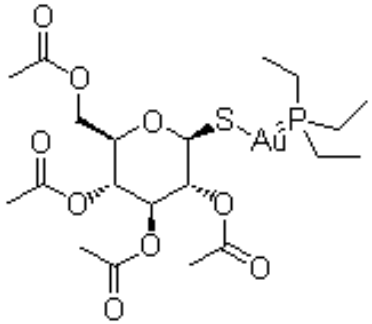
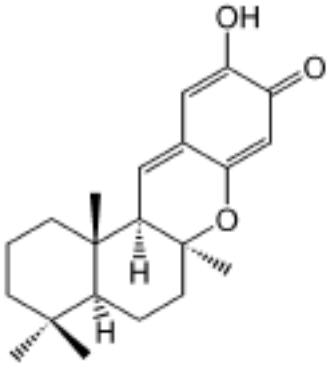




Calbiochem

A Tale of Two Antibiotics

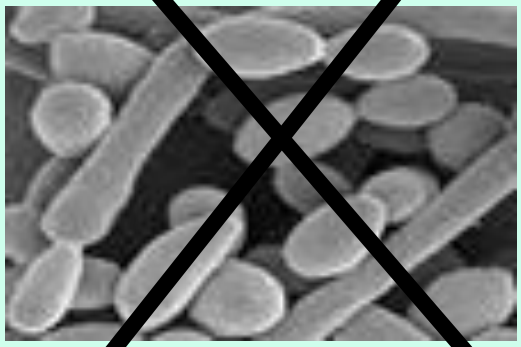
By Kelly Cobaugh

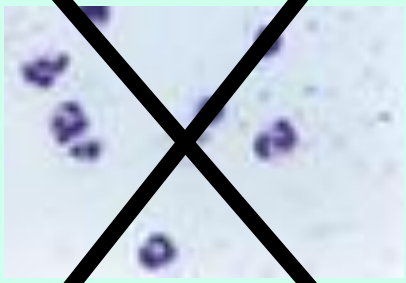
Mentor: William T. Self, Ph.D.

Photo Credits: NIH or CDC,
unless noted

The Basics..

- Antibiotics is a general term given to medicines that kill or slow the growth of bacteria- not to be confused with viruses, fungi and parasites

