

‘Electromagnetic signals are produced by aqueous nanostructures derived from bacterial DNA sequences’

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Montagnier and his colleague Lavalée observed that under certain conditions, biological fluids containing infectious microorganisms can still cause infection *after* being passed through filtration procedures designed to sterilise the fluid.

A fluid containing human white blood cells (lymphocytes) infected with a microorganism called *Mycoplasma pirum* was filtered through filters with either 100nm diameter holes or 20 nm holes; as *M. pirum* are 300nm in size they could not pass through and the resulting fluids (called filtrates) were apparently sterile.

However when this filtrate was mixed with un-infected human lymphocytes in conditions promoting growth, the blood cells became infected by *M. pirum* within 2-3 weeks. Similarly fluid containing HIV particles with a diameter of 100-120nm were not sterilised by 20nm filtration.

When investigating these filtrates it was also discovered that if they were diluted and agitated in a specific way, they emitted reproducible low-frequency electromagnetic waves referred to as electromagnetic signals (EMS). The authors suggest that when the fluid is diluted and agitated, new tiny structures might be created by an interaction between the original biological material and the water it is mixed with; if these ‘nanostructures’ are of a certain size, they are able to generate measurable EMS.

Fluids containing uninfected cells were used as a comparison (control) and the resulting filtrates did not produce electromagnetic waves, supporting the idea that EMS are generated by nanostructures derived from the disease-causing microorganism rather than the blood cells.

Montagnier’s paper describes his team’s ideas about the EMS and underlying nanostructures produced by some purified bacterial samples. The team found that DNA fragments from most pathogenic (disease-causing) bacteria were able to generate signals. Their suggested application of this discovery is the future development of highly sensitive detection systems for identifying chronic bacterial infections in both humans and animals.

Implications for understanding how homeopathic medicines work

Although homeopathy is not mentioned in this article, the discovery that biological materials can demonstrate electromagnetic activity at high dilutions is an exciting step towards understanding how homeopathic medicines at a similar level of dilution can have an effect on the body; **EM activity was demonstrated at dilutions from 10^{-5} to 10^{-12} which equate to homeopathic potencies from ~ 3c to 6c.** An EMS was not detected in most of the experiments using dilutions above 10^{-12} , so this paper cannot be related directly to how higher potencies might work.

Preparation of the filtrates in this study involved serial 1 in 10 dilution (i.e.1 part filtrate to 9 parts sterile water, repeated multiple times). Between each dilution the mixture was strongly agitated using a Vortex apparatus for 15 seconds. This mimics the serial dilution and ‘succussion’ processes used in preparation of homeopathic remedies very closely.

Homeopaths have always believed that it is the succussion which allows homeopathic medicines to be clinically active; this idea is supported by Montagnier’s work as his team found that the **diluted filtrates only generated EMS if they had been agitated using the Vortex apparatus during their preparation.**

Some general findings of these experiments

- EMS only occurred when the sample could interact with 'background' electromagnetic waves given off by the measuring apparatus, suggesting that the EMS might be triggered by interacting (resonating) with this electromagnetic 'background noise'.
- Filtration was an essential part of the process, suggesting that nanostructures from the original substance needed to be a specific size to generate EMS that could be picked up against the electromagnetic background noise.
- Changing the concentration of bacterial cells in the original sample had no effect on the size of EMS produced.
- The samples which produced EMS were mostly at dilutions from 10^{-8} – 10^{-12} . (Homeopathic medicines of the strength 6c are made from 10^{-12} dilutions.)
- EMS were unaffected by adding enzymes which destroy biological material to the filtrate. This showed that cell components (e.g. DNA, the similar molecule RNA, and proteins) were not generating the signal.
- No EMS were generated if the filtrate had been heated (70°C for 30 mins) or frozen (for 1hr at -20°C or -60°C) suggesting that nanostructures are destroyed by these processes.
- When a sample generating an EMS was left in a shielded container with an 'inactive' sample, 24hrs later neither sample gave off an EMS, showing that nearby samples can interact with each other. This phenomena was only noted between samples derived from the same bacterial species. Samples derived from different species did not demonstrate any interaction.

