

The Importance of Studying Growth Proportionality and Body Composition in Pediatric Patients with Respiratory and Other Disorders and in Experimental Animal Models

Viktor I Goudochnikov*

Council of International Society for DOHaD, Santa Maria - RS, Brazil

***Corresponding Author:** Viktor I Goudochnikov, Council of International Society for DOHaD, Santa Maria - RS, Brazil.

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During one of previous short visits to the University of Sao Paulo in the decade of nineties of the last century, the author of presented article was really lucky to find in a library of the Institute of Biosciences a book that was published in 1945, with a chapter describing some aspects of growth proportionality [1]. It took more than half a century for at least some tendency to appear for reanimation of this important area of research, although even at present the publications continue to be scarce. Only just recently the author was able (thanks to Gutenberg project) to download a digital copy of a classic book of D'Arcy Thompson "On Growth and Form", with his famous theory of transformations in the last chapter [2]. As was outlined in one of recent publications [3], anthropometry applied to human neonates is a simple, inexpensive and non-invasive methodology, but the question remains: why is it not widely used in pediatric clinics?

In that decade of nineties the author participated also in the International Conference organized by Federal University of Santa Maria (UFSM), presenting a review [4] on the use of knemometry, a non-invasive method of evaluating in children the growth of lower leg segment with high precision (0.1 mm), allowing to observe the inhibitory effects of oral or inhaled corticosteroids on growth during several months and even weeks, contrary to years in conventional auxology [5]. And again, the interest to this methodology persists only in a quite low grade.

Perhaps, the partial explanation of this low interest is simple: studies on growth (except knemometry) are performed by too simplified methods, although accepted worldwide. Nevertheless, it is not easy to understand, why pediatricians do not use anthropometric tools and till the present moment are usually measuring only body weight and height.

In the same decade of nineties the author was able to organize several studies on growth proportionality in healthy children and infants, using an anthropometric method based on a system of acupuncture channels and points [6-8]. Unfortunately, this method was not used in pediatric clinics yet, although, on the other hand, a simple and not so expensive device of mini-knemometry was earlier adapted by other researchers for measurements of human infants, in order to reveal growth-inhibitory action of dexamethasone [9]. Moreover, there were also some research efforts to elaborate micro-knemometry for studying segmental growth in laboratory animals [10].

The main advantage of our morphometric method is the possibility of its application in parallel to humans and at least to some laboratory animals like dogs [11], although currently it is not explained, why the system of acupuncture channels and points is almost the same in humans and at least some mammals. Somewhat later, already in the first decade of the 21st century, the author was able to organize a pilot study that allowed for evaluating a tendency to disproportionate inhibition of somatic growth in dog pups treated with dexamethasone [12]. Unfortunately, these preliminary results were not reproduced yet in amplified studies, although later it was possible, on the other hand, to observe a short-term growth inhibition by means of micro-knemometry applied to chicken treated with dexamethasone, also in a pilot study [13].

Why these studies on growth proportionality are potentially important for pulmonary and respiratory medicine? As a matter of fact, bronchial asthma and perhaps, some other chronic disorders in children can provoke somatic growth retardation per se, without any treatment and in addition, the utilization of oral and inhaled corticosteroids with growth-inhibitory properties in such pediatric patients should be carefully monitored [14,15].

For studies on the mechanisms of growth-inhibitory effects of corticosteroids, experimental models on laboratory animals are widely used. One of unique opportunities these models provide is evaluation of organ growth, used by us already in several earlier investigations. Although this methodology is invasive, its advantages are simplicity and relatively low cost. Because of this peculiarity, by simply weighing organs before and after drying, it was possible to show the capacity of glucocorticoids to decrease a water content in target organs, especially in thymus [16,17], suggesting a novel mechanism of glucocorticoid action on growth by altering the extent of tissue hydration. These studies of body composition complement the investigations of body proportions mentioned above.

It is interesting that water loss, at least in skin tissue, was shown as a consequence of inhaled glucocorticoid use [18]. On the other hand, growth disproportionality has been already suspected in pediatric patient treated with topical glucocorticoid in a case report [19].

In conclusion, the attention of researchers to studies of growth proportionality and body composition should be attracted, especially as referred to the paradigm of developmental origins of health and disease (DOHaD). Not accidentally one of the founders of International Society for DOHaD, English epidemiologist David J.P. Barker always underlined the importance of cross-sectional and especially longitudinal evaluation of even simple anthropometric variables like body weight, body mass index, ponderal index, etc. that otherwise are perfectly suitable in large-scale populational studies ([20]; see also discussion in [21]). We suppose that somewhat more sophisticated anthropometric tools and the evaluation of body composition, especially tissue hydration may be also quite useful in future studies on the ontopathogeny of respiratory and other disorders and the effects of pharmacotherapeutic agents including corticosteroids.

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