

# Chromogranins and Secretogranins as Prohormones: Consequences for Endocrinology as A Science of Bioregulation

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## Abstract

In a short commentary two related topics are discussed: about chromogranins and secretogranins as prohormones and on endocrinology as a science of bioregulation.

**Keywords:** chromogranins; secretogranins; endocrinology; bioregulation

## Introduction

For a long time chromogranins and secretogranins were considered to be merely the proteins necessary for package of hormonal compounds in secretory granules (or vesicles). It appears that Karen B. Helle from University of Bergen, Norway, was one of the first to isolate these proteins and to suggest that they may serve as prohormones [1]. At present it is already well known that at least some of them, like chromogranin A can produce a series of biologically active peptides, among which one can mention catestatin, parastatin, pancreastatin and many others. This production is realized by means of physiological proteolysis using enzymes called proconvertases, in a manner similar to production of corticotropin and other peptides from opiomelanocortin in pituitary corticotrophs [2, 3]. Unfortunately, although we have participated formally in one of symposia organized by K.B. Helle [4], our attention at that time was entirely focused on the known pituitary hormonal proteins, in particular growth hormone (GH) and prolactin. However, just recently we have launched an hypothesis trying to explain the long-known fact of the presence in anterior pituitary of some sort of metabolic inhibitor [5], unidentified till the present moment, via the existence of at least one of chromogranins or secretogranins and peptide products of their proteolysis [6].

On the other hand, already at the end of fifties of the last century the physiologist from Buenos Aires, Argentina, Bernardo Alberto Houssay, Nobel prize laureate has shown the presence in pituitary gland of a diabetogenic substance [7], also not identified till the present time. But perhaps, at least pancreastatin that inhibits insulin secretion may be a candidate for such biological activity contributing to pathogeny of

metabolic syndrome [8]. It is interesting that already in 1979 we have shown an increased secretion of GH and prolactin in primary cultures of anterior pituitary cells isolated from rats with acute alloxan-induced experimental diabetes [9]. Later on we have observed inhibitory action of insulin on GH secretion by cultured anterior pituitary cells from adult rats, as well as by pup cells after their premedication in vitro with glucocorticoid and thyroid hormone [10]. Nevertheless, at the end of eighties of the last century we have developed a method of preparative electrophoresis in polyacrylamide gel in mildly acidic conditions that has shown the existence of unidentified pituitary proteins, besides GH and prolactin [11]. Therefore, in our recent article [6] we tried to use this fact for launching our hypothesis mentioned above for explanation of metabolic inhibitor in anterior pituitary.

However, chromogranins and secretogranins are present not only in pituitary gland, but also in other endocrine organs and moreover, in the cells of so called diffuse neuroendocrine system (DNES) [12] that together with cells of “classical” endocrine organs appear to differentiate from neuroectoderm precursors in early development. That’s why we need to alter our recent hypothesis [6] by adding a proposal of tissue-specific expression of chromogranins and secretogranins and / or tissue-specific proteolysis by proconvertases to peptide derivatives. Of course, all these suggestions are able to highly enhance the complexity of bioregulation, that was already offered by us in the form of the needed broadening and expansion of endocrinology as scientific field [13]. It is already clear to us that new version of endocrinology should discuss not only “classical” hormones, but also many other bioregulators,

including neurotransmitters, eicosanoids, various neuropeptides and cytokines like interleukins and growth factors.

In this regard, many internal organs such as lungs should be considered not only as targets of hormones, but also as organs deeply involved in endocrine regulation [13]. In fact, non-respiratory pulmonary function may include metabolism of hormones, as well as bioregulatory activities of neuroendocrine cells and neuroepithelial bodies [14]. It is interesting that these structures of the lungs are related to the niches of progenitor and stem cells and may serve also as biosensors of oxygen levels in airways, reacting, e.g., to hypoxia by the release of several bioactive molecules including peptides and neurotransmitters [14]. Obviously, if to assume that chromogranins and secretogranins apparently take part of dense core vesicles in the cells of DNES present in many organs and tissues, we should focus our attention in near future on studying these prohormones and their peptide derivatives inside the broadening version of endocrinology as a science of bioregulation.

**Abbreviations:** GH-growth hormone; DNES-diffuse neuroendocrine system, PhD-philosophy doctor.

## References

1. Helle KB, Corti A, Metz-Boutigue M-H, Tota B. (2007). The endocrine role for chromogranin A: a prohormone for peptides with regulatory properties. *Cell Mol Life Sci*, 64:2863-2886.
2. Loh YP, Cheng Y, Mahata SK et al. (2012). Chromogranin A and derived peptides in health and disease. *J Mol Neurosci*, 48:347-356.
3. D'Amico MA, Ghinassi B, Izzicupo P et al. (2014). Biological function and clinical relevance of chromogranin A and derived peptides. *Endocr Connections*, 3:R45-R54.
4. Fedotov VP, Goudochnikov VI. (1999). The role of catecholamines in neurohumoral influences on cultured rat pituitary cells: high sensitivity in early postnatal development and interactions with glucocorticoid hormone. In: *10<sup>th</sup> International Symposium on Chromaffin Cell Biology*. Bergen, 180.
5. Denckla WD. (1974). Role of the pituitary and thyroid glands in the decline of minimal O<sub>2</sub> consumption with age. *J Clin Invest*, 53:572-583.
6. Goudochnikov VI. (2024). Possible explanation of metabolic inhibitor in anterior pituitary. *J Endocrinol Disorders*, 8(3):1-3.
7. Houssay BA, Smyth FS, Foglia VG, Houssay AB. (1942). Comparative diabetogenic action of the hypophysis from various animals. *J Exp Med*, 75(1): 93-106.
8. Watanabe T. (2021). The emerging roles of chromogranins and derived polypeptides in atherosclerosis, diabetes and coronary heart disease. *Int J Mol Sci*. 22:6118.
9. Gudoshnikov VI, Komolov IS, Pluzhnikova GN et al. (1979). Changes in somatotrophic and lactotrophic functions of the adenohypophysis in rats with acute alloxan diabetes. *Bull Exp Biol Med (Moscow)*, 88:1261-1264.
10. Fedotov VP, Mamaeva TV, Gudoshnikov VI. (1994). Age-specific effects of insulin on the secretion of somatotrophic hormone. *Bull Exp Biol Med (Moscow)*, 117:307-310.
11. Gudoshnikov VI, Abramova VV, Fedotov VP. (1988). The procedure for separation of pituitary proteins by means of preparative gel electrophoresis. Certificate of invention. Moscow.
12. Helle KB. (2010). Chromogranins A and B and secretogranin II as prohormones for regulatory peptides from the diffuse neuroendocrine system. *Results Probl Cell Differ*, 50:21-44.
13. Goudochnikov VI. (2024). Endocrinology and gerontology; disciplines that need the broadening and expansion. *J Endocrinol Diabetes Res*, 2(1): 1-4.
14. Cutz E, Yeger H, Pan J, Ito T. (2008). Pulmonary neuroendocrine cell system in health and disease. *Curr Respir Med Rev*, 4:174-186.

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