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Maggots in Medicine: Engineering the Perfect Critter

By Lila Abassi — March 24, 2016

Green bottle flies via
Visual Photos [1]

Medicinal maggots are experiencing a therapeutic renaissance [2] – specifically for wound healing. Using maggots in this way is not a novel process [3] – it goes as far back as the Mayan Indians and aboriginal tribes of Australia. However, the first documented use of maggots was during the early 1800's, when people in Napoleon's armies observed that some flies facilitated the mechanical removal of dead tissue and aided in the healing of wounds.

There is accumulating evidence [4] to suggest that maggots and their externalized secretions may also promote wound healing in stubborn, recalcitrant chronic ulcers. Indeed, reports that wounds that have been exposed to a maggot debridement (removal of dead tissue) therapy (MDT) also show earlier healing and closure. In addition, recent preclinical studies also indicate that the secretions from the larvae can promote important cellular processes, which are responsible for the observed benefits.

In a recent article [5], published in *BMC Biotechnology*, scientists from North Carolina State University, have been able to create a transgenic strain of *Lucilia sericata* (green bottle fly) larvae that expresses and secretes growth factors that promote wound healing. This proof of concept was built on well-established evidence that MDT is a safe and cost-effective tool to successfully treat wounds, promote healing and decrease infection.

Of note, the scientists observed that chronic wounds there had decreased concentrations of platelet-derived growth factor (PDGF) in comparison to acute wounds. This led to the idea of investigating whether they could successfully create transgenic maggots that express and secrete human PDGF, which they did.

PDGF [6] is a protein that regulates cell growth and division as well as the formation of blood vessels (angiogenesis). Specifically, PDGF stimulates fibroblasts (cells that aid in formation of scar tissue), smooth muscle cells and glial cells (cells that help protect nerves). This protein is made and stored inside granules which are found in platelets – tiny cells that help wounds to heal and

blood to clot.

Although this method has not yet been clinically tested, the authors argue that there is potential power in genetically engineering maggots to express various factors that are involved in wound healing and antibacterial activity. Growing maggots in the lab utilizing this technology is inexpensive, and there's already FDA-approved recombinant versions of human PDGF gene that is made by the bacteria *Escherichia coli*.

The clinical application of this technology would be invaluable, since chronic wounds [7] present a tremendous burden to the healthcare system, affecting roughly 5.7 million Americans with an estimated price tag of 20 billion dollars annually. The most common are seen in diabetic foot ulcers.

“A vast majority of people with diabetes live in low- or middle-income countries, with less access to expensive treatment options,” said Dr. Max Scott [8], a professor of entomology at NC State. “We see this as proof-of-principle study for the future development of engineered L. sericata strains that express a variety of growth factors and anti-microbial peptides with the long-term aim of developing a cost-effective means for wound treatment that could save people from amputation and other harmful effects of diabetes.”

If one can overcome the "creepy critter factor" and this method lives up to its full potential, maggot therapy could perhaps be the best treatment options available to deal with chronic, non-healing wounds.
