

Aggregation Forms of Type I Collagen Studied by Simultaneous Small- and Wide-Angle X-ray Scattering

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Type I collagen solution (bovine skin based) is studied using the biological small- and wide-angle X-ray scattering beamline at the 3.0 GeV Taiwan Photon Source of the National Synchrotron Radiation Research Center. Concomitant SAXS-WAXS data are collected from the sample elution with an online size exclusion column (SEC) of HPLC, incorporated with UV-vis absorption followed by refractive index measurements. SEC-SAXS result indicates a relatively monodisperse size distribution of the tropocollagen, which comprises three left-handed helices of polypeptide strands that are twisted together into a right-handed coiled coil for a triple helix. The SAXS-revealed gyration R_g of 195 Å and elongated shape together with the molecular mass and the hydrodynamic radius R_h measured from dynamic light scattering and multi-angle laser light scattering, together, indicate a dimer form of the tropocollagen. Interestingly, these dimers can gradually form visible networks in solution upon adding short peptides; further, circular dichroism result indicates that these peptides are found to preserve better the secondary structure of tropocollagen in solution upon UV illumination. The network formation mechanism of tropocollagen will be discussed in terms of the interaction of tropocollagen with the short peptides.

Keywords: tropocollagen, peptides, SAXS, WAXS.