



A rare connection between autoimmune thyroiditis and *Yersinia enterocolitica* infection affecting male reproductive health: A clinical case report

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ABSTRACT

Autoimmune thyroiditis (AIT) is the most common autoimmune endocrine disorder, and recognizing infectious triggers like *Yersinia enterocolitica* (*Y. enterocolitica*) is crucial for clinicians to improve diagnosis and management. A 53-year-old man presented with fatigue, irritability, sweating, and palpitations. Laboratory findings showed suppressed TSH, elevated FT3, normal FT4, and an anti-TPO level of >1000 IU/mL. Western blotting confirmed *Y. enterocolitica* infection through IgA and IgG detection, highlighting the importance of specific serological methods for accurate diagnosis. Mild lymphocytosis with relative neutropenia suggested immune activation. The diagnosis was AIT with transient thyrotoxicosis triggered by *Y. enterocolitica*. Treatment with thiamazole and doxycycline led to complete symptom resolution and normalized thyroid hormone levels. This case supports the hypothesis that *Y. enterocolitica* may trigger AIT through molecular mimicry and immune dysregulation, which can also affect male reproductive health, underscoring the importance of a comprehensive assessment. Screening for infectious cofactors, such as *Y. enterocolitica*, in men with thyroid autoimmunity is vital for accurate diagnosis and effective management, thereby encouraging clinicians to adopt proactive testing strategies.

KEYWORDS

autoimmune thyroiditis, *Yersinia enterocolitica*, molecular mimicry, thyroid autoimmunity, male fertility

Received: 10.12.2025 Revised: 25.01.2026 Accepted: 27.04.2026 Post-print published: 13.05.2026 Final published: 17.09.2026

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Publisher: Medical University of Silesia, Katowice, Poland



INTRODUCTION

Autoimmune thyroiditis (AIT), or Hashimoto's thyroiditis, is the most common organ-specific autoimmune endocrine disorder, affecting 5%–10% of the global population [1]. The disease is characterized by lymphocytic infiltration of the thyroid gland, progressive follicular destruction, and elevated thyroid autoantibodies, particularly anti-thyroid peroxidase (anti-TPO) and antithyroglobulin (anti-Tg). Although women are most often affected, recent data indicate a rising prevalence among men, with significant systemic effects, including metabolic disturbances, ongoing inflammation, and reproductive problems [2,3]. An increasing number of studies suggest that infectious pathogens can act as environmental triggers that initiate or worsen thyroid autoimmunity. *Yersinia enterocolitica* (*Y. enterocolitica*) is among the most strongly linked pathogens because of the notable structural similarity between its outer membrane proteins (*Yersinia* outer membrane proteins – Yops) and epitopes of the human thyroid-stimulating hormone receptor (TSHR). This similarity promotes molecular mimicry, where immune responses targeting microbial antigens cross-react with host endocrine tissues, leading to chronic autoimmune inflammation [4,5,6,7]. Furthermore, *Yersinia* antigens activate dendritic cells and promote polarization toward Th1 and Th17 immune responses, leading to increased secretion of interleukin 6 (IL-6), interleukin 17 (IL-17), interferon gamma (IFN- γ), and tumor necrosis factor alpha (TNF- α) [8,9]. These cytokines are crucial in disrupting thyroid immune tolerance and advancing autoimmune thyroid disease. Continued exposure to *Yersinia* antigens can cause a persistent inflammatory state, resulting in episodes of transient thyrotoxicosis or fluctuating thyroid function, especially in patients with preexisting conditions, such as AIT [4,10].

Another important aspect is the increasing awareness of the link between AIT and male reproductive issues. Thyroid hormones help regulate gonadotropin release, Leydig cell testosterone production, Sertoli cell metabolism, and spermatogenesis. Even mild thyroid dysfunction can decrease testosterone levels, impair sperm motility and morphology, and increase oxidative stress [11,12]. Autoimmune processes worsen this by disrupting testicular immune privilege, causing germ-cell apoptosis, and increasing sperm DNA fragmentation [13,14].

