WebLog Journal of Gerontology and Geriatrics

Short Communication
Published: 18 May, 2026

Phylo- and Ontopathogenic Models: Relations to Gerontology and Endocrinology

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Abstract

The present short communication serves to justify important relations of phylo- and ontopathogenic models elaborated by us to the broadened versions of gerontology and endocrinology, culminating in our recently offered, more general concept of ontogenetic bioregulation.

Keywords: Conceptual Models; Ontogeny; Phylogeny

Introduction

At first, we should explain what are theoretical or conceptual models. They are expressed in words of human language by several observers that attain certain agreements on understanding the mechanisms of some phenomena [1] in the form of hypotheses that later on have to be confirmed or rejected, in accord to results of experimentation in real world.

It is important that conceptual models are primary and mathematical models are secondary, because the latter absolutely depend on agreements to use certain terms. For example, in geometry such terms are the points, straight lines, planes, etc. that, strictly speaking, don't exist in nature, but are perfectly possible in theory.

We began to elaborate phylo- and ontopathogenic conceptual models during the second decade of current century, but prerequisites for them were obtained by us much earlier, since the end of eighties of the last century.

The aim of present article is to perform an overview of our previous works, in order to established the relations of conceptual models mentioned above to gerontology and endocrinology.

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Received Date: *26 Apr 2026*
Accepted Date: *15 May 2026*
Published Date: *18 May 2026*

Citation:
Goudochnikov VI. Phylo- and Ontopathogenic Models: Relations to Gerontology and Endocrinology. WebLog J Gerontol Geriatr. wjgg.2026.e1802. https://doi.org/10.5281/zenodo.20329182

Early Experimentation *In Vitro* and *In Vivo*

In brief, our experiments on primary liver and pituitary cell cultures obtained from rats of different age groups have allowed at first to establish high sensitivity to various hormones including glucocorticoids (GC) already in perinatal period. Thereafter we have observed higher sensitivity of neonatal rats to growth-inhibitory GC action [2]. All these data were obtained in the nineties of the last century.

Therefore, at the beginning of current century we were ready to be associated with International Society for DOHaD (Development Origins of Health and Disease), the unique entity worldwide that studies both development and aging in conjunction. This society was founded chronologically in parallel to our experimentation *in vitro* and *in vivo*, principally due to the works of English epidemiologist David J.P. Barker and his colleagues. The investigations of several researchers have allowed to suggest an important role of endo- and exogenous GC as candidates to mediators of programming/imprinting phenomena [3].

This was the main reason for us to initiate the elaboration of ontopathogenic model, since it is based on DOHaD concept affirming that adverse events in prenatal and early postnatal periods of development can result in long-term consequences till at least adult state, but generally, during the whole life-course extention.

On the other hand, later on it became clear to us that ontopathogenic model is a particular case of phylopathogenic model, when the consequences in later life are evaluated in the intergenerational mode, from founder generation of parents F_0 to offspring generation F_1 [4, 5].

It should be admitted that only just recently the data began to accumulate on multi- or transgenerational modes, i.e. in the sequence of three or more generations:

$F_0 \rightarrow F_1 \rightarrow F_2 \rightarrow ...$

It appears that at least in the cases of intergenerational mode the adaptation of female offspring to pregnancy and even lactation can be adversely affected by previous stress or similar events in prenatal and early postnatal periods (malnutrition, infections), being GC as mediators of these influences [6].

Let's turn now finally to gerontology and endocrinology.

Broadened or Expanded Versions of Gerontology and Endocrinology

It is interesting that historically, the appearance of gerontology as a science was connected to the works of three Russian researchers: Elie I. Metchnikoff, Nikolai A. Rybnikov and Vladimir G. Korenchevsky, although the first and third of them worked in Paris and London respectively. Nevertheless, the term "gerontology" used for the first time by E. I. Metchnikoff, came to English language literature due to the work of psychologist N. A. Rybnikov, originally published in Moscow journal and spread worldwide because of active involvement of V. G. Korenchevsky in the organization of International Association of Gerontology and Geriatrics [7].

It appears also that especially N. A. Rybnikov helped in broadening the sense of the term "gerontology" to whole ontogeny. However, if to accept that gerontology is a science not only of senescence, but also of aging, it turns out obvious that aging onset from the early moment of conception perfectly justifies gerontology as a science of whole ontogeny. In this case, the genial contribution of E. I. Metchnikoff, the Nobel prize laureate, becomes quite clear, since the term "gerontology" originally offered by him, included ontogeny from the very beginning.

What for endocrinology, its broadened version should include not only "classical" hormones, but also various other bioregulators (neurotransmitters, eicosanoids, neuropeptides, cytokines, etc.), thus tranforming endocrinology to the science of bioregulation [8, 9]. In relation to this point, earlier we justified that programming/ imprinting phenomena may be mediated by GC in combinations with many other hormones and bioregulators [10].

It is interesting that just recently the possibililty emerged of important bioregulatory activities of non-classically released extracelular vesicles (or exosomes), thus broadening even more the biochemical branch of expanded version of endocrinology.

Conclusion

Our recent article [11] has already stated that exactly on the crossroad of broadened versions of gerontology and endocrinology the new general concept of ontogenetic bioregulation appears to be elaborated. We insist that conceptual models of phylo- and ontopathogeny should be developed much more in near future, for the sake of more rapid advances in experimental and clinical gerontology and endocrinology.

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