

# α-thalassemia

1 in 9,000 births — α-thalassemia  
1 in 55,000 births — β-thalassemia

Frequency of carriers is higher in Africa, Asia (south and southeast), Mediterranean and Middle East.

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Handouts and references available at [www.stevenchan.us/alphathal](http://www.stevenchan.us/alphathal)

## CHROMOSOME 16

## HEMOGLOBIN PRODUCED

## SYMPTOMS & LABS

## MANAGEMENT

Four genes control α-globin chain synthesis. **Normal.**



95% ● HbA      α<sub>2</sub> β<sub>2</sub>  
2% ○ HbA<sub>2</sub>    α<sub>2</sub> δ<sub>2</sub>  
2% ○ HbF        α<sub>2</sub> γ<sub>2</sub>

Normality.

No therapy required.

1 gene is deleted in **α-thalassemia minima, α-thalassemia-2 trait, silent carrier of α-thalassemia.**



HbA      α<sub>2</sub> β<sub>2</sub>  
HbA<sub>2</sub>    α<sub>2</sub> δ<sub>2</sub>  
HbF        α<sub>2</sub> γ<sub>2</sub>

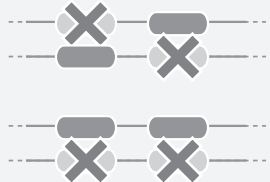
**Asymptomatic.**

Slight hypochromia.  
Slight microcytosis.

No therapy required.

Dx only by DNA analysis.

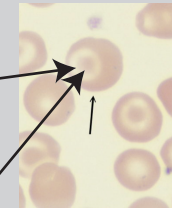
2 genes are deleted in **α-thalassemia minor, α-thalassemia-1 trait.**



↓ HbA      α<sub>2</sub> β<sub>2</sub>  
↓ HbA<sub>2</sub>    α<sub>2</sub> δ<sub>2</sub>  
↓ HbF        α<sub>2</sub> γ<sub>2</sub>

**Hypochromia.**  
**Microcytosis.**  
**Target cells.**

MCV < 80 fL.



No therapy required.

Risk for producing offspring with **Hb Barts.**

3 genes are deleted in **Hemoglobin H disease.**



↓ HbA      α<sub>2</sub> β<sub>2</sub>  
↓ HbA<sub>2</sub>    α<sub>2</sub> δ<sub>2</sub>  
↓ HbF        α<sub>2</sub> γ<sub>2</sub>  
5-30% ● HbH      —β<sub>4</sub>

**Microcytic. Target cells.**

HbH can't release O<sub>2</sub> to tissues, because affinity is greater than HbA + HbH insoluble → Precipitates form inclusion bodies. → **Chronic hemolytic anemia** (hepatosplenomegaly, indirect hyperbilirubinemia, ↑LDH, ↓haptoglobin, ↓leg ulcers) → **Neonatal jaundice, occasionally hydrops fetalis.**

Most don't require chronic transfusion in 1st decade of life.

**Splenectomy, transfusion** in 2nd, 3rd decade of life.

**Avoid oxidants that may exacerbate HbH** (e.g. antimalarials, some sulfa drugs).

All 4 genes are deleted in **Hb Barts.**



~~HbA      α<sub>2</sub> β<sub>2</sub>~~  
~~HbA<sub>2</sub>    α<sub>2</sub> δ<sub>2</sub>~~  
~~HbF        α<sub>2</sub> γ<sub>2</sub>~~  
**Hb Barts    —γ<sub>4</sub>**

**Hydrops fetalis:** High output heart failure → excess fluid accumulation → fetal demise, neonatal mortality.

Almost always lethal in utero. Consider therapeutic termination of pregnancy in mothers at risk.

**Chronic intensive hypertransfusion, iron chelation, hematopoietic cell transplantation.**

Both HbH and Hb Barts can't release O<sub>2</sub> to tissues → ischemia.

