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Original Research Article

TREATMENT OF HUMAN SKIN BURNS THROUGH USING TILAPIA SKIN

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***Abstract*:** *Burns are medical conditions that are the fifth major reason behind non-fatal and adult injuries due to compulsiveness and a lack of risk calculation ability. 1.2 In Pakistan, 2500 children suffer serious burns that necessitate medical attention each year, with 15,000 requiring hospitalizations. The WHO (World Health Organization) has revealed in the reports that child burn mortality is greater (seven times) in countries with low and middle-income backgrounds compared to those with high incomes. Polypeptides of varied molecular weights were discovered in MCPs. These MCPs come from Nile tilapia's skin with the help of enzyme-aided hydrolysis, with polypeptides with a molecular weight smaller than 5kDa accounting for 99.1 percent of the total. The key molecular conformations within MCPs were casual coil, according to FTIR. The MCPs application was done in the quantity of 50g/ml. The treatment significantly affected scratch closure in an in vitro scratch assay. MCPs improve wound healing in child burn skin with a deep partial-thickness scald wound. As a result, it was concluded that the MCPs derived from Nile tilapia's skin have promising wound care effects and results*.

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Introduction

Burns are becoming more common as the speed of life quickens, and people's lifestyles change, and burns cause significant economic issues and irreversible damage to patients and their families. Various medications, for example, silvery sulfadiazine and mafenide acetate solution, have been used in burn treatment. Although these medications have several significant drawbacks, including adverse side effects, ill-performed treatments lead to deep burn wounds and visible scarring, and the final cost is high. Developing new effective agents for treating burns is still required to fulfil the urgent demands. Marine fish, sponges and molluscs have all been found to have collagen. Fish tissues like scales, bones, and skin form at least 30% of marine processing waste (Costa *et al*., 2019). The hydrolysis is performed using chemicals or enzyme catalysts of marine collagen; it leads to the production of marine collagen and its peptides. MCPs are known to process minor molecular weights than marine collagen, making them more readily absorbed and having high water affinities. MCPs from marine fishes vary appreciably from those from the terrestrial cattle in each physicochemical house. Different combinations of amino acid chains and their features hold amazing roles in physiology and holding properties like antioxidant, anti-hypersensitive, antibacterial, antioxidant, antihypertensive, neuron protective, and anti-skin-getting old activities, mainly because of the unique climate in the marine ecosystem. It includes highly saline, low temperature and high-pressure conditions (Dias *et al*., 2019). Peptides from marine collagens from the skin of the organism Chum Salmon (*Oncorhynchus keta*) were found to improve wound healing of the cutaneous layer along with angiogenesis in the animal rats when given orally. Recently, collagen nanofibers were created from electrospun tilapia that can potentially speed up injury curing in a rat model quickly and effectively. However, to our knowledge, only a few studies have investigated the healing properties of tilapia collagen peptides. We formerly said that collagen solubilized in acid was efficiently extracted and characterized from its skin and pores (Lima et al., 2021). Burns are the world's 5th common cause of children's non-fatal injuries, with partial thickness burns accounting for most cases. The most popular etiologic element is scalded, with flame burns coming in second. Additional risk factors for burns in paediatric patients include improper parental control, child mistreatment, poor quality, crowd, and lack of

