

# Soaks and compresses in dermatology revisited

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Soaks have been one of the traditional methods of treatment as evidenced by the use of potassium permanganate soaks dating to the late 19<sup>th</sup> century to treat an infection. Current practice advocates the use of various types of soaks in clinical practice, and it poses a tricky question to answer for a beginner.

## Condy's soaks

### History

The use of potassium permanganate dates back to the 1850s when Henry Bollman Condy advocated it as a surface disinfectant, water purifier and cleanser for infected wounds. It became popular as Condy's fluid.<sup>1</sup>

### Mechanism of action

1. Astringent: it draws water out of the cells leading to drying of oozy lesions.
2. It is an oxidising agent liberating nascent oxygen, responsible for its antibacterial and anti-fungal properties.<sup>2</sup>
3. Anti-pruritic and anti-inflammatory properties.

### Indications

1. Weeping lesions of dermatitis atopic dermatitis, allergic contact dermatitis or irritant contact dermatitis.<sup>3</sup>
2. Chronic leg ulcers—venous ulcers and diabetic ulcers.<sup>4</sup>
3. Oozing lesions of bullous disorders like pemphigus foliaceus or vulgaris.
4. Haemorrhagic crusts over the vermillion lip in Stevens-Johnson syndrome.
5. Condy's gargles may be used for the management of oral ulcers. However, extra dilutions are needed for mucosal surfaces to prevent irritation and paradoxical ulceration.

### Available form

Crystals are available in India and some companies provide 400 mg sachets of crystals. In the United Kingdom, it is available in the form of 400 mg tablets for dissolution, and liquid.<sup>3</sup>

### Storage

It is advisable to store it in a dry and airtight packet.

### Preparation of soaks

The preparation used for medicinal purposes is diluted to 1:10,000 which is usually achieved by dissolving 400 mg of potassium permanganate in 4 L of water.<sup>5</sup> However, in clinical practice an easy way to educate patients is to dilute the solution to reach a colour that matches the pink colour of ones nail bed [Figure 1]. Caution should be exercised that the bottom of container remains visible, i.e., the colour becomes hazy to semi-transparent due to dilution without any visible crystals. Some may even recommend a separate smaller container to dissolve the crystals, followed by pouring of stronger concentrate into the bucket/tub for soaking. This avoids crystals in the bucket as they settle in the smaller container. The contact time for soak solution should be <15 minutes as oxidation makes it ineffective.<sup>5</sup> There is no need to rinse with water at the end of procedure.

The soak maybe applied by dipping the affected area in the solution in a bucket or bath depending on the size and site of involved area. Extra care is necessary for genitals. Another effective method is the application of gauze swabs or clean cotton soft cloth folded in several layers soaked in Condy's solution on the affected areas, called Condy's compresses (preferably dipping/soaking the gauge piece every 3–4 minutes

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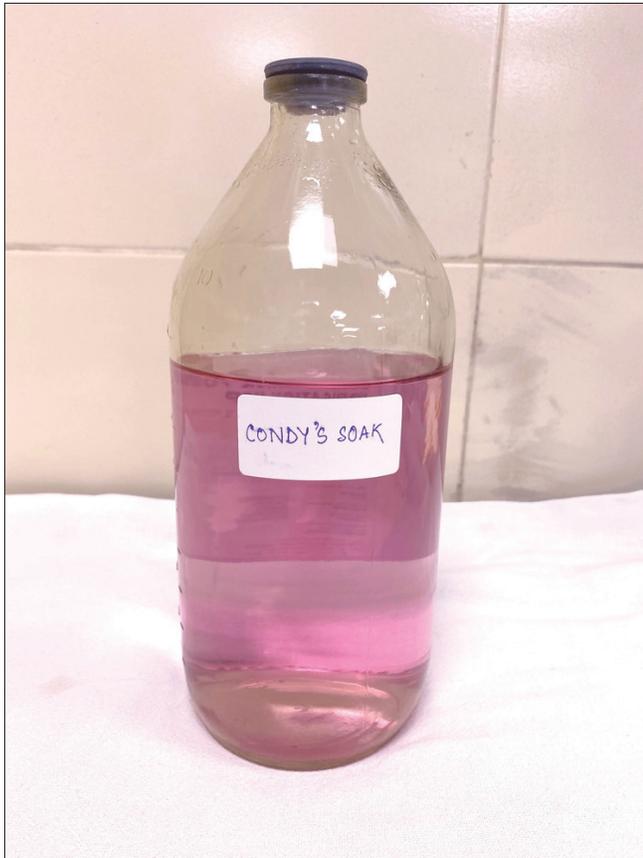
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for 10–15 minutes [Figure 2]. Yellowish-brown discoloration of the solution indicates its end of effectiveness.

