

content. CHS, JNB, and MAS were involved in study supervision.

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Skin Is Not the Largest Organ

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TO THE EDITOR

When scanning the newly published literature cited on PubMed/Medline, it is almost a weekly occurrence that I see something go by stating that the skin is the largest organ in the human body. The problem is that there is no factual basis for this ubiquitous dogmatic statement.

As an example, the editor's introduction to the timely and informative Review Series on Dermatology that appeared in the 1 February 2012 issue (volume 122, issue 2) of the *Journal of Clinical Investigation* began with the following sentence "Though the body's largest organ, the skin may be occasionally forgotten as a site of clinically important disease." Similar statements have been made in earlier *Journal of Investigative Dermatology* publications authored by prominent dermatology/skin biology investigators (Setoguchi *et al.*, 1994; Bickers and Athar, 2006; Clark *et al.*, 2007).

On 31 May 2013, a PubMed search using the phrase, "skin largest organ" returned 194 citations. A review of the

text of the abstracts accompanying the first 20 of those citations revealed that in 16 (80%) it was specifically stated that the skin is the largest human organ. However, published data simply do not support the "common knowledge" proposition that the skin is the largest organ in the human body.

An earlier analysis of this question by Goldsmith (1990) eloquently and humorously concluded that the human skin is not the largest organ in the human body. By weight, the skin may be considered to be the largest of the "medium-sized" organs such as the liver and brain. However, the skin is no match in weight for the much larger organs of the musculoskeletal system. In such comparisons, clearly the musculoskeletal system must be considered as a human organ system.

Goldsmith's (1990) assumptions and calculations resulted in a determination that the human skin (epidermis plus dermis) weighs 3.86 kg, or 5.5% of the total body weight of the proverbial 70 kg man.

It has been reported that the skeleton accounts for ~14% of the human

body's weight (Reynolds, 1977). In addition, it has been reported that an average adult male is made up of 42% of skeletal muscle and an average adult female is made up of 36% (as a percentage of body mass; Marieb and Hoehn, 2007).

If one included the subcutaneous fat, the skin by mass would be a stronger contender for being the largest organ in the human body. However, as its name implies "subcutaneous" fat is not an official part of the skin. Wikipedia also states that human skin is the largest organ. However, Wikipedia, that fount of conventional wisdom, also states that the skin is composed of the epidermis and dermis. It specifies that the hypodermis (subcutaneous tissue) underlies the skin but is not part of the skin (<http://en.wikipedia.org/wiki/Skin#Hypodermis/>, accessed 31 May 2013).

Nor can the skin be considered to be the largest human organ with respect to functional surface area. The human skin surface area is identical to body surface area. The body surface area of the proverbial 70 kg man is 1.7 m² (Goldsmith, 1990). By comparison, the gas exchanging surface of the lung's

airways has been estimated to be 70 m² (Notter, 2000), which is approximately half the size of a tennis court. The mucosal surface of the human gastrointestinal tract has been estimated to be the size of a football field.

Thus, with apologies to all those dermatologists who for so long have felt emboldened by the thought that theirs is the largest organ, in neither weight nor functional surface area can the human skin be considered to be human body's largest organ.

CONFLICT OF INTEREST

The author states no conflict of interest.

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Reply to Sontheimer

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TO THE EDITOR

The following is my response to the letter by Dr Sontheimer (2013) objecting to the common statement that skin is the largest organ in the body.

Short answer: Dr Sontheimer is correct.
Long answer:

- To capture attention, make a point, cop a plea, praise the past, impugn the present, predict the future, posit hypotheses, neatly knit raveled skeins. *Write a letter to the editor.*
- To lead others to care that Antarctica is the second largest land mass and has the lowest population density, zero, that Macau has the highest population density, that Manhattan has the highest density of dermatologists. *Write a letter to the editor.*

- To argue that skin has more sweat glands than any other organ, more Langerhans cells, more Merkel cells, more sebaceous glands, and more hair follicles—and is therefore the most important organ in the body. *Write a letter to the editor.*
- To argue against quoting nonfacts as facts, mistaking rhetoric for science, expecting that public-relations statements morph into research grants, substituting dreams for hard work. *Write a letter to the editor.*

- To express the joy of being quoted after a quarter century, to praise Dr Sontheimer for bringing the “biggest organ” debate to front stage. *Write a letter to the editor.*

- To stimulate others to study an organ that is more than a covering for the innards, and to remind the world that only scientific advances will solve the daunting problems of those with diseased skin. *Write a letter to the editor.*

CONFLICT OF INTEREST

The author states no conflict of interest.

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