# Review of: "Thermally damaged porcine skin is not a surrogate mechanical model of human skin"

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Studying human skin is usually not readily accessible due to the ethical issue, and thus looking for a substitute is necessary. Porcine skin is believed to be a surrogate model to unburned human skin because of the main anatomical and physiological similarity between them. However, different from the unburn skin, this study evidenced that the burned porcine skin was unsuitable surrogate for burned human one from the standpoint of mechanical characteristics. It collected burned human skin from hospital and created burned porcine skin manually, and contrasted five mechanical properties of burned full-thickness human and porcine skins by uniaxial tension testing, and more finally found their significant difference by employing univariate and multivariate statistical analyses. I read throughout the work with interest and concerned a main issue.

On the one hand, the discussion presented “The structural, compositional, and functional differences of the burned human and porcine skin were attributed to the differences in the mechanical properties of the two type tissues”. On the other hand, it stated “the difference in burn temperature and collagen fiber orientation in samples from anatomically different locations is unlikely to contribute to the statistically significant difference” on the basis of the denaturation-induced gel-like collagen. However, the structure, composition, function, burn temperature, collagen fiber orientation, and anatomical location were not seriously examined, thus the concluded unlikeliness seemed hasty. Actually, sample characteristics (e.g. age) and experimental conditions (e.g. preserving environment) may also alter their structures, compositions and functions, and thus influence the result or even the significant difference. Herein, definition of the full thickness burned skin (or burned severity), mechanical anisotropy, loading rate, testing method *etc* can be also such factors. Of course, the loading rates (i.e., 0.3, 2, 8 mm/s) and testing method (i.e., uniaxial tension) are here excluded as they were parallel in testing the two kinds of samples.

1. Age was generally scoped from 38 to 78. Actually, it is a key factor strongly influence the skin properties (1,2), and aging person has a varied skin elasticity which can greatly change the stress-strain response of skin.
2. Skin locating different anatomical positions has varying characteristics (3). The mechanical responses of the skin from the different positions may be greatly different (4). Indeed, the untreated issue were acknowledged thanks to the limited skin source.
3. The sample preservation for the two kinds of samples were not clearly stated. Different freezing conditions could alter the samples’ mechanical properties, and in particular, the preservation temperature was reported to have strong effect

(5). Thus, were the samples preserved under a same temperature environment?

4. The full thickness burn was only defined as the evaluation index of burn severity between the human and porcine skin. Actually, the burned severity between the two tissue types should be histologically analyzed. Plus, the high temperature resulted in the human skin burn were unclear, compared to the stated 430 $^{o}$F for burned porcine skin.
5. The fiber directions are consistent with the lines of maximum skin tension over the entire human body (6), and the skin anisotropy originating from the network of collagen and elastin fibers were not carefully discussed. Even though the fibers in skin experienced denaturation due to the high temperature, the anisotropy still could not be fully removed (75$^{o}$C *vs* 95$^{o}$C, 7). Indeed, the burn temperature (430$^{o}$F for porcine skin) in the current work was much higher than 95$^{o}$C (7), a biaxial tensile test can be easily adopted to examine the burned skin anisotropy.

Unfortunately, all the above factors were not treated. In any case, there is a possibility that the significant difference between the burned human and porcine skin could be influenced.

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