

# Cytokine production in peripheral blood cells of patients with differentiated thyroid cancer: elevated Th2/Th9 cytokine production before and reduced Th2 cytokine production after radioactive iodine therapy

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Received: 25 June 2014 / Accepted: 29 September 2014 / Published online: 9 October 2014  
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**Abstract** Cytokines play a key role in the regulation of cells of the immune system and also have been implicated in the pathogenesis of malignant diseases. The aim of this study was to evaluate cytokine profiles in patients with differentiated thyroid cancer (DTC) before and 7 days after radioactive iodine ( $^{131}\text{I}$ ) therapy. Cytokine levels were determined in supernatants obtained from phytohemagglutinin-stimulated whole blood cultures of 13 patients with DTC and 13 control subjects. The concentrations of selected cytokines: Th1—interferon gamma ( $\text{IFN-}\gamma$ ), interleukin 2 (IL-2) and tumor necrosis factor alpha ( $\text{TNF-}\alpha$ ); Th2—interleukin 4 (IL-4), interleukin 5 (IL-5), interleukin 13 (IL-13) and interleukin 10 (IL-10); Th9—interleukin-9 (IL-9); and Th17—interleukin 17 (IL-17A) were measured using multiplex cytokine detection systems for Human Th1/Th2/Th9/Th17/Th22. We have shown that peripheral blood cells of DTC patients produce significantly higher concentrations of Th2/Th9 cytokines (IL-5, IL-13 and IL-9) than control subjects. The  $^{131}\text{I}$  therapy led to reduced secretion of Th2 cytokines (IL-4, IL-5 and IL-13). Despite this, the calculated cytokine ratios (Th1/Th2) in DTC patients before and 7 days after  $^{131}\text{I}$  therapy were not different

from those in healthy subjects. DTC patients have significantly higher concentrations of Th2/Th9 cytokines (IL-5, IL-13 and IL-9) than control subjects. There is no influence of hypothyroidism or stage of disease on cytokine production in DTC patients before  $^{131}\text{I}$  therapy. The radioactive  $^{131}\text{I}$  therapy leads to reduced secretion of Th2 cytokines (IL-4, IL-5 and IL-13). Additional studies are needed to determine the significance of these findings.

**Keywords** Cytokines · Differentiated thyroid cancer · Radioactive iodine therapy · Th1/Th2 ratio

## Abbreviations

$^{131}\text{I}$	Iodine 131
DTC	Differentiated thyroid cancer
EANM	European Association of Nuclear Medicine
$\text{IFN-}\gamma$	Interferon gamma
IL-2	Interleukin 2
IL-4	Interleukin 4
IL-5	Interleukin 5
IL-9	Interleukin 9
IL-10	Interleukin 10
IL-13	Interleukin 13
IL-17A	Interleukin 17A
PHA	Phytohemagglutinin
SD	Standard deviation
Th1	T-helper-1
Th2	T-helper-2
Th9	T-helper-9
Th17	T-helper-17
$\text{TNF-}\alpha$	Tumor necrosis factor alpha
TSH	Thyroid-stimulating hormone
$\text{TxNOM0}$	Patients without any proven metastases
$\text{TxNxM0}$	Patients with nodal metastases

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