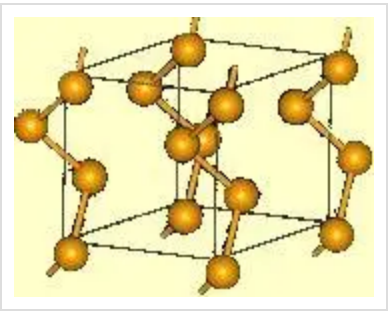
Hashimotos Thyroiditis and Selenium Part One by Jeffrey Dach MD

Posted on **March 19 2013**



Hashimoto's Thyroiditis and Selenium

This article is Part One of a Series

For Part Two, Click Here

For part three click here.

by Jeffrey Dach MD

Susan has Hashimoto's thyroiditis, an autoimmune thyroid disorder causing fatigue, puffy face and muscle weakness. For the past year, she had been under the care of an endocrinologist who started thyroid medication called Synthroid, and tested for thyroid antibody levels. Susan found it disturbing that her anti-thyroid antibody

levels kept climbing higher on each subsequent lab test. The doctors had no explanation, so she asked me if there was something else that could be done.

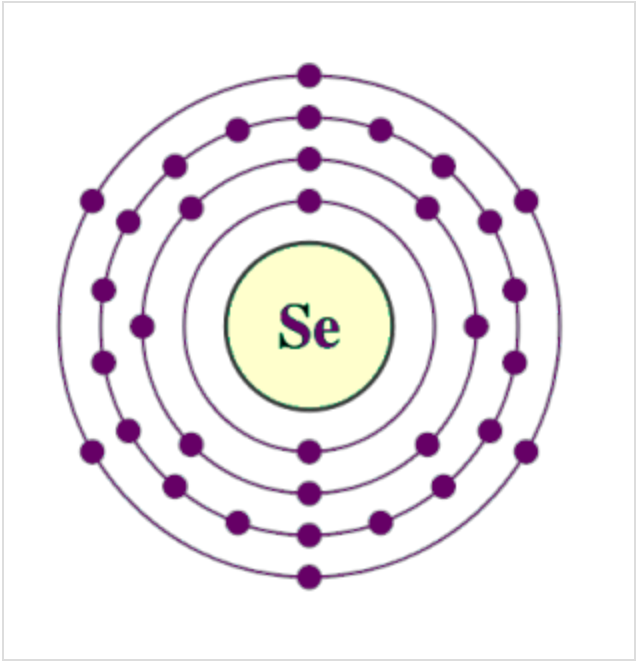
Selenium Can Decrease Antibody Levels

Yes, selenium is an essential trace mineral important for the thyroid gland. Selenium deficiency has been implicated in the etiology of Hashimoto's thyroiditis, and selenium supplementation has been found beneficial.

Three Selenium Studies Showing Selenium Beneficial

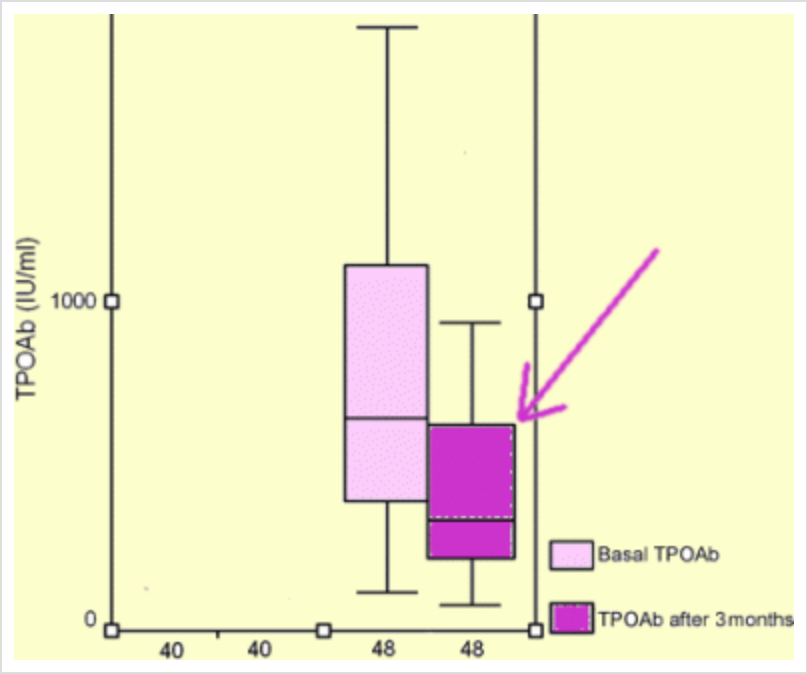
The first study by Dr. Mazokopakis from Crete was published in the 2007 Thyroid Journal.(1) This study reported a 21 % reduction in the anti-thyroid antibody called thyroid peroxidase (TPO) antibodies after one year of selenomethionine supplementation at a dosage of 200 mcg per day.