awareness among family head`s children (Ge*et al*., 2020). The foundation of burn care in children is infectivity avoidance and the support of a humid wound setting. For external biased width wounds, complete healing can take 7 to 14 days, while profound dermal burn can take up to 4 to 6 weeks. Creams with Ag (silver), natural dressing such as anion membranes, allograft skins of human origin and xenografted are among the treatment options. Other options include silver-containing dressings, semi-synthetic and artificial dressing, enzymatic debridement, and surgery. The Nile tilapia is a member of the Cichlidae family and is native to East Africa's Nile River basin. Generally, it is found to be present in tropical and sub-tropical areas. The food and Agriculture Organization says it is the most popular in Brazil and comes on 4th globally (Hsieh *et al*., 2020). It has been found from previous research experiments that they made use of techniques like FTIR, SDS PAGE, CD and DSC to draw a comparison between Collagen soluble in acidic conditions and the pepsin enzyme, which was soluble in collagen and had been extracted through tilapia skin. Using the self-aggregating properties of collagen, a new dressing o the material hydrogel was getting much attention when it was developed. PSC hydrogel structure and rheological properties were studied at different PSC concentrations. By cell examination and mouse experiment models, the ability to repair and belter the skin and the cytotoxicity role of collagen hydrogel dressings got assessed. Our research provides straight verification and foundational data for using collagen from marine sources as wound dressings in the healing of refractory wounds (Coppola *et al*., 2021).

Materials and methods

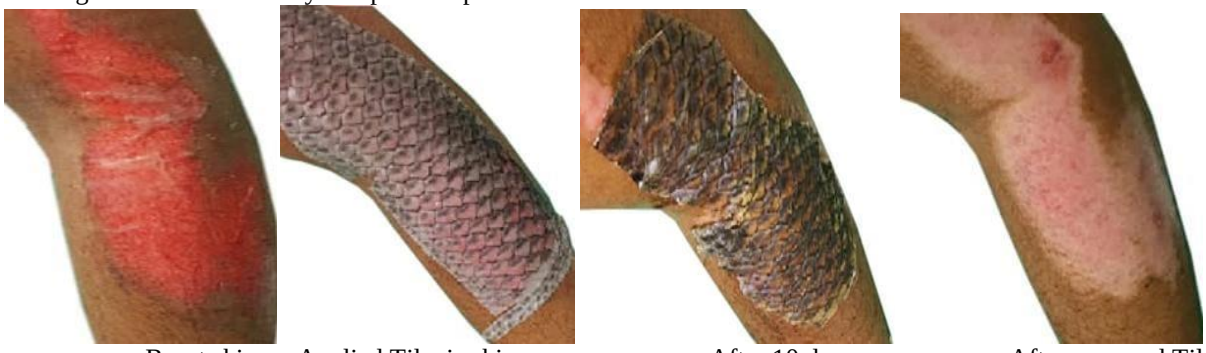
The skin samples of Tilpia fish were obtained from the Manawan Research Centre, Lahore. The skin was stripped off to remove any blood or other contaminants and cleaned using water after the fish were slaughtered. The skin taken off was then put in an isothermal packaging and sent to a lab. Their remaining muscle`s skin is removed, then cut into 10.0 and 5.0cm sections, washed in a saline solution of concentration 0.9% and kept to a clean and sterile trunk. It was subjected to a rather dilute (2%) chlorhexidine gluconate solution. This was done for 1 hr. In the next step, the taken-off skin was placed with a solution of 75% glycerol and 25% salinity. It was kept there for 60 minutes, and now it was cleaned with a saline solution of concentration 0.9% and transferred to non-diluted glycerol. It was in rubbed and massaged for 5mins. While sit was immersed within 100% glycerol, the skin is centrifuged for 4 hours at an RPM of 15 and room temp. It's then wrapped and kept at 4°C in a plastic bag that was double enveloped for future use. The skin may be kept in sterile refrigerated packaging for up to two years. Gamma irradiation at 30 kGy on a Cobalt 60 Multi-use Irradiator is the final step in the sterilization process. Microbiological testing was done on each sample to check for bacteria and other microbes. A young boy with scalds on his left arm was taken to a burn care centre. The Lund and Browder map was used to measure the participation of 18 percent of TBSA in external biased width burns. The scalds occurred at home due to the younger boy accidentally coming into touch with hot boiling water. Later the boy was transferred to the hospital for around two hrs. Hemodynamically, the patient remained healthy. There were nocomobidites, current drug usage, or a history of allergies to any item or material. The tilapia skin was prepared for application after receiving approval from the local Institutional Re-examine Board and a legal letter seeking permission from the guardian before being used on him it was cleaned in a sterile solution of 0.9% salinity for a period of 5mins, and the procedure was done there three times in a row. To ensure that subsequent movement in the first days of treatment does not lead to uncovering any region of the bum, at least 1 cm of healthy skin in the wound borders and at least 1 cm of superposition between skin pieces are both needed. The patient was given 0.5 mg of midazolam and 30 mg of ketamine for anaesthesia. After washing the burn with 2% chlorhexidine gluconate and removing the blisters, the tilapia skin was put on the left arm (a necessary step to enable a high degree of exposure between the wound bed and the biological biomaterial). The left arm was treated with 1% silver sulfadiazine cream, which is still used as a regular treatment by almost all Pakistan burn centres (the problem of tilapia pores skin attachment on the one's regions changed into expected because of the pores and skin folds). Finally, complete insurance of popular dry gauze and bandage was carried out to the completely burned region.