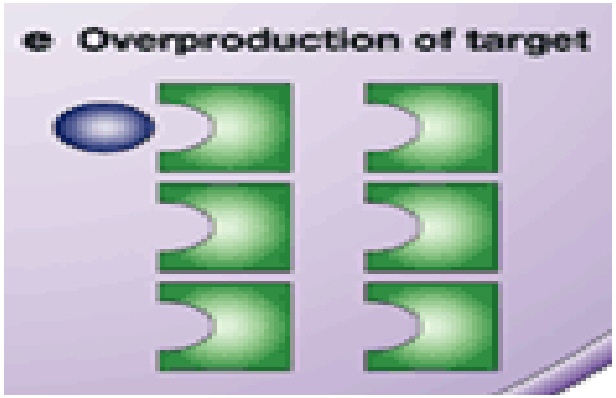


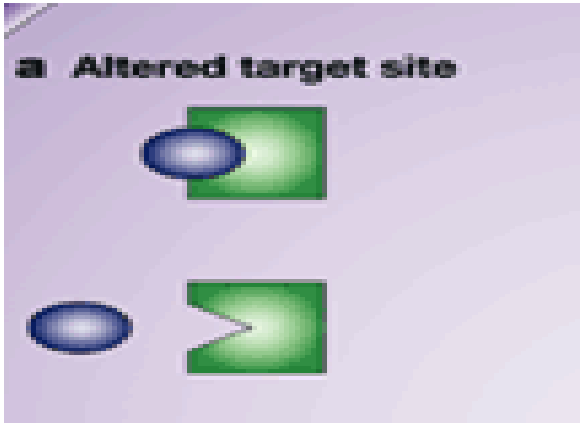


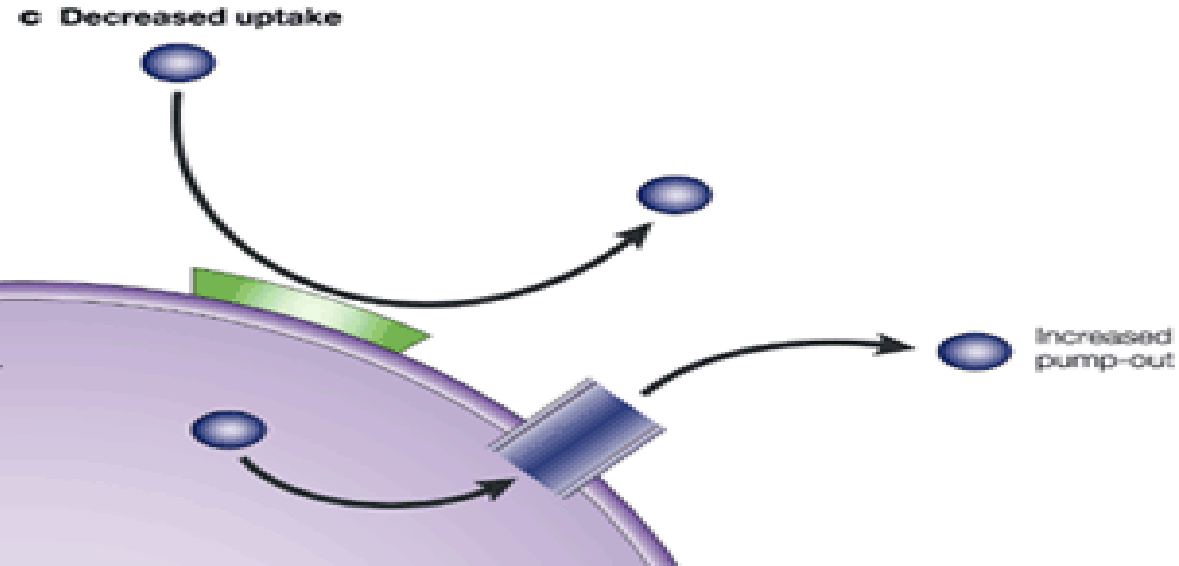
Penicillin G, Cepalothin, Penicillin V, Cephapirin, Methicillin, Cephradine, Subactam, Tazobactum, Oxacilin, Cefprozil, Cefaclor, Cloxacilin, Loracarbef, Cefoxtin, Dicloxacilin,Cefmetazole, Impipanem, Meropenem, Asteonam, Calavulanate, Nafcilin, Ampicilin, Amoxicilin, Carbenicilin, Ticarcilin, Streptomycin, Tetracycline, Neomycin, Cefpirome, Chloretitracycline, Kanamycin, Paromycin, Demeclocycline, Rifampicin, Doxyclcine, Isepamicin, Ceftazidime, Cefdhir, Minocycline, Oxytetracycline, Rifaxmin, Spectinomycin, Nefilmicin, Erythromycin, Sisomicin, Dibekalin, Isepamicin, Linezolid, Quinupristin, Vancamycin, Azithromycin, Bezoxazinorifamycin, Dafopristin, Sulphanilamide, Naidixic acid, Sulfathaldine, Norfloxacin, Ciprofloxacin, Temafloxin, Diprofloxacin, Oxolinic acid, Clarithromycin, Methacycline, Lomefloxacin, Levofloxacin, Rifabutin, Sitafloxacin, Moxifloxacin, Enoxacin, Polymyxin, Metronidazole

Sound the Alarm!

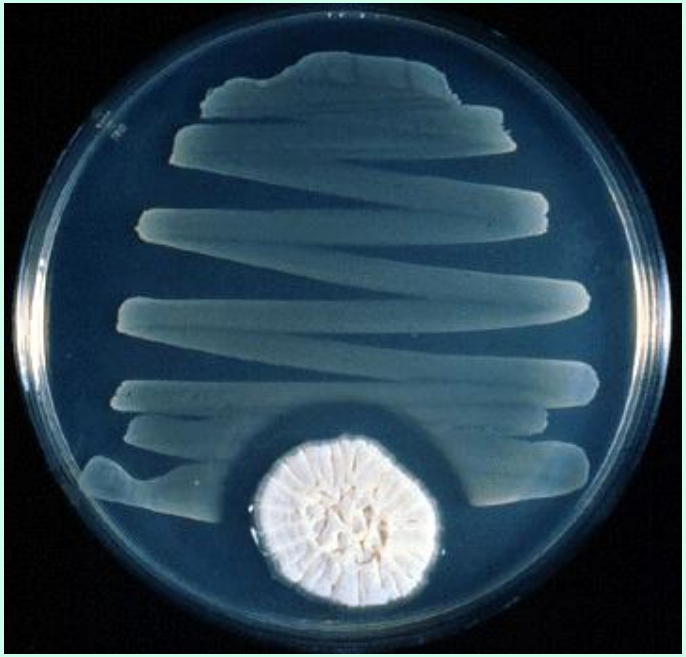
Resistance is coming to a neighborhood near you!



