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## The effects of cyclic tensile and stress-relaxation tests on porcine skin

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### Abstract

When a living tissue is subjected to cyclic stretching, the stress-strain curves show a shift down with the increase in the number of cycles until stabilization. This phenomenon is referred to in the literature as a preconditioning and is performed to obtain repeatable and predictable measurements. Preconditioning has been routinely performed in skin tissue tests; however, its effects on the mechanical properties of the material such as viscoelastic response, tangent modulus, sensitivity to strain rate, the stress relaxation rate, etc....remain unclear. In addition, various physical interpretations of this phenomenon have been proposed and there is no general agreement on its origin at the microscopic or mesoscopic scales. The purpose of this study was to investigate the effect of the cyclical stretching and the stress-relaxation tests on the mechanical properties of the porcine skin. Cyclic uniaxial tensile tests at large and constant strain were performed on different skin samples. The change in the reaction force, and skin's tangent modulus as a function of the number of cycles, as well as the strain rate effect on the mechanical behavior of skin samples after cycling were investigated. Stress-relaxation tests were also performed on skin samples. The change in the reaction force as a function of relaxation time and the strain rate effect on the mechanical behavior of skin samples after the stress-relaxation were investi-

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