Understanding the Thyroid Gland

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Aims of Webinar

• To understand the thyroid gland, thyroid hormone synthesis and role of thyroid in health

• What can go wrong with the thyroid?

• Thyroid testing – benefits and limitations

• Supporting thyroid health naturopathically through diet and supplements
Thyroid Gland

- Lobular endocrine gland
- Produces thyroid hormones and calcitonin:
  - Regulates metabolism
  - Growth and rate of tissue function (protein synthesis) and hormone sensitivity
  - Temperature control
  - Regulates calcium homeostasis

Thyroid Hormones

- Triiodothyronine (T3) and thyroxine (T4)
- 80:20% T4:T3 produced by normal thyroid
- T4 = pro-hormone, T3 4-10 times more active
Thyroid Hormone Synthesis Pathway

Thyroglobulin

Iodine + tyrosine → Monoiodotyrosine (MIT) → Diiodotyrosine (DIT) → Thyroxine (T4) = 2 x DIT → Triiodothyronine (T3) = 1 x MIT + 1 x DIT

Thyroid Hormone Synthesis Nutrients

Thyroglobulin

Iodine, Tyrosine, Zinc, B1, 2, 6, Vitamin C → MIT & DIT → Thyroxine (T4) → Triiodothyronine (T3) → Selenium, Zinc, Copper, Iron
Thyroid Hormones Around the Body

- Thyroid hormone transport around body
  - T4 mainly bound to thyroid binding globulin (TBG)
  - T3 mainly bound to thyroxine-binding prealbumin (TBPA) and albumin

- T4 converted into active T3 hormone in liver, spleen, muscles and kidneys

- Excess T4 converted into reverse T3 (rT3) in liver and kidneys to prevent hyper-thyroid conditions

Thyroid Hormone Control

Pituitary gland provides direct control via TSH

T3 and T4 hormones also provide negative feedback to control thyroid hormone production
Thyroid and the Gut

- T3 converted in gut via sulfatase enzyme
- Sulfatase activity related to gut bacteria levels
- Gut associated lymphoid tissue (GALT) sensitivity (food allergies, stress, dysbiosis etc) will raise cortisol levels (increases rT3 conversion)
- Beta glucuronidase activity increases enterohepatic circulation of oestrogen (blocks thyroid hormone receptors)

Thyroid and the Liver

- Healthy liver required for thyroid function:
  - Conversion of T4 – T3
  - Production of thyroid binding globulin and transport proteins
  - Detoxification of oestrogen, toxins
Thyroid Conditions – What Can Go Wrong?

Thyroid imbalances can be categorised:

– **Primary**: low T4 production

– **Secondary**: under functioning pituitary = low TSH = thyroid fails to work properly

– **Tertiary** (rare) – hypothalamus defect reducing TRH secretion

– **T4 – T3** conversion failure at tissue level or increased rT3 production

– **Auto-antibodies** for TSH receptor, thyroid peroxidase (TPO) and thyroglobulin (TG) attack thyroid (increase or decrease thyroid activity and output)

Goitre

• Non-cancerous enlargement of the thyroid

• Most commonly caused by iodine deficiency

• Also caused by:
  – Hyperthyroidism – increased activity leads to increased thyroid growth
  – Hypothyroidism – low T4 increases serum TSH which slowly stimulates thyroid growth
Hyperthyroidism

• Overactive thyroid produces high levels of free T3 and T4

• Blood tests show low TSH and high free T3/T4

• Symptoms include nervousness, increased appetite but often with weight loss, increased perspiration, intolerance to heat, tachycardia, hand tremors, irritability, thinning skin, fine brittle hair and muscular weakness, increased bowel movement, hypoglycemia

Causes of Hyperthyroidism

1. Autoimmune hyperthyroidism:
   – 60-90% cases over active thyroid stem from Graves disease

   – Auto-antibodies stimulate TSH receptor on thyroid gland = increased T3/T4 and goitre

2. Thyroiditis also causes hyperthyroidism

• Prolonged hyperthyroidism may result in eventual hypothyroid conditions
Thyroid Antibodies

- Thyroid autoantibody (anti-TSH, anti-TPO, anti-TG) production trigger?
  - Genetic
  - Non-thyroid autoimmune diseases (e.g. Type I diabetes, systemic lupus erythematosus SLE)
  - Ageing
  - Pregnancy
  - Environmental and lifestyle factors

Hypothyroidism

1. Primary = Low T3/ T4 production by thyroid gland
   - Iodine and/or nutrient and cofactor deficiency
   - Inflammation (auto-antibodies, e.g. Hashimoto’s disease)

