

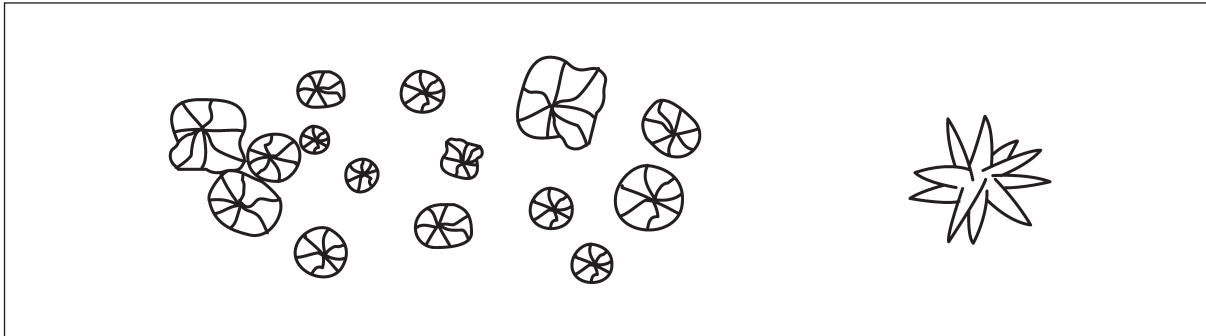
## Xanthine stones

### Introduction

Xanthine stones are absolutely rare. They are caused by an inborn defect of xanthine oxidase. Xanthine cannot be oxidized to uric acid, so that the excretion of hypoxanthine and xanthine increases. Xanthine is only poorly soluble, which results in xanthine stone formation.

A drug therapy to dissolve xanthine stones is not available. Consequently a high dilution day and night is the most important measure in xanthine stone disease. An ovo-lacto-vegetarian diet to increase the urinary pH value and to decrease xanthine excretion is also indicated.

## Xanthine stones



- Occurrence: very rare
- Caused by an autosomal recessive hereditary defect of the enzyme xanthine oxidase
- Lifelong consistent treatment is necessary
- Can easily be confused with uric acid stones

## Specific notes for xanthine stone disease

see *General aspects*, page

### Medical history

22 f.

Stones in family history  
Treatment with high doses of allopurinol  
Lesch-Nyhan disease  
Chemotherapy of malignant diseases

#### Age at the first manifestation

Mostly in infancy

### Imaging

24 f.

Radiolucent  
Contrast defect on the urogram  
▶ **Confusion with uric acid stones**  
Ultrasonography:  
Structure with a high density and a typical echo

### Minimal program

26 f.

**Serum analysis:**  
Urate markedly decreased <119  $\mu\text{mol/l}$  (2 mg/100 ml)

### Establishment of the diagnosis only possible by

**stone analysis:** Xanthine stone

192 f.

## Quick reference with known serum and urine composition

(in case of unclear findings, first episode of stone, etc.: consider the following pages on diagnostic work-up)



### Serum analysis

**Urate** <119 μmol/l (<2 mg/100 ml)



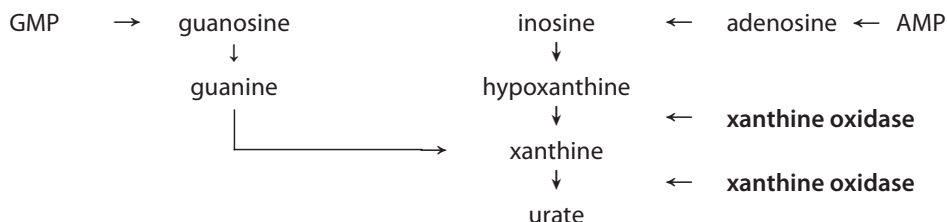
### 24h urine analysis

Volume	<2 l/24h	▶	Urine dilution	▶	158 f.
Urine density	>1.010 g/cm <sup>3</sup>	▶	Urine dilution	▶	158 f.
<b>Xanthine</b>	>40 μmol/24h	▶	Diet	▶	158 f.
<b>Hypoxanthine</b>	>70 μmol/24h				

## Biochemical investigations

### Serum analysis

The striking and most important diagnostic finding is the markedly decreased serum level of urate. This is caused by the lack of activity of xanthine oxidase, which catalyzes the transformation of hypoxanthine to xanthine and xanthine to urate.



