

Research Article**Importance of Synthesis and Formulation of Innovation Ointment and Effect it Against *pseudomonas Aeruginosa* in burned Infection**Sepideh Hassanirad¹, Maryam Meskini² and Davoud Esmaeili^{2*}¹Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Chemistry, Pharmaceutical Science Branch, Islamic Azad University, Tehran, Iran (IAUPS)²Microbiology Department, Baqiyatallah University Medical of Sciences, Tehran, Iran**Abstract****Aim**

The present study was aimed to investigate for preparing innovation ointment in order to Inhibition of Burn Infection *Pseudomonas aeruginosa*.

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 36 article considered more effective health care. This paper demonstrate that natural products such as Potato, Probiotic Yogurt, *Saturejak huzestaniaea* and Chitosan can inhibit *pseudomonas aeruginosa* Infection in burn patients.

Results

Results of researches on *Saturejak huzestaniaea* and Probiotics indicate that they have antibacterial activity against *pseudomonas aeruginosa* and Potato is effective in burns patients wound healing.

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.

Key Words: *Pseudomonas aeruginosa*; Potato; Probiotic Yogurt; *Saturejak huzestaniaea*; Chitosan

Introduction

Pseudomonas aeruginosa, is a Gram negative pathogen found in soil, water, skin flora, and most man-made environments throughout the world, and lead to opportunistic infections in humans [1-2]. *P.aeruginosa* possess lipopolysaccharide (LPS), polar flagellum and pili which are responsible for fever, motility and adherence of the bacteria to biological cell membranes and virulence factors in burn patients [3-4].

In normal hosts, with a healthy epithelial barrier, *P. aeruginosa* rarely causes disease. *P.aeruginosa* is a common cause of nosocomial infections. Most of these are acute infections, including sepsis, ventilator-associated pneumonia, and infections in postoperative wound and burn patients. *P.aeruginosa* also chronically colonizes

Cystic Fibrosis (CF) patients, leading to severe pulmonary damage and death. *P.aeruginosa* has a large of secreted virulence factors that rely on specialized export systems, including the type I, II, III, and VI secretion systems [5-7]. The type III secretion system (T3SS) is thought to play a key role in the pathogenesis of acute *P. aeruginosa* infections [8].

For infection control medical practitioners, the implementation of prophylactic measures aimed at reducing the risk of nosocomial infection, and the use of treatments based on microbiological and pharmacological data, should be precedence [9-10].

Serious infections caused by *Pseudomonas aeruginosa* in patients with burns and remain the leading cause of mortality [11]. A 25-year review of bacteremia in burn patients revealed *P.aeruginosa* was etiological agent for bacteremia in these patients leading to 77% mortality [12]. Treatment of these infections is frequently complicated by antibiotic resistance [13]. The resistance of *P.aeruginosa* to many antimicrobial agents mainly occurs as a result of synergy between low outer membrane permeability, multi-drug efflux system and type 1 Amp C β -lactamase [14].

Beta-Lactam antibiotics such as cephalosporin's are widely used in Iran to treat a variety of infections, including serious infections of *P. aeruginosa*. Beta-Lactam resistance represents a serious problem in treatment of patients in Iran [15]. Because of drug resistance, we need new drugs efficiently as replacement therapy. Therefore, the uses of natural ingredients are recommended as a method to inhibit infection by *Pseudomonas* in burn wounds.

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Objective

The present study was aimed to investigate for preparing innovation ointment in order to Inhibition of Burn Infection *Pseudomonas aeruginosa*.

Method

Ointments are homogeneous, semi-solid preparations intended for external application to the skin or mucous membranes. They are used as emollients or for the application of active ingredients to the skin for protective, therapeutic, or prophylactic purposes and where a degree of occlusion is desired. Ointments are formulated using hydrophobic, hydrophilic, or water-emulsifying bases to provide preparations that are immiscible, miscible, or emulsifiable with skin secretions. They can also be derived from hydrocarbon (fatty), absorption, water-removable, or water-soluble bases. Hydrophobic (lipophilic) ointments are usually anhydrous and can absorb only small amounts of water. Typical bases used for their formulation are water-insoluble hydrocarbons such as hard, soft, and liquid paraffin, vegetable oil, animal fats, waxes, synthetic glycerides, and polyalkylsiloxanes [16]. In this work, we are going to extract from *Saturejak huzestaniae* by maceration by ethanol 80%. Then we extract starch from potatoes and combine with probiotic yogurt and chitosan. We intend to formulate the composition for greasy ointment, because of its greater durability at the wound site and dressing change intervals increased because dressing in a very short interval can be unpleasant for patients with burn wounds.

Potato

Since ancient times, the different materials used for dressing wounds, such as boiled potatoes peel [17]. In Keswani and Patil study, usage of potato peel in treatment of burns was recommend [18]. The potato dressings relieve pain, prevent the desiccation of the wound surface, with survival of superficial skin cells, and permit optimal regeneration of the epithelium [19,20]. Gore MA and Akolekar D, used boiled potato peel and banana leaf bandage with a topical agent consequently for the majority of patients, both products are tolerable, easily handling and less painful during every day dressing change [21]. Other potato ingredients that are effective, including steroidal glycosides (steroidal glycolalkaloids), exist in the boiled peel, and the fiber from sweet potato and this seems to be effective for absorbing exudates [22]. Potato peel does not seem to be antibacterial but some studies have used it applied in priority to other antiseptics, such as silver sulfadiazine [23].

