

PREPARATION OF PLLA MEMBRANE FOR GUIDED BONE REGENERATION

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Conflict of Interest (COI) of the Principal Presenter : No potential COI to disclose

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Purpose

A variety of bone transplant materials have been developed and used for alveolar ridge augmentation. However, the conventional guided bone regeneration (GBR) membranes were difficult to give a free three-dimensional form and do not have sufficient mechanical strength. In this study, various thermoplastic membranes for GBR were prepared from Poly(L-lactic acid) (PLLA) of different molecular weights. The mechanical strength of the membranes and the cell proliferation on their surfaces were examined. Following application of PLLA membranes onto the parietal bone of rabbits, bone formation was evaluated histologically.

Materials

• PLLA membrane

- ① The molecular weight 100,000 (PLLA Mw:100,000, LACTEL, USA)
- ② The molecular weight 380,000 (PLLA Mw:380,000, Boehringer Ingelheim, GERMANY)

• Control

- ③ PLGA membrane (GC membrane^R, GC, Tokyo)
- ④ Titanium mesh (Jeli Ti mesh^R, pore size: ϕ 1.48–1.51, ProSeed, Tokyo)

Preparation of PLLA membranes

① 8wt% PLLA Mw:100000

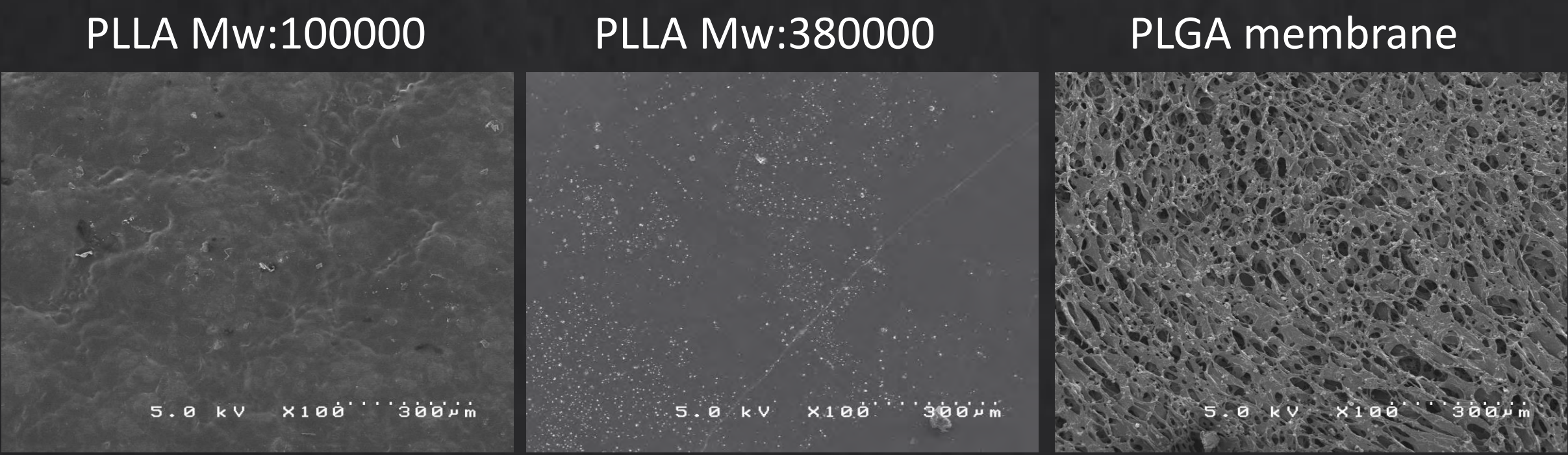
② 4wt% PLLA Mw:380000



Results