### Urine analysis

#### 24h urine

In addition to the analysis of the quality standard (see p. 28 f.), assessing the 24h excretion of xanthine and hypoxanthine is essential for a correct diagnosis.

The patient has to collect a complete *24h urine sample*.

► Detailed instructions how to collect the sample are essential:

- the first portion of urine in the morning is discarded and the time noted
- collect all urine during the following 24h in the bottle
- the last voiding should be made at the same time as the collection was started on the previous day
- if possible, store the urine in a cool place and bring it to analysis as soon as possible after the collection has been completed

(for detailed instructions how to collect urine, see p. 190)

Treatment with high doses of allopurinol in case of Lesch-Nyhan disease and with chemotherapy in malignant diseases can also lead to decreased serum levels of uric acid and an increased xanthine excretion with a risk of xanthine stone formation. To confirm the diagnosis of a primary xanthinuria, other medical reasons must be excluded.

**Urate markedly decreased <math><119 \mu\text{mol/l}</math> (<math><2 \text{ mg}/100 \text{ ml}</math>)**Normal value 119–380  $\mu\text{mol/l}$  (2.0–6.4 mg/100 ml)**24h urine collection**

1. According to the quality standard ▶ 28 f.
2. Quantitative determination of xanthine and hypoxanthine ▶ 196

**Xanthine**

very much increased

normal value &lt;math&gt;&lt;40 \mu\text{mol}/24\text{h}&lt;/math&gt;

Caution: high doses of allopurinol may also cause xanthinuria

**Hypoxanthine**

normal or increased

normal value &lt;math&gt;&lt;70 \mu\text{mol}/24\text{h}&lt;/math&gt;

**Arrange a family screening**

## Treatment

### Stone removal

Chemolitholysis of xanthine stones is not possible. The symptoms caused by xanthine stones are less pronounced; therefore, at the time of diagnosis the stones often have reached a size which necessitates interventional measures. Because of the inborn error of metabolism with a risk of rapid stone growth, the aim should always be a complete surgical removal of all stones.

## Metaphylactic treatment

At present, there are no possibilities for medical treatment of primary xanthinuria. Treatment with allopurinol is not successful. An increased urine dilution is particularly important.

### Urine dilution

More than 2.5 l of urine should be excreted daily. The daily *fluid intake* should be 3 l for adults and 1.5–2 l for children. Since extremely high concentrations of xanthine might occur during the sleeping period, the fluid intake should be evenly *distributed over the 24h period*. It is a good habit to drink again before or after each voiding.

Therefore, **in addition** to the intake of other fluids:

- ▶ **During day-time: drink at least 2.5 dl every second hour**

(approx. 2 cups or 2 small glasses)

**During sleeping period:** drink before going to bed and drink again **before or after** each voiding

### Diet

Since xanthine originates from purine metabolism, a *reduction of the dietary intake* of purine is indicated. An ovo-lacto-vegetarian diet has a low purine content (see p. 82 f.) and is thus ideal for adults. In children, the *requirements of protein, iron and iodine may not be sufficiently satisfied* with such a diet. Thus, *1–2 meat meals and 1 fish meal* should be given weekly. Foodstuff with extremely high purine content should always be avoided.



## Stone removal

- ▶ Xanthine stones are insoluble
- ▶ Indication for stone removal
  - complaints and complications
  - if metaphylactic therapy cannot prevent stone growth and new stone formation

▶ 174 f.



## Goal: urine dilution ▶ at least 2.5 l of urine per day



**Fluid intake:** adults 3 l/day, children 1.5–2 l/day  
evenly distributed over the 24h period



## Adults: a diet with a low purine content

- **restrict:** meat, meat products and fish (max. 150 g/day), legumes, including soy products
- **avoid:** innards, sardines, anchovies, sprats, mackerel, skin from fish, poultry and pork



## Children: do not completely exclude meat and fish from diet

- ▶ important for the supply of protein, iron, iodine