A second study from Germany by Dr. Gärtner in the 2002 Journal of Clinical Endocrinology and Metabolism showed a **40 %** reduction in antibody levels after selenium supplementation. Twenty Five percent (9 of 36 patients) completely normalizing their antibody levels.



Left images: selenium diagrams courtesy of wikimedia commons.

A third study done in Turkey by Omer Turker et al. was published in the 2006 Journal of Endocrinology.(5) They showed a 30% decrease in anti-thyroid antibodies after three months of L-selenomethionine supplementation at 200 mcg per day in women with Hashimotos thyroiditis. The starting average TPO antibodies of 803 and after three months the average was 572. The below bar chart shows the data from Omer Turker et al.



Left chart: Thyroid antibody (TPOAb) concentrations at the beginning of the study (light pink) and 3 months after treatment (arrow) with 200 mg L-selenomethionine/day (group S2). Higher Light pink bar shows antibody levels before starting treatment. Lower Dark pink bar (arrow) shows decrease in antibody levels after three months of selenium supplementation. Bar Chart Image courtesy of Omer Turker et al. Journal of Endocrinology.

A fourth study in 2003 by Dr Duntas from Athens Greece examined the effect of selenomethionine supplementation in 60 patients with Hashimotos thyroiditis. All patients were treated with Thyroxine (T4). Half (30) were also given selenomethionine 200 mcg/day. The selenium treated group showed a much more impressive reduction in TPO antibodies at the end of the 6 month study.(7)

Why is Selenium So Important for Thyroid Function?

Recent advances in research into thyroid cell physiology shows that selenium is very important for thyroid function. There are at least 30 selenium dependent proteins, including the glutathione peroxidase enzyme, and the Iodothyronine deiodinases enzyme (this is the one that converts thyroxine (T4) to bioactive (T3). These proteins all need selenium as a co-factor in order to function properly. The selenoprotein, glutathione peroxidase, protects thyroid cells from damage by hydrogen peroxide (H2O2) produced by the thyroid cell. H2O2 is needed as a normal step in thyroid hormone production, However, too much H202 can damage the thyroid cell. In the event of selenium deficiency, the glutathione peroxidase enzyme cannot do its job protecting the thyroid cell, and the thyroid cells are damaged by excess H2O2. The current theory is that this damaged cell material is then recognized by the immune system as foreign, leading to Hashimoto's autoimmune disease.

Link to Wheat Consumption. Leaky Gut and Molecular Mimicry

Although selenium deficiency is a predisposing factor, wheat gluten consumption is the other major culprit. As discussed in my previous article, in genetically predisposed individuals, wheat gluten consumption will cause Leaky Gut, with leakage of bacterial antigens into the blood stream. Via a mechanism called molecular mimicry, the immune system then attacks the thyroid gland, explaining the underlying causation of autoimmune thyroid disease, Hashimotos, and Graves disease. Yersinia is one such bacterial organism that has been implicated. In addition, there is a high correlation between Hashimoto's thyroidits and Celiac Disease, an autoimmune diease

caused by wheat gluten consumption. Obviously, elimination of wheat gluten from the diet is necessary and in many cases, curative, for the autoimmune thyroid patient. I have found this to be the case in actual clinical practice.

Back to the Patient

Susan was started on selenium, 400 mcg per day. In addition, we switched her thyroid medication from Synthroid to natural dessicated thyroid, a more robust and clinically superior preparation. Three months later, Susan returned for follow up labs which showed a significant decline in antibody levels.

Thyroid Testing and Treatment

A good thyroid testing protocol includes the following lab values, TSH, Free T3, Free T4, TPO Abs, Tgb Abs, reverse T3, serum selenium level, and spot urinary iodine level. The thyroid panel is usually part of a larger evaluation with additional lab tests tailored to the clinical history and examination. A good thyroid treatment protocol uses natural dessicated thyroid medication such as Nature-throid from RLC labs. Dosage for natural dessicated thyroid medication varies, based on body weight, thyroid lab values and thyroid function.

