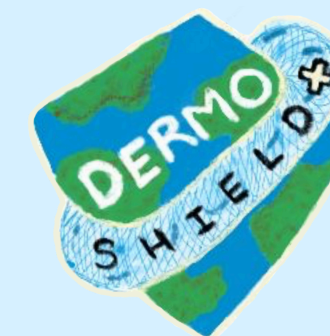


# DERMOSHIELD



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## Introduction:

Burns are complex and perhaps overlooked injuries, causing complicated immune and inflammatory responses that not only affect and threaten physical health but also mental well-being, requiring long-term care and affecting the quality of life.

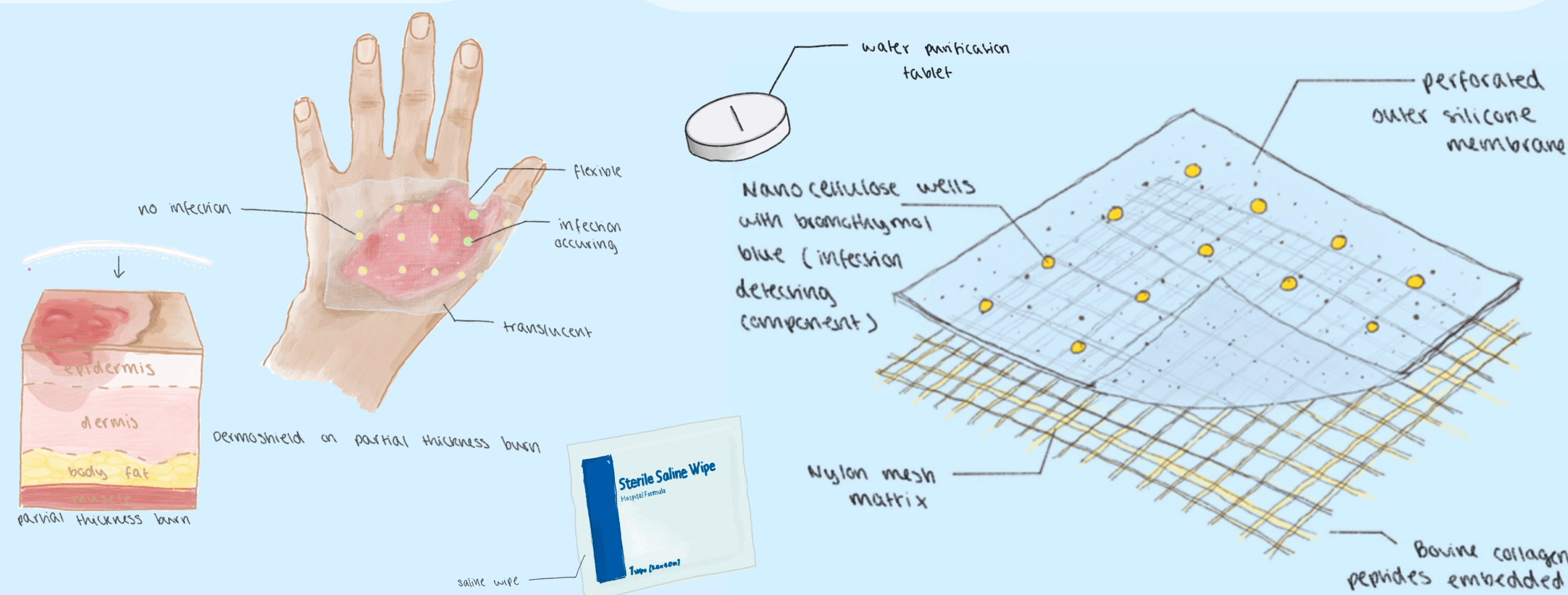
Globally, most of the morbidities associated with burn injuries are due to war and conflicts. War patterns are changing, marked by the recent developments in the world's political scene. More and more non-combatant civilians are being targeted in war and accounting for those killed or wounded, with an increasing case of these being a result of powerful explosive devices.

The focus of our project for the Global Health Prize is proposing a short-term relief to deliver as effective treatment as possible to partial-thickness burn wounds, which are typically the most common type of burn in war settings. These burns are also known as second degree or secondary burns, which affect the first and second layers of the skin (epidermis and dermis), followed by severe pain and risk infection. It takes into account the challenging conditions of a human-made disaster in refugee camps of displaced peoples, where resources are limited and antibiotic use is not readily available or cannot be safely regulated. It aims to promote skin regeneration with bovine collagen, using new nanocellulose technology as markers of infection which can improve the management of burn complications in these environments.

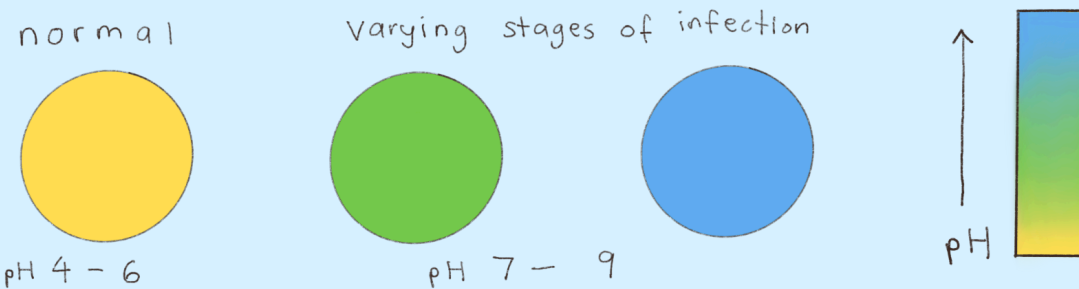
## Importance of Preventing Infection:

The most prominent cause of death is post-burn injury, although risk significantly decreases post-1st week so it is important to implement sterile measures during this time. Typically prophylactic antibiotics would be used in such situations to prevent future infection, but this is difficult to regulate in 3rd world countries- antibiotics may be inappropriately prescribed, over-prescribed or courses may not be completed. This leads to antibiotic resistance and therefore difficulty in preventing infections of resistant strains.

