Mussel-based recombinant proximal thread matrix protein promotes osteoblast cell adhesion and proliferation

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Recently, Proximal Thread Matrix Protein1 (PTMP1) in mussel composed of two vWF type A like domains has characterized and it is known to bind both mussel collagens and mammalian collagens. Here, we cloned and mass produced a recombinant PTMP1 from E. coli system after switching all the minor codons to the major codons of E. coli. Recombinant PTMP1 has an ability to enhance mouse osteoblast cell adhesion, spreading, and cell proliferation. In addition, PTMP1 showed integrin-like properties as promoting collagen expression as well as binding to collagen type I, subsequently enhanced cell viability. Consequently, we found that recombinant PTMP1 acts as an integrin by mediating cell adhesion, spreading, proliferation, and formation of actin cytoskeleton.
This study suggests that both mammalian cell adhesion and marine underwater adhesion exploits a strong vWF-collagen interaction for successful wet adhesion. In addition, vWF like domains containing proteins including PTMP1 have a great potential for tissue engineering and the development of biomedical adhesives as a component for extra-cellular matrix.