• Surface analysis of membranes

SEM micrographs

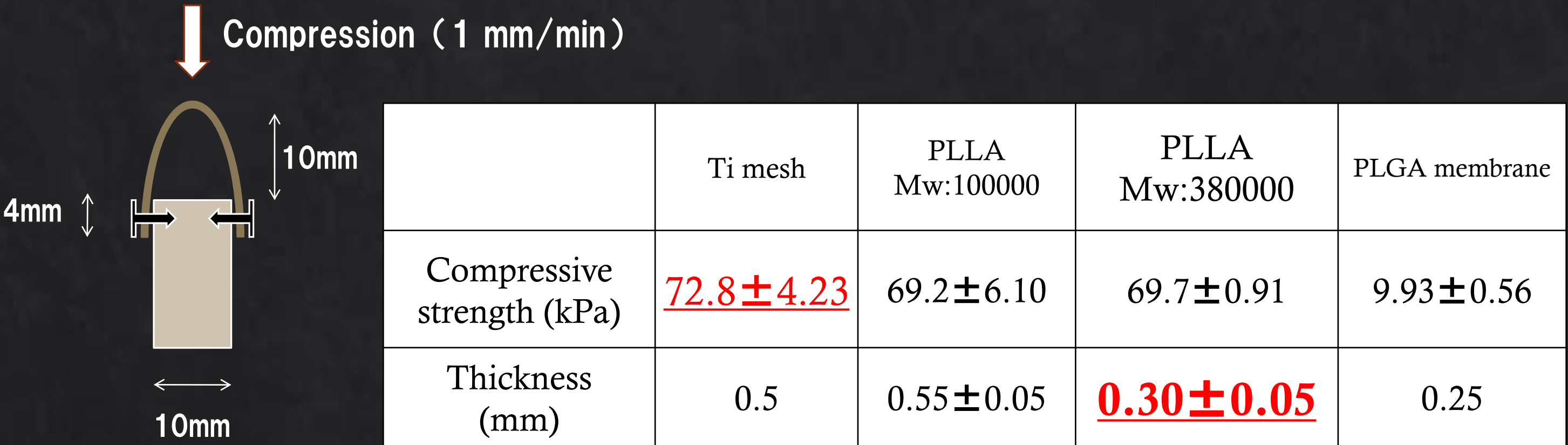


rough surface with a wave-like structure

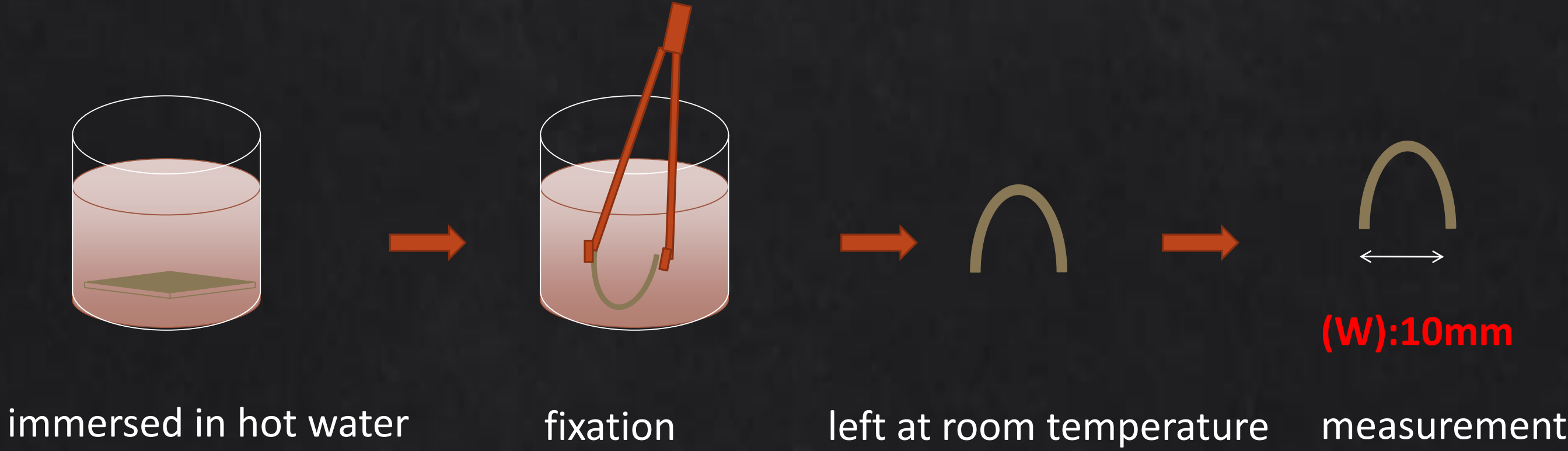
smooth

microporous network structure

• Compression test



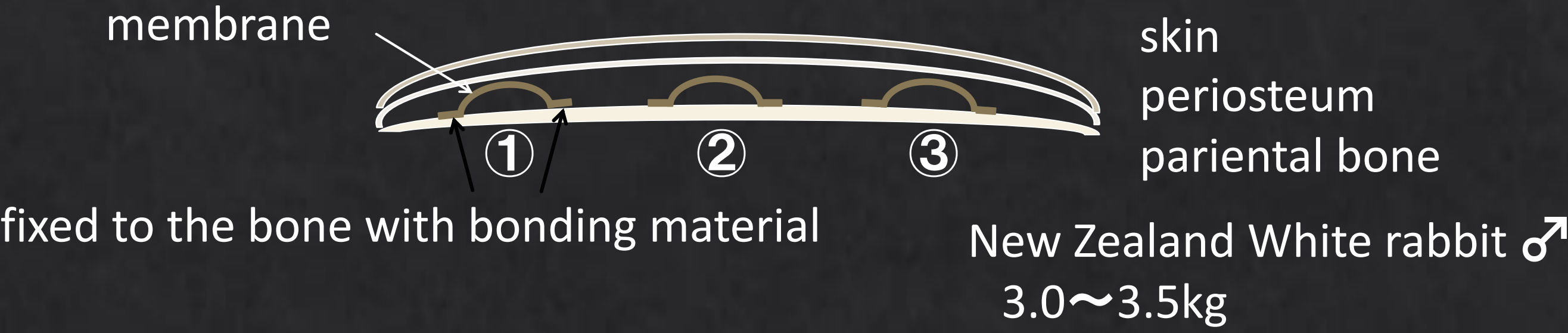
• Temperature and time to form the PLLA membrane



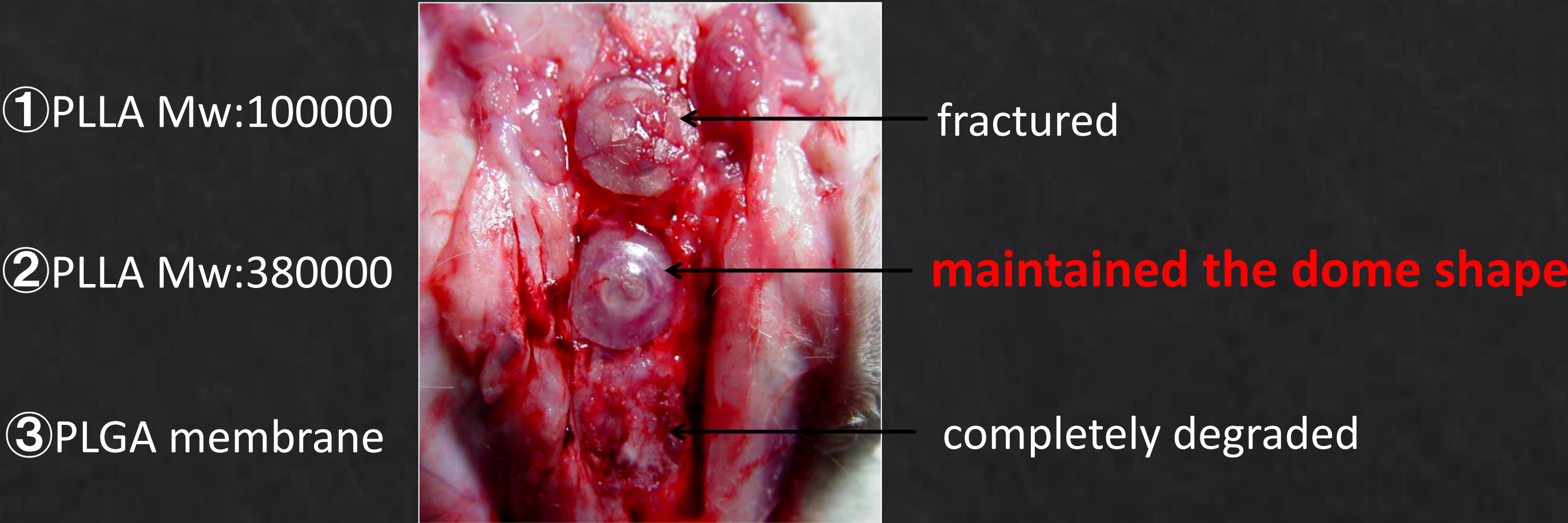
		temperature (°C)	Time (min)	Length of (W) (mm)
1	PLLA Mw:100000	70~75	1	17.3
2	PLLA Mw:100000	70~75	2	16.6
3	PLLA Mw:100000	75~80	1	14.9
4	PLLA Mw:100000	75~80	2	13.2
5	PLLA Mw:100000	75~80	3	10.1
6	PLLA Mw:380000	70~75	1	12.4
7	PLLA Mw:380000	70~75	2	10.7
8	PLLA Mw:380000	75~80	1	10.2

