

New antibiotics could come from a DNA binding compound that kills bacteria in 2 minutes

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(PhysOrg.com) -- A synthetic DNA binding compound has proved surprisingly effective at binding to the DNA of bacteria and killing all the bacteria it touched within two minutes. The DNA binding properties of the compound were first discovered in the Department of Chemistry at the University of Warwick by Professor Mike Hannon and Professor Alison Rodger (Professor Mike Hannon is now at the University of Birmingham). However the strength of its antibiotic powers have now made it a compound of high interest for University of Warwick researchers working on the development of novel antibiotics.

Dr Adair Richards from the University of Warwick said:

"This research will assist the design of new compounds that can attack bacteria in a highly effective way which gets around the methods bacteria have developed to resist our current antibacterial drugs. As this antibiotic compound operates by targeting DNA, it should avoid all current resistance mechanisms of multi-resistant bacteria such as MRSA."

The compound $[Fe_2L_3]^{4+}$ is an iron triple helicate with three organic strands wrapped around two iron centres to give a helix which looks cylindrical in shape and neatly fits within the major groove of a DNA helix. It is about the same size as the parts of a protein that recognise and bind with particular sequences of DNA. The high positive charge of the

compound enhances its ability to bind to DNA which is negatively charged.

When the iron-helicate binds to the major groove of DNA it coils the DNA so that it is no longer available to bind to anything else and is not able to drive biological or chemical processes. Initially the researchers focused on the application of this useful property for targeting the DNA of [cancer cells](#) as it could bind to, coil up and shut down the cancer cell's DNA either killing the cell or stopping it replicate. However the team quickly realised that it might also be a very clever way of targeting drug-resistant bacteria.

New research at the University of Warwick, led by Dr Adair Richards and Dr Albert Bolhuis, has now found that the $[\text{Fe}_2\text{L}_3]^{4+}$ does indeed have a powerful effect on bacteria. When introduced to two test bacteria *Bacillus subtilis* and *E. coli* they found that it quickly bound to the bacteria's DNA and killed virtually every cell within two minutes of being introduced - though the concentration required for this is high.

Professor Alison Rodger, Professor of Biophysical Chemistry at the University of Warwick, said:

"We were surprised at how quickly this compound killed bacteria and these results make this compound a key lead compound for researchers working on the development of novel antibiotics to target drug resistant bacteria."

The researchers will next try and understand how and why the compound can cross the bacteria cell wall and membranes. They plan to test a wide range of compounds to look for relatives of the iron helicate that have the same mechanism for action in collaboration with researchers around the world.

Source: University of Warwick ([news](#) : [web](#))

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