The Investigation of Pleural Effusions
Please state the fluid type clearly on the request form under ‘specimen type’.

1. What are the sampling requirements?
   • Microbiology – culture bottles for bacterial culture and one universal for gram staining and tuberculosis culture.
   • Biochemistry – protein, LDH, lipids and amylase in plain container; glucose in fluoride oxalate bottles; pH in heparinised blood gas syringe immediately after aspiration. Purulent samples may block or damage the gas analyser and should not be analysed (see point 4).
   • Cytology – one universal for differential cell count or may use remnant of the above.

2. What is the appearance of the effusion and what does it signify?
   • Clear, straw-coloured, non-viscous and odourless: normal.
   • Homogeneously bloody sample: may be consistent with a haemothorax and/or a malignant exudative process or due to a traumatic tap. Samples that show haemolysis post-centrifugation will not be analysed for Biochemistry tests.
   • Turbid/milky/cloudy: chylothorax or pseudo-chylothorax (see point 9).
   • If an urinothorax is suspected, request fluid creatinine. A detectable creatinine is indicative of the presence of urine in an effusion.

3. Is it a transudate or exudate?
   • Total Protein: > 35 g/L – exudate; <25 g/L – transudate.
   • If total protein: 25-35 g/L, check LDH: If >300 u/L (local cut-off) classify as an exudate.
   • Causes of transudates: CHF, cirrhosis, nephrotic syndrome
   • Causes of exudates: Infection, inflammation, neoplastic, drug-induced – methotrexate, amiodarone, phenytoin, beta-blockers, etc.

4. Does the effusion need draining?
   • If purulent (pus visible), draining almost always indicated; pH not required.
   • If non-purulent, a pH < 7.2 or [H+] > 63 nmol/L indicates the need for pleural fluid drainage

5. Is infection a cause of an effusion?
   • Microbiology tests required - gram staining & culture.

6. Is malignancy a cause of an effusion?
   • Tumour markers in pleural or peritoneal effusions are not recommended. Suggest cytology, radiology & serum tumour markers as appropriate.

7. Is it rheumatoid?
   • Pleural fluid glucose <1.6 mmol/L reported in 78% of patients with rheumatoid arthritis. Rarely useful.

8. Is pancreatitis a cause?
   • Amylase has been shown not to be useful in the investigation of a pleural effusion (Brance et al, Arch Intern Med 2001; 161: 228-232).

9. Why does the effusion appear milky or turbid?
   • Chylothorax, if triglyceride concentrations >1.24 mmol/L; pseudo-chylothorax, if cholesterol >5.18 mmol/L. Rarely, clinically useful.
**Pleural effusion:** history, clinical examination, chest X-ray

Does the patient have congestive heart failure, hypoalbuminaemia or is on dialysis?

- Yes: Treat
- No: Pleural aspiration and send sample to laboratory.

What is the appearance of the collected fluid?

- If non-purulent and drainage may be required, measure pH.
- If infection suspected, request culture and/or gram staining.
- If malignancy, request pleural fluid cytology.
- If urinothorax, measure creatinine.
- If blood stained, suggestive of haemothorax.
- If milky/turbid (chylous), measure triglycerides.

Request total protein concentration on all requests.

- **<25 g/L**
  - Consistent with a transudate
- **25 - 35 g/L**
  - Measure LDH
- **>35 g/L**
  - Consistent with an exudate

If **<300 U/L**
- Consistent with a transudate

If **>300 U/L**
- Consistent with an exudate

On Consultant request only:
- If rheumatoid disease suspected, measure glucose.
- If pancreatitis suspected, measure amylase.