**Side effects and their prevention**

1. It is corrosive and may cause burns; hence the extra precaution for dilutions and ensuring complete and uniform dissolution of the crystals [Figure 3]. Special care is needed to avoid its contact with mucosae.
2. Temporary skin and nail discoloration are common. Nails can be covered with paraffin to prevent this. Fresh stains over the skin can be removed by rubbing a damp tablet of vitamin C over the affected areas.



**Figure 1:** Freshly prepared therapeutic solution of Potassium Permanganate

3. Patients should be warned about the staining of fabrics and ceramic vessels/bathtubs.
4. This product must be kept out of reach of children as it is nephrotoxic and hepatotoxic if ingested.<sup>3,5</sup>

**Acetic acid soaks**

**Introduction**

Acetic acid is a synthetic carboxylic acid with antibacterial and antifungal properties. The natural food sugars are fermented by yeast to form alcohol, which subsequently transforms into acetic acid by *Acetobacte spr*. Though used for thousands of years as a food preservative, its activity against *Pseudomonas* was first demonstrated during World War-I.

**Pharmacology**

Glacial acetic acid (99.9%) appears as a clear colourless liquid with pungent smell. Though corrosive, it is non-toxic at concentrations  $\leq 5\%$ , as used in vinegar.<sup>6</sup> Acetic acid is liquid at ambient pressure and temperature, therefore, any preparation containing acetic acid is a liquid.

**Mechanism of action**

Undissociated acetic acid enhances lipid solubility, allowing accumulation of fatty acids on the cell membrane or other cell wall structures leading to the cellular death. Infected wounds have an average pH of 9; acetic acid being a weak acid lowers the pH thereby inhibiting bacterial carbohydrate metabolism, protease activity, and growth of microorganisms. It also improves tissue oxygenation and wound healing by decreasing tissue pH (Bohr effect).<sup>7</sup>

Acetic acid has good bacteriostatic activity against *Pseudomonas aeruginosa*, including multiple antibiotic-resistant strains. It also acts against other Gram-negative and Gram-positive bacteria, including *Staphylococcus aureus* (methicillin-susceptible and methicillin-resistant strains), and *Acinetobacter baumannii*.<sup>8</sup> It kills planktonic bacteria and eradicates bacteria growing in mature biofilms.<sup>9,10</sup>

