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Thyroid Dysfunction, either Hyper or Hypothyroidism, Promotes Gallstone Formation by Different Mechanisms

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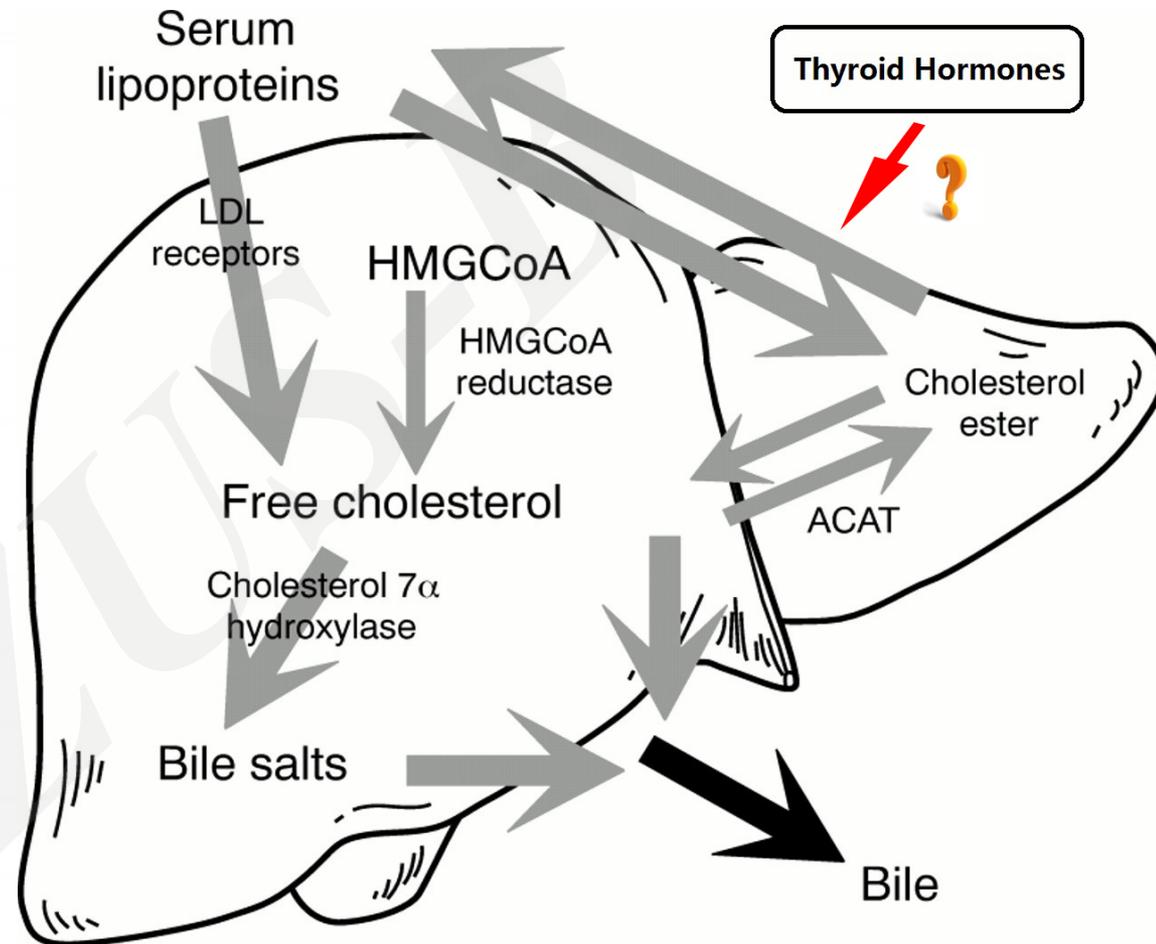
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Introduction

- Gallstone disease is one of the most common gastrointestinal diseases that require hospitalization in the West.
- The major events leading to the disease include supersaturation of bile with cholesterol, rapid precipitation of cholesterol crystals in the gallbladder, increased bile salt hydrophobicity and inflammation of the gallbladder.
- The function of **thyroid hormones** is associated with cholesterol gallstone formation?



