



# Autoimmune thyroid diseases

Serological detection of relevant autoantibodies and hormones



- Reliable detection of thyroid-specific antibodies (against TSH receptor, TPO and TG) and hormones (FT3, FT4, rT3, calcitonin)
- Useful to support the diagnosis of autoimmune thyroid diseases and in suspected thyroid carcinoma, as well as for therapy monitoring and postoperative tumour after-care
- Comprehensive ELISA and IIFT product portfolio

# Autoimmune thyroid diseases

The delicate balance of thyroid hormone regulation can be disturbed by the presence of various autoantibodies. Antibodies (Ab) against thyroid microsomes, with their main antigen thyroperoxidase (TPO), and antibodies against thyroglobulin (TG) or thyrotropin receptor (also thyroid-stimulating hormone) are characteristic of autoimmune thyroid diseases. The most frequent autoimmune thyroid diseases are autoimmune thyroiditis (AIT) of the Hashimoto type and immune hyperthyroidism, which is also known as Graves' disease.<sup>1</sup> Whereas AIT can manifest in the form of thyroid overfunction (hyperthyroidism) or underfunction (hypothyroidism), Graves' disease is always associated with hyperthyroidism.<sup>1</sup>

## Hashimoto's thyroiditis

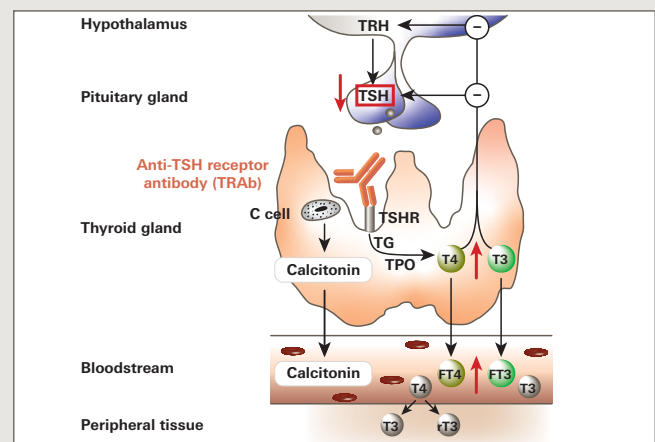
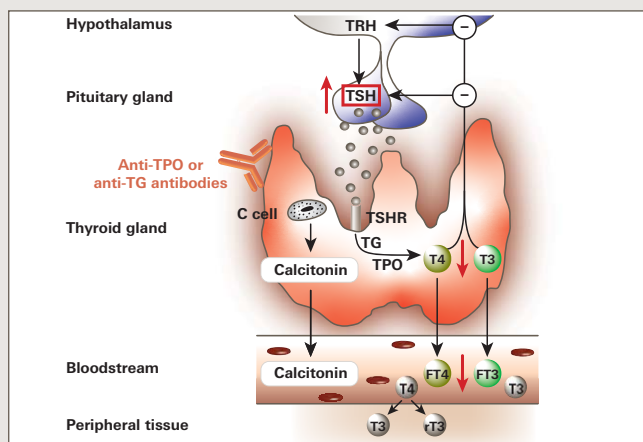
Hashimoto's thyroiditis is characterised by the destruction of thyroid tissue due to autoimmune lymphocytic infiltration, which mostly results in a long-term diminished thyroid hormone production.<sup>2</sup> Initial hyperthyroidism is explained by the release of preformed thyroid hormones during organ destruction (hashitoxicosis). The symptoms can therefore vary significantly.<sup>1</sup> However, they typically include fatigue, muscle weakness and weight gain.

**Associated antibodies:** Anti-TPO antibodies can be detected in 90% of patients. They have the highest prevalence in Hashimoto's thyroiditis.<sup>3</sup> Additionally, autoantibodies against TSH receptor (TRAb)<sup>4</sup> can be found in 6 to 60% of cases and anti-TG antibodies in 45 to 60%.<sup>5</sup>

## Graves' disease

Graves' disease is characterised by the continuous stimulation of the TSH receptor through the binding of autoantibodies. This results in the activation of signal cascades, leading to an increased uptake of iodine in the thyroid. Consequently, the production and release of the thyroid hormones triiodothyronine (T3) and thyroxine (T4) is increased.<sup>6</sup> Typical symptoms include struma, exophthalmos, and tachycardia (Merseburg triad).

