

Breakthrough cancer therapy destroys drug-resistant superbugs

Oliver Moody Science Correspondent

An experimental cancer drug has been found to kill superbugs and a range of deadly viruses from HIV to ebola.

Scientists say the compound holds promise as a "universal" flu treatment and wipes out infectious bacteria that have become impregnable to conventional medicines. It breaks down the machinery of viruses and cancers in damaged cells while leaving the rest of the body unharmed.

Early laboratory results have been so striking that a pharmaceutical company now plans to bring the therapy to the UK for a clinical trial against otherwise untreatable cases of HIV.

The US army is backing a project to use the drug as a last line of defence against viral epidemics such as ebola and to turn it into a weapon against antibiotic-resistant bacteria including MRSA and *E. coli*.

Known as AR-12, it was first discovered just over a decade ago by a scientist experimenting with the painkiller

Celebrex at Ohio State University. It quickly became apparent that the drug had powerful anti-cancer properties, and a clinical trial showed that it could be safely used in tablet form to treat solid tumours. It has also been approved in the UK for dealing with rare yeast and bacterial infections.

Researchers led by a team at Virginia Commonwealth University (VCU) have discovered that it targets a fundamental aspect of diseases, from mumps and measles to deadly bacteria.

It hits "chaperone" proteins, which act as mufflers to stop infected or cancerous cells from breaking down and ejecting the material they need to reproduce. When these proteins are broken up, the cells "eat" themselves to death through an innate stress response.

Writing in the *Journal of Cellular Physiology*, scientists showed that this mechanism worked against viruses of almost every type, including rabies, rubella, dengue and yellow fever. It also increased the survival rate of rabbits

infected with an ebola-like haemorrhagic fever from 30 per cent to more than 60 per cent.

A separate study showed that it not only killed off drug-resistant "super-gonorrhoea", which has spread around the UK over the last few years raising fears among doctors that it may be untreatable, but also weakened its defences against other antibiotics.

Drug-resistant "superbugs" have been identified as one of the most severe threats to society over the coming decades. The chief medical officer warned that they could "end modern medicine" by turning even routine operations into a dice with death.

These infections kill at least 10,000 people a year in the UK but that figure is projected to rise more than tenfold by the middle of the century if science does not find new ways to break down the bacteria's formidable shields.

The challenge will now be to turn AR-12 from a set of remarkable results in test tubes and animals into a drug that is safe and effective for humans to

use. Arno Therapeutics, the American company that owns the rights to the chemical, is planning its first clinical trial as an antiviral drug in Nottingham.

Professor Paul Dent, who has worked on the compound for more than ten years, said it hit viruses and bacteria at such a fundamental part of their make-up that it was highly unlikely they would be able to evolve any resistance. This property means it could also be a breakthrough against highly mutable viruses such as flu.

He said: "Lots of bits of the chaperones change throughout evolution, but the key bits of the chaperones have often stayed almost the same. The result is that AR-12 can nuzzle malaria just like it can do to bacteria."

The cancer clinical trial data suggest that AR-12 is safe to use, but there is still a chance that it could harm beneficial gut bacteria in the long run. Daniel Hawcutt, of the University of Liverpool, who was not involved in the research, said the side effects in the anti-cancer trial had all been relatively gentle.

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