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Bending rigidity of type I collagen homotrimer fibrils SEJIN HAN, University of Maryland, SERGEY LEIKIN, National Institutes of Health, WOLFGANG LOSERT, University of Maryland — Normal type I collagen is an $\alpha 1(\mathrm{I})_2\alpha 2(\mathrm{I})$ heterotrimeric triple helix, but $\alpha 1(\mathrm{I})_3$ homotrimers are also found in fetal tissues and various pathological conditions, e.g., causing bone fragility and reducing tendon tensile strength. It remains unclear whether homotrimers alter mechanical properties of individual fibrils or affect tissues by altering their organization at a higher level. To address this question, we investigated how homotrimers affect fibril bending rigidity. Homotrimer fibrils have been shown to be more loosely packed so that we expected them to be more susceptible to bending. However, homotrimer fibrils were more rigid despite being thinner and more hydrated. To quantify fibril rigidity, we analyzed their shape by Fourier decomposition, determined the correlation function for the direction along each fibril, and calculated the distribution of local fibril curvature. The estimated persistence length of homotrimer fibrils was $3 \sim 10$ times longer than for heterotrimer fibrils, indicating much higher bending rigidity of homotrimer fibrils.

Sejin Han
University of Maryland

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