Infectious triggers such as *Y. enterocolitica* may contribute to both thyroid issues and male reproductive problems through complex immune and hormonal interactions. This case emphasizes the importance of testing for infectious causes in men with autoimmune thyroid disease and systemic or reproductive symptoms [8,15].

CASE REPORT

A 53-year-old man presented with worsening fatigue, irritability, sweating, and palpitations over 3 months, prompting testing for infectious causes given his history of AIT and prior antibiotic treatments. The patient had a documented history of Lyme disease, diagnosed in March 2025, before the current presentation. That diagnosis was based on clinical features and serological testing; the patient was treated with standard antibiotic therapy (100 mg of doxycycline twice daily for 21 days). According to the patient, treatment led to clinical resolution of acute manifestations. No chronic or relapsing Lyme-related symptoms were noted since that time. No long-term antibiotic therapy was administered and there was no clinical suspicion of ongoing active *Borrelia burgdorferi* (*B. burgdorferi*) infection at the time of this evaluation.

The patient had a positive rheumatoid factor level of 18.51 IU/mL, marginally exceeding the reference threshold of ≤ 18 IU/mL. Furthermore, he tested positive for IgM antibodies to *B. burgdorferi*, assessed by enzyme-linked immunosorbent assay (ELISA). The index of 1.44 surpassed the normal limit of ≤ 0.81 . The slight elevation in rheumatoid factor was considered a nonspecific marker of immune activation, given the absence of clinical evidence of inflammatory joint disease. Western blot analysis of serum IgM antibodies against *Borrelia burgdorferi* indicated reactivity with specific *Borrelia* antigens: p31 (OspA, *Borrelia afzelii* [*B. afzelii*]) showed borderline (equivocal) IgM reactivity at an intensity of 22. At the same time, p25 (OspC), a surface protein of *B. afzelii*, showed a positive IgM response with an intensity of 32. The patient has a long-standing (since 2012) diagnosis of AIT, with very high anti-TPO titers (>1000 IU/mL), no goiter, and no ophthalmopathy – findings typical of Hashimoto AIT. The current episode represents transient thyrotoxicosis (Hashitoxicosis) rather than classic Graves' disease. Although TRAb was mildly positive, such findings have been reported in Hashitoxicosis and do not rule out destructive thyroiditis (Table I).

Physical examination

- The patient seemed anxious but was alert.
- Heart rate: 92 bpm
- Blood pressure: 128/78 mmHg
- Temperature: 36.6 °C
- BMI: 25.1 kg/m²
- Skin: warm, slightly moist
- Thyroid gland: normal size, non-tender, no nodularity
- No ophthalmopathy or tremor observed

**Table I.** Laboratory evaluation

Parameter	Result	Reference
TSH	0.29 μ IU/mL	0.4–4.0
FT3	4.98 pg/mL	2.0–4.4
FT4	16.99 pmol/L	12–22
Anti-TPO	>1000 IU/mL	<35
Anti-Tg	mildly elevated	<50
TRAb	2.6 IU/L	<1.75
Thyroglobulin	145.85 ng/mL	<77
HLA-B27	negative	–

TSH – thyroid-stimulating hormone; FT3 – free triiodothyronine; FT4 – free thyroxine; anti-TPO – anti-thyroid peroxidase antibodies; anti-Tg – anti-thyroglobulin antibodies; TRAb – thyrotropin receptor antibodies; HLA-B27 – human leukocyte antigen B27

The pattern suggests T3-predominant thyrotoxicosis, commonly associated with destructive thyroiditis or immune activation.

Infectious and immunological testing

Western blot for *Y. enterocolitica* – IgA: p46, p38 positive; IgG: p46, p44, p38, p36 YopD positive

These findings suggest a recent or active *Y. enterocolitica* infection, as indicated by the multiple immunogenic bands.

