

PMMA FORMULA MODIFICATION THROUGH THE PREINFILTRATION AND INFILTRATION TIMES TO CREATE OPTIMAL PRODUCT FOR IMMUNOHISTOCHEMISTRY STUDIES

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Approximately 185,000 amputations are performed in the United States annually. The current standard of care for limb loss patients is the suspension-type attachment of an exoprosthesis to the residual limb. However, it is not suitable for all amputees. Patients often experience discomfort and pain, even when they have been successfully fitted with suspension-type attachments. It is for these patients that the Percutaneous Osseointegrated Docking System (PODS), an alternative docking system, are being developed. PODS devices are titanium alloy (Ti6Al4V) implants that use host bone to anchor the implant into the medullary canal of an amputated limb. During development, embedment of prototype PODS device in polymethyl methacrylate (PMMA) allows sectioning, staining, and evaluation of the body's histological response to the device implantation. Various PMMA formulas are being used in different laboratories throughout the country, with mixed results. These formulas are not suitable for immunohistochemistry (IHC) studies as they often generate high temperature during polymerization which causes degradation of cellular and protein structures. This project focuses on identifying the preinfiltration and infiltration times needed to produce and replicate an optimal PMMA product by modification of an existing formula (Technovit 9100 NEW kit). This optimal PMMA product will exhibit less heat during polymerization in the shortest amount of time and allow successful preservation of cellular structures for IHC studies.

Nine groups of three specimens will be embed with the Technovit 9100 NEW kit (Energy Beam Sciences, East Gran by CT). These groups are randomly assigned to various combinations of preinfiltration and infiltration times (flowchart). The embedment process of each combination is then measured and recorded. The specific combination that polymerize the fastest will be identified by the integrity of the embedded sample. The best PMMA embedment with the least amount of polymerization time and sample damage will be identified and replicated for validation of the process. We anticipate the optimal PMMA product will be produced by the two hour preinfiltration time and two hour infiltration time combination. This optimal PMMA product will exhibit fast low temperature polymerization and allow successful preservation of cellular structures for IHC studies.



