may also be a useful adjunct to serum copper in the investigation of acute Cu poisoning. Measurement of urine Cu is not useful in assessing Cu deficiency and here, serum or plasma Cu must be used.

Zinc (Zn) is also an essential trace element, but undergoes greater urinary excretion than does Cu.

In Wilson's Disease, often zinc monotherapy or zinc combination therapy (with a chelating agent) is utilized to block copper uptake and to eliminate excess copper. Here, measurement of urine zinc may be used to check compliance. Otherwise measurement of Zn in urine has limited applications, especially in assessing deficiency. It can be important in monitoring Zn loss in patients being treated with chelation for heavy metal poisoning and may be useful in assessing excessive zinc intake or in monitoring occupational exposure to zinc fumes.

## References


1. http://www.sas-centre.org/assays/traceelements/ copper and http://www.sascentre.org/assays/trace-elements/zinc accessed Jan 2017
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3. Giusy Ranucci et al (2014) Zinc monotherapy is effective in Wilson's disease patients with mild liver disease diagnosed in childhood: a retrospective study : Orphanet Journal of Rare Diseases 9:41


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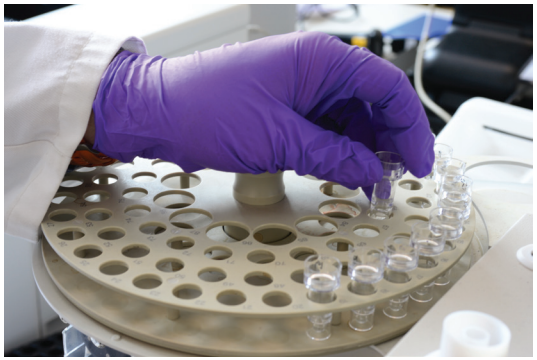
NHS
Black Country Pathology Services

# Urine Copper and Zinc

## Trace Elements Laboratory Clinical Biochemistry



BCPS
NHS Pathology Serving the Black Country


Provided by Sandwell and West Birmingham NHS Trust, The Dudley Group NHS Foundation Trust, The Royal Wolverhampton NHS Trust and Walsall Healthcare NHS Trust.

## Sample requirements

- Store samples at 4 C prior to dispatch
- Send samples by first class post at ambient temperature to the address on the back of this leaflet

**Diagnosis or monitoring of Wilson's Disease**

- 'Spot' urine specimen not acceptable (unless in very young children)
- 24h urine collection in polypropylene collection container or acid-rinsed polyethylene container
- Specimens can be aliquoted into a plain white -top universal container prior to transportation
- 24 hour collection period dates, time and total volume MUST be recorded

To aid interpretation of results, please include the following information on the request form:

- If known Wilson's Disease
- If samples are part of a penicillamine challenge test and whether they are pre or post penicillamine for correct result comments
- If patient is on zinc therapy

Investigation of acute toxicity & occupational monitoring:

- Spot urine (2mL) collected into a plain white -top universal container

## Turnaround times

We aim to analyse and report the results within 3 working days from receipt of the specimen.

## Analytical details and testing strategy

Copper and zinc are measured in urine by inductively-coupled plasma mass spectrometry (ICP-MS) in an acid sample diluent containing an internal standard.

24 hour samples are reported as 24 hour copper or zinc excretions while random urine samples are reported as ratios with creatinine.

**Copper Reference Ranges**

24 hour urine copper:

| | |
|---|---|
| All | Less than 0.8 µmol/24h |
| Cholestasis, hepatic cirrhosis, covert Wilson's Disease | Greater than 0.8 µmol/24h |
| Acute hepatic crisis, frank Wilson's Disease | Greater than 1.6 µmol/24h |

**24 hour urine copper - post-penicillamine chelation:**

Excretion post chelation will depend upon the dosing regimen used. Thus for 500mg penicillamine given orally before, and again 12hr into a 24hr urine collection excretion is typically:

- Normal individual less than 12 µmol/24hr
- Wilson's Disease greater than 25 µmol/24hr

Random (spot) urine copper to creatinine ratio:

Less than 50 nmol/mmol creatinine

## Zinc Reference Ranges

24 hour urine zinc:
3 to 19 µmol/24hr

Random (spot) urine zinc to creatinine ratio:
Less than 1.5 µmol/mmol creatinine

## Clinical Use

Copper (Cu) is an essential trace element, excess amounts of which are normally excreted in the bile. However, in conditions producing biliary impairment, and in Wilson's Disease, disruption to normal Cu transport and storage within the body occurs leading to accumulation within the liver and increased urinary excretion.

Urine Cu measurement is useful in screening for and diagnosis of Wilson's Disease. The diagnostic specificity may be increased in difficult cases by measuring urine copper both pre and post penicillamine chelation. Urine Cu