EMS readings of samples were recorded by different operators, in random order and in 4 different locations around the world. Results remained identical under these different test conditions.

Working out which part of the sample is the generating the signal

Steps were taken to identify which part of the bacteria was responsible for forming the nanostructures and therefore generating the EMS. This was done by repeating the experiment several times using different materials each time:

1. Material used: Dead but intact bacteria
Result: Same EMS still generated
Note: The bacteria were killed using diluted formaldehyde which damages the surface of the bacteria but not the internal DNA.
2. Material used: DNA extracted from the bacteria on its own
Result: Same EMS still generated
Implication: The EMS were produced by the bacterial DNA
3. Material used: Enzyme which destroys DNA is added to the filtrate
Result: Same EMS still generated
Implication: Nanostructures formed from the DNA are generating the EMS, rather than the DNA molecule itself generating the signal
4. Material used: DNA taken from E. Coli bacteria mixed with an enzyme which chops the DNA into small fragments
Result: EMS still generated
Implication: Either short sequences or rare sequences are generating the nanostructures rather than the whole DNA molecule

Comparing the ability of disease-causing and 'friendly' microorganisms to generate EMS

- Most disease-causing (pathogenic) bacteria and their DNA are able to produce EMS. (The bacterial DNA and whole bacteria appear to produce nanostructures of the same size and generate EMS at similar levels of dilution.)
- Most 'good' or 'friendly' bacteria and their DNA cannot produce EMS e.g. *Lactobacillus* found in the gut.
- Many microorganisms are only able to cause disease because they have the ability to physically attach themselves to body cells e.g. cells in the mucous membranes lining the nose and mouth. A protein called 'adhesin' enables *M. pirum* to attach to these cells. The piece of DNA containing the gene needed to produce this protein was isolated and found to produce EMS.
- EMS detected from different species of bacteria were similar in frequency. In the future it is hoped that by refining the experimental techniques and equipment, it may be possible to detect differences between the signals from different species of bacteria and even between different sequences of DNA.

As yet it is unknown whether only DNA sequences involved in disease generate EM signals, or whether DNA sequences involved in 'healthy' processes do this too. It is noted however that pathogenic microorganisms have evolved many methods of surviving hostile conditions.

EMS signals from human samples

The team has carried out further experiments showing that EMS are produced by the human body; plasma (the liquid portion of the blood) was taken from patients with various diseases, then DNA was isolated from this plasma. The results showed that both complete plasma and DNA extracted from plasma produced similar EMS. This was seen in samples taken from patients suffering from Alzheimer's disease, Parkinson's disease, Multiple Sclerosis and Rheumatoid Arthritis. The authors suggest that this indicates the presence of bacterial infections in these conditions.

Implications for homeopathy

According to homeopathic philosophy, symptoms of disease are produced when abnormal changes occur within the body's energetic fields. It is suggested that homeopathic medicines (carrying an 'energetic imprint' of the original substance they were made from) interact with the body on this energetic level, restoring the energy field to its original 'healthy' state. This in turn influences the body's biochemistry to reverse physical symptoms of the disease.

Discovering that EMS are produced both by highly diluted samples of external substances and by samples taken from the bodies of diseased individuals is an encouraging step towards a better understanding/verification of these philosophical concepts.

Viruses can also produce EMS

The team found that EMS were generated by viruses which do not contain DNA, but contain the similar molecule 'RNA' e.g. HIV, influenza virus A and hepatitis C virus. The level of filtration needed to create the nanostructures suggests that these RNA-derived nanostructures are smaller than those made from DNA.

What might these nanostructures be made from?

Until these nanostructures are identified as precise physical structures, their existence and properties will remain speculative. What we do know is that water molecules tend to 'stick' to DNA molecules and that under certain circumstances water molecules can form long 'strings'. Whether these phenomena are involved in the creation of nanostructures is just one of the many questions raised by this work which will keep research physicists and biologists busy for years to come.

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