Original article

Importance of Herbal Ointment for Pseudomonas aeruginosa infection in burn patients

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Abstract

Aim: The present study was aimed to investigate for preparing herbal ointment in order to treatment burned wounds and *Pseudomonas aeruginosa* infection.

Methods: Because of resistance of *Pseudomonas aeruginosa* to antibiotics and cost of health care to improve infection in burn Patients is increasing, hence we decided to review about 51 article considered more effective health care. This paper demonstrate that herbal medicine such as *Origanum vulgare*, *Zataria multiflora*, *Satureja khuzestaniea* and natural Honey can inhibit *pseudomonas aeruginosa* Infection in burn patients.

Results: Results of researches on *Origanum vulgare*, *Zataria multiflora*, *Satureja khuzestaniea* indicated that they have antibacterial activity against *pseudomonas aeruginosa*. This research demonstrated Minimum Inhibitory Concentration (MIC) of natural honey is 12.5-25% (ml/ml).

Conclusion: According to results of current research we hope in future are used drugs to the clinic with a wider range as a complementary therapy and also for burned infections.

Keywords: *Pseudomonas aeruginosa, Origanum vulgare, Zataria multiflora, Satureja khuzestaniea, Natural Honey.*

Introduction

Pseudomonas aeruginosa is an opportunistic gram-negative. In Cystic fibrosis, Chronic lung infections, Bronchiectasis, Neoplasia, Neutropenia, Diabetes, AIDS and burn patients, this bacteria cause acute infection (1,2,3). Pseudomonas aeruginosa have several virulence factors such as toxin, enzymes, flagella, LPS, Pilli, Alginate, Quorum sensing that enable suppress immune system (4). One of the most disadvantages of *Pseudomonas aeruginosa* is scar infection of burning (5).

Despite of scientific advances in burn Treatment, the burning is one of the major health problems in all over the world specially in developing counties (6,7). Annual nearly 2/4 million burn injuries occur world that 650 000 patients require to treatment. The 75 000 persons were admitted to the hospital and the burning level of over 25000 patients were 25%. Eight to twelve thousand people die each year from burn injuries which most of them are children and persons with 65 years age (8). This demonstrates the importance of increasing in the ability of the immune system against infections.

In 2000, Burns was responsible for the deaths of 238 million peoples around the world. In 2005, 2576 peoples in the Iran and in Tehran were exposed with burn infections and 406 peoples died (9). *Pseudomonas aeruginosa* is prevalence pathogen in Pseudomonas genus and most common bacterium in burn infection (10). During many decades the pattern of burn wound infection have changed. This may be due to the increasing use of antibiotics. *Pseudomonas aeruginosa* is the second common pathogen in Surgeries and the third pathogen in medicine (11).

In some works of literature, *Pseudomonas aeruginosa* is mentioned as prevalence bacterium in nosocomial infection (12,13,14). Deep and superficial burns are a rich protein area involves tissue necrosis which is a suitable medium for the colonization of microbes and their generations (15). Infection is one of the major health issues which caused to increasing time of hospitalism in the hospital, as well as increased mortality and the cost of nosocomial infection treatment (16). In 2006, Sharma et al demonstrate that 65% mortality in

burn patients is septic caused by wound infection (17). The morality caused by *Candida albicans* is 30-50%, by pseudomonas aeruginosa 20-30% and by staphylococcus aureus 5% (18). Recent researches from southwest of Iran confirmed that rate of admission and morality caused by burning is 13.4% and 4.6% between 100 thousand peoples annually (rate of morality 34.4% (19). In another study in Tehran the most common microorganism founded from wound infection was *pseudomonas aeruginosa* (20). Because of *Pseudomonas aeruginosa* resistant to a variety of new antibiotics,researchers are looking for new methods, such as herbal medicines for the treatment and prevention of infections caused by this bacteria.Since 1960 using of immunologic assay is one of important and essential assays, based on pathogenicity, virulence factor and new antibiotics (21).

Due to prevalence of β-lactamase in *Pseudomonas aeruginosa* and resistance to antibiotics, researchers proposed herbal medicine.According to World Health Organization (WHO) report, nearly 4 billion peoples (80%) utilize herbal medicine as part of treatment (22). This can reduce utilization of chemical drugs and their side effects (22). Many researchers studied and experimented diverse groups of plants for research based on the antibacterial herbs, for example *Origanum vulgare*, *Zataria multiflora*, *Satureja khuzestaniea*.Thyme and Satureja not only were utilized to traditional medicine but also it demonstrated that they have antimicrobial activity against fungi and contain phenolic component, Thymol and Carvacrol (23,24,25). Recently, antiviral, antibacterial, antifungal, and antiprotozoal effects were investigated from various species of *Satureja khuzestaniea* (26).

