

75 years of penicillin in people

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A scratch from a rose thorn while gardening. It's an easy injury to pick up even if you're being careful. It's annoying but no more than that. If that scratch were to be in your mouth, that would be unusual, unfortunate and maybe a little embarrassing.

But what if it gets infected? That's inconvenient – you'll have to go to your GP, who can prescribe an antibiotic that will soon clear things up. It's hardly life threatening.

Today, with a range of antibiotics available, we take for granted our ability to cure infections. Yet, it's only 75 years since a team of Oxford University researchers proved that penicillin could fight infections in people.

In December 1940, the story goes that Albert Alexander managed to scratch his mouth while pruning roses. The scratch became infected and in 1941 he was in Oxford's Radcliffe Infirmary with abscesses around his face.

In fact, there is no evidence for the rose thorn story. Instead, there is evidence that Albert, a police officer in Berkshire, had been sent to Southampton under wartime mutual aid arrangements between police forces. While there, he was injured when a bomb struck a police station.

However the injury was caused, what is undisputed is that he was admitted to the Radcliffe Infirmary with a painful and incurable infection. However, he was about to make a major contribution to the development of drugs that have saved millions of people.

From mould to medication

Two years previously, as Europe descended into war, a team in Oxford led by Dunn School head Howard Florey had begun work on penicillin. Since 1928, Alexander Fleming, who had discovered penicillin's antibiotic effects, had tried to interest scientists in researching how to purify, and thus derive products from, the mould.

Florey and Ernst Chain turned to penicillin as part of a comprehensive programme of research on antibacterial substances, began work on penicillin at Oxford. Chain soon extracted material that had antibacterial activity from penicillin cultures. Tests on mice showed that this antibacterial substance was not toxic.

Norman Heatley, whose plan to work in Denmark had been stymied by the outbreak of war, was brought into the team. He first devised the cylinder-plate diffusion technique that provided a reliable and sensitive assay for penicillin and that was later adopted as the standard assay for antibiotic activity. He then suggested a procedure for purifying penicillin extracting from organic solvents, in which penicillin was soluble, a stable salt that was soluble in water.

In the face of wartime shortages, the team turned their lab into a penicillin factory, first using bedpans and then specially-made pottery vessels designed by Heatley. Further experiments on animals confirmed penicillin's potential.

Penicillin into people

After many months of preparative work, the team accumulated enough stable penicillin to permit trials on people with normally fatal bacterial infections. On 12 February 1941, their first patient was Albert Alexander. He received an intravenous infusion of 200 units of penicillin.

The results were initially excellent. Within 24 hours, Albert Alexander's temperature had dropped and the infection had begun to heal. But then the penicillin ran short. The team extracted penicillin from their patient's urine to reuse it but after five days there was no more. Sadly, Albert Alexander relapsed and died on 15 March.

Penicillin into production

Further trials were more successful, but the key issue was generating a large enough quantity of penicillin. Florey and Heatley travelled to America, where they persuaded both US government and industry to

industrialise penicillin production. The target was to have penicillin available in sufficient quantities for the medical support to the planned invasion of Europe. By D-Day (6 June 1944), the allied armies were well stocked with [penicillin](#) to treat war wounds. On 15 March 1945, Penicillin could be made available over the counter in US pharmacies, although it would not be available to British civilians – as a prescription drug – until 1 June 1946, the year after Florey and Chain received a Nobel prize for their work.

Provided by University of Oxford

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