Methods and Materials



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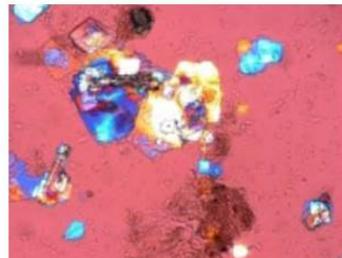


Hyperthyroidism Group

Euthyroidism Group

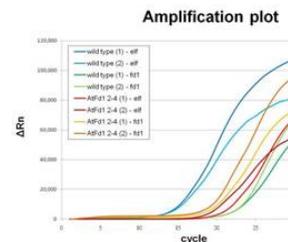
Hypothyroidism Group

Cholesterol Diet for 5 Weeks



Thyroid Hormone

Cholesterol Testing



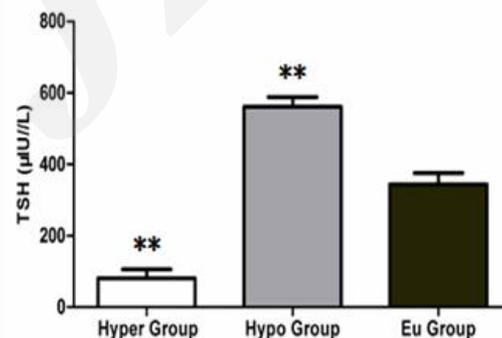
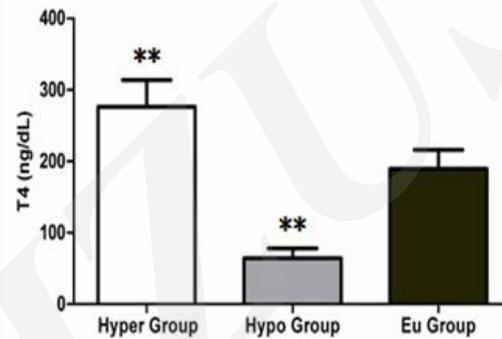
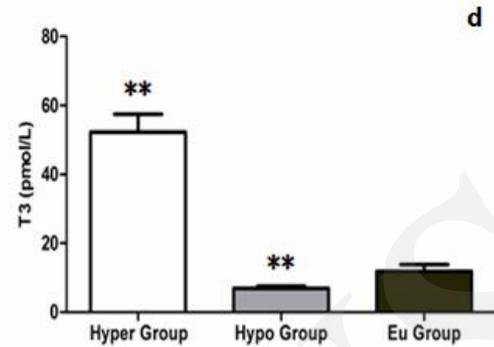
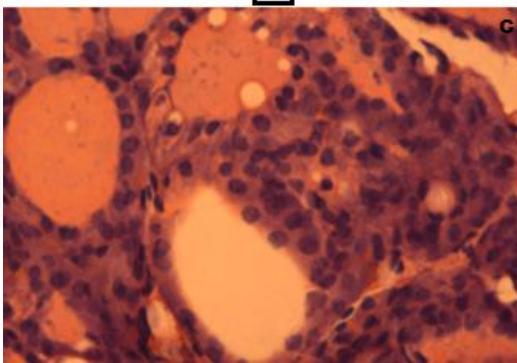
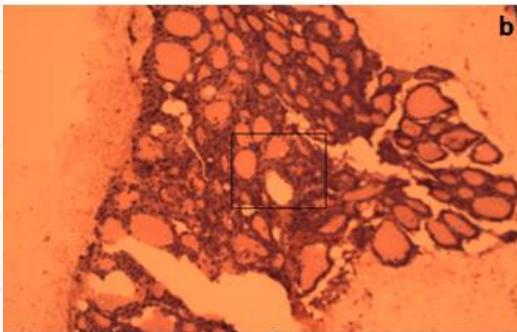
- **Hyperthyroidism Group**
sham surgery +
triiodothyronine injection
- **Euthyroidism Group**
sham surgery +
PBS injection
- **Hypothyroidism Group**
subtotal thyroidectomy +
PBS injection

Results



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Establishment mice models of thyroidectomy