Selenium Safety or Toxicity Depends on Dosage

Although Selenium is an inexpensive mineral supplement available without a prescription at the health food store, I would recommend working closely with your physician if you are considering selenium supplementation. Selenium is generally considered safe at standard doses of 200-400 mcg per day. However, very high dosage can cause selenium toxicity. Your physician will determine if you need thyroid medication, the type and dosage of the medication, etc. By the way, for those looking for a food source for selenium, Brazil nuts are high in selenium.

Testing and Treatment in Hashimoto's Thyroiditis

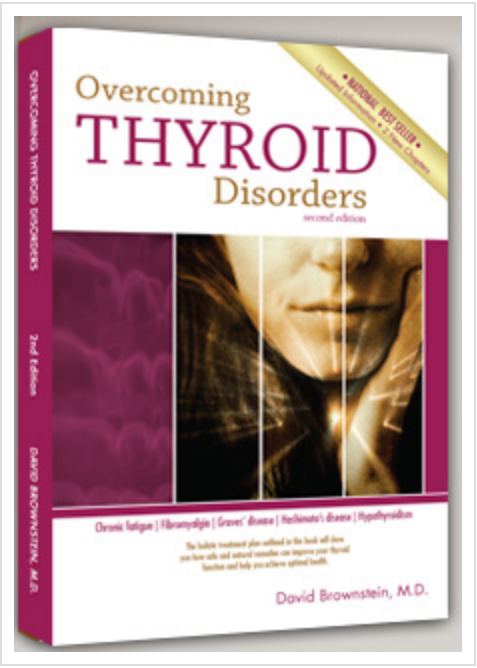
Thyroid function in Hashimoto's Thyroiditis **can have a variable course,** with thyroid function varying over time. This is called the **"roller coaster effect" .** The need for thyroid medication will also vary depending upon thyroid function which can change over time. Lab studies at any one time may show low, normal or high thyroid function in patients with elevated antibody levels and Hashimoto's thyroid disease.

David Brownstein's protocols are excellent recommendations regarding thyroid testing and treatment.

See his book, "**Overcoming Thyroid Disorders".** *left above image, book cover, Overcoming Thyroid Disorders courtesy of David Brownstein MD*

Web Sites with Reliable Information about Selenium for Hashimoto's

Janie Bowthorpe's book and the Stop the Thyroid Madness Blog is an excellent source of reliable information. Mary Shomon's, Thyroid web site and newsletter is also an excellent source of reliable information. Beware and avoid anonymous message boards that may give false or incorrect information about selenium. One question to ask about information on anonymous message boards: Is the information backed up by citations or references in the peer reviewed medical literature? If not, then it may not be reliable information.



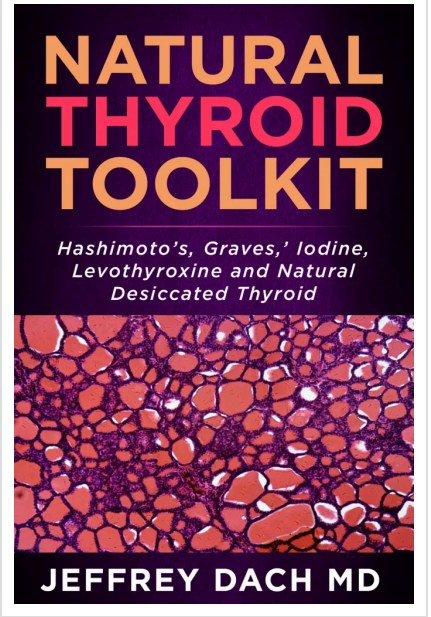
Hypothyroid Mom – Dana Trentini

Another good resource is Dana Trentini's web site , Hypothyroid Mom.

Disclosure of Financial Interest: I have no financial interest in any books or supplements mentioned in this article, with the exception of my own books, Natural Medicine 101 and Bioidentical Hormones 101, both available on Amazon.