2. Secondary = Reduced pituitary function (low TSH)

3. Reduced T4 – T3 conversion or increased rT3 in peripheral tissues = euthyroid sick syndrome (ESS)
Causes & Symptoms

• Constipation, lethargy, weight gain, fatigue, depression, cold-intolerance, muscle weakness, hair loss, dry, flaky skin, elevated cholesterol/triglycerides, infertility (goitre)

• Hypothyroidism caused by many things:
  – Dysbiosis, chronic stress and anxiety, drugs (beta-blockers, steroids), heavy metal toxicity, environmental pollution, poor liver detox, cigarette smoke and chronic alcohol intake

Role of the Adrenals in Hypothyroidism

• Raised cortisol (stress) affects the thyroid gland:
  – Decreases pituitary response to TRH from hypothalamus
  – Lowers TSH production
  – Lowers T4 and fT4
  – Lowers T3 and raises rT3

• Always address stress and adrenal health in any thyroid programme
Thyroid Hormone Reference Range

<table>
<thead>
<tr>
<th></th>
<th>Reference Range (mU/L)</th>
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<tbody>
<tr>
<td>TSH</td>
<td>0.4-4.5</td>
</tr>
<tr>
<td>Total T4</td>
<td>50-160</td>
</tr>
<tr>
<td>Free T4</td>
<td>10-24</td>
</tr>
<tr>
<td>Free T3</td>
<td>4.0-8.3</td>
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</tbody>
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Total = bound to proteins

Free = small fraction that is not bound to transport proteins and free for physiological action

Source: Thyroid UK

Thyroid Function Tests – Blood Tests

- Conventional blood tests measure T4
- Does not account for T4 – T3 conversion problems
- Blood reference range very broad so can lead to symptomatic patients being classed as ‘normal’
- Standard tests do not report on antibodies
- Should consider TSH, T4, T3, rT3 and Abs for full screen
Thyroid Function Tests – Barnes Temperature Test

Measure basal (underarm) temperature first thing in the morning, before rising

Normal basal temperature = 36.3°C (97.3°F) – 37°C (98.6°F)

- Overactive thyroid = 1-2 above normal
- Underactive thyroid = 1-2 below normal

Importance of Iodine

- Iodine required for synthesis of T4 and T3 hormones
- Also naturally high in ovaries, prostate and required for brain development and maintenance
- Diets low in sea vegetables and ocean fish
- Bromide, fluoride and chloride negatively impact on iodine levels
Gluten & Thyroid Dysfunction

• Gluten can negatively affect thyroid hormone balance

• Autoimmune thyroid disease (Hashimoto’s and Graves’) may be linked with gluten intolerance/allergy

• Gliadin closely resembles thyroid gland tissue

• Reduced gut barrier function allows gliaden to enter blood stream raising antibody response

• Gliadin Abs can also attack thyroid tissue

• Immune response to gluten may last up to 6 months

Naturopathic Thyroid Support

• Support gut health
  – Bowel cleanse
  – Dysbiosis
  – Protein digestion (tyrosine availability)

• Support liver health
  – Detoxification support

• Support thyroid health
  – Iodine – kelp, nettles, sea vegetables (food +/- supplements)
  – Selenium – Brazil nuts, anti-oxidant supplement
  – Tyrosine - chicken, fish, avocados, bananas and almonds
Naturopathic Thyroid Support

• **Alkalising diet** + monitoring goitrogens

• **Anti-inflammatory nutrients**
  – Omega 3 essential fatty acids (increase dietary fish, Krill oil)
  – Antioxidants (Vitamin C, Vitamin E, zinc, selenium, coenzyme Q10 etc)

• Cold water spray to underactive thyroid, body brushing to support lymph and detoxification

• Reduce stress – yoga, massage etc

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Essential Fatty Acids and Thyroid

• Omega 3 essential fatty acids from diet and highly bioavailable Krill oil

  – Supports cell membrane structure
  – Increases thyroid receptor proteins in liver for T3 response (enhances metabolism)
  – Balances serum triglycerides and cholesterol levels
Vitamin D and Thyroid Function

- Thyroid hormone imbalances and disease coexists with low vitamin D levels
- Gut malabsorption and/or poor endogenous activation
- Address gut epithelial integrity, mild sunlight exposure, diet and supplementation

Checklist for Thyroid Health

- Support bowel health – bowel cleanse, probiotics
- Support liver health – detoxification nutrients
- Directly support thyroid tissue and hormone production – kelp, iodine, selenium, B vitamins
- Krill oil (omega 3 EFAs), Vitamin D
- Increase alkalising and anti-inflammatory nutrients and supplements
**Nutrigold Newsletters**

See Nutrigold newsletters and updates service for full reference list:

- Wherewithal to Detoxify
- Detoxification
- Nutrigold Updates Service: The Art of Detoxifying, The Truth Behind the Need to Detoxify
- Importance of Alkalising Diet
- Calming and Cleansing the Colon

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