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Some ground and excited state interactions among extracellular matrix molecules and type I dermal collagens

Dermal collagen and the surrounding extracellular matrix (ECM) have been described as the respective "bricks and mortar" of mammalian skin. Proteoglycans are glycosylated proteins with covalently attached anionic sulfated glycosaminoglycans (GAG). These in turn are attached to a hyaluronate (HA) backbone. Although the ECM macromolecules are best known for their architectural support of tissues, recent work indicates many other important cell functions. e.g. The ECM and collagen are both susceptible to ground and excited state environmental processes that can result in altered properties. We have arbitrarily divided the ECM into two sections: the collagen- PG complex itself, including the external membrane – bound PG, (e.g. aggrecans and decorin) and the perturbations caused by the effects of the surrounding internal and external environment. Examples are age, mechanical loading, ECM disruption, internal and external effects of UV, temperature, and glycation by abnormal amounts of simple sugars. In the ground state, collagen readily reacts with ambient molecular O2 and can dimerize to form dityrosine. In the excited state, dityrosine is preferentially formed via photodimerization. These alterations are readily followed by fluorescence spectroscopy. We are interested in the effects of UV radiation on type I collagen. In simple *in vitro* work, UV causes collagen concomitant degradation and cross-linking that changes its basic properties and results in abnormal fibers, altered gelation and fluorescence properties, altered photochemical kinetics, and altered susceptibility to collagenase. More recently, we have commenced a study of the effect of hyaluronate on collagen photochemistry. Using a model in vitro system of collagen - HA 1:2 mixtures at pH 7.4 For T<Tm (~36 C) HA retards the rate of photolysis in wavelength-dependent manner that is directly proportional to the relative helical content. At T>Tm, where the coiled form predominates, there seems to be little or no such effect. Thus, stabilization of collagen helical structure seems to be one important function of the ECM. We envision further studies with added model proteoglycans.

Biography

Julian M Menter has received his PhD degree in Chemistry from the George Washington University in 1969. He has completed his Postdoctoral fellowship with Prof. Dr. Theodor Foerster at the Institut fuer physikalische Chemie der Universtaet Stuttgart, Germany. Subsequently, he was at the University of Alabama, Birmingham, and the VA Medical Center (Atlanta). He currently serves as Research Professor of Biochemistry at Morehouse School of Medicine. He is recognized internationally for his work in the areas of collagen photochemistry and melanin photobiology as pertaining to redox reactivity.

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