Hyperthyroidism Group

T3 52.3 ± 1.1 pmol/L

T4 276.3 ± 37.2 ng/dL

TSH 81.3 ± 24.2 μIU/L

Euthyroidism Group

T3 11.9 ± 1.0 pmol/L

T4 189.1 ± 26.9 ng/dL

TSH 343.7 ± 31.9 μIU/L

Hypothyroidism Group

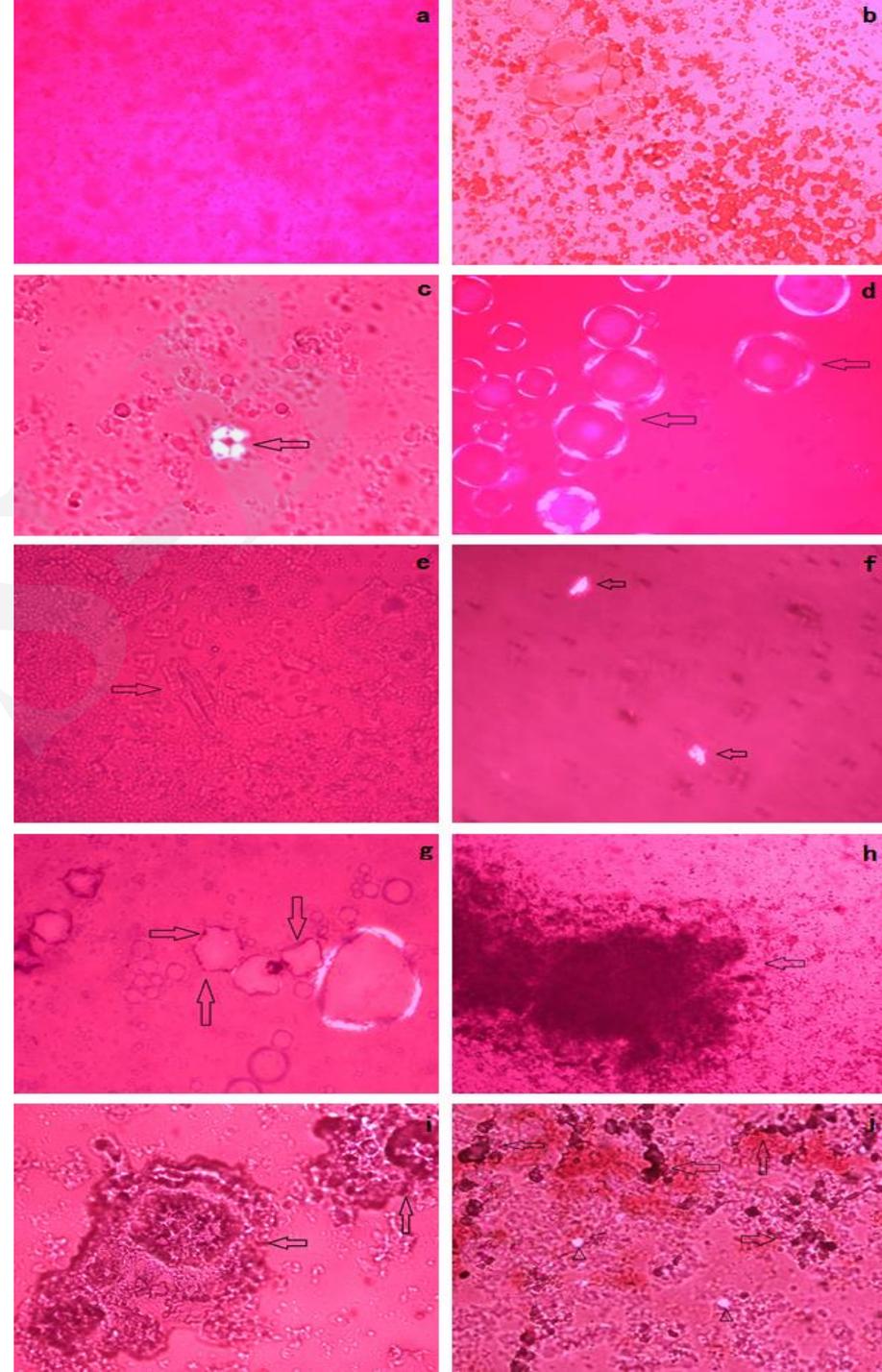
T3 6.9 ± 0.7 pmol/L

T4 64.2 ± 13.7 ng/dL

TSH 561.3 ± 27.1 μIU/L

Establishment mice models of gallstones

- a, Mucin gel;
- b, Liquid crystals were denoted as aggregated;
- c, Non-birefringent;
- d, Fused non-birefringent;
- e, Non-birefringent tubular crystals;
- f, Plate-like ChM crystals with a notched corner;
- g, Amorphous masses of ChM crystals;
- h, Disintegratable amorphous sandy stones;
- i, Individual ChM crystals projecting from their edges;
- j, True gallstones exhibited typical round contours and black centers