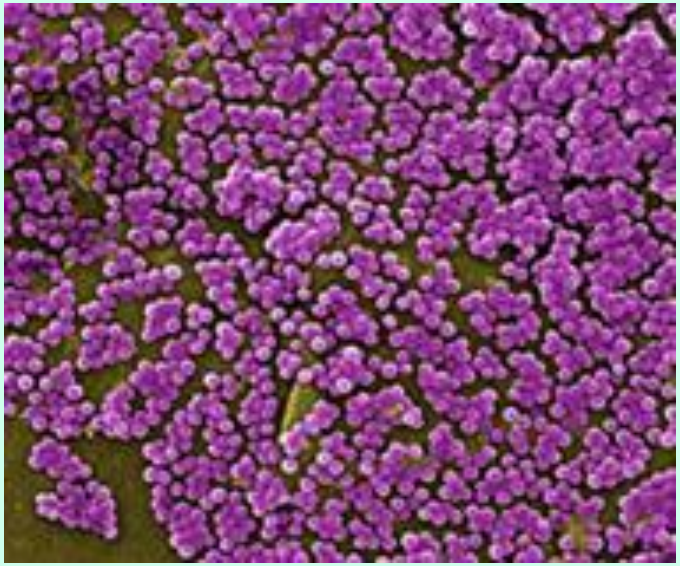




A Fortunate Accident



In 1928, Alexander Fleming discovered Penicillin



But after years of widespread use, evolution of bacteria has resulted in many antimicrobials losing their effectiveness.

Issues

- **Inappropriate Use-** Sometimes doctors will prescribe inappropriate antimicrobials
- **Inadequate Diagnostics-** Doctors prescribe an antimicrobial just-in-case or prescribe a broad-spectrum antimicrobial when a specific antibiotic is available
- **Overconfidence-** Because antibiotics dramatically changed the fight against bacteria, it led to overconfidence that infectious diseases are no longer a problem

It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.

Cartoon by Nick Kim; cartoonstock.com

Another Part of the Problem..

Pharmaceutical companies care too much about money

- Roche has left the field, GlaxoSmithKline, Bristol-Myers Squibb and Eli Lilly have downsized their Research and Development antibiotic branches.
- Drugs might become useless in a few years, because of drug resistance, so this discourages companies from developing new antibiotics

The Need For Narrow Spectrum Antibiotics

- Broad spectrum antibiotics wipe out all bacteria
- This allows opportunistic bacteria like *Clostridium difficile* to take advantage of the situation and proliferate
- We need antibiotics that specifically target the bad bacteria

Now Introducing… Clostridium difficile

Clostridium difficile

Toxin will cause colitis and the patient will develop some of the following symptoms:

- Diarrhea
- Fever
- loss of appetite
- Nausea
- Abdominal pain

Patients at risk are those that have recently undergone:

antibiotic exposure

gastrointestinal surgery

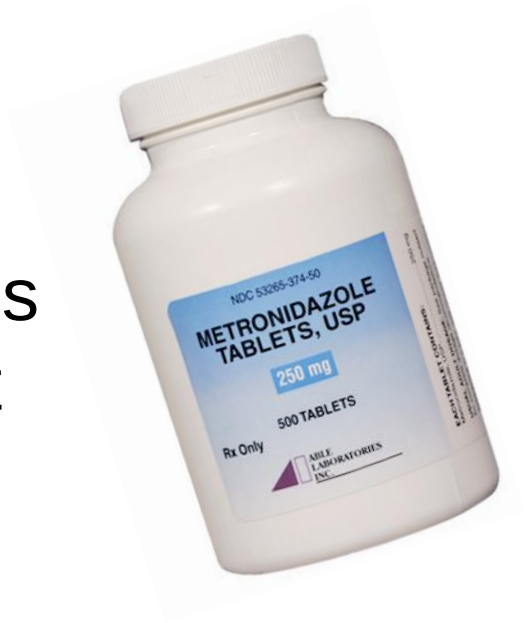
long length of stay in healthcare settings

Immuno-compromising conditions including advanced age

Current Treatment

The infection can usually be treated with antibiotics (usually metronidazole or vancomycin) for about 10 days

Infection relapses are common so it is important to invest time in drug discovery.