• Animal experiments

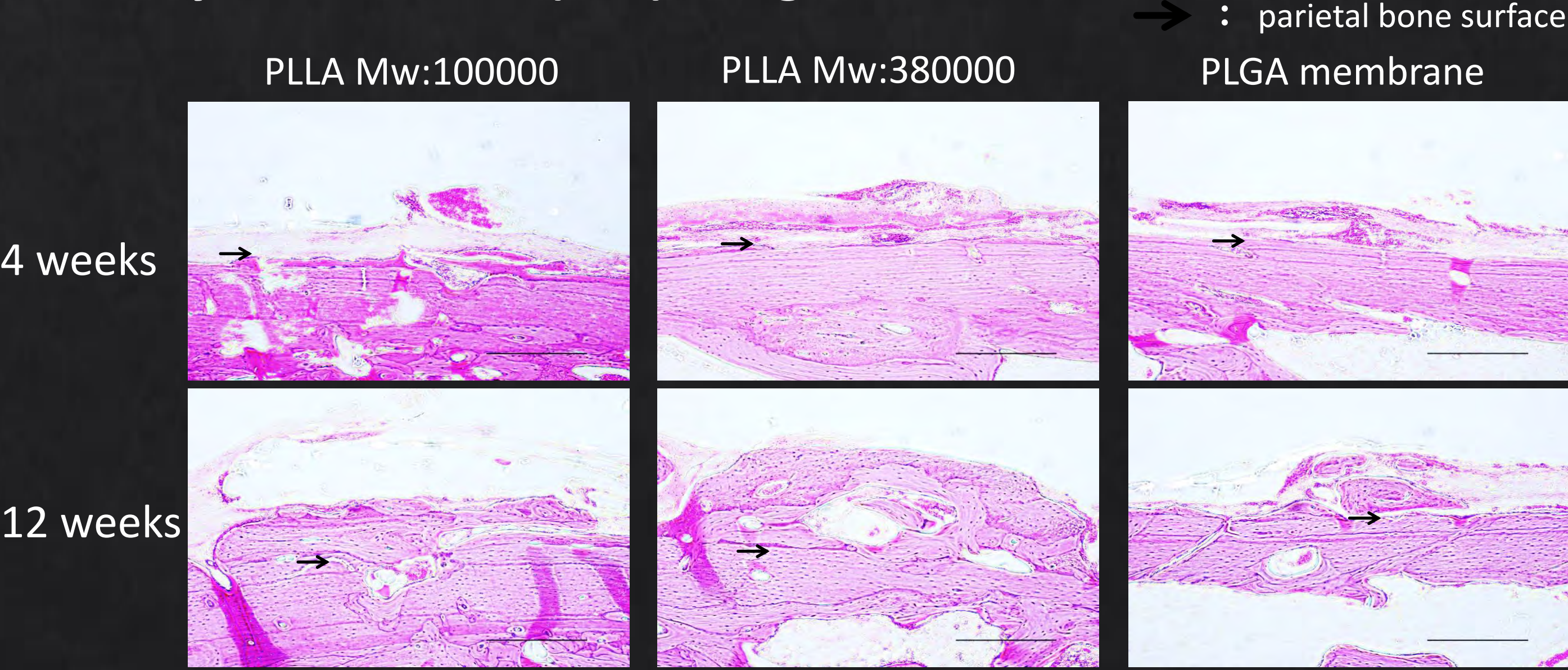
Parietal bone of rabbits(sagittal plane)



