

# HOW FUNGI HELPED WIN THE WAR

*and why we need to stay as an ally!*

- The Allies focussed on a huge collaborative effort to mass-produce penicillin.
- By D-Day, 2.3 million doses were available to allied troops.
- During the Battle of Normandy the allies sustained 209,000 casualties, only 36,000 of these troops went on to die
- Penicillin saved an estimated 12-15% of lives, not to mention the amount of amputations it prevented.



- Germany focused their efforts on Sulfonamides, a German-born alternative to penicillin.
- During D-Day, Germans only had enough penicillin to "dust on open wounds".
- Out of 400,000 German casualties, over 200,000 went on to die. 3 times more Germans than allies died from their wounds.
- Many Germans believed the miracle drug was allied propaganda after their own failed attempts to culture the mould.



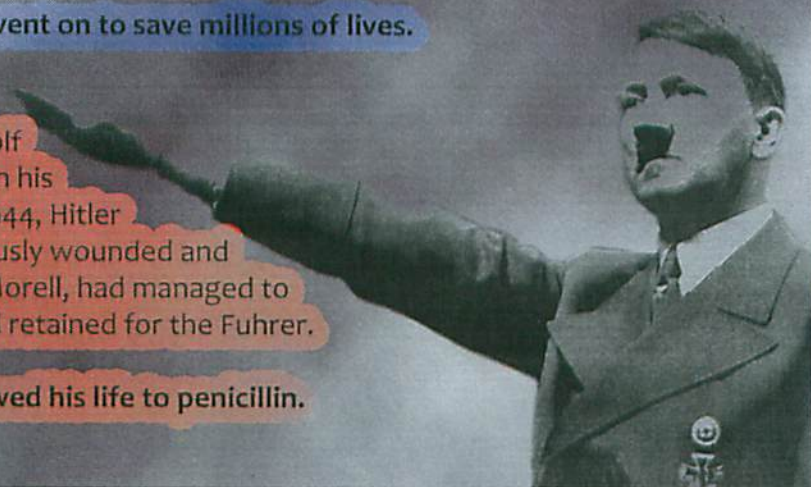
In 1928, Alexander Fleming was researching ways to destroy common bacteria. He was growing a culture of bacteria known as *Staphylococci* on agar plates, like the one pictured above. By pure accident, Fleming left the lid undone on one of these plates whilst on holiday. When Fleming returned he found that the plate had been contaminated by a fungus from the lab below.

As he was about to throw away the thought-to-be ruined plates, Fleming noticed that the area around the fungal growth was devoid of any bacteria. He hypothesised that the fungus had actually destroyed the bacteria.

**This hypothesis went on to save millions of lives.**

Despite his apparent popularity in Germany, Adolf Hitler still had many assassination attempts upon his life. During one particularly close call, July 20<sup>th</sup> 1944, Hitler was nearly killed by a bomb which left him seriously wounded and almost totally deaf. His personal physician, Dr. Morell, had managed to obtain intercepted allied penicillin which he had retained for the Fuhrer.

**Hitler himself was one of those millions who owed his life to penicillin.**

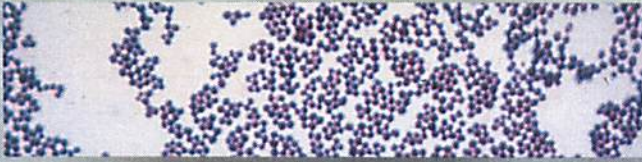




# A WORLD WITHOUT PENICILLIN

## How does penicillin work?

Bacteria use a substance known as *peptidoglycan* to build their cell walls. *Peptidoglycan* forms a mesh of many layers made from a mixture of sugars and amino acids. Penicillin is able to prevent the formation of bacteria cell walls by stopping the layers of *peptidoglycan* from joining together. It does this by binding to an important enzyme called DD-transpeptidase that is the key to forming the peptide cross links that join the layers together. Once penicillin is bound to this enzyme it can no longer do its job and the bacteria can't grow.



## Antibiotic Resistance

Due to the fact many bacteria can multiply in number extremely quickly, once they have infected a person they will quickly grow to a population of millions in size. Antibiotics like penicillin can usually deal with this infection, but every now and then a bacterium will mutate and grow a trait that makes it resistant to the antibiotics. Although this is a very unlikely event, because so many bacteria grow within such a short time it is almost bound to happen every now and then.

Antibiotic resistant diseases such as MRSA are already starting to cause problems for doctors, as there is no other medicine currently available that can treat the infection. Many of these diseases can be deadly if left untreated.



## How can we stop antibiotic resistance?

- 1) **Don't take antibiotics for viral infections** - Antibiotics will do nothing to stop a viral infection like a cold or flu. In fact, taking antibiotics without a bacterial infection will only destroy the healthy bacteria that live in our guts and other places in our bodies.
- 2) **Take the full course prescribed to you** - Even if you feel completely cured half way through the course given to you, there may be some bacteria left in your body that can start growing again to cause a secondary infection. These leftover bacteria are also more likely to be resistant to antibiotics.
- 3) **Never share antibiotics** - Only a doctor is able to decide which antibiotics are needed for the symptoms presented. Using inappropriate antibiotics has the same effect as attempting to use them to treat a viral infection.

## If we lose antibiotic cover...

If antibiotic resistant bacteria become more common than they already are, we may find ourselves in a situation very similar to how it was before penicillin was discovered.

In 1940, a police officer named Albert Alexander was one of the first people to ever receive penicillin as a treatment. He was suffering from septicemia (blood poisoning). His eye became infected and had to be removed, then his lung. He was close to death.

After being injected with penicillin his condition rapidly improved. His temperature returned to normal and he was able to sit up in bed. However, so little penicillin was available that the hospital staff had to recycle the remainders in his urine.

Eventually the staff ran out of penicillin. Albert's condition quickly worsened and less than a month later he had died.

So what horrible injury had caused Albert's death? A gunshot wound? A stabbing? A car crash?

Albert had been pricked by a rose thorn.

