



Is there any benefit in generating thyrocytes from stem cells?

Czy warto wytwarzać tyreocyty z komórek macierzystych?

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So far, progress regarding the use of both *in vitro* and *in vivo* regenerative medicine models already offers hope for the application of different types of stem cells as a powerful new therapeutic option to treat different disorders that were previously thought to be untreatable [1]. Remarkable achievements in cell biology resulting in the isolation and characterization of various stem cells and progenitor cells has increased the expectation for the development of a new approach to the treatment of genetic and developmental human diseases [2].

Based on our current knowledge and strong supporting evidence from previous experience, different types of stem cell populations are capable of undergoing differentiation or trans-differentiation into functionally active cells for use in therapeutic interventions [3]. However, some scientists have raised concerns regarding the benefits of generating thyrocytes from stem cells as a valuable potential therapeutic option [4]: It has been stated that the availability of an effective, economical, standardized, and well-tolerated hormone replacement therapy for hypothyroid states may render stem cell-based treatments unnecessary in most cases, and if such a therapeutic option is to be used for transplantation therapy, certain requirements should be met [4].

We believe that before reaching such a conclusion, some important considerations should be kept in mind:

1. We admit that while there are medicines like levothyroxine and liothyronine, which, thanks to new technology, are manufactured with a low price, trying to cure patients inflicted with hypothyroidism using stem cells is not very reasonable and cost effective. Yet, can we generalize this argument with certainty and without a comprehensive evaluation or studies regarding cost effectiveness to patients

suffering from hypothyroidism or, most importantly, congenital thyroid aplasia? In fact, in these special cases, we should consider the lifelong costs of drug therapy and different follow-up experiments at certain intervals, and still keep in mind the costs of probable mismanagement in childhood or pregnancy of these patients. Only after these calculations can one declare with confidence that these studies do not have practical justification at the present time.

2. In those patients suffering from congenital forms of hypothyroidism, destruction by the recipient's immune system seems not to be an important concern, and immunosuppression to bypass the immune system response is not required, because using the patient's own stem cells, the resulting thyroglobulin-producing cells are not immunologically rejectable by the immune system.
3. Due to the fact that currently stem cells and umbilical cord banks are so strictly defined and available, it seems that this mission is investigational more practical than in the past, particularly for those children suffering from developmental aplasia of the thyroid gland.
4. Studies performed on stem cells, targeting their conversion into functionally mature tissue, are not necessarily seeking to result in the clinical application of the differentiated cells; In fact, still one of the important goals of these studies is to get acquainted with the natural process of development of mature cells from their immature progenitors during the embryonic period onwards, which can produce valuable results as knowledge of the developmental processes during embryogenesis [5]. For example, the cellular and molecular mechanisms leading



to thyrocyte developmental abnormalities are relatively unknown [5]. This lack of understanding stems from the lack of a good model system to study thyrocyte development and differentiation [5]. Hence, the knowledge reached through these studies can prove to be a breakthrough in preventing developmental disorders like aplasia, hypoplasia, or ectopic thyroid. Meanwhile, many researchers conduct these studies to understand the molecular and cellular basis of cancer development. Owing to the fact that thyroid cancer is the most prevalent cancer in the endocrine system of the body, one cannot dismiss these studies and consider them worthless.

References

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