**Advantages**

1. It has good antibacterial activity, not affected by organic materials such as cotton.<sup>6</sup>



**Figure 2:** Condy's compress being done for crusted erosions of pemphigus vulgaris



**Figure 3:** Potassium permanganate crystals causing ulcers on the dorsum of left hand (Image courtesy: Reviewer 1)

**Table 1: Commonly used soaks in dermatology and their preparation**

Name of Soak	Preparation	Uses
Hydrogen peroxide soak	Used as 2–3% solution of H <sub>2</sub> O <sub>2</sub> (readily available or prepared by dilution with normal saline). Soak the area for 5 mins.	<i>Staph. aureus</i> infected wounds. Deep wounds requiring debridement and orthopaedic interventions. Prior to skin graft for better graft uptake.
PUVA soaks	Dilute 8-methoxypsoralen in water to 2.6–3.75 mg/L. Bath for 15 mins and immediately irradiate to UVA or soak hands and feet for 15 mins, wait for 30 mins (for penetration) and irradiate.	Psoriasis, palmoplantar pustulosis, atopic dermatitis, vitiligo, pityriasis rubra pilaris, mycosis fungoides, others.
Atopic dermatitis—soak and smear	Soak in plain water for 20 mins followed by smearing of mid-strength to high-strength. Corticosteroid ointment.	Atopic dermatitis.
Eczema Bath	Bleach bath: Sodium hypochlorite 6% (½ cup in 1 bathtub) — soak for 5–10 mins. Epsom bath: Dead sea salt bath (magnesium-rich salt).	Atopic dermatitis. Extensive contact dermatitis. Air-borne dermatitis.
EUSOL (Edinburgh University Solution of Lime) soak	Mix 12.5 mg sodium hypochlorite, 12.5 mg boric acid in 1 L of water. Soak for 30 mins.	Chronic non-healing ulcer.
Saline soak	Swab soaked in normal saline is kept on the lesion for 10–15 mins. Warmed saline can be used for Sitz bath.	Crusted lesions at sensitive area—periorbital, perioral, face, and genital, hidradenitis suppurativa, pyoderma gangrenosum.

2. It prevents the development of drug-resistant strains of microorganisms in the hospital environment.
3. It does not affect the re-epithelialization of wounds unlike other antiseptics such as 10% povidone with 1% free iodine, 0.25% sodium hypochlorite or 3% hydrogen peroxide.<sup>7</sup>
4. It promotes wound healing in hypergranulating wounds.
5. Relatively inexpensive.

#### Indications

Acetic acid is approved for bladder irrigation and treating otitis externa as 0.25% and 2% solution, respectively. Its use in dermatology is as follows:

1. Infected wounds, especially when multi-drug resistant.
2. Local wound care in patients with pemphigus vulgaris.<sup>11</sup>
3. Chronic non-healing wounds, including hypergranulating wounds.
4. Reduces staphylococcal colonization in eczema/atopic dermatitis.<sup>12</sup>
5. Vinegar sock soak for tinea pedis/onychomycosis.<sup>13</sup>
6. Chloronychia.

#### Preparation of soaks

It is prepared by adding an appropriate amount of distilled water carefully into glacial acetic acid with adequate personal protection, to reach the target concentration of 1–5%. It is then stored in amber-coloured bottles, away from the light with an airtight seal. Evaporation has a negligible impact on its activity in first 24 hours.<sup>10</sup> Sterile gauze soaked in diluted acetic acid is applied over the wound for 15 minutes twice daily for 1–2 weeks. It can also be used as an irrigating solution or foot soak in necrotic wounds, particularly if associated with *Pseudomonas* or anaerobic flora. Patients may be instructed to prepare appropriate vinegar/acetic acid solution at home, instead of buying more expensive medical-grade acetic acid.

#### Side-effects and their prevention

Mild stinging and burning sensations are commonly reported. Chemical burns are reported after prolonged contact at concentrations >5%.<sup>14</sup> Thus, these solutions should not be used for a prolonged contact period for risk of cytotoxicity.<sup>11</sup> Precautions should be taken to avoid eye contact.

#### Other soaks

Multiple other soaks are used in dermatology for wound care and skincare as listed in Table 1.<sup>12–20</sup> Psoralen soak or bath followed by UVA irradiation called PUVA has multiple indications. It is essential for a resident to soak in this knowledge in detail from available guidelines.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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#### Conflicts of interest

There are no conflicts of interest.