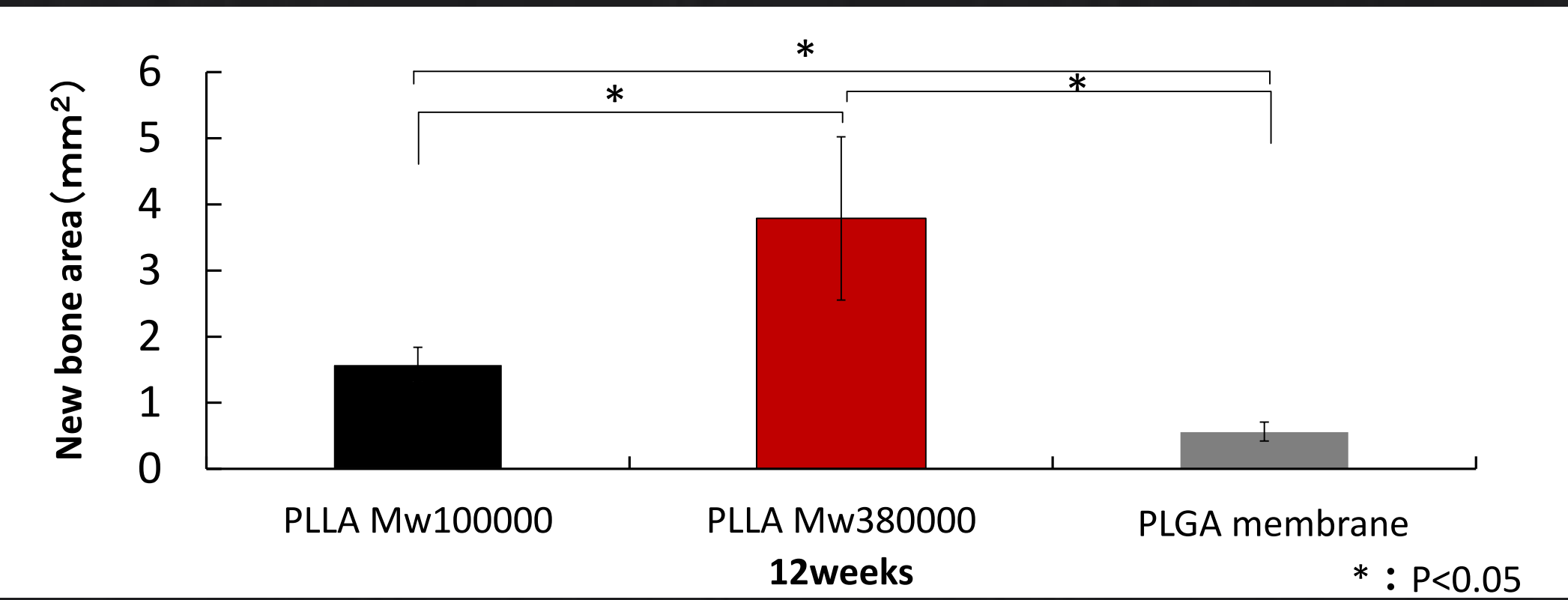
Macroscopic picture(12weeks)



Hematoxylin and eosin (H-E) images



The volume of newly formed bone tissue



CONCLUSION

The membrane prepared from PLLA Mw:380,000 showed excellent thermoplasticity at 75-80°C and the compressive strength was equal to that of titanium meshes, which is in contrast to that of PLLA Mw:100,000 and PLGA membranes. When the dome-shaped membrane were applied to the parietal bone of rabbits, they induced formation of new, dome-shaped bone tissue inside the membrane. The thermoplastic PLLA membrane is promising for GBR in vertical bone augmentation.