

# A case report: Soy milk

A case report: Soy milk - a possible cause of Hashimoto's thyroiditis

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Abstract

Hashimoto's thyroiditis is an autoimmune disease with symptoms of hypothyroidism including psychosis, weight gain, heat and cold sensitivity etc. Some risk factors such as certain human leukocyte antigen (HLA), cytotoxic T-lymphocyte antigen (CTLA) polymorphisms or certain infections are related to this disease. There are some reports claiming soy food could interfere with thyroid function. In this study, we found a case that soy milk might be a possible cause of Hashimoto's thyroiditis by collecting relevant history and laboratory data from patient. The literature reviews provide supportive proof for this claim. It is concluded that the soy milk might be an etiology of Hashimoto's thyroiditis which can be especially alarming for Asian people who favor drinking soy milk instead of milk.

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## 1. A brief history of Hashimoto's thyroiditis with soy food

Hashimoto's thyroiditis is an autoimmune disease [1]. Patients produce various auto-antibodies against thyroid peroxidase, thyroglobulin and thyroid-stimulating hormone (TSH) receptors. Cell or antibody mediate immune response flared and the thyroid gland was destroyed [2, 3]. Symptoms of Hashimoto's thyroiditis include some typical symptoms of hypothyroidism such as: weight change, psychosis, heat and cold sensitivity, heart failure, constipation, paresthesia, chronic fatigue, arrhythmia, hypercholesterolemia, heavy period, infertility and hair loss etc [4]. Some risk factors that might contribute to the disease are: HLA (human leukocyte antigen)-A\*02:07 and HLA-DRB4 [5], HLA-DR3 gene [6], CTLA-4 (cytotoxic T-lymphocyte associated-4) gene polymorphisms [7], Herpesviridae-6 (HHV-6) infection [8], TH17 cells and interleukin-17 (IL-17) [9]. The first report about soy food effect on the thyroid function was in 1959 [10]. After that, more reports indicated the goitrogenic role of soy food [11-14]. Soy milk and other soy food are the main nutrition in Asian dining table and become more and more popular in the west world. Since late 1950, several reports showed soy food might cause goiter [10, 15-17]. There was one retrospective analysis report published in 1990 about soy formula feedings in infancy, which was related with significantly higher prevalence of autoimmune thyroid disease in children [18]. In animal research, it was

shown that certain meals can cause Hashimoto-like thyroiditis [19]. Other report found that in hypothyroidism patients, the intake of soy products might interfere with the thyroid function [20]. The following case was reported by our group in which a possible soy milk triggers Hashimoto's thyroiditis. To our knowledge, this is the first case reporting about the soy milk consumption as a cause of Hashimoto's thyroiditis.