**Associated antibodies:** TRAb are the most important serological markers in Graves' disease. They are detectable in over 90% of patients. Increased antibody titers are associated with a severe course of the disease.<sup>7</sup> In addition, anti-TPO and anti-TG antibodies occur with a prevalence of around 80% and 30%, respectively.<sup>5, 7</sup>



<b>TRH</b>	TSH-releasing hormone	<b>T3</b>	triiodothyronine	<b>FT3</b>	free, non-protein-bound, biologically active form of T3/T4	<b>rT3</b>	reverse T3, biologically inactive form of
<b>TSH</b>	thyrotropin	<b>T4</b>	thyroxine (tetraiodothyronine)	<b>FT4</b>	free, non-protein-bound, biologically active form of T3/T4	<b>T3</b>	protein-bound, biologically inactive form of T3/T4
<b>TSHR</b>	TSH receptor					<b>T4</b>	protein-bound, biologically inactive form of T3/T4
<b>TG</b>	thyroglobulin (precursor of T3 and T4)						↑ ↓ increase or decrease in the concentration
<b>TPO</b>	thyroperoxidase						

## Further autoimmune thyroid diseases

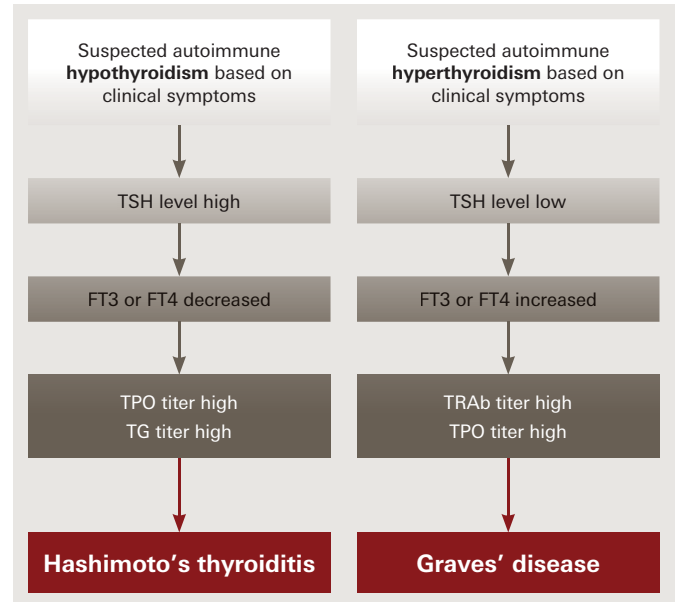
A special form of AIT is postpartum thyroiditis, a temporary hypothyrotic functional disorder of the thyroid gland which is accompanied by high titers of anti-TPO antibodies. The disease affects around 5 to 9% of women after giving birth. The risk is particularly high in women with diabetes mellitus.<sup>5</sup> The measurement of anti-TPO antibodies is therefore advisable in all postpartum women as they require hormone substitution if they have the disease.

Moreover, AIT often occurs together with other autoimmune diseases, such as rheumatoid arthritis, Sjögren's syndrome, Addison's disease, coeliac disease, type 1 diabetes mellitus and vitiligo.<sup>8</sup> For this reason, other autoantibodies directed against non-thyroid antigens are frequently found in the serum of AIT patients.



## Serological diagnostics of autoimmune thyroid diseases

In suspected autoimmune thyroid disease, the concentration of TSH in serum should be measured. An increased TSH level indicates hypothyroidism, while a decreased level is indicative of hyperthyroidism. Additionally, the serum FT3 and FT4 values should be determined. For differentiation of autoimmune thyroid disease from acute (bacterial) or subacute (non-infectious) thyroiditis or a non-autoimmune disorder of the thyroid hormone regulation, the determination of antibodies against thyroid antigens is helpful.<sup>1</sup> For the detection of thyroid-specific antibodies, hormones and antigens, EUROIMMUN offers a variety of different test systems such as enzyme-coupled immunoadsorption assays (ELISA) or indirect immunofluorescence tests (IIFT). Reliable differential diagnostics must be based on the overall picture obtained from the analysis of different parameters. Besides serological methods, clinical examinations (e.g. ultrasound, scintigraphy) and symptoms must also be considered. The patient's sex may also be relevant.<sup>9</sup>