CBC findings – Leukocytes: 6.1×10^9 /L, Lymphocytes: 39%, Neutrophils: 46%

This is consistent with infection-induced immune activation. The liver and renal profiles were normal.

We performed a differential diagnosis including the following diseases:

1. Hashitoxicosis (destructive thyroiditis)
2. Infection-triggered AIT
3. Early or subclinical Graves' disease (unlikely without goiter or ophthalmopathy)
4. Drug-induced thyroid dysfunction
5. Non-thyroidal causes of thyrotoxicosis

The clinical presentation indicated an AIT flare-up caused by a *Yersinia* infection.

The patient was given 10 mg of thiamazole daily to control excess thyroid hormone release caused by the autoimmune flare-up. Because a Western blot confirmed active *Y. enterocolitica* infection, 100 mg of doxycycline twice daily for 14 days was prescribed to eliminate the infectious trigger and decrease immune activation. Clinical symptoms and thyroid parameters returned to normal within 6 weeks, confirming a successful treatment response. Thiamazole was used only for the short term, not as definitive therapy for Graves' disease, but solely to control symptomatic thyrotoxicosis during the inflammatory flare-up.

At the 6-week follow-up, the patient had complete resolution of palpitations, sweating, fatigue, and irritability. Thyroid function tests showed normalized TSH (0.29 μ IU/mL) and FT3 (4.98 pg/mL) levels, with FT4 remaining stable within the reference range

(16.99 pmol/L) (Table I). No adverse effects from thiamazole or doxycycline were reported and liver function remained normal throughout the treatment. These clinical and biochemical improvements support the conclusion that eliminating *Y. enterocolitica* resolved the autoimmune flare-up.

The patient had been evaluated by a urologist for several years due to male infertility, as he has been living with his wife for 15 years without having children. His wife is completely healthy, with no identified gynecological disorders, and her fertility has been preserved. Urological examination did not reveal any urinary tract infections; however, semen analysis revealed the presence of immotile spermatozoa. Multiple attempts to achieve pregnancy were all unsuccessful.

In patients with AIT and concomitant *Y. enterocolitica* infection, immune dysregulation is more likely to affect endocrine and reproductive functions. AIT has been linked to alterations in male reproductive hormone profiles and semen parameters, suggesting that thyroid autoimmunity may contribute to impaired male fertility [5,16]. Infectious agents, including *Y. enterocolitica*, are considered potential environmental factors that may initiate or modulate autoimmune thyroid diseases through immune-mediated mechanisms such as molecular mimicry [5,17]. In this context, infection-related immune activation, combined with thyroid autoimmunity, may indirectly affect male reproductive function by disrupting endocrine regulation and spermatogenesis [18,19,20].

DISCUSSION

The current case illustrates a complex interaction between infectious and autoimmune mechanisms in a patient with AIT, complicated by transient thyrotoxicosis and immune activation caused by *Y. enterocolitica*. This case adds to the growing body of literature suggesting that infectious agents may play a key role not only in triggering autoimmune thyroid disease, but also in influencing its clinical progression and systemic effects, including impacts on male reproductive health.

Infectious triggers and molecular mimicry in autoimmune thyroid disease

Y. enterocolitica has long been considered a potential infectious trigger of AIT, but recent advances in molecular immunology have strengthened this association. Several Yops, especially p46, p38, p44, and p36, share structural and antigenic similarities with TSHR. This similarity enables molecular mimicry, in which the immune system produces antibodies against bacterial antigens that unintentionally cross-react with thyroid tissue.



