

## Understanding the effect of carbon dots with size variation on collagen

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The unique optical properties of carbon dots (CDs) offer a wide variety of applications both in chemical and biological environments. The interaction of CDs with biological molecules such as proteins and DNA has been studied extensively. In the present study, the interaction of two different sizes of CDs with collagen, a fibrillar protein, has been investigated. The different sizes of CDs have been characterized using various techniques such as HR-TEM, SEM, and zeta potential. Upon interaction with CDs, the triple helical nature was not altered and  $R_{pn}$  value was similar to the control collagen. The influence of size on the fibrillation of collagen process is significantly impacted with photoirradiation process. Similarly, in DSC experiments, the CDs destabilized the collagen with  $\Delta T_m$  value of  $16 \pm 1^\circ\text{C}$  but with photoirradiation, the stability of the collagen is improved but less than the control collagen. In EPR studies upon photoirradiation, a significant amount of generation of hydroxyl radicals is observed. The gel electrophoresis studies show that the presence of CDs did not inhibit the collagenase activity without or with photoirradiation. The data from the present study clearly reveals that the carbon dots can be utilized with varied drug loading on collagen that can be utilized for bioengineering applications.

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