Instead, our mechanism allows for antibiotics to only be prescribed once an infection is detected through the bandage- this reduces the need for prophylaxis that can't be regulated. Therefore, infections can be treated but only when necessary when the bandage changes colour.



## pH Indicator:



## Our Product:

Our Dermoshield package contains a water purification tablet, saline wipe and Dermoshield skin substitute. Ideally, the wound would be irrigated with clean water, however in situations where this is not possible the surrounding skin should be cleaned with our provided saline wipe before the application of the Dermoshield patch. This dressing for burnt skin is comprised of an outer silicone membrane with nano-sized pores combined with infection-detecting nanocellulose material; the silicone layer performs as a temporary epidermal barrier, offering protection from bacteria, and the tight mesh of nanocellulose prevents microbes from entering the wound while simultaneously allowing gases and liquids to diffuse through, ensuring water balance which is vital to the healing of a burn wound. The infection detecting ability of our proposed solution is a result of the addition of bromothymol blue, a dye which changes colour from yellow to green/blue when the pH passes 6.5 and the wound is infected. Bacteria in the wound increase the pH of their surroundings to fit their optimal growth and damage the skin's acid mantle, thus affecting the pH of the wound. The healing properties of Dermoshield lies underneath, comprised of a nylon matrix with bovine collagen peptides embedded within it. The collagen peptides reduce pain and stimulate enhanced recovery of the damaged skin tissue by encouraging deposition of new tissue and fibres in the wound bed.

## Clinical Trials:

Conducting clinical trials may be difficult due to ethical concerns in animal testing or gaining consent to use an untested method on burns. However, ideally:

Test product on pig skin (closest to human skin in nature) to eliminate risks of toxicity or side effects.

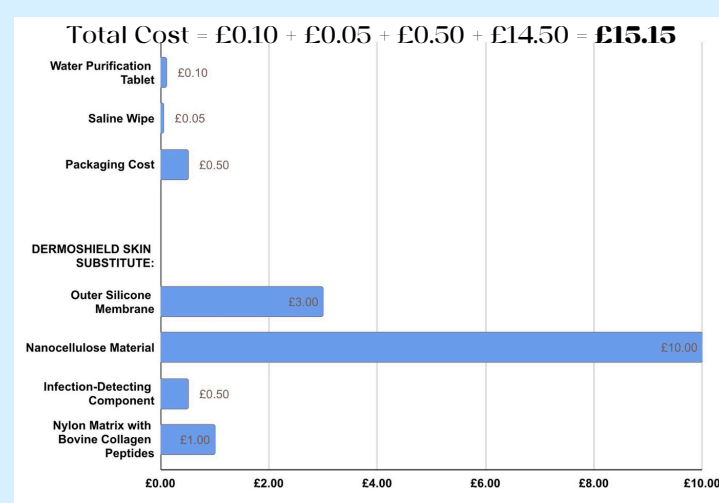
Test in highly controlled clinical environments on adult human burns of similar thickness- use prophylactic antibiotics, and monitor regularly as an inpatient.

Trials can be continued on varying thicknesses of burn and paediatric patients, although remaining within 1st/2nd degree burns. Remain in a controlled clinical environment.

Meanwhile, the product's ease of application can be tested by volunteers speaking varying languages and of varying ages to test ease of application- should be conducted on people without burns to ensure no damage is done from incorrect application.

Amend packaging based on feedback.

Following success in all stages, roll out to refugees/displaced persons in war zones with continued monitoring of use/success for years to come. Amend as necessary based on data.



## Affordability:

Additional Strategies to Reduce Costs:

1. Bulk Purchasing: Buying in larger quantities often reduces the per-unit cost.
2. Negotiating with Suppliers: Establishing long-term contracts can result in discounts.
3. Government Subsidies: Governments can provide subsidies or grants for companies developing innovative healthcare solutions, which can significantly reduce production costs.
4. NGO Funding: NGOs offer grants and funding programs to support healthcare initiatives, especially in underserved regions, providing essential financial support.

## Psychological Impacts:

During such a physically painful incident, it is natural for burn victims to feel distressed, anxious and easily startled, especially due to the uncertainty of how to treat it and fear of medical expenses and accessibility. Our product allows for a quick, simple and easily accessible treatment solution, without the huge cost of hospital care, which may also not even be available. This will eminently lessen the emotional impact on patients as the stress of how to treat the burn will be relieved. Furthermore the easy detection of infections means that help can be received when necessary as soon as possible, further lowering stress on how to manage the after effects of the burn.

## Application:

1. To cleanse the burn, the damaged area must be irrigated with water. This is where the water purification tablet and saline wipe are implemented.
2. Open the patch carefully and make sure to maintain sterility.
3. Place it over the burn and make sure it is covering the full surface area while applying slight tension to ensure there is no wrinkling.
4. The product is kept on for around 2 weeks or until cell proliferation and migration eventually cause the Dermoshield patch to lift naturally, leaving a healed epithelial surface.
5. Monitor the wells for any colour change over the treatment process which would indicate an infection - take the necessary steps if observed.

## Ethics:

- Religious Implications: The use of an animal-based dressing has been discussed with representative religious leaders of all major faiths, who have confirmed that it is acceptable since it is for medical usage.
- Animal Testing: There are undoubtedly animal welfare issues due to the nature of the product revolving around burns, however animal testing is the current standard in most clinical trials, and therefore must be used.