

ABSTRACT 07

Evaluation of Sterilisation and Disinfection Methods of Halal Biodegradable Collagen Scaffolds from Bovine Tendon for Wound Healing Applications

Munira Shahbuddin¹, Fasyiezha Asyrien Abdul Hamid¹, Hashem Abdulwali¹, Charfaoui Badaoui Mohamed¹, Dahlia Shahbuddin²

Objectives: Collagen scaffold is an excellent biomaterial for skin regeneration and wound healing that facilitates the restoration of tissue after an injury. The physiochemical properties of the scaffold are important to determine the outcome of the closure and the re-establishment of tissue integrity. Sterilisation of collagen scaffold is critical and important to wound healing. Methods of sterilization such as gamma irradiation and ethylene oxide often require additional equipment and chemicals, which can be costly and not widely available. High temperature, humidity and exposure to chemicals alter collagen scaffold integrity and compromise its biological activities. The study aims to provide an optimized method and conditions of sterilization and disinfection of collagen scaffold using UV radiation and ultracold temperature. **Methods:** We used readily available UV radiation from the fume hood and ultracold freezer used in the extraction and fabrication process for sterilization and compared the effects on the collagen structural integrity using SEM and bioactivities against fibroblast cells. **Results:** Sterility tests found that our method of extraction and production of collagen scaffold which involved freeze drying and ultracold storage inhibited the growth of microorganisms thus safe to be used for clinical trials. Although in vitro studies showed no cytotoxicity effects on all treated samples, microscopic observations using semi-electron microscopy (SEM) and cell culture media analysis showed that the collagen scaffold physico- and mechanochemistry were altered with UV sterilisation. While all treated samples did not show any cytotoxicity effects, the pH of cell culture media showed that the UV sterilised scaffold was less acidic than the other treated samples. Interestingly, we observed that the non-UV-treated samples influenced the migration of fibroblasts from the polystyrene surface into the scaffold. **Conclusion:** The knowledge in materials-cell interactions is critical to the physiological outcome of healing and regeneration.

Keywords: sterilisation, wound healing, collagen scaffold, tissue engineering, ultracold storage

1. Department of Chemical Engineering and Sustainability, Kuliyah of Engineering, International Islamic University of Malaysia, Jalan Gombak, 53100 Kuala Lumpur.
2. School of Biological Sciences, Universiti Sains Malaysia, 11900 Gelugor, Pulau Pinang, Malaysia.

International Journal of Human and Health Sciences Supplementary Issue 01, 2025

DOI: <http://dx.doi.org/10.31344/ijhhs.v9i10.800>

Correspondence to: Munira Shahbuddin, Department of Chemical Engineering and Sustainability, International Islamic University of Malaysia, Jalan Gombak, 53100 Kuala Lumpur, Malaysia. Email: munirashah@iium.edu.my