## 2. Case report

A healthy 37 year old Chinese female researcher went to primary care physician for regular checkup at July, 2012. The lab returned with TSH 7.4  $\mu$ IU/ml (0.4-4.5  $\mu$ IU/ml) and thyroxin (T4), free, 1.03 ng/dl (0.8-1.8 ng/dl). One year before this checkup, her thyroid test was within normal range. The patient recalled that she had mild depression in January same year and was seen by psychiatrists and social workers. Her depression was improved after visiting. By reviewing her history, we found that she started drinking soy milk twice per day (1000 ml) for the past whole year. The patient had allergic rash to sulfur drug. Physical exam found that her body weight was 120 pounds. She was afebrile with a pulse rate of 60 beats/second and blood pressure of 90/60 mmHg. Physical exam showed mild enlarge thyroid. Examination of laboratory values revealed that the thyroglobulin antibodies (TgAb) was 105.9 U/ml (higher than normal range) and thyroid peroxidase antibody (TPOAb) was 121.7 U/ml (higher than normal range), hepatitis B surface Ab was H reactive while Hepatitis B surface Ag and Be antigen was nonreactive. Some lab test results are shown in Table 1. Ultrasound showed a normal thyroid (Fig. 1). The patient was given 80-100 mcg/day levothyroxin and was suggested to stop drinking soy milk. Her TSH was 0.01  $\mu$ IU/ml on October 2nd, 2012, afterwards the levothyroxin dose was decreased to 40 mcg/day. TSH went back to 3.85  $\mu$ IU/ml on December 6th, 2012. The patient visited an endocrinologist and stop to take levothyroxin on February, 2013. The lab test at that time was: thyroglobulin antibody decreased to <20 IU/mL (back to normal) and thyroid peroxidase antibody was 121 IU/mL, TSH was 4.58  $\mu$ IU/mL. In another follow-up with endocrinologist on March, 2014, the lab test showed: TSH was 4.11  $\mu$ IU/ml, T4, free (direct) was 1.18 ng/dL, TSI was 41 % baseline, thyroid peroxidase antibody was 121 IU/MI (<35 IU/mL), and thyroglobulin antibody was <20 IU/mL. Some lab test results are shown in Table 2. After 22 months she was diagnosed as thyroiditis, the patient's thyroid peroxidase antibody was higher than normal, and other tests were within the normal range. Patient had no complaint. By reviewing her history, we found that the patients had positive HBsAg (hepatitis B surface antigen) at age of 22, and the HBsAg turned out to be negative at age 30 for pregnancy checkup. The patient received HBV (hepatitis B virus) vaccine in 2006 and no antibody was induced after vaccination. In 2012 the HBsAb (Hepatitis B surface antibody) was strong positive and was still positive in 2014. The patient has no family history of thyroid disease and she takes vitamin every other day.

Table 1. Biomedical characteristic of the patient with Hishimoto thyroiditis in 2012.

Test	Value	Normal value	Unit	Test	Value	Normal value	Unit
White blood count	4	4-11	10 <sup>3</sup> /μl	HBsAg	nonreactive	nonreactive	-
Red blood count	4.1	3.7-5.2	10 <sup>6</sup> /μl	HBsAb	68.2		IU/L
Hemoglobin	11.7	11.0-15.0	g/dL	Cholesterol	176	125-200	mg/dL
Hematocrit	37.5	34-47	%	HDL Cholesterol	55	45.9-	mg/dL
MCV	91	80-102	fL	LDL Cholesterol	105	<130	mg/dL
MCH	28.5	25.0-33.0	pg/cell	Triglycerides	82	<150	mg/dL
MCHC	31.2	30-35	g/dL	AST(SGOT)	20	10-30	IU/L
Neutrophils%	53.8	40-70	%	ALT(SGPT)	16	6-40	IU/L
Lymphocytes%	36.3	15-45	%	Bilirubin, Total	0.9	0.2-1.2	mg/dL
Monocytes%	6.5	2-10	%	Alkaline Phosphatase	59	33-115	IU/L
Eosiphils%	2.6	0-7	%	Urea Nitrogen	15	7-25	mg/dL
Basophils%	0.8	0-2	%	Creatinine	0.72	0.5-1.3	mg/dL
Platelets	260	150-450	10 <sup>3</sup> / μl	EGFR	>60	>60-	-

### 3. Discussion

Environmental factors such as infections can be considered as a trigger for autoimmune diseases [8, 21-25]. For this patient, she has been infected with HBV a long time ago and then developed antibody to HBsAg from 2011. However, HBV is not likely to be the cause of autoimmune thyroiditis condition because: (1) her infection of HBV was more than 15 years ago before she was diagnosed with thyroiditis in 2012, while her abnormal thyroid function was observed from June 2011 to June 2012. Therefore, the timing of the hepatitis infection doesn't correlate with her thyroiditis. In addition, thyroiditis is more common in HCV (hepatitis C virus) infection than HBV infection. Hypothyroidism was found in HCV infected patient while not in HBV infected patients, although these patients have positive TPOAb and TgAb [26]. (2) A review paper from New England Journal of Medicine found an inverse relation between the incidences of infectious disease with immune disorders [27]. Other factors like certain HLA genotype are also related with high incidence of this disease [5-7], especially HLA-DR [28, 29]. This patient has never been tested for the HLA typing, so we can not relate her disease with HLA type. The soy milk drinking in this case might contribute to the development of Hashimoto's thyroiditis in this female patient because the cause-effect relationship is strongly supported by the reduction of thyroglobulin antibody levels back to normal after she stopped drinking soy milk, along with a relief in her symptoms. Furthermore, the diagnosis of Hashimoto-like thyroiditis came after the consumption of one liter soy milk per day since 2011. The common finding in ultrasound is nodule [30] while this patient shows normal texture of thyroid from ultrasound at ultrasound result.