Yogurt

Yogurt enhance wound healing by providing protein is essential. Fermentation products in Yogurt as Synbiotic may be inhibited the growth of microbial pathogens. Yogurt also contains vitamins and nutrients that accelerate wound healing and cause odor control infection. Topical *Lactobacillus plantarum* inhibited *Pseudomonas aeruginosa* colonization, improved tissue repair, and enhanced phagocytosis in burn wounds in mice [24]. Clinical studies on patients with second- and third-degree burns found that the application of *Lactobacillus plantarum* was as effective as silver

sulfadiazine in decreasing bacterial load, promoting the appearance of granulation tissue, and can cool burned wound [25]. Probiotics may also disrupt biofilms by regulating the levels of interleukin-8, a neutrophil chemo attractant, and thereby modulating the activity of neutrophils. A decrease in necrosis and apoptosis of neutrophils in the wound may allow for more effective phagocytosis and decrease the bacterial load, facilitating tissue repair [26,27]. One study showed that diet supplemented whit lactobacillus, reduced wound infection and increased serum albumin [28].

Chitosan

Natural polymers such as chitosan, collagen, elastin and fibrinogen are used in burns dressing because they are biocompatible and biodegradable and similar to macromolecules recognized by the human body [29,30]. Chitosan is a natural polysaccharide which is a potentially biologically compatible material that is chemically versatile ($-NH_2$ groups and various Mw). N-CarboxyMethyl Chitosan was used as biomaterial to heal deep second-degree burn wounds. The results demonstrated that the N, CMCS was efficient in accelerating wound healing via activating transforming growth factor- β 1/Smad3 signaling pathway [31]. The wound dressings of CMCS developed by Qin and coworkers evaluated for wound healing ability *in vitro* also displayed promising results [32]. An *in vivo* experiment to evaluate the wound healing effect of water soluble chitosan/heparin complex on the full thickness skin excision performed on the backs of the rat displayed that the complex is most effective in wound healing [33]. Chitosan has a great potential as a dressing for advanced wound therapy. Chitosan possesses not only hemostatic, biodegradable, bacteriostatic and non-toxic properties, but the present study confirmed its good bioadhesiveness and potential to provide, in combination with liposomes, sustained drug release, which is highly beneficial for wound treatment [34]. Useful formulation of novel wound dressing composed of chitosan (CH) film and minocycline hydrochloride (MH), for the treatment of intense burn wounds is $CH_{83}-MH_2-A$ that CHs with deacetylation degrees of 83% (mol/mol) [35].

Saturejak Huzestaniae

Satureja khuzestaniae is a native plant of southern Iran. The extensive research has been conducted on the antimicrobial properties of plants. Phenolic compounds of *Saturejak huzestaniae* and *Thyme*, such as Thymol and Carvacrol cause of anti-microbial and anti-fungal properties [36-38]. Carvacrol has antibacterial, analgesic, anti-inflammatory and anti-jerky effects [39]. *Saturejak huzestaniae* essential oil significant antimicrobial effects on bacterial and fungal agents include *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *C. albicans* is shown [40]. Recently research has been done on different species of *Saturejak huzestaniae* and investigated antibacterial and antifungal effects. In research of Esmaeili et al observed strong inhibitory effects of *Saturejak huzestaniae* against Multidrug-resistant strains of *Pseudomonas aeruginosa* with MIC 80 μ g/ml. The essential oil of *Saturejak huzestaniae* was effective on *Pseudomonas aeruginosa* in the range from MIC=0.5 μ g/ml and showed higher activity compared to reference antibiotics [41-44].

Discussion

Significant thermal injuries induce a state of immunosuppression that predisposes burn patients to infectious complications. All burns carry the risk of infections because bacteria can enter broken skin. Sepsis, or a bloodstream infection, can occur in the most severe cases. This can lead to shock or even death. Sharma et al concluded in their research that 65% mortality in burn patients is septic caused by wound infection and mortality caused by *Candida albicans* is 30-50%, by *pseudomonas aeruginosa* is 20-30% and by *staphylococcus aureus* is 5% [45,46].

Given the importance of the inhibition of *Pseudomonas* infection in burn wounds and drug resistance in the bacteria, the use of alternative medicines is essential.

Due to prevalence of burn infection and infections after surgery and also the key role of *Pseudomonas aeruginosa* in these infection and availability of natural ingredients like *Saturejak huzestaniaea*, Potato, Probiotic Yogurt and chitosan. We will consider ointment constructed of mentioned component in the future. These compounds are effective in *Pseudomonas aeruginosa* bacteria on the cell membrane and DNA and RNA. *Saturejak huzestaniaea* antibacterial effect is due to the presence of carvacrol, like other phenolic compounds, antibacterial effects of Carvacrol due to increased permeability of the bacterial cell membrane to H⁺ and K⁺ ATP depletion [47].

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