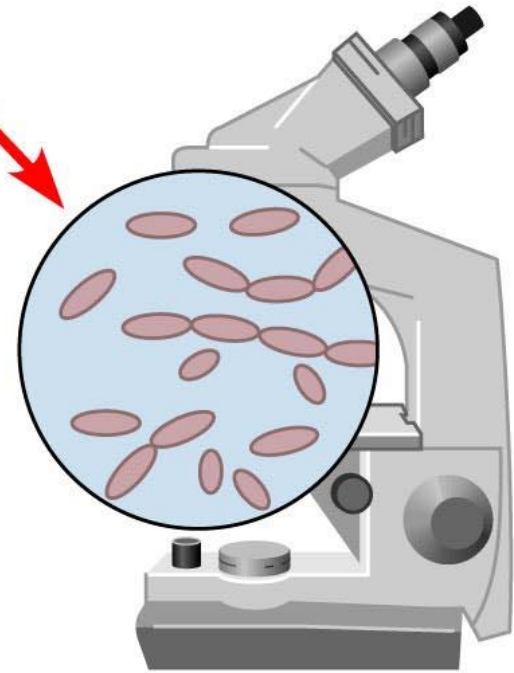


1 Microorganisms are isolated from a dead animal.

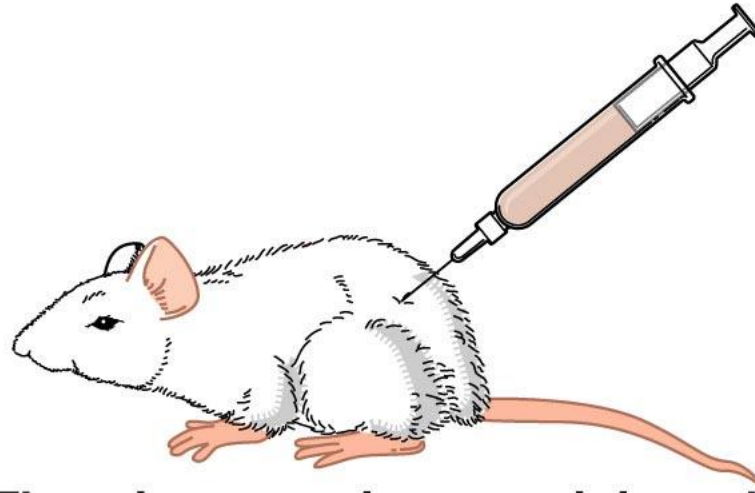


Colony

2a The microorganisms are grown in pure culture.



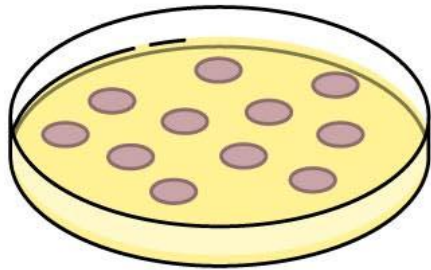
2b The microorganisms are identified.



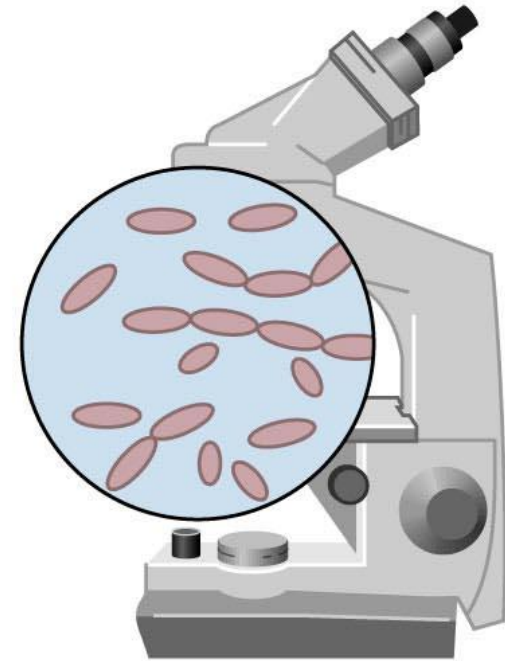
3 The microorganisms are injected into a healthy animal.



4 The disease is reproduced in the second animal; microorganisms are isolated from this animal.



5a Pathogenic microorganisms are grown in pure culture.



5b Identical microorganisms are identified.

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Exceptions to Koch's Postulates

- Koch's Postulates do not apply or are not possible in every possible situation. Some exceptions include:
 - Microorganisms that are unable to be cultured on artificial media
 - (example: *Treponema pallidum*)
 - When 2 or more organism work in synergy to cause a disease.
 - Symptoms or diseases that can be caused by several microbes.
 - Ethical exceptions.
 - Highly contagious, virulent, or dangerous strains (e.g small pox)
 - We obviously do not want to create more of a dangerous disease.



Severity or Duration of a Disease

- Not all disease behaves the same!
 - Diseases vary widely in their onset, duration, and level of activity
- Disease Classifiers:
 - **Acute disease:** Symptoms develop rapidly and tend to be more severe
 - **Chronic disease:** Disease develops slowly and are less severe
 - **Subacute disease:** Symptoms between acute and chronic
 - **Latent disease:** Disease with a period of no symptoms when the causative agent is inactive
 - The host has the disease but has subclinical symptoms



Clinical vs. Subclinical

- Not all disease produces visible evidence!
 - A clinical disease would be when a pathogen produces visible or detectable symptoms in its host
 - A subclinical disease would be when a pathogen does not cause visible or detectable symptoms in the host despite the fact that the host is affected by the disease.
 - For example, in subclinical mastitis, a cow could be carrying, and spreading, a strain of mastitis
 - However, a cow with subclinical would not be diagnosable without a laboratory-based test (such as MECS or CMT)