Results and discussion

The patient's vital signs and health conditions were monitored every 6 hours and remained stable. The entire day, gauze and bandage of the left arm were examined and checked to see if the exudates were present or not and if obvious improvement’s need, but it was not found. It was reported that Analgesia was achieved by injecting the drug dipyrone in the amount 150 mg intravenously. It was monitored during the first 48 hours for every 6 hrs. Additional analgesia was not required after assessing the younger boy and the activity and his comfort. Every day, the neck and face area dressings were manufactured using 1% silver sulfadiazine cream (Lima *et a*l., 2019). The patient has been given anaesthesia a small (0.5) midazolam dose and a Ketamine dose of 0 mg for almost a week (6 days). After that, the dressing of fish skin got to be opened and examined for the first time. The skin of the tilapia adhered in a promising manner to the burn. Silver sulfadiazine is used to replace this portion and the gauze and bandage. The dressing was removed

on the tenth day of treatment to assess the wound`s appearance. The tilapia pores and skin become dried out. It was later sloughed off because later when it became hard. The underlying affected person's pores and skin in a few areas. Researchers knew full re-epithelialization occurred when the biomaterial detachment from wound borders revealed healed underlying patient skin. The tilapia skin could be removed when the detachment of the fish skin biomaterial from wound borders was important. The dressing removal was an easy and painless procedure requiring no analgesia or anaesthesia. Later the patient was allowed to shower after the wounds were soaked in water.

The tilapia skin weakened, cracked, and slipped due to the hydration process, revealing the repaired skin beneath. After ten days of therapy for his superficial partial thickness burn, which included full re-epithelialization, the patient was released from the hospital. There was no recorded negative side effect (Stoica *et al*., 2020).



Burnt skin Applied Tilapia skin After 10 days After removed Tilapia skin, wound has healed

Later from the tilapia skin ASC and PSC collagen were isolated, and the self-meeting properties of collagen were exploited to make one wound dressing of the material hydrogel containing 10 mg/ml of PSC. Hydrogels generated have expected community structure, adequate mechanical strength, a mild water maintenance ratio, and no cytotoxicity. In animal research, the collagen hydrogel dressing has proven to speed up recovery drastically. Collagen hydrogel dressing, compared to industrial products, can resource within the formation of epidermal layers and the maturation of pores and skin appendages. This shows that a collagen hydrogel dressing crafted from tilapia pores and skin might be produced as a singular and powerful wound dressing for deep-diploma burn wounds (Costa *et al*., 2019). An exterior partial thickness burn on a younger boy patient was successfully treated with tilapia skin as a xenograft in this case study. Tilapia skin adhered effectively to where the burn was found and was free of antigenicity and toxicity, allowing for thorough wound healing. Further research, we believe, must enable advanced, affordable, readily accessible, simple and better biomaterials to emerge as a viable choice in the healing arsenal for paediatric scalds, with substantial societal along with economic implications designed for our healthcare system (Hu *et al*., 2019).