In our patient, Western blot positivity for multiple Yop immunogenic bands (IgA and IgG) indicates recent or ongoing exposure to *Yersinia* antigens. The presence of high anti-TPO titers (>1000 IU/mL) further suggests an elevated autoimmune state that may be intensified or maintained by this infection. This pattern aligns with previous research showing that patients with AIT often have increased seroreactivity to *Yersinia* antigens compared to healthy controls [5,6]. Immune cross-reactivity between these antigens and TSHR may accelerate follicular destruction, cause transient thyrotoxicosis, or lead to fluctuations in thyroid function. Notably, the patient exhibited a pattern of transient thyrotoxicosis with elevated FT3 and suppressed TSH but normal FT4 – a biochemical profile linked to acute inflammatory activation or antigen exposure in the context of underlying AIT.

Role of Th1/Th17 responses and cytokine activation

Another important aspect of immunopathogenesis is the activation of Th1 and Th17 pathways. *Y. enterocolitica* is known to stimulate the production of IL-6, IL-17, TNF- α , and IFN- γ . These cytokines are crucial in the development of thyroid autoimmunity and can worsen glandular infiltration, oxidative stress, and the breakdown of immune self-tolerance. Persistent Th17 activation has been associated with more severe structural damage to the thyroid and fluctuating thyroid hormone levels. The patient's mild lymphocytosis and relative neutropenia were consistent with an activated cellular immune response, which may indicate chronic antigenic stimulation.

Additionally, *Yersinia*-induced dendritic cell activation may boost antigen presentation, further promoting the production of anti-thyroid autoantibodies. These mechanisms highlight why chronic infections – especially in the gastrointestinal system – can have lasting effects on autoimmunity even after the initial infection has cleared.

Clinical significance of antibiotic treatment in infection-associated autoimmune thyroiditis

Several reports suggest that targeted antibiotic therapy can reduce autoimmune activity in patients with infection-related thyroid autoimmunity [5,6,8]. In this case, treatment with doxycycline – a standard therapy for *Yersinia* infections – led to normalization of TSH and FT3 levels and complete symptom relief within 6 weeks. Although thiamazole temporarily controlled hyperthyroid symptoms, the return of normal thyroid function strongly indicates that removing the infectious trigger was crucial in reversing the immune and hormonal disturbances.

This supports the hypothesis that in selected patients – particularly those with serological evidence of *Yersinia*

infection – antimicrobial therapy may be beneficial in addition to standard endocrine treatment. Although this approach is not universally recommended, emerging research underscores the importance of individualized assessment of infectious triggers in patients who exhibit atypical thyroid fluctuations, systemic inflammatory signs, or resistance to conventional therapy.

Relationship between autoimmune thyroiditis and male reproductive dysfunction

AIT is increasingly recognized as a condition with systemic effects that go beyond the endocrine system. Thyroid hormones directly affect spermatogenesis, Leydig cell testosterone production, Sertoli cell metabolism, and epididymal sperm maturation. Changes in TSH or thyroid hormone levels, whether hyperthyroid or hypothyroid, can significantly harm male reproductive health.

Three mechanisms appear to be particularly important:

Hormonal dysregulation of the hypothalamic-pituitary-gonadal axis

Thyroid hormones may influence the hypothalamic-pituitary-gonadal (HPG) axis by affecting gonadotropin-releasing hormone (GnRH) secretion, which then regulates the release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH). Transient thyrotoxicosis, as seen in this patient, can reduce LH pulsatility and testosterone production. Even slight elevations in FT3 levels have been associated with decreased sperm concentration and motility.

Autoimmune-driven testicular inflammation

Autoimmunity is increasingly associated with male infertility. Elevated systemic cytokines (IL-6, IL-17, and TNF- α) can weaken the blood–testis barrier, allowing immune cells to infiltrate and cause apoptotic damage to germ cells. Cross-reactive antibodies, arising from molecular mimicry, may target testicular antigens, potentially leading to autoimmune orchitis – a condition that may go unnoticed clinically.