Update 9/19/21: BMJ Rapid Response: **Iodine deficiency, not excess, is the cause of autoimmune thyroid disease.** The link between iodine intake and thyroid autoimmunity is more complex than Neeru Gupta suggests (Response, 08 April 2016), but increasing evidence implicates iodine deficiency, not excess, as the cause of autoimmune thyroid disease…. 12 April 2016 Peter J Lewis General Practitioner with Special Interest in Integrative Medicine 15 South Steyne, Manly, NSW 2095, Australia

This article is Part One of a Series,
For Part Two, Click Here. For Part Three



Natural Thyroid Toolkit

If you liked this article, you might like my new book, **Natural Thyroid Toolkit** available on Amazon. If you purchase a book, remember to leave a favorable review. That would be much appreciated. See the book cover, left image.

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The TSH Reference Range Wars – Part One

TSH Wars, Part Two

Thyroid Nodules

The Thyroid Nodule Epidemic

The Strange Case of the Autonomous Thyroid Nodule

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References

1) http://www.ncbi.nlm.nih.gov/pubmed/17696828
Thyroid. 2007 Jul;17(7):609-12. Effects of 12 months treatment with L-selenomethionine on serum anti-TPO Levels in Patients with Hashimoto's thyroiditis. Mazokopakis EE, Papadakis JA, Papadomanolaki MG, Batistakis AG, Giannakopoulos TG, Protopapadakis EE, Ganotakis ES. Department of Internal Medicine, University Hospital of Heraklion, Crete, Greece.

OBJECTIVE: We studied the effects of selenium (Se) treatment on serum anti-thyroid peroxidase (TPO) levels in Greek patients with Hashimoto's thyroiditis (HT). DESIGN: We prospectively studied 80 women with HT, median age 37 (range 24-52) years, for 1 year.

All patients received 200 microg Se in the form of l-selenomethionine orally for 6 months. At the end of the 6-month period, 40 patients continued taking 200 microg Se (Group A) and 40 patients stopped .

Serum thyrotropin (TSH), free triiodothyronine (FT(3)), free thyroxine (FT(4)), anti-TPO, and anti-thyroglobulin (Tg) levels were measured at baseline and at the end of each 3-month period.

MAIN OUTCOME: There was a significant reduction of serum anti-TPO levels during the first 6 months (by 5.6% and 9.9% at 3 and 6 months, respectively). An overall reduction of 21% ($p < 0.0001$) compared with the basal values was noted in Group A. In Group B, serum anti-TPO levels were increased by 4.8% ($p < 0.0001$) during the second 6-month period.

CONCLUSIONS: Our study showed that in HT patients 6 months of Se treatment caused a significant decrease in serum anti-TPO levels, which was more profound in the second trimester. The extension of Se supplementation for 6 more months resulted in an additional 8% decrease, while the cessation caused a 4.8% increase, in the anti-TPO concentrations.

2) http://jcem.endojournals.org/cgi/content/full/87/4/1687
The Journal of Clinical Endocrinology & Metabolism Vol. 87, No. 4 1687-1691, 2002 Selenium supplementation in patients with autoimmune thyroiditis decreases thyroid peroxidase antibodies concentrations. Gärtner R, Gasnier

BC, Dietrich JW, Krebs B, Angstwurm MW. Department of Endocrinology, Medizinische Klinik Innenstadt, University of Munich, D-80336 Munich, Germany.

In areas with severe selenium deficiency there is a higher incidence of thyroiditis due to a decreased activity of selenium-dependent glutathione peroxidase activity within thyroid cells. Selenium-dependent enzymes also have several modifying effects on the immune system. Therefore, even mild selenium deficiency may contribute to the development and maintenance of autoimmune thyroid diseases.

We performed a blinded, placebo-controlled, prospective study in female patients (n = 70; mean age, 47.5 +/- 0.7 yr) with autoimmune thyroiditis and thyroid peroxidase antibodies (TPOAb) and/or Tg antibodies (TgAb) above 350 IU/ml. The primary end point of the study was the change in TPOAb concentrations. Secondary end points were changes in TgAb, TSH, and free thyroid hormone levels as well as ultrasound pattern of the thyroid and quality of life estimation.

Patients were randomized into 2 age- and antibody (TPOAb)-matched groups; 36 patients received 200 microg (2.53 micromol) sodium selenite/d, orally, for 3 months, and 34 patients received placebo. All patients were substituted with L-T(4) to maintain TSH within the normal range. TPOAb, TgAb, TSH, and free thyroid hormones were determined by commercial assays. The echogenicity of the thyroid was monitored with high resolution ultrasound.