Conflict of interest

The author declared absence of conflict of interest.

References

Coppola, D., Lauritano, C., Palma Esposito, F., Riccio, G., Rizzo, C., & de Pascale, D. (2021). Fish waste: from problem to valuable resource. *Marine Drugs*, **19**(2): 116. DOI: https://doi.org/10.3390/md19020116

Costa, B. A., Duete, Ú. R., Lima Júnior, E. M., ... &Bezerra, L. R. P. S. (2019). Neovaginoplasty for radiation-induced vaginal stenosis using Nile Tilapia Fish Skin as a biological graft.*Journal of surgical case reports*, **2019**(11):311. DOI: https://doi.org/10.1093/jscr/rjz311

Costa, B. A., Lima Júnior, E. M., de Moraes Filho, M. O., Fechine, F. V., de Moraes, M. E. A., Silva Júnior, F. R., ... & Rocha, M. B. S. (2019). Use of Tilapia skin as a xenograft for pediatric burn treatment: a case report. *Journal of burn care & research*, **40**(5): 714-717. DOI: https://doi.org/10.1093/jbcr/irz085

Dias, M. T. P. M., Júnior, E. M. L., Alves, A. P. N. N., Bilhar, A. P. M., Rios, L. C., Costa, B. A., ...&Bezerra, L. R. P. S. (2019). Tilapia fish skin as a new biologic graft for neovaginoplasty in Mayer-Rokitansky-Kuster-Hauser syndrome: a video case report. *Fertility and Sterility*, **112**(1):174-176. DOI: https://doi.org/10.1016/j.fertnstert.2019.04.003

Ge, B., Wang, H., Li, J., Liu, H., Yin, Y., Zhang, N., & Qin, S. (2020). Comprehensive assessment of Nile tilapia skin (Oreochromis niloticus) collagen hydrogels for wound dressings. *Marine drugs*, ***18***(4): 178. DOI: https://doi.org/10.3390/md18040178

Hsieh, C. M., Wang, W., Chen, Y. H., Wei, P. S., Liu, Y. H., Sheu, M. T., & Ho, H. O. (2020). A novel composite hydrogel composed of formic acid-decellularized pepsin-soluble extracellular

matrix hydrogel and sacchachitin hydrogel as wound dressing to synergistically accelerate diabetic wound healing. *Pharmaceutics*, **12**(6): 538.
DOI: https://doi.org/10.3390/pharmaceutics12060538

Hu, Z., Yang, P., Zhou, C., Li, S., & Hong, P. (2017).Marine collagen peptides from the skin of Nile Tilapia (*Oreochromis niloticus*) Characterization and wound healing evaluation. *Marine drugs*, **15**(4): 102. DOI: https://doi.org/10.3390/md15040102

Lima Júnior, E. M., de MoraesFilho, M. O., Costa, B. A., Fechine, F. V., Rocha, M. B. S., Vale, M. L., ... & de Moraes, M. E. A. (2021). A Randomized Comparison Study of Lyophilized Nile Tilapia Skin and Silver-Impregnated Sodium Carboxymethyl cellulose for the Treatment of Superficial Partial-Thickness Burns.*Journal of Burn Care & Research*, **42**(1): 41-48.
DOI: https://doi.org/10.1093/jbcr/iraa099

Lima-Junior, E. M., de MoraesFilho, M. O., Costa, B. A., Fechine, F. V., de Moraes, M. E. A., Silva-Junior, F. R., ...& Leontsinis, C. M. P. (2019). Innovative treatment using tilapia skin as a xenograft for partial thickness burns after a gunpowder explosion. *Journal of surgical case reports*, **2019**(6):181.
DOI: https://doi.org/10.1093/jscr/rjz181

Stoica, A. E., Chircov, C., &Grumezescu, A. M. (2020). Hydrogel dressings for the treatment of burn wounds: an up-to-date overview. *Materials*, **13**(12): 2853. DOI: https://doi.org/10.3390/ma13122853