

# Lecithin enhances antimicrobial properties of the essential oil, eugenol

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Lecithin, a natural emulsifier commonly used in processed foods, synergistically enhances the antimicrobial properties of the natural essential oil, eugenol, but only when applied in very small quantities. The research is published in *Applied and Environmental Microbiology*, a journal of the American Society for Microbiology.

"This is the first time that [lecithin](#) has been shown to exhibit synergism in combination with a bioactive compound at a critical concentration," said corresponding author Federico M. Harte, PhD, associate professor of food science, Pennsylvania State University, State College, PA.

The research began serendipitously. Lecithin had been known to improve the physical stability of essential oils in aqueous systems, including eugenol, which is derived from clove.

"Our initial goal was to reduce the droplet size of eugenol using high pressure homogenization," said Harte. The purpose of shrinking the droplet size was to put each bacterium in contact with as many tiny eugenol droplets as possible. "In order to increase the antimicrobial power of eugenol, we thought it was better to have huge numbers of nanoscale droplets in contact with one bacterium than to have a single milliliter diameter droplet with only one point of contact with a bacterium," said Harte.

When they failed to squeeze the droplets down to less than 100 nm, "we decided to add a small amount of lecithin with the hope of creating even

smaller eugenol droplets," said Harte. (Emulsifiers reduce the size of droplets in target liquids.) At this point, the investigation seemed to go awry. Holding that size constant, they obtained antimicrobial activity that varied unpredictably, "suggesting high experimental error," said Harte.

From there, the investigators proceeded, keeping the eugenol content constant, while assaying different tiny amounts of lecithin, said Harte. These experiments demonstrated that at a critical concentration, lecithin synergistically increased eugenol's [antimicrobial properties](#).

The most obvious benefit from the research would be to use lecithin to boost the antimicrobial properties of natural components in foods, said Harte. More generally, "Our research shows that lecithin has bioactive properties that we have ignored until now. What are the consequences in terms of specific benefits or hazards for human beings is difficult to predict at this point."

Harte plans to investigate the potential of lecithin to alter the permeability of mammalian cells, research that he emphasizes is fairly basic, but which could ultimately lead to biomedical applications. One very interesting possibility would be to change the permeability of the [blood brain barrier](#), in order to enable passage of insoluble drugs. "But it's way too soon to make predictions," said Harte.

Provided by American Society for Microbiology

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