The mean TPOAb concentration decreased significantly to 63.6% (P = 0.013) in the selenium group vs. 88% (P = 0.95) in the placebo group. A subgroup analysis of those patients with TPOAb greater than 1200 IU/ml revealed a mean 40% reduction in the selenium-treated patients compared with a 10% increase in TPOAb in the placebo group. TgAb concentrations were lower in the placebo group at the beginning of the study and significantly further decreased (P = 0.018), but were unchanged in the selenium group.

Nine patients in the selenium-treated group had completely normalized antibody concentrations, in contrast to two patients in the placebo group (by chi(2) test, P = 0.01). Ultrasound of the thyroid showed normalized echogenicity in these patients. The mean TSH, free T(4), and free T(3) levels were unchanged in both groups. We conclude that selenium substitution may improve the inflammatory activity in patients with autoimmune thyroiditis, especially in those with high activity. Whether this effect is specific for autoimmune thyroiditis or may also be effective in other endocrine autoimmune diseases has yet to be investigated.

3) http://www.ncbi.nlm.nih.gov/pubmed/12487769
Thyroid. 2002 Oct;12(10):867-78.The impact of iron and selenium deficiencies on iodine and thyroid metabolism: biochemistry and relevance to public health. Zimmermann MB, Köhrle J.Laboratory for Human Nutrition, Swiss Federal Institute of Technology, Zürich, Switzerland.

Several minerals and trace elements are essential for normal thyroid hormone metabolism, e.g., iodine, iron, selenium, and zinc. Coexisting deficiencies of these elements can impair thyroid function. Iron deficiency impairs thyroid hormone synthesis by reducing activity of heme-dependent thyroid peroxidase. Iron-deficiency anemia blunts and iron supplementation improves the efficacy of iodine supplementation. Combined selenium and iodine deficiency leads to myxedematous cretinism. The normal thyroid gland retains high selenium concentrations even under conditions of inadequate selenium supply and expresses many of the known selenocysteine-containing proteins. Among these selenoproteins are the glutathione peroxidase, deiodinase, and thioredoxine reductase families of enzymes. Adequate selenium nutrition supports efficient thyroid hormone synthesis and metabolism and

protects the thyroid gland from damage by excessive iodide exposure. In regions of combined severe iodine and selenium deficiency, normalization of iodine supply is mandatory before initiation of selenium supplementation in order to prevent hypothyroidism. Selenium deficiency and disturbed thyroid hormone economy may develop under conditions of special dietary regimens such as long-term total parenteral nutrition, phenylketonuria diet, cystic fibrosis, or may be the result of imbalanced nutrition in children, elderly people, or sick patients.

4) http://nuclmed.web.auth.gr/magazine/eng/jan07/8.pdf
Hashimoto's thyroiditis and the role of selenium. Current concepts
by Hellenic in the Journal of Nuclear Medicine January – April 2007 Review Article

5) http://joe.endocrinology-journals.org/cgi/content/full/190/1/151
Journal of Endocrinology (2006) 190, 151-156
Selenium treatment in autoimmune thyroiditis: 9-month follow-up with variable doses. Omer Turker et al
Thyroidology Unit, Department of Nuclear Medicine, GATA Haydarpasa, Istanbul, Turkey

The aim of this study is to investigate the long-term (9 months) effects of variable doses (200/100 μg/day) of L-selenomethionine on autoimmune thyroiditis (AIT) and the parameters affecting the success rate of this therapy. The present study was designed in three steps:

(1) 88 female patients with AIT (mean age = 40.1 ± 13.3 years) were randomized into two groups according to their initial serum TSH, thyroid peroxidase antibody (TPOAb) concentrations, and age. All the patients were receiving L-thyroxine to keep serum TSH 2 mIU/l. Group S2 (n = 48, mean TPOAb = 803.9 ± 483.8 IU/ml) received 200 μg L-selenomethionine per day, orally for 3 months, and group C (n = 40, mean TPOAb = 770.3 ± 406.2 IU/ml) received placebo.

(2) 40 volunteers of group S2 were randomized into two age- and TPOAb-matched groups. Group S22 (n = 20) went on taking L-selenomethionine 200 μg/day, while others (group S21) lowered the dose to 100 μg/day.

(3) 12 patients of group S22 (group S222) went on taking L-selenomethionine 200 μg/day, while 12 patients of group S21 (S212) increased the dose to 200 μg/day.

