

Heterogeneity of neural crest-derived melanocytes

Review Article

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Abstract: The majority of melanocytes originate from the neural crest cells (NCC) that migrate, spread on the whole embryo's body to form elements of the nervous system and skeleton, endocrinal glands, muscles and melanocytes. Human melanocytes differentiate mainly from the cranial and trunk NCC. Although melanocyte development has traditionally been associated with the dorsally migrating trunk NCC, there is evidence that a part of melanocytes arise from cells migrating ventrally. The ventral NCC differentiate into neurons and glia of the ganglia or Schwann cells. It has been suggested that the precursors for Schwann cells differentiate into melanocytes. As melanoblasts travel through the dermis, they multiply, follow the process of differentiation and invade the forming human fetal epidermis up to third month. After birth, melanocytes lose the ability to proliferate, except the hair melanocytes that renew during the hair cycle. The localization of neural crest-derived melanocytes in non-cutaneous places e.g. eye (the choroid and stroma of the iris and the ciliary body), ear (cells of the vestibular organ, cochlear stria vascularis), meninges of the brain, heart seems to indicate that repertoire of melanocyte functions is much wider than we expected e.g. the protection of tissues from potentially harmful factors (e.g. free radicals, binding toxins), storage ions, and anti-inflammatory action.

Keywords: *Neural crest cells • Melanocytes origin • Skin melanocytes • Ocular melanocytes • Ear melanocytes • Epidermal melanin unit*

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1. Introduction

The melanocyte biology has fascinated scientists of different disciplines for years, especially according to the basic function of these cells – production of the skin, hair and eye pigment [1-3]. Nowadays these cells seemed to play many other functions in the organism. The cells broadly classified as melanocytes (cells able to synthesize melanins) form a heterogeneous group of cells referring to their embryonic origin and anatomical location. There are attempts to group pigment-producing cells into classical (cutaneous) and non-classical (non-cutaneous) melanocytes [4,5]. The embryonic origin of these two groups is different, cutaneous melanocytes develop from the neural crest cells (NCC) while non-cutaneous from NCC and neural tube cells (e.g. retinal pigment epithelium, RPE). This review will focus on a group of melanocytes differentiating from the NCC – an embryonic population that develops from the dorsal part of the forming neural

tube during neurulation (formation of the neural tube, primordium for central nervous system) [6,7]. Neural crest cells (NCC) leave the epithelium of the neural tube, migrate to many specific places in the body, where they differentiate into a remarkable variety of cells as neurons, glial cells, endocrine cells, chondroblasts, osteoblasts, smooth muscles and melanocytes [7-10]. Migration occurs along the well-defined pathways which determines in part what type of cells NCC will form [8,10].

Melanocytes differentiate from all NCC populations but the molecular pathways of development are well characterized only for the trunk NCC [8,11,12]. Except the skin and eye melanocytes are present in ear, nervous system and probably other places e.g. heart [5]. The remarkable feature of the melanocytes is the melanin production. Melanin protects cells in the epidermis against sun-induced damage by ultraviolet radiation (UVR) but what is/are its function/s in other place e.g. ear, meninges is not clear [11,12].

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