

# Introduction

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**ABBREVIATIONS:** AIDS = acute immunodeficiency syndrome; CSF = cerebrospinal fluid; HIV = human immunodeficiency virus; RBC = red blood cell.

**INDEX TERMS:** body fluids; cerebrospinal; serous; synovial.

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## LEARNING OBJECTIVES

1. Discuss the necessity of performing the cell counts and slide preparation on body fluids as soon as possible after collection.
2. Explain the value of a monolayer slide preparation in determining cell morphology in body fluids.
3. Explain why the presence of serous and synovial fluids in quantities sufficient to sample is an indication of a disease process.

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This series of articles will address the performance of cell counts and differential cell counts on the three most common categories of body fluids: cerebrospinal fluid (CSF), serous or body cavity fluids (pleural, pericardial, peritoneal), and synovial or joint fluids. Each has unique characteristics and cell counts, and differentials are performed for different purposes on each one. When a fluid is received in the laboratory, information that can be helpful in determining the cell counts is obtained from the gross appearance of the fluid. A point to be remembered is that the specimen is obtained by a physician who also observes the gross appearance of the fluid. This is especially significant in CSF if only one tube is obtained and it is bloody. Every body fluid should be examined—cell count performed and slide for evaluation of cell morphology prepared—immediately after collection since cells, especially neutrophils, begin disintegrating within 30 minutes.

Cytocentrifuge concentration of cell preparations improves cell identification over attempting to differentiate cells while performing hemacytometer cell counts. With appropriate dilution, a monolayer slide can be prepared to enhance morphology of cells. Cytocentrifuge concentration provides enough nucleated cells to perform a 100-cell differential count if the nucleated cell count is greater than 3/ $\mu$ L. Since there will be some cell yield even if the cell count is zero, important diagnostic information can be obtained especially in leukemic patients when blast cells may be present. The presence of red blood cells (RBCs) in fluids can interfere with nucleated cell morphology due to crowding and distortion of significant cells. Cytocentrifuge preparations also help identify eosinophils in urine and lupus erythematosus cells in serous and synovial fluids.

Many conditions are diagnosed based on findings in a body fluid. Since CSF is a normal fluid for which reference ranges are defined, any increase in the nucleated cell count may herald meningitis, whether viral or bacterial. Blast cells or lymphoma cells in CSF of a patient previously diagnosed with acute leukemia or lymphoma may be the first indication of relapse. In patients with HIV or AIDS and neurologic symptoms, the finding of cryptococcal organisms may explain the patient's symptoms.

The presence of serous and synovial fluids in quantities sufficient to sample is an indication of a disease process involving a body organ or a joint. It is helpful to identify effusions in body cavities as transudates or exudates to aid in identification of the pathologic condition responsible for the excess fluid. This delineation can be confirmed by the types of cells seen in the fluid. Often, cancer metastasizes to the lungs and liver so metastatic tumor cells as well as primary tumor cells may be seen in exudative effusions.

Synovial fluids will contain neutrophils in the presence of inflammation or infection. If inflammation in the joint is due to gout or pseudogout, the characteristic crystals for these conditions will be present.

It is important for laboratory personnel performing body fluids to be familiar with methods for performing accurate nucleated cell counts, preparing cytocentrifuge cell concentrations, and identifying significant cell morphotypes in fluids.