

DIFFERENT VIEWPOINTS

A Note from the Editor:

The article "Microwaves Imitate Pesticides" is presented to stimulate discussion. It is authored by the director of a national support group for individuals with sensitivity to low levels of non-ionizing radiation (the Electrical Sensitivity Network¹), who contacted the RMQ requesting that their viewpoint be presented. While most of the past RMQ articles have been written by DOE technical staff involved in nuclear energy activities, the DOE does include arms which transmit energy of this kind and the RMQ is open to publishing differing perspectives.

The similarity between the effects of microwaves and those of pesticides may be coincidental or it might be a result of common interactions with enzymes that affect the transmission of nerve impulses. More research is needed to determine the mechanisms of action for both pesticides and microwaves.

¹ The Electrical Sensitivity Network is a national support and advocacy group for people with electrical sensitivity. Goals of the Network include: 1) assisting the ES in locating medical, legal, housing and EMF-reduction resources; 2) Idea-sharing on a regional basis; 3) informing the public about ES and health hazards of EMFs; and 4) encouraging development of EMF reduction technology. To achieve these goals, the Network is developing a resource directory with regional contact lists to help people find ES others in their area, and an international newsletter, *Electrical Sensitivity News*, to expand the networking and information exchange process.

MICROWAVES IMITATE PESTICIDES

by Lucinda Grant
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As director of the national support group Electrical Sensitivity Network, I have become very interested in why some people develop electrical sensitivity (ES), which means that they are ill when exposed to low-level non-ionizing radiation. The sources of electromagnetic exposure triggering symptoms in the ES include power lines, household appliances, computers, lighting, household wiring, and any of the various radio and microwave transmitting devices in our environment.

Several electrically sensitive (ES) patients have mentioned organophosphate pesticide poisoning as the specific event that led to their multiple chemical sensitivity (MCS) symptoms and subsequently to their being electrically sensitive. Although not all cases of ES report chemical exposure related to their ES onset, the MCS-related ES cases provide us with an interesting link to radiation health effects by understanding chemical effects. For example, a well-known health effect of organophosphate pesticides (Malathion, Parathion, etc.) is their ability to reduce the function of the body's cholinesterase enzyme.^{1,2,3,4} Cholinesterase is an important nervous system enzyme that prevents excessive accumulation of acetylcholine, a neurotransmitter.^{1,4,5} By inhibiting cholinesterase and thus causing an excess of acetylcholine, organophosphate pesticides overstimulate the nervous system, resulting in death in cases of acute poisoning.^{2,3,5,6} These pesticides are chemically related to the even more deadly military nerve gases, such as Sarin, which use the same mechanism of action – inhibiting cholinesterase.⁶

Symptoms of organophosphate poisoning include nausea, muscle weakness, memory and concentration problems, chest pain, breathing difficulty, headache, blurred vision, in-

creased sweating, etc.^{2,5,7} A recent ES survey reported the five most common ES symptoms as:

- confusion, poor concentration, and/or memory loss
- skin itch, rash, flushing, burning and/or tingling
- fatigue, weakness
- headache
- chest pain or heart problems.⁸

Of these five symptoms, all except the skin problems match the symptoms of cholinesterase inhibition from organophosphate pesticide poisoning.

Soviet research of electromagnetic radiation health effects in the 1960s and 1970s found that non-thermal electromagnetic field (EMF) exposures could produce effects similar to other toxins, such as chemicals and heavy metals.⁹ One consistent finding from the Soviet research was that when humans and animals were exposed to radio wave or microwave frequency, this radiation would inhibit cholinesterase, producing an excess of acetylcholine – the same effect as organophosphate pesticides.^{10, 11, 12} Some Soviet EMF researchers specifically pinpointed this enzyme effect as a significant factor leading to nervous system disfunction.^{9, 12, 13}

In a 1973 Soviet study, blood cholinesterase reduced to below 70% of pre-exposure levels in rats and rabbits exposed to the 30-300 MHz range at intensities of only .01mW/cm² or .0019mW/cm² for four months.¹³ According to the U.S. National Institute of Occupational Safety and Health (NIOSH), when organophosphate pesticide exposure results in a decrease of blood cholinesterase to less than 70% of the pre-exposure level, that exposure is considered unacceptable due to the health hazard.² A 1994 Soviet study by the Russian Institute of Cell Biophysics produced an average drop in brain cholinesterase to 70% of pre-exposure levels in rats after one 60-minute exposure to pulsed 880 MHz at 1.5mW/cm².¹⁴ Also, a U.S. government study conducted in cooperation with Soviet researchers in an effort to replicate Soviet findings discovered that microwaves of

2.45 GHz at .5mW/cm² intensity resulted in blood cholinesterase inhibition in rats exposed during three months for seven hours daily.¹⁵ This study confirmed prior Soviet accounts of non-thermal microwave health effects.

The importance of this enzyme effect in producing ES-type symptoms

from chemicals and from chronic, low-level EMF exposures leads to a mechanism of action for explaining many EMF-related health effects by using conventional medical and scientific knowledge of poisons. That radiation exposure at non-thermal, non-ionizing doses can produce the same effect as chemical poisons such as organophos-

phate pesticides provides sound evidence for a radiation poisoning effect. It also may explain why some MCS patients become ES, too, and why some ES patients also become MCS. The agents are different (chemical versus physical), but the effect is the same — inhibiting cholinesterase. ■

Table 1.— Limits for Maximum Permissible Exposure (MPE)¹⁶

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0.....	614	1.63	*(100)	6
3.0-30.....	1842/f	4.89/f	*(900/f ²)	6
30-300.....	61.4	0.163	1.0	6
300-1500.....	.....	.....	f/300	6
1500-100,000.....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34.....	614	1.63	*(100)	30
1.34-30.....	824/f	2.19/f	*(180/f ²)	30
30-300.....	27.5	0.073	0.2	30
300-1500.....	.....	.....	f/1500	30
1500-100,000.....	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Note 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

This table presents permissible exposures which can be compared to the test exposures cited in this article.

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