Molecular Interactions of Collagen-binding Proteins

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Introduction

The connective tissue is composed of cells and an extracellular matrix consisting of structural fibers and specialized proteins. The most abundant structural fiber is collagen. A collagen-fiber is comprised of bundles of collagen-fibrils, which again are comprised of individual collagen-molecules that are bundled together in a process called fibrillogenesis (**Figure 1**) [1, 2]. The fibrillogenesis of collagen is a highly orchestrated process where several collagen-binding proteins are necessary for correct assembly and subsequent maintenance of the collagen-fibrils [2, 3]. Numerous diseases are associated with a deregulation of the fibrillogenesis or the maintenance of collagen. These diseases are as various as the "brittle-bone disease" [2], osteoarthritis [4] or keratoconus, a bulging of the cornea leading to impaired vision [5].

Aim of the study

To further elucidate the mechanisms of collagen-binding proteins in fibrillogenesis and maintenance of collagen. The focus of the study will be on a small number of proteins for a more thoroughly investigation of these.

Motivation

Investigation and characterization of the collagen-binding proteins and their molecular interactions with collagen could lead to new therapeutic approaches for collagen-associated diseases and further development of tissue-engineering strategies for regeneration of damaged tissues.

Methods

- Extract and purify collagen-binding proteins from connective tissues.
- Characterize collagen-binding proteins using SDS-PAGE and mass spectrometry.
- Investigate the interactions of collagen-binding proteins with collagen and other extracellular matrix protein using techniques such as co-immunoprecipitation and bead-based assays.
- Collagen-fibrillation assays using Microplate-reader.
- Structural/biophysical characterization of collagen-binding proteins using techniques such as small-angle X-ray scattering and/or circular dichroism (change of research environment).

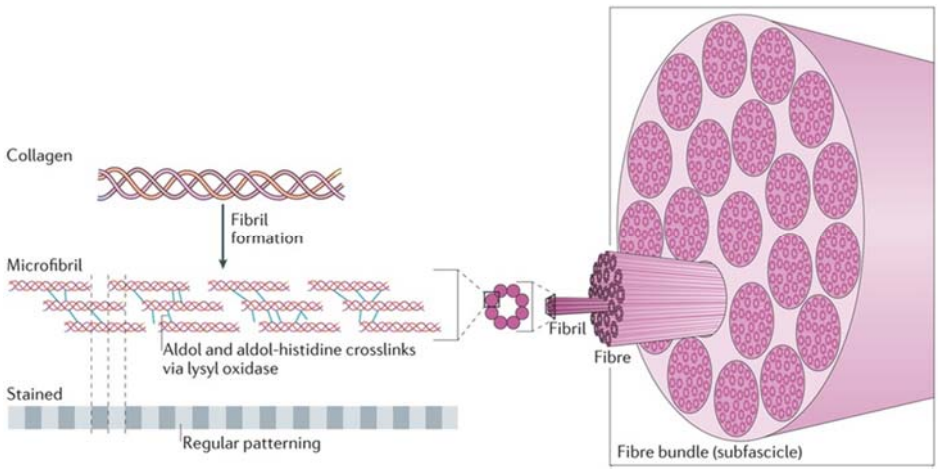

Figure 1 Collagen fibrillogenesis: Collagen-molecules are assembled into microfibrils, which have a characteristic banding-pattern appearance when observed with an electron microscope. The microfibril is stabilized by covalent crosslinks which is the basis for fibril-, and subsequent, fiber formation. Adapted from Mouw, J. K. et al., 2014 [1].

References

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