CSF Xanthochromia

Pseudonyms – CSF bilirubin

For investigation of suspected subarachnoid haemorrhage (SAH) in CT negative patients

Xanthochromia is the yellow discoloration indicating the presence of bilirubin in CSF which appears as oxyhaemoglobin released from the breakdown of red blood cells following haemorrhage into the CSF is converted *in vivo* into bilirubin in a time-dependent manner. A subarachnoid haemorrhage (SAH) is a spontaneous arterial bleeding into the subarachnoid space, usually from a cerebral aneurysm, and characterised by a severe sudden-onset headache.

The majority of positive cases are detected by computed tomography (CT) scanning but for those CT-negative patients presenting with a history suggestive of SAH the measurement of xanthochromia in CSF is advocated to detect those patients who actually have sustained a SAH and require treatment and to eliminate the possibility of SAH in the remainder without the need of confirmatory angiography. The CSF is collected by means of lumbar puncture (LP).

For full interpretation of the result other CSF and blood tests must be collected at the same time – CSF protein and glucose; plasma glucose; and serum protein and bilirubin.

General information

CSF Xanthochromia sample collection kits are provided in the ACU (ORC) and AMU (Trafford) and also available from the Specimen Receptions at the laboratories at both sites. Concurrent samples should be requested for CSF protein and glucose, plasma glucose and serum LFTS (for protein and bilirubin) using the sample containers supplied.

Collection container:

CSF xanthochromia:	White topped Universal container

(In addition the following samples should be collected:-

CSF glucose & protein:	1.2 mL fluoride-EDTA glucose (Sarstedt yellow top)
Serum protein & bilirubin:	4.9 mL SST (Sarstedt brown top)
Plasma glucose:	2.7 mL fluoride-EDTA glucose (Sarstedt yellow top)

Type and volume of sample:

1 mL CSF requested, minimum 400 µL required for analysis

Specimen transport/special precautions:

A CSF Xanthochromia sample collection kit should be used. These are located on the ACU (ORC) and AMU (Trafford) and from the Laboratory Specimen Receptions at both sites.

The CSF Xanthochromia sample should be delivered to the lab:

1) Protected from light (use transport envelope provided in kit)
2) By hand and not via the pneumatic tube system
3) Within 30 minutes

Other CSF and blood biochemistry samples can be sent together with the CSF Xanthochromia sample, but Microbiology samples should be sent separately and directly to the Microbiology Department.

NOTE: Samples should reach the laboratory by 4pm for same day analysis

Laboratory information

Method principle:

Spectrophotometric analysis.

CSF sample scanned between 350 and 600 nm and the net bilirubin absorbance (NBA) above the predicted baseline at 476 nm calculated.

Biological reference range or cut off:

Results are reported as a qualitative interpretation, essentially as either positive or negative, and reported as a comment stating either analysis is '*Consistent with SAH*' or there is '*No evidence to support SAH'.*

A result >0.007 AU (after any required correction has been applied) is reported as 'positive'.

Turnaround time:

This test is only analysed Monday to Friday and samples should reach the laboratory by 4pm for same day analysis.

Outside these hours samples are prepared and stored for analysis the next routine working day.

Clinical Information

Clinical decision point:

A result >0.007 AU (after any required correction has been applied) is reported as '*Consistent with SAH*'.

Factors known to significantly affect the results

Sample collection time:

The guideline suggests the test is only valid for samples collected at least 12h after and up to 14 days since a suspected SAH. Outside these times samples will be still analysed and may still be produce a valid positive result but negative results will not be valid (and will be comment on appropriately).

Sample transport:

1) Bilirubin is photo-sensitive, with measured levels decreasing with increasing length of exposure to light. Therefore samples must be transported to the lab protected from light.
2) Samples should not be transported by the pneumatic tube system as this may cause *in vitro* lysis of any red blood cells within the sample and release of oxyhaemoglobin. Excess oxyhaemoglobin can impair the ability to detect bilirubin and is a confounding element in interpretation.
3) The guideline recommends that the sample be delivered to the lab and prepared for analysis (by centrifugation) within 1h of collection. We therefore request that samples are delivered within 30 mins to allow for booking in and preparation within the 1h recommended.

Repeat collection:

A repeat LP for xanthochromia should not generally be performed due to the possibility of generating a false positive result arising from the breakdown of blood introduced into the CSF space during the original LP, however a negative result will be correct and samples would be analysed.

This information and precautions to limits these effects are all addressed by the provision of CSF Xanthochromia sample collection kits which informs users of these specific requirements and provides means (such as a transport envelope) to eliminate them.

References:

Cruickshank *et al*. National guidelines for analysis of cerebrospinal fluid for bilirubin in suspected subarachnoid. Ann Clin Biochem 2008; 45: 238-244

(Last updated November 2019)