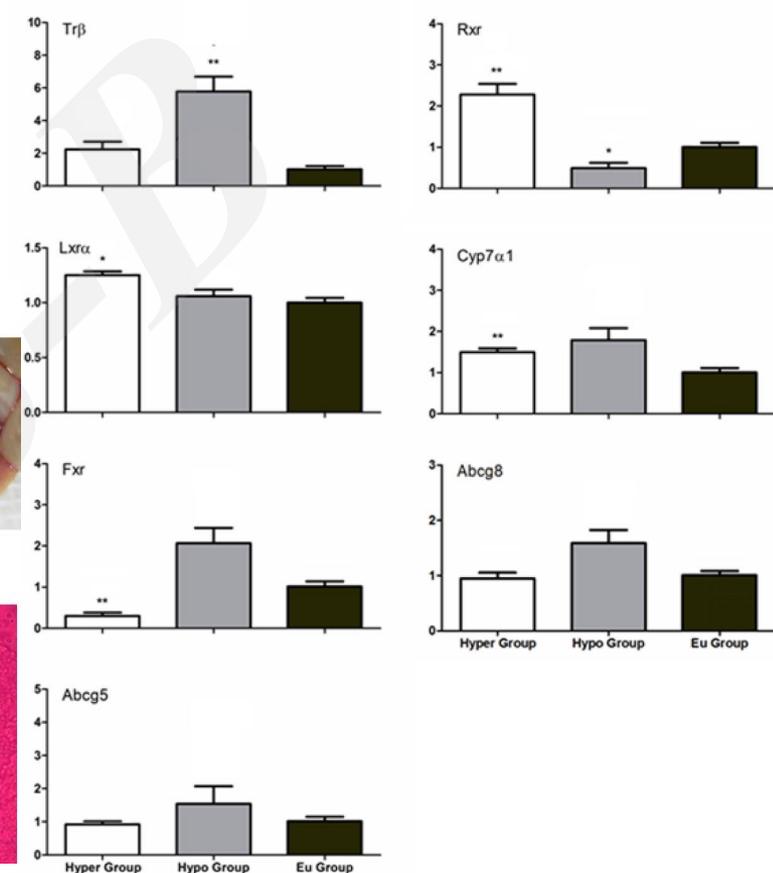
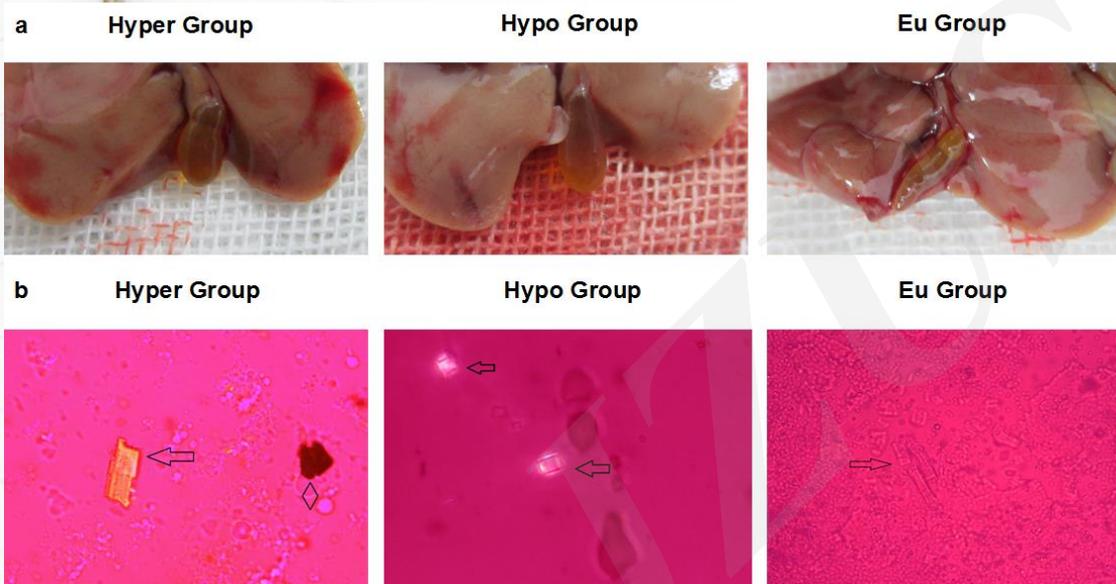


Results



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The macrophage, microphage and molecular results of hyper, hypo and euthyroidism groups



Feeding with cholesterol diet for 5 weeks, the **gallbladder volume**, microphage results under **polarized light** and **nuclear receptor** expression level with liver tissue.

Summary



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- We established the mice models of gallstone and thyroidectomy with the help of macrophage and microphage in polarized light.
- Either hyper or hypothyroidism, promotes gallstone formation in C57BL/6 mice.
- Hypothyroidism increases the serum cholesterol level;
- Hyperthyroidism increases the expression level of gallstone associated nuclear receptors.