Esmaeili et al demonstrated that *Satureja khuzestaniea* had strong inhibitory effects against Multidrug-resistant strains of *Pseudomonas aeruginosa with MIC 80 µg/ml (27).*

Antimicrobial activity of *Satureja khuzestaniea*, basically is mainly because of phenolic components, Carvacrol and Thymol (28).

The essential oil of *Satureja khuzestaniea* was active against *Pseudomonas aeruginosa* in the range from MIC=0.5µg/ml which remarkably was exhibited higher activity relative to the referent antibiotics (29).

Objective: The present study was aimed to investigate for preparing herbal ointment in order to treatment burned wounds and *Pseudomonas aeruginosa* infection.

Method:

It is demonstrated that bactericidal effects of Carvacrol is like other phenolic compounds with increased permeability of the bacterial cell membrane to H + and K + ATP depletion and lead to bactericidal activity (30). Thymol is the main part of phenolic in Thyme, naturally and also Carvacrol is secondary phenolic component (31). Antibacterial activity of *Zataria multiflora* is because of Thymol and Carvacrol (32).

Antibacterial and antioxidant activity of *Origanum vulgare* including (menthapiperita, mentharotondipholia, menthapolgium and menthalongipholia) is proved (33,34).

Due to inhibitory agents such as peroxide, flavonoide and phenolic acid, the honeys have inhibitory effects against microorganism growth (35). Honey has osmotic effect which is undesired the medium by effect on active water (36,37,38). Furthermore materials like propolises paly antimicrobial role (39).

Recent researches on honey component by HPLC assay showed that honey has various antibiotics specially sulfonamides (40,41), tetracycline (42), non-carbonic materials (43) or Carbonic like ascorbic acid (44) or various tylosin (45).

Ointment is semi-solid form and contain one or more active ingredients dissolved or uniformly dispersed in a suitable base and any suitable excipients such as emulsifiers, viscosity-increasing agents, antimicrobial agents, antioxidants, or stabilizing agents (46,47). Preparations susceptible formulation for microbial growth, should contain a suitable antimicrobial agent in an appropriate concentration unless the preparations themselves have adequate antimicrobial properties (46,47).

The choice of a base for semi-solid dosage forms depends on many factors such as desired therapeutic effect, nature of the active ingredient(s) to be incorporated; the availability of the active ingredient(s) at the site of action, In many cases, a compromise has to be made in order to achieve the required stability (46,47). For example, a drug that hydrolyses rapidly is more stable in hydrophobic bases than in water-containing bases, even though they may be more effective in the latter (46,47)**.**

Results:

Results of researches on *Origanum vulgare*, *Zataria multiflora*, *Satureja khuzestaniea* indicate that they have antibacterial activity against *pseudomonas aeruginosa*.

Disadvantages such as irregular consumes of antibiotics, prevalence of resistant bacteria, expensive cost and etc help to honey to play a major role as treatment (48). Actually by increasing prevalence resistance bacteria, the cost of honey's antimicrobial activity is raised (49).

Mehrabian et al show that the most effective antibacterial honey against *pseudomonas aeroginosa* is Lorestan honey and Damavand honey respectively (50).
Zarabi et al founded Minimum Inhibitory Concentration (MIC) of natural honey is 12.5-25% (ml/ml) (51) which is similar to other researches showing this rate for honeys is in range 20-30% (52).
Natural honey with a concentration of 10% is effective on bacterial growth but with a concentration of 20% inhibited bacterial growth (53). Effects of Honey on Burn Wound Healing Process are demonstrated by Alizade et al (53).

Discussion:
Most studies on infections in patients who have suffered burns is on burn wound infections while urinary tract infections and blood fewer studies have been conducted.
In burn patient, due to the loss of the skin's protective barrier opportunistic bacteria is colonized and also wound burning is one of the main causes of nosocomial infections in these patients. The majority of these infections are caused by bacteria. The most important and the most prevalence of them is *Pseudomonas aeruginosa*.
Pseudomonas aeruginosa is resisting against various antibiotics and aseptic material that is one of the most important issues in all over the world.
With respect to importance *of Pseudomonas aeruginosa* in surgery and burn and also resistant of this bacteria against antibiotics and side effect of them, using of alternative materials is more common.
Origanum vulgare, Zataria multiflora, Satureja khuzestaniea and natural honey are involve of component can inhibit Pseudomonas aeruginosa.
Due to prevalence of burn infection and infections after surgery and also the key role of *Pseudomonas aeruginosa* in these infection and availability of herbal medicine like *Origanum vulgare, Zataria multiflora, Satureja khuz estaniea* and natural honey we will consider ointment constructed of mentioned component in the future.
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