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# Physicochemical characterization of barrier membranes for bone regeneration

LABORATORY TESTS

180


## ABSTRACT

In the case of tissue and/or bone defects, the use of a barrier membrane is essential in order to achieve an optimal guided regeneration. Various kinds of membranes are available and they are normally classified based on their different origin or degradation patterns and, consequently, different mechanical properties and clinical behaviours can be expected. As it is important to know the specific properties of the different types of membrane, so to identify the more suitable one for each clinical situation, the aim of this study was to evaluate the physicochemical and mechanical properties of various barrier membranes. Physicochemical properties were evaluated in terms of tension, stiffness, absorption ability, pH and wettability. For the purpose of the study, fifteen membranes of different origin were selected and divided into biological or synthetic origin and grouped in natural allogenic collagen, natural xenogenic collagen, cross-linked collagen and synthetic membranes. Among the membranes, OsteoBiol® *Lamina* (Porcine) (Tecnoss®, Giaveno, Italy), OsteoBiol® *Evolution* and OsteoBiol® *Lamina* (Equine) were tested. All types of membrane had a stable pH after the absorption test, in which porcine-derived barrier membranes showed an increased absorption capacity reaching a plateau in most cases after 4min. All membranes demonstrated similar low tension and low stiffness, especially after 4-min hydration, except for bone laminas that showed a greater stiffness and a high tension withstand particularly in a dry status. Porcine origin membranes had greater hydration; wettability was also superior in porcine-derived barrier membranes and showed a faster absorption of the drop on the rough surfaces.

## CONCLUSIONS

Bone laminas offer good physicochemical features to be used in regeneration techniques that demand a stiff membrane. On the other hand, the low stiffness, high resistance to rupture and high elasticity of porcine pericardium membranes makes them suitable for regeneration techniques in which membrane needs to be fixed and withstand tension. It is challenging to transfer these data to the clinical practice as barrier membranes might behave differently in biologic fluids or when they are degraded. More studies closer to clinics regarding adsorption, integration and degradation of membranes are needed to understand their crucial behavior in the regeneration process.



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