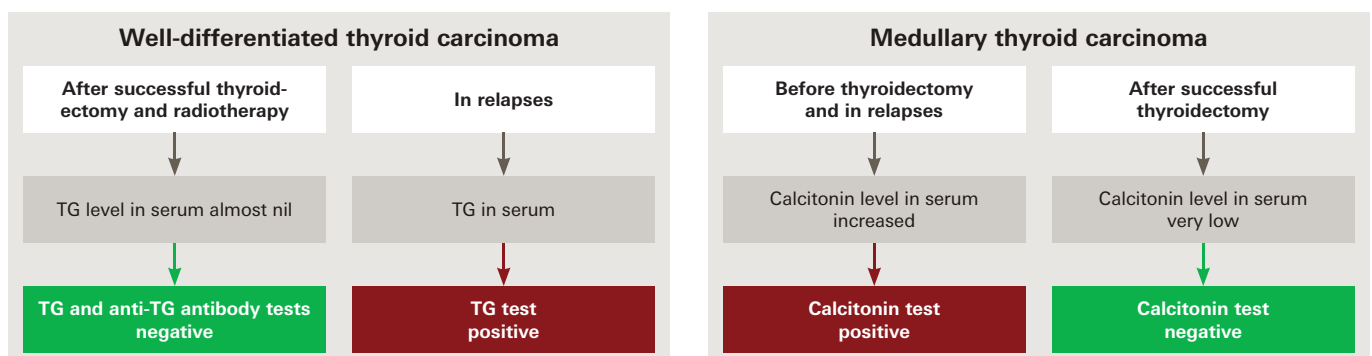


## Malignant tumour diseases of the thyroid gland

The incidence of thyroid carcinoma in Germany is 5 to 11 cases per 100,000 inhabitants (as of 2016). Distinction is mainly made between well-differentiated (papillary, follicular and oncocytic forms) and medullary carcinoma. The most important tumour treatment is surgery, which often involves complete removal of the thyroid gland (thyroidectomy).<sup>10</sup> This results in the loss of the body's own production of thyroid hormones T3 and T4 and their precursor TG.

After total thyroidectomy due to differentiated thyroid carcinoma and successful radiotherapy, regular examinations should be performed, including serological determination of TG. The presence of TG indicates an incomplete resection of the thyroid gland or a relapse (TG-producing tumour cells).<sup>10</sup> In parallel with the direct determination of TG, antibodies against TG should be investigated. Due to the binding of the antibodies to TG, it is possible that the latter is not correctly detected by direct tests. The investigation of endogenous antibodies against TG helps to limit false-negative TG results.<sup>11</sup>

In suspected cases of medullary thyroid carcinoma, the patient serum should be investigated for calcitonin. Malignant C cells of this type of tumour produce high amounts of calcitonin. Determination of this protein in serum is the method of choice for early diagnostics as well as postoperative after-care.<sup>10</sup> The following serological results can be useful:





## In a nutshell

- The balance of thyroid hormone regulation can be disturbed by various autoantibodies.
- The detection of anti-TPO and anti-TG antibodies as well as TRAb can support the diagnosis of autoimmune thyroid diseases such as Hashimoto's thyroiditis or Graves' disease. Measurement of the FT3 and FT4 levels can be helpful in therapy monitoring.
- The investigation of anti-TG antibodies and others is useful for early identification of relapses and metastases after surgical removal of well-differentiated thyroid carcinoma.
- The determination of the serum calcitonin level is recommended in the diagnostics of medullary thyroid carcinoma and for monitoring after total thyroidectomy.
- EUROIMMUN offers various test systems for the detection of thyroid-specific autoantibodies (TRAb, anti-TPO, anti-TG), and thyroid hormones (FT3, FT4, rT3, calcitonin).

## Order information

Test system	Test name	Detected parameter	Antigen/substrate	Order number
ELISA	Anti-TSH Receptor (TRAb) ELISA (IgG)	Ab against TSH receptor (thyrotropin receptor)	Ag-coated microplate wells	EA 1015-9601 G
	Anti-TSH Receptor (TRAb) <i>Fast</i> ELISA (IgG)			EA 1015-9601-1 G
	Anti-Thyroglobulin ELISA (IgG)	Ab against thyroglobulin (TG)		EA 1013-9601 G
	Anti-TPO ELISA (IgG)	Ab against thyroperoxidase (TPO)		EA 1012-9601 G
	Calcitonin ELISA	Calcitonin	Antibody-coated microplate wells	EQ 6431-9601
	Free Triiodothyronine (FT3) ELISA	Free triiodothyronine (FT3)		EQ 1016-9601
	Free Thyroxine (FT4) ELISA	Free thyroxine (FT4)		EQ 1017-9601
	Reverse Triiodothyronine (rT3) ELISA	Reverse triiodothyronine (rT3)		EQ 1016-9601-9
IIFT	IIFT: Thyroid gland (Monkey)	Ab against thyroid antigens	Thyroid gland (monkey)	FA 1010-1005
	EUROPLUS Thyroid Gland (Monkey)/Thyroglobulin	Ab against thyroid antigens and thyroglobulin (TG)	Thyroid gland (monkey), Thyroglobulin EUROPLUS	FA 1010-1005-3 FA 1010-1010-3

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