Table 2. Thyroid function test.

Date	TSH (μIU/mL)	T4, Free (ng/dL)	T3, Total (ng/dL)	Thyroglobulin Antibodies (IU/ml)	Thyroid Peroxidase Antibodies (IU/ml)
2/26/2011	3.54	1.02			
6/30/2012	7.4	1.03			
8/25/2012	0.02	1.92		105.9	121.7
10/2/2012	0.01	1.64	125		
12/6/2012	3.85	1.00			
2/28/2013	3.07			<20	121
4/6/2013	4.58	1.00			
6/27/2013	3.74	1			
7/13/2013	5.08	1.02			
3/1/2014	4.11	1.18			

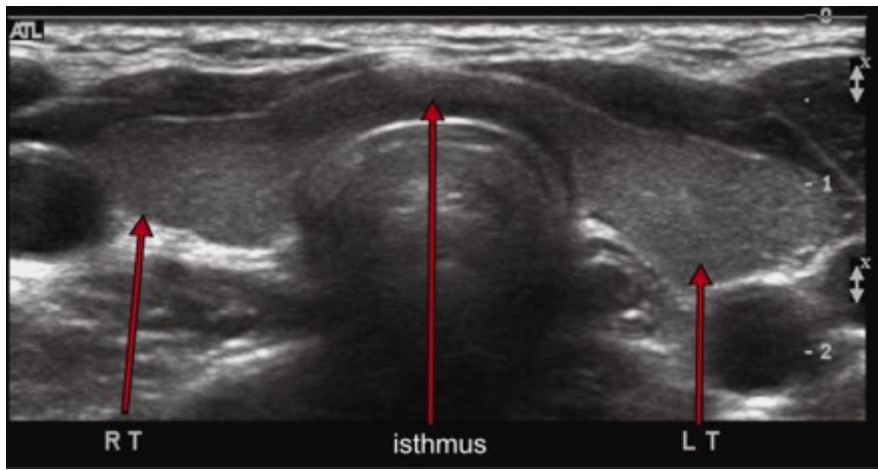


Fig. 1. Thyroid ultrasound: Negative thyroid ultrasound exam. Multiple static images from real-time ultrasound of the thyroid gland were submitted without prior comparison films or reports. The thyroid gland appeared normal in size, configuration and echotexture. The right thyroid lobe (RT) size was 0.8x1.0x4.4 cm. The isthmus size was 0.3 cm AP. The left lobe thyroid (LT) size was 1.0x1.4x4.4 cm.

#### 4. Summary and Conclusion

Hashimoto's thyroiditis is autoimmune disease without obvious etiology. Several factors were connected to this disease. This, to our knowledge, is the first reported case of revealing the correlation of soy milk with etiology of Hashimoto's thyroiditis. This is especially alarming for Asian people because they favor drinking soy milk instead of milk. Especially, the pregnant women should be more cautious with drinking soy milk as it might interfere with the thyroid function of newborn baby (maybe fetus).

#### Consent

For publication of this case report, a written informed consent was acquired from the patient; no Identifying information was used in the publication of this manuscript.

#### Conflict of interest

The authors declared that they do not have anything to disclose regarding funding or conflict of interest with respect to this manuscript. The authors do not have a relationship with pharmaceutical company either in the past or present.

#### Authors' contributions

LL, HM conceived, wrote and edited the manuscript.

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