Characterizing the Role of Calcium Interactions in the Elasticity and Strength of Slug Glue: Steps Toward an Organic Hydrogel Glue and a Stitch-Free World

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Stitches are often times cumbersome for patients and pose a risk for infection. Medical glues could serve as an alternative but have limitations. A biomimetic approach to glue development holds promise. Analysis of the tough, sticky defensive secretion of the slug *Arion* subfuscus has guided development of a novel medical glue. The properties of this secretion hold great value for the medical field, with potential for various surgical applications. It is established that the glue of *Arion subfuscus* consists of a double network of carbohydrates and proteins and is held together by sacrificial bonds. These sacrificial bonds appear to be based on metal interactions. Calcium in particular seems important due to its high abundancy. The role of calcium was tested by manipulating calcium interactions within the glue to observe how this impacts its elasticity. Calcium interactions were controlled by varying pH and determining the resulting elasticity. The glue's elasticity was measured in cut glue samples in a tensometer, and the association between calcium and glue in different pH buffers was measured with an atomic absorption spectrometer. We found that glue elasticity decreased markedly at pH 4.5 while calcium levels dropped almost linearly in the range from 2.5 to 7. Thus, although decreased calcium was associated with loss of strength, they were not tightly correlated. This research provides valuable insight into the properties of this slug glue and opens avenues for investigation into the properties of other slug glues. A stepping stone is also provided for future research focused medical glue creation based on organic material.