Bacteria on the Radio: DNA Could Act as Antenna By Brandon Keim 04.25.11 Wired.com

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Theoretical physicists have proposed an explanation for how bacteria might transmit electromagnetic signals: Chromosomes could act like antennae, with electrons traveling gene circuits to produce species-specific wavelengths.

It's just a hypothesis, and the notion that bacteria can generate radio waves is controversial. But according to Northeastern University physicist Allan Widom, calculations based on the properties of DNA and electrons square with what's been measured.

For a long time, there have been signals in water. Something is happening around a kilohertz," said Widom, lead author of a paper posted April 15 on the preprint website arXiv. "You have to look for natural energy levels in the system that would give you a kilohertz frequency. With the lengths of DNA and the mass of the electron, you get the right frequency range for these signals."

The original report of bacterial radio transmissions was made by French virologist Luc Montagnier, who in 2009 described how inductor coils wrapped around flasks of bacteria-enriched water and hooked to an amplifier detected signals in the 1-kilohertz range.

Montagnier's findings were greeted with considerable skepticism. Though his work linking HIV and AIDS had earned Montagnier a Nobel Prize, his observations of bacterial radio waves — on their own a novel, never-before-seen finding — were followed by even-more-radical descriptions of signals causing loose pieces of DNA to assemble into bacterialike structures. He also speculated about related "nanostructures" in water, which he linked to neurodegenerative diseases.

The claims were embraced by homeopaths, and Montagnier himself became involved in a dubiously designed clinical trial of autistic children. Eventually he left France to head a research institute at Jiaotong University in Shanghai, telling Science that he sought to escape the constrictions of intellectually fearful European scientists. "It's not pseudoscience. It's not quackery. These are real phenomena which deserve further study," he said.

Underneath all the controversy, however, are the original recordings of bacteria-enriched water. Widom considers them sound. The next question, then, is how bacteria produce electromagnetic waves around a 1-kilohertz frequency. In Widom's arXiv paper, he and other physicists calculate that as electrons flowed through loops of DNA in E. coli and Mycoplasma pirum, the species tested by Montagnier, they should generate wavelengths similar to what was recorded.

"Different species have different lengths of DNA" in their chromosomes, he said. "These lengths probably determine frequency."

Widom noted that electromagnetic radio transmissions were not in principle so different from electron transmission between bacteria connected by nanowires. Such bacteria have been described in recent years. Their nanowire-enabled transmissions may allow networked microbes to communicate.

is could be a wireless version," said Widom. "Bacteria that set up nanowires are, on an evolutionary scale, fairly old. It's occurred to me that more modern bacteria may use wireless."

Widom is especially curious about whether cells in higher life forms might also use electromagnetic signaling, perhaps in coordinating DNA code with protein-making cellular machinery. But as a theoretical physicist, he doesn't plan to investigate the phenomenon himself. That's for other researchers to do, Widom said.

"We're just saying that this gets you to the right frequencies," he said. "We're right at the very beginning."

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