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Editorial

Non-Genomic Actions of Thyroid Hormones During Development

Ahmed RG*

Division of Anatomy and Embryology, Zoology Department, Faculty of Science, Beni-Suef University, Beni-Suef, Egypt

***Corresponding author:** Ragab G. Ahmed, Division of Anatomy and Embryology, Zoology Department, Faculty of Science, Beni-Suef University, Beni-Suef, Egypt. Tel: +201091471828; Email: ahmedragab08@gmail.com

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Editorial

Thyroid Hormones (THs) display a key activities during the ordinary development [1-53] through genomic and non-genomic actions [51]. Extra nuclear or non-genomic actions of THs have been found in the cellular organelles, cytoplasm and plasma membrane [51,54,55]. Also, these actions have comprised the activation of Mitogen Activated Protein Kinase (ERK/MAPK) and Protein Kinases (PKA & PKC), modulation of glucose transport and sodium, potassium and calcium ions, and regulation of Phospholipases (PLC & PLD) [56,57]. Specifically, Thyroxine (T4) can bind to a membrane integrin receptor (αVβ3) inducing MAPK activity [58,59]. In addition, THs regulate the behaviors of interferon-γ (IFN-γ) [60] and growth factors, such as vascular growth factors [61, 62], transforming growth factor-β (TGF-β) [63], and Epidermal Growth Factor (EGF), by non-genomic mechanisms [49,64,65]. T4 can increase the levels of TGF-β and EGF-induced the expression of c-fos and activation of ERK1/2 and in HeLa cells [63]. Thus, non-genomic mechanisms of TH are not regularly stimulatory because of TH can inhibit the actions of TGF-β and stimulate the autocrine/paracrine effects of EGF [49].

On the other hand, THs can induce the action of insulin growth factor I (IGF-I) on account of integrin αVβ3 has a cell surface receptor for THs and co receptor for IGF-I [49,66]. IGF-I supports the cellular growth, regulates the glucose homeostasis, and stimulates the level of insulin sensitivity in the biological tissues through paracrine, autocrine, and endocrine actions [40, 50]. More importantly, in the smooth muscle cells, the action of IGF-I may be mediated by the receptors of and integrin αVβ3 [67,68,49]. Thus, the nature of integrin as a structural and functional may be very important to the actions of the muscles [69-72]. Recently, my group reported that T4 (sub nano molar free hormone concentration) prevents IGF-I stimulation of glucose uptake and of cell proliferation [49]. This action may be mediated by the crosstalk between the IGF-I receptor (IGF-IR) and integrin αVβ3[68].

Thus, these data propose that the non-genomic action can show a significant role during the regular development. Additional examinations are desired to distinguish the crosstalk between THs and their non-genomic actions during the development. In addition, several studies are needed to explore the interactions between the T4 and IGF-I on the actions of PI3K and ERK1/2 signal transduction pathway in the glucose uptake and cell proliferation.

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