Serum titers of TPOAb decreased significantly in group S2 (26.2%, $P < 0.001$), group S22 (23.7%, $P < 0.01$) and group S212 (30.3%, $P < 0.01$).

There were no significant changes in group C and group S222 ($P > 0.05$).

TPOAb titers increased significantly in group S21 (38.1%, $P < 0.01$).

A significant decrease in thyroglobulin antibody titers was only noted in group S2 (5.2%, $P < 0.01$).

L-selenomethionine substitution suppresses serum concentrations of TPOAb in patients with AIT, but suppression requires doses higher than 100 μg/day which is sufficient to maximize glutathione peroxidase activities. The suppression rate decreases with time.

Selenium is essential for optimal endocrine and immune function and for moderating the inflammatory response. These actions are mediated in most cases through the expression of at least 30 selenoproteins. There are at least

six different glutathione peroxidases (GPX); Iodothyronine deiodinases type D1 and D2 convert thyroxine (T4) to bioactive 3,5,3′-tri-iodothyronine (T3);

6) http://edrv.endojournals.org/cgi/content/abstract/26/7/944
Endocrine Reviews 26 (7): 944-984, 2005
Selenium, the Thyroid, and the Endocrine System by J. Köhrle, F. Jakob, B. Contempré and J. E. Dumont Institut für Experimentelle Endokrinologie (J.K.), Charité Universitätsmedizin Berlin, Humboldt Universität, D-10098 Berlin, Germany;

Recent identification of new selenocysteine-containing proteins has revealed relationships between the two trace elements selenium (Se) and iodine and the hormone network. Several selenoproteins participate in the protection of thyrocytes from damage by H2O2 produced for thyroid hormone biosynthesis. Iodothyronine deiodinases are selenoproteins contributing to systemic or local thyroid hormone homeostasis. The Se content in endocrine tissues (thyroid, adrenals, pituitary, testes, ovary) is higher than in many other organs. Nutritional Se depletion results in retention, whereas Se repletion is followed by a rapid accumulation of Se in endocrine tissues, reproductive organs, and the brain.

7) http://www.ncbi.nlm.nih.gov/pubmed/12656658
Eur J Endocrinol. 2003 Apr;148(4):389-93.Effects of a six month treatment with selenomethionine in patients with autoimmune thyroiditis.Duntas LH, Mantzou E, Koutras DA.Endocrine Unit, Evgenidion Hospital, University of Athens Medical School, 20 Papadiamantopoulou Str, 11528 Athens, Greece.
OBJECTIVE:Selenium (Se) in the form of selenocysteine is an essential component of the family of the detoxifying enzymes glutathione peroxidase (Gpx) and of the iodothyronine selenodeiodinases that catalyse the extrathyroidal production of tri-iodothyronine (T(3)). Thus, Se deficiency may seriously influence the generation of free radicals, the conversion of thyroxine (T(4)) to T(3) and the autoimmune process. Therefore, we performed a randomised, placebo-controlled prospective study to investigate the effects of Se treatment on patients with autoimmune thyroiditis (AIT).

DESIGN AND METHODS:
Sixty five patients aged 22-61 years (median age 48 years) with AIT were recruited into two groups. Group I (Gr I) (n=34) was treated with selenomethionine (Seme) 200 microg, plus L-thyroxine (LT(4)) to maintain TSH levels between 0.3-2.0 mU/l, whereas group II (Gr II) (n=31) received LT(4) plus placebo over a period of 6 months. Moreover, the pharmacokinetics of Seme were studied in 10 patients and eight volunteers at baseline and 2 h, 4 h, 6 h and 24 h after oral administration of a 200 microg tablet of Seme. Finally, Se levels were measured at the end of the study in some patients of both groups and their results were correlated with thyroid hormone levels.
RESULTS:In the pharmacokinetics study, basal serum concentration of Se (75+/-6 microg/l) was within the reference range (70-125 microg/l), it promptly increased at 2 h, peaked at 4 h (147+/-17 microg/l; P<0.0001) and it was abundant in serum at 24 h.

In Gr I, antibodies against thyroid peroxidase (anti-TPO) levels showed an overall decrease of 46% at 3 months (from 1875+/-1039 U/l to 1013+/-382 U/l; P<0.0001) and of 55.5% at 6 months.