Oxidative stress and DNA fragmentation

Both thyroid dysfunction and cytokines from infection increase oxidative stress, impairing mitochondrial function in sperm and raising DNA fragmentation: a key factor in male subfertility. Studies show that men with AIT have notably higher sperm DNA damage indices compared to healthy controls [8,9,20]. In the context of *Yersinia* infection, additional mucosal immune activation may further enhance these pathways, worsening the adverse effects on male reproductive health.



Diagnostic value of screening for infectious triggers in autoimmune thyroiditis

This case study highlights the importance of laboratory screening for infectious agents in patients with AIT who exhibit:

- sudden or unexplained fluctuations in thyroid hormone levels
- persistent lymphocytosis or elevated inflammatory markers
- systemic symptoms such as fatigue, sweating, or irritability
- a history of other autoimmune or infectious conditions
- reproductive concerns

Testing for *Y. enterocolitica* (IgA/IgG or Western blotting), *B. burgdorferi*, *Chlamydia*, and other immune-modulating pathogens can reveal clinically significant interactions that directly affect thyroid function and systemic immunity.

Comparison with published cases

Published literature includes several observations linking *Yersinia* infection to thyroid dysfunction, but reports documenting simultaneous reproductive implications in men are rare. This case offers a new perspective by highlighting the dual endocrine-immune-gonadal interaction and emphasizing the need for interdisciplinary evaluation. While most cases of AIT follow a chronic, slowly progressive course, infection-triggered episodes may present acutely, fluctuate unpredictably, and respond more favorably to antimicrobial treatment than classic Hashimoto's disease.

Clinical implications

1. *Yersinia* should be included in the differential diagnosis of atypical or transient thyrotoxicosis.
2. Screening for infectious triggers might alter diagnostic and treatment strategies in AIT.
3. In men with thyroid autoimmunity, assessing reproductive function should be a routine part of evaluation.
4. Treating underlying infections can help stabilize thyroid function and enhance endocrine and reproductive outcomes.

CONCLUSIONS

Y. enterocolitica infection may initiate or exacerbate AIT through molecular mimicry and inflammatory responses. The resulting endocrine-immune disturbances may negatively affect male reproductive health. Screening for infectious triggers may improve the management of thyroid autoimmunity in men.

Conflict of interest

The author declares no conflict of interest.

Funding

No external funding was received.

Use of AI tools statement

ChatGPT was used to literature review.

Authors' contribution

Study design – R. Zhurayev

Data collection – R. Zhurayev

Manuscript preparation – R. Zhurayev, T. Solomenchuk

Literature research – R. Zhurayev, T. Solomenchuk

Final approval of the version to be published – R. Zhurayev, T. Solomenchuk

REFERENCES

1. Antonelli A, Ferrari SM, Corrado A, Di Domenicantonio A, Fallahi P. Autoimmune thyroid disorders. *Autoimmun Rev.* 2015;14(2):174–180. doi: 10.1016/j.autrev.2014.10.016.
2. McLeod DS, Cooper DS. The incidence and prevalence of thyroid autoimmunity. *Endocrine.* 2012;42(2):252–265. doi: 10.1007/s12020-012-9703-2.
3. Ben Salah R, Hadj Kacem F, Soomauro S, Chouaib S, Frikha F, Charfi N, et al. Autoimmune thyroiditis associated with autoimmune diseases. *Electron J Gen Med.* 2022;19(6):em409. doi: 10.29333/ejgm/12399.
4. Fountoulakis S, Tsatsoulis A. On the pathogenesis of autoimmune thyroid disease: a unifying hypothesis. *Clin Endocrinol (Oxf).* 2004;60(4):397–409. doi: 10.1046/j.1365-2265.2004.01978.x.
5. Zangiabadian M, Mirsaedi M, Pooyafar MH, Goudarzi M, Nasiri MJ. Associations of *Yersinia Enterocolitica* Infection with Autoimmune Thyroid Diseases: A Systematic Review and Meta-Analysis. *Endocr Metab Immune Disord Drug Targets.* 2021;21(4):682–687. doi: 10.2174/1871530320666200621180515.
6. Benvenega S, Guarneri F. Molecular mimicry and autoimmune thyroid disease. *Rev Endocr Metab Disord.* 2016;17(4):485–498. doi: 10.1007/s11154-016-9363-2.
7. McLachlan SM, Rapoport B. Breaking tolerance to thyroid antigens: changing concepts in thyroid autoimmunity. *Endocr Rev.* 2014;35(1):59–105. doi: 10.1210/er.2013-1055.
8. Tomer Y, Davies TF. Infection, thyroid disease, and autoimmunity. *Endocr Rev.* 1993;14(1):107–120. doi: 10.1210/edrv-14-1-107.
9. Bogović Crnić T, Giroto N, Ilić Tomaš M, Krištofić I, Klobučar S, Batičić L, et al. Innate Immunity in Autoimmune Thyroid Disease during Pregnancy. *Int J Mol Sci.* 2023;24(20):15442. doi: 10.3390/ijms242015442.
10. Antonelli A, Ferrari SM, Giuggioli D, Ferrannini E, Ferri C, Fallahi P. Chemokine (C-X-C motif) ligand (CXCL)10 in autoimmune diseases. *Autoimmun Rev.* 2014;13(3):272–280. doi: 10.1016/j.autrev.2013.10.010.



