The Antimicrobial and Structural Effects of Essential Oils on Wounds in Rats Following Infection with Staphylococcus Bacteria

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The Topic

Wound healing with essential oils is a holistic technique that has been developed for many centuries all around the world. Traditional Chinese medicine (TCM) emphasizes that only the human body’s natural homeostasis will promote healing, and this balance is encouraged by the use of acupuncture and herbal medicines (Bhattacharya, 2012). The Egyptians are also an exemplary example of historic medicine using essential oils, for when inflammation or infection were detected the ancient Egyptians would apply concoctions of honey, lint, and grease to the affected area (Bhattacharya, 2012). Recently, scientists have been researching the affects of essential oils on wound care by conducting controlled experiments. One such experiment, conducted by Edwards-Jones, Buck, Shawcross, Dawson, and Dunn, investigated the effect of essential oils on antibiotic resistant Staph infection by using a dressing model; which showed an increased antibacterial effect of essential oils when compared to already common wound dressings (2004). The antibacterial effects of essential oils can become a medical asset to combat antibiotic resistant bacteria, and the natural healing capabilities can lead to expedited healing of any type of wound.

The Research Problem

Methicillin is an antibacterial agent used to combat a bacterial infection known commonly as Staph (Staphylococcus aureus), however a methicillin-resistant strain of Staph has recently arisen called MRSA (methicillin-resistant Staphylococcus aureus) (Edwards-Jones, Buck, Shawcross, Dawson, & Dunn, 2004). MRSA, commonly found in
untreated flesh or burn wounds, is a gram-negative bacteria that develops “tolerant strains” that are not affected by antibiotics (Reagor, Gusman, McCoy, Carino, & Heggers, 2002). Many scientists are actively trying to find some kind of topical agent to combat MRSA. In a study conducted by Al-Âni, Tawfik, and Shehab the antimicrobial properties of Grapefruit seed extract were evaluated against many bacterium, including *Staphylococcus aureus*. This study concluded that Grapefruit seed extract did exhibit some antimicrobial properties and could most likely be used as some type of topical antiseptic (2011). Essential oils possess antimicrobial effects, however, structural benefits have also been observed. Dursun, Liman, Özyazgan, Güneş, and Saraymen conducted a study that tested the role of thymus oil in wound healing, in this study rats were uniformly wounded and these wounds were dressed with thymus oil or a proven antiseptic. This study observed more new tissue in wounds treated with thymus oil, showing that essential oils can increase structural healing in a shorter time frame (2003). This thesis will investigate the antimicrobial and structural effects of essential oils in flesh wounds, in order to gain more knowledge on ways to combat antibiotic resistant bacteria.

**Deficiencies in the Evidence**

Dursun, Liman, Özyazgan, Güneş, and Saraymen assert that essential oils produce higher percentages of newly formed tissue than common antiseptics, or natural healing (2003). Other scientists found that natural healing with different light-related patterns did not effect the structural healing (Meszaros & Bigger, 1999). These studies support each other by showing that natural healing is less effective than healing with the addition of an essential oil. An investigation by Edwards-Jones, Buck, Shawcross, Dawson, and Dunn
(2004) “demonstrates the potential of essential oils as antibacterial agents” (p. 772). While a separate study, conducted by Reagor, Gusman, McCoy, Carino, and Heggers (2002), manifests the “effectiveness [of essential oils] against a wide range of bacterial biotypes is significant” (p. 325). Also a similar study, investigated by Al-Âni, Tawfik, and Shehab (2011), concludes, “aqueous GSE has a good antimicrobial effect, which makes it a good natural preparation for use as an antiseptic or disinfectant” (p. 341). All of these investigations acknowledge the antimicrobial effects of a wide range of essential oils, however each study is very broad in how the oils can be refined into an antiseptic or something that can be developed for public use.

**Definition of Terms**

- **Antimicrobial**: 1. Destructive to or inhibiting the growth of microorganisms. 2. An antimicrobial agent, as a drug.

- **Essential Oils**: any class of volatile oils obtained from plants, possessing the odor and other characteristic properties of the plant, used chiefly in the manufacture of perfumes, flavors, and pharmaceuticals.

- **Gram’s Method**: a method of staining and distinguishing bacteria, in which a fixed bacterial smear is stained with crystal violet, treated with Gram’s solution, decolorized with alcohol, counterstained with safranine, and washed with water.

- **Gram-Negative Bacteria**: Bacterium with two membrane layers. Of, or relating to the group of bacteria that lose the violet stain in Gram’s method and take the color of the red counterstain.

- **Gram-Positive Bacteria**: Bacterium with only one membrane layer. Of, or relating to that group of bacteria that retain the violet stain following Gram’s method.
Holistic: Medicine/Medical. Identifying with principles of holism in a system of therapeutics, especially one considered outside the mainstream of scientific medicine, as naturopathy or chiropractic, and often involving nutritional measures: holistic medicine.

MRSA: Methicillin-resistant *Staphylococcus aureus*, a bacterium that is highly resistant to methicillin, penicillin, and certain other antibiotics, and may cause infections of the skin, blood, lungs, etc.

Structural Effects: for the proposed study, any effects like tissue, blood vessel, dermis, and epidermis reformation.

Topical: Of, relating to, or applied externally to a particular part of the body; local.

**Purpose of the Study**

The purpose of this study is to develop a greater understanding of how essential oils can be used in topical wound healing, and what is the extent of the structural and antimicrobial properties they possess. A deeper understating of essentials oils in medicine can be used to combat antibiotic resistant bacteria, and can be used to help people all round the world heal more safely and quickly due to the vast structural benefits essential oils have in wounds. The primary field of study for this investigation is biology, specifically focusing on regenerative medicine. This study will be modeled from a study conducted by Dursun, Liman, Özyazgan, Güneş, and Saraymen where they uniformly wounded rats and designed dressing models of specific essential oils and compared these rats to rats treated with common antiseptics and rats not treated at all (2003). The dressing models used in this study will most likely be modeled from a study by Edwards-
Jones, Buck, Shawcross, Dawson, and Dunn where they combined the most effective combinations of essential oils with a common antiseptic to dilute it to make it more safe and applicable for an experiment with live animals (2004). Studying essential oils on wound healing will give scientific backing to the medicine of ancient times, and make medicine much more available to people all around the globe.
References


Potential Sources Bibliography