In Gr II the overall decrease of anti-TPO amounted to **21%** at 3 months and to **27% at 6** months (from 1758+/-917 U/l to 1284+/-410 U/l; P<0.005). There were no significant changes of antibodies against thyroglobulin levels between the groups. At the end of this study Se levels were found to be statistically significantly increased in Gr I (n = 9/34) compared with Gr II (n=11/31) (97+/-8.4 vs 79+/-8; P<0.01) but no correlation with thyroid hormone was

found.
CONCLUSIONS:Seme is proven to be rapidly absorbed by the gastrointestinal tract. It appears to be useful as adjunctive therapy with LT(4) in the treatment of AIT. The exact mechanism(s) is not very well determined, it might enhance the activity of detoxifying enzymes and enforce the defense against oxidative stress.

Link to this article:http://wp.me/P3gFbV-5N

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Summary

About Jeffrey Dach MD

Medical Director of TrueMedMD, a Clinic in Davie Florida specializing in Bioidentical Hormones and Natural thyroid. Office address 7450 Griffin Road Suite 190, Davie, Florida 33314 telephone 954-792-4663

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Roxie

on **April 20, 2015 at 10:33 AM** said:

Funny thing is that on same site a study from 2013 says selenium supplementation has not improved significantly Hashimoto's condition: http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0056729/

jeffrey_dach_md
on **April 20, 2015 at 2:01 PM** said:

Hi Roxie, Our own experience in the office is in agreement with numerous published studies showing selenium is useful in reducing antibody levels in the HAshimotos patient. One difference is that we actually test for and follow selenium levels in our patient population, which was not done in any of the studies. ……This supplement is very safe and in my opinion, it would be a mistake to withhold selenium from the autoimmune thyroid-Hashimotos patient. regards from dr d

Roxie
on **August 4, 2015 at 3:53 AM** said:

Do you know is selenium in the form of L-selenomethionine is better? Or which form of selenium do you recommend? Thank you very much.

Guest
on **April 20, 2015 at 2:00 PM** said:

Hi Roxie, Our own experience in the office is in agreement with numerous published studies showing selenium is useful in reducing antibody levels in the HAshimotos patient. One difference is that we actually test for and follow selenium levels in our patient population, which was not done in any of the studies. This supplement is very safe and in my opinion, it would be a mistake to withhold selenium from the autoimmune thyroid-Hashimotos patient. regards from dr d

Roxie
on **April 21, 2015 at 2:45 AM** said:

Do you know if it has some unwanted effect if is taken with calcium… I've read somewhere that selenium should be taken at 5 hours after any other supplement. Thank you.

NOLIKEO
on **April 5, 2018 at 8:10 PM** said:

> You can also take too much selenium. I did and hair was falling out.

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Eva
on **May 30, 2016 at 2:55 PM** said:

Hello,

I saw that physiological doses selenium stimulate immunity, and thus auto-antibodies. I take 100mcg of selenomethionine and I fear eventually stimulate my antibodies. Do you know if from 100mcg antibodies are stimulated or if there is at least a slight inhibitory effect?
Have you met with toxic reactions 200mcg?

Thank you very much.
Sincerely, Eva.

KB
on **August 24, 2016 at 5:24 PM** said:

Dr. Dach,
Interested in supplementing with a selenium supplement. My cousin in Germany was recommended Selen+Zink by her doctor for frail nails and thinning hair and it actually worked. I see that the same company sells selenium in 100mcg. Would this product have what it takes for reducing antibody levels?
https://www.pharmanord.com/us-products/selenoprecise
Warm regards. KB

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Chana Ben-Shimon
on **October 7, 2016 at 4:21 PM** said:

i also read somewhere that selenium is known to block goitrogens. is this true?

Pingback: Low Thyroid, Hashimotos and Pregnancy - Jeffrey Dach MD

Sara
on **January 22, 2017 at 7:36 PM** said:

Are there any known benefits to lowering the antibodies?

Thank you for your time.

> NOLIKEO
> on **April 5, 2018 at 8:09 PM** said:
> I took a standard amount of Selenium for Hashimotos according to one of the biggest selling Hashimotos book. I took it four years. My hair was falling out. I had read you can take too much. I asked my doctor to test my levels. (He had never heard of that;) Lo and behold, test came back, my levels were twice the normal amount and he said to stop immediately. And it would take several months to get it out of my system. Hair stopped falling out. There are other symptoms also.

Pingback: Thyroid autoimmunity & its link to glutathione peroxidase/selenium – Science & Rhetoric