11. Krassas GE, Pontikides N. Male reproductive function in relation with thyroid alterations. *Best Pract Res Clin Endocrinol Metab.* 2004;18(2):183–195. doi: 10.1016/j.beem.2004.03.003.
12. Sengupta P, Dutta S, Karkada IR, Chinni SV. Endocrinopathies and Male Infertility. *Life (Basel).* 2021;12(1):10. doi: 10.3390/life12010010.
13. La Vignera S, Vita R. Thyroid dysfunction and semen quality. *Int J Immunopathol Pharmacol.* 2018;32:2058738418775241. doi: 10.1177/2058738418775241.
14. Algaidi SA, Faddladdeen KA, Alrefaei GI, Qahl SH, Albadawi EA, ALmohaimeed HM, et al. Thymoquinone protects the testes of hypothyroid rats by suppressing pro-inflammatory cytokines and oxidative stress and promoting SIRT1 testicular expression. *Front Pharmacol.* 2022;13:1040857. doi: 10.3389/fphar.2022.1040857.
15. Farsimadan M, Motamedifar M. Bacterial infection of the male reproductive system causing infertility. *J Reprod Immunol.* 2020;142:103183. doi: 10.1016/j.jri.2020.103183.
16. Krysiak R, Kowalcze K, Okopień B. The effect of testosterone on thyroid autoimmunity in euthyroid men with Hashimoto's thyroiditis and low testosterone levels. *J Clin Pharm Ther.* 2019;44(5):742–749. doi: 10.1111/jcpt.12987.
17. Giannone M, Dalla Costa M, Sabbadin C, Garelli S, Salvà M, Masiero S, et al. TSH-receptor autoantibodies in patients with chronic thyroiditis and hypothyroidism. *Clin Chem Lab Med.* 2022;60(7):1020–1030. doi: 10.1515/cclm-2022-0162.
18. Karaca N, Akpak YK. Thyroid disorders and fertility. *Int J Res Med. Sci.* 2017;3(6):1299–1304. doi: 10.18203/2320-6012.ijrms20150135.
19. Brix TH, Hegedüs L. Genetic and environmental factors in the aetiology of simple goitre. *Ann Med.* 2000;32(3):153–156. doi: 10.3109/07853890008998821.
20. Silva AR, Gonçalves-de-Albuquerque CF, Pérez AR, Carvalho VF. Immune-endocrine interactions related to a high risk of infections in chronic metabolic diseases: The role of PPAR gamma. *Eur J Pharmacol.* 2019;854:272–281. doi: 10.1016/j.ejphar.2019.04.008.