#### References

1. Condy HB. Disinfection and the Prevention of Disease. 1st ed. London: Harrison and Sons; 1862. Available from: <https://archive.org/details/b22367287/page/4/mode/2up> [cited 7 June 2021].
2. Rai V. What is the evidence for the use of potassium permanganate for wound care? *Drug Ther Bull* 2020;58:71–4

3. Joint Formulary Committee. British National Formulary. 78th ed. London: BMJ Group and Pharmaceutical Press; 2019.
4. Delgado-enciso, Madrigal-perez VM, Lara-esqueda A, Diaz-Sanchez MG, Guzman-Esquivel J, Ross-Vizcaino LE, *et al*. Topical 5% potassium permanganate solution accelerates the healing process in chronic diabetic foot ulcers. *Biomed Rep* 2018;8:156–9.
5. British Association of Dermatologists. How to use potassium permanganate soaks. 2015 [online]. Available from: <https://www.bad.org.uk/ResourceListing.aspx?sitesectionid=159&itemid=7623> [accessed 7 June 2021].
6. Bjarnsholt T, Alhede M, Jensen PØ, Nielsen AK, Johansen HK, Homøe P, *et al*. Antibiofilm properties of acetic acid. *Adv Wound Care (New Rochelle)* 2015;4:363–72.
7. Agrawal KS, Sarda AV, Shrotriya R, Bachhav M, Puri V, Nataraj G. Acetic acid dressings: Finding the Holy Grail for infected wound management. *Indian J Plast Surg* 2017;50:273–80.
8. Fraise AP, Wilkinson MA, Bradley CR, Oppenheim B, Moiemien N. The antibacterial activity and stability of acetic acid. *J Hosp Infect* 2013;84:329–31.
9. Gao X, Jin Z, Chen X, Yu J. Advances in the progress of anti-bacterial biofilms properties of acetic acid. *Zhonghua Shao Shang Za Zhi* 2016;32:382–4.
10. Halstead FD, Rauf M, Moiemien NS, Bamford A, Wearn CM, Fraise AP, *et al*. The antibacterial activity of acetic acid against biofilm-producing pathogens of relevance to burns patients. *PLoS One* 2015;10:e0136190.
11. Grada A, Obagi Z, Phillips T. Management of chronic wounds in patients with pemphigus. *Chronic Wound Care Manag Res*. 2019;6:89–98.
12. Asch S, Vork DL, Joseph J, Major-Elechi B, Tollefson MM. Comparison of bleach, acetic acid, and other topical anti-infective treatments in pediatric atopic dermatitis: A retrospective cohort study on antibiotic exposure. *Pediatr Dermatol* 2019;36:115–20.
13. Kelly S, Liu D, Wang T, Rajpara A, Franano C, Aires D. Vinegar sock soak for tinea pedis or onychomycosis. *J Am Acad Dermatol* 2017;S0190–9622:32448–9.
14. Bunick CG, Lott JP, Warren CB, Galan A, Bologna J, King BA. Chemical burn from topical apple cider vinegar. *J Am Acad Dermatol* 2012;67:e143–4.
15. Lu M, Hansen EN. Hydrogen peroxide wound irrigation in orthopaedic surgery. *J Bone Jt Infect* 2017;2:3–9.
16. American Academy of Dermatology. Atopic dermatitis: bleach bath therapy, 2021 [online]. Available from: <https://www.aad.org/public/diseases/eczema/childhood/treating/bleach-bath> [cited 18 July 2021].
17. Hon KL, Tsang YC, Lee VW, Pong NH, Ha G, Lee ST, *et al*. Efficacy of sodium hypochlorite (bleach) baths to reduce *Staphylococcus aureus* colonization in childhood onset moderate-to-severe eczema: A randomized, placebo-controlled cross-over trial. *J Dermatol Treat* 2016;27:156–62.
18. Proksch E, Nissen HP, Bremgartner M, Urquhart C. Bathing in a magnesium-rich Dead Sea salt solution improves skin barrier function, enhances skin hydration, and reduces inflammation in atopic dry skin. *Int J Dermatol* 2005;44:151–7.
19. Lorrain SJ, Rettie T. The composition of EUSOL. *Lancet* 1916;187:1058–9.
20. El-Amawy HS, Sarsik SM. Saline in dermatology: A literature review. *J Cosmetic Dermatol* 2021;20:2040–51.