Research

Previous work in our lab proposed that the gold compound auranofin inhibited growth of *C. difficile* through its formation of a complex with hydrogen selenide

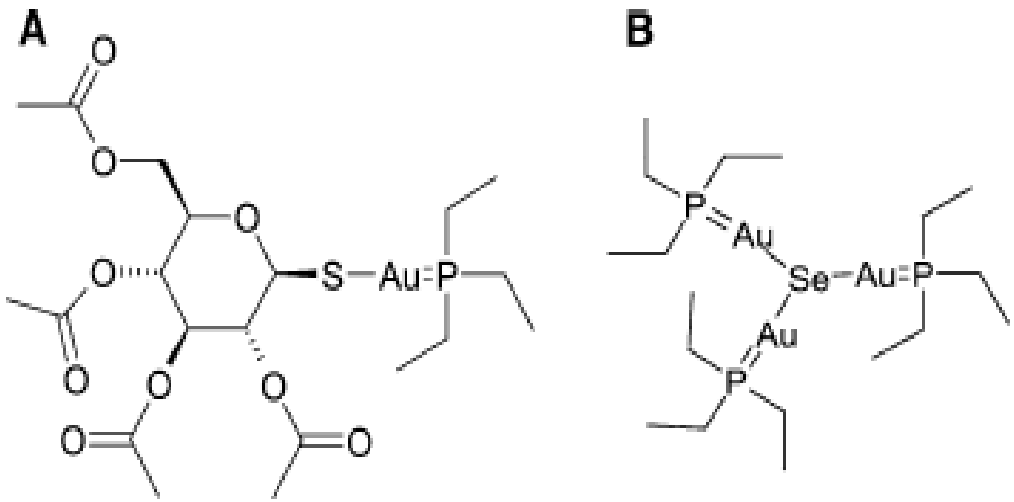


Photo Credit: Jackson-Rosario, Sarah, et al. (2009)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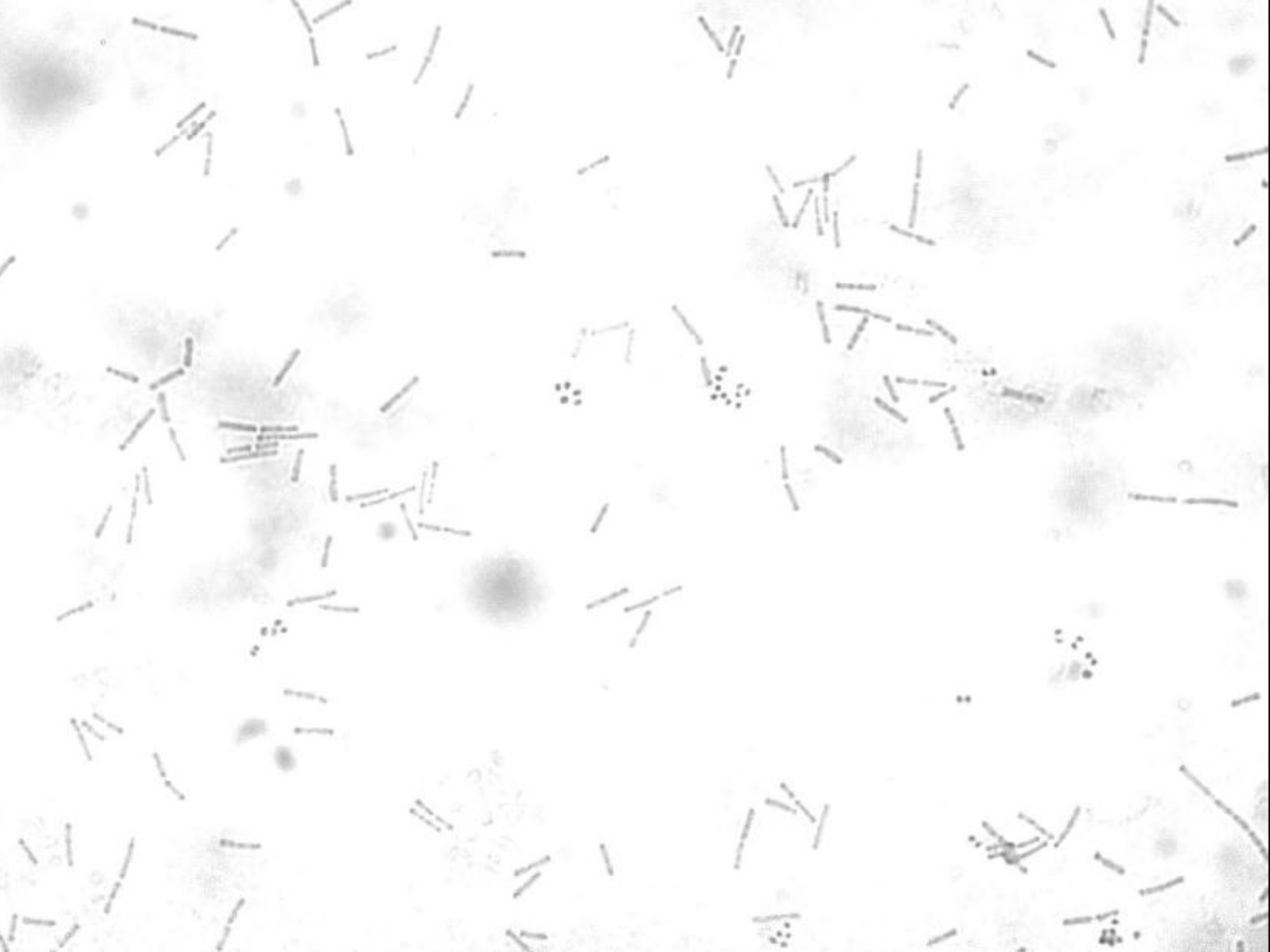
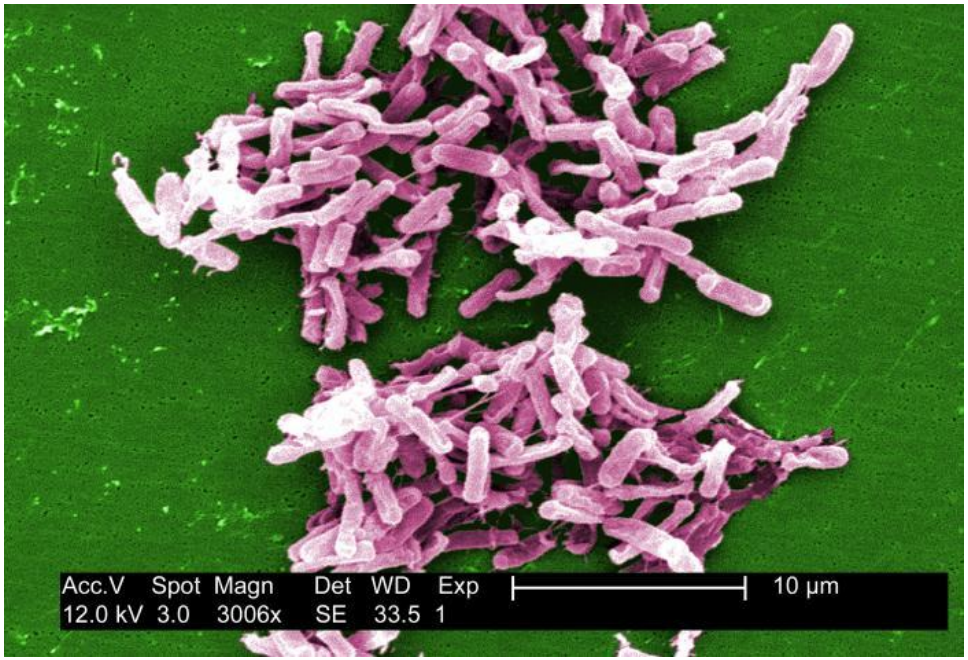


Future Studies

- Hamster studies to determine efficacy of this drug to prevent or treat *C.difficile* are needed.

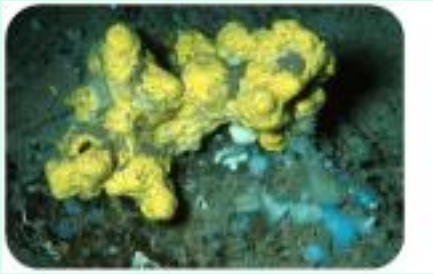
VS.



My Side Project

Screen extracts from sponge against *C.diff* for antimicrobial activity

Harbor Branch Video



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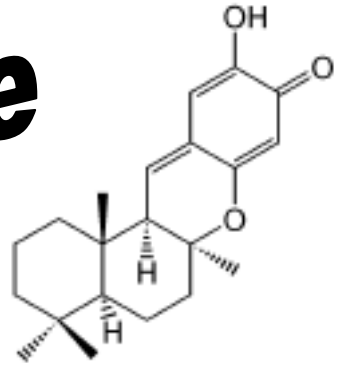

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