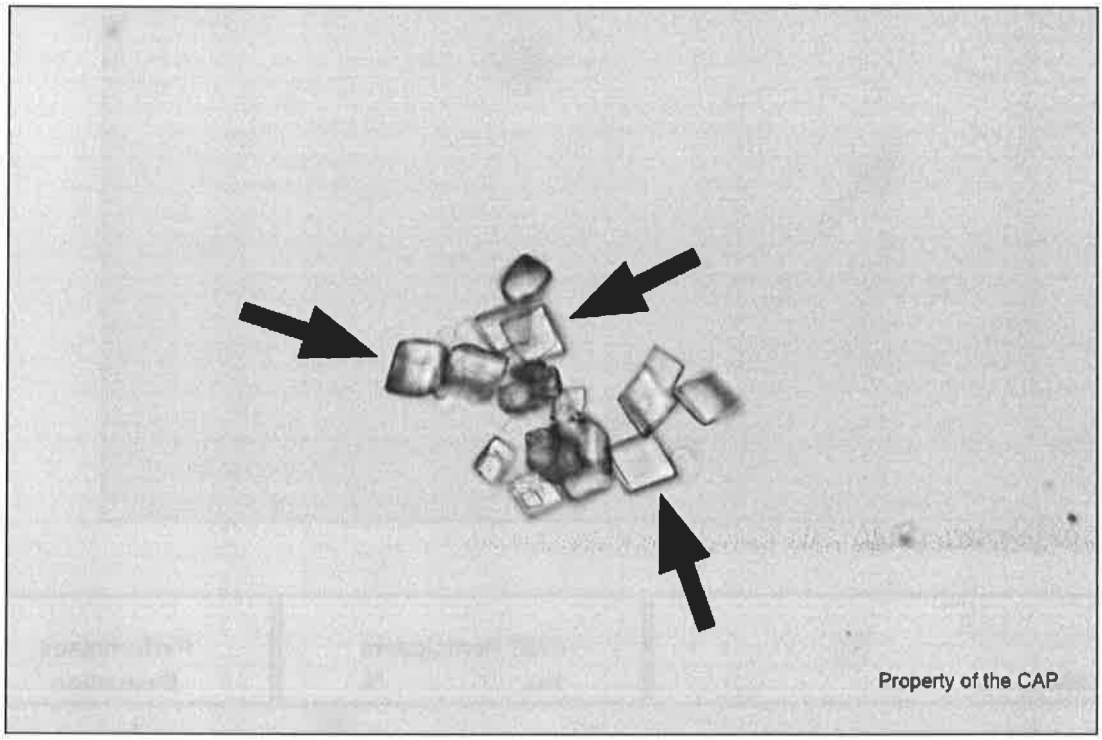
## Urine Sediment Photographs

**Case History CMP-17 through CMP-20**

This urine sample is from a 26-year-old pregnant woman.

Laboratory data include: specific gravity = 1.012; pH = 5.5; glucose and ketones = negative; protein, nitrite, blood, and leukocyte esterase = positive.

CMP-17



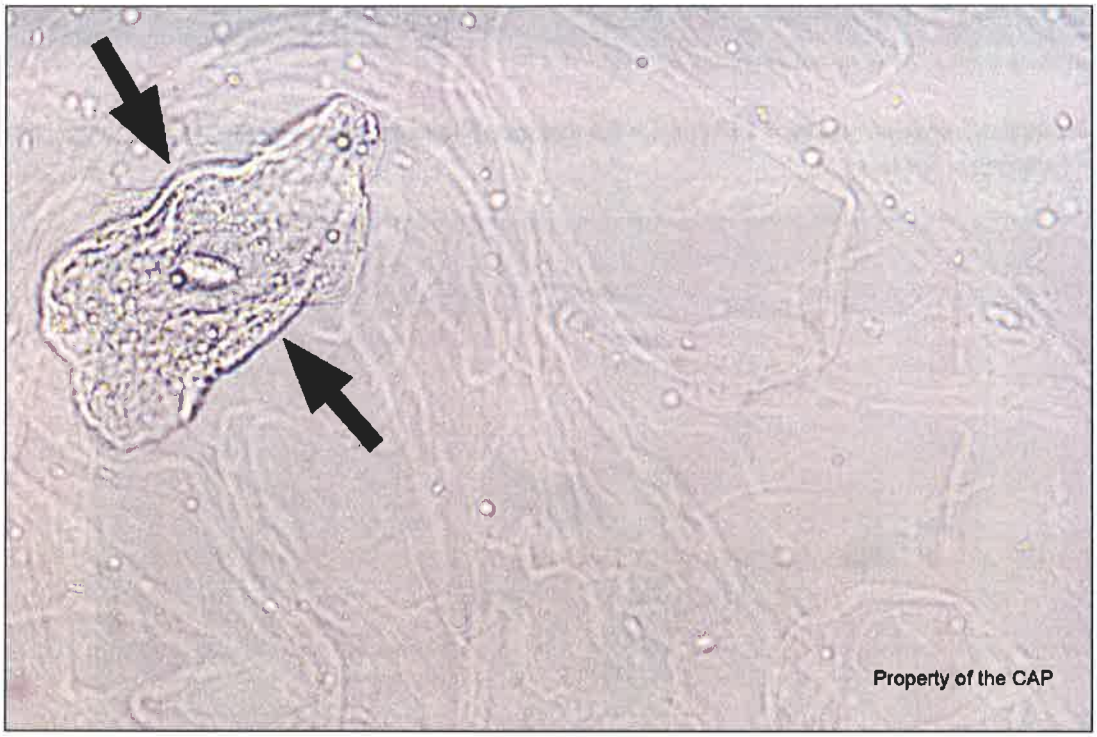

(URINE, UNSTAINED, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Uric acid crystal | 5238 | 97.7 | Good |

The arrowed objects are uric acid crystals as correctly identified by 97.7% of participants. Uric acid crystals are found in acid urine (<5.8) and may assume a variety of shapes. These include rhomboidal plates, hexagons, stars, barrels, cubes, rosettes and lemons. Uric acid crystals exhibit strong polychromatic birefringence. Uric acid crystals may be normal, however, when found in large numbers, may indicate gouty nephropathy and/or nephrolithiasis.

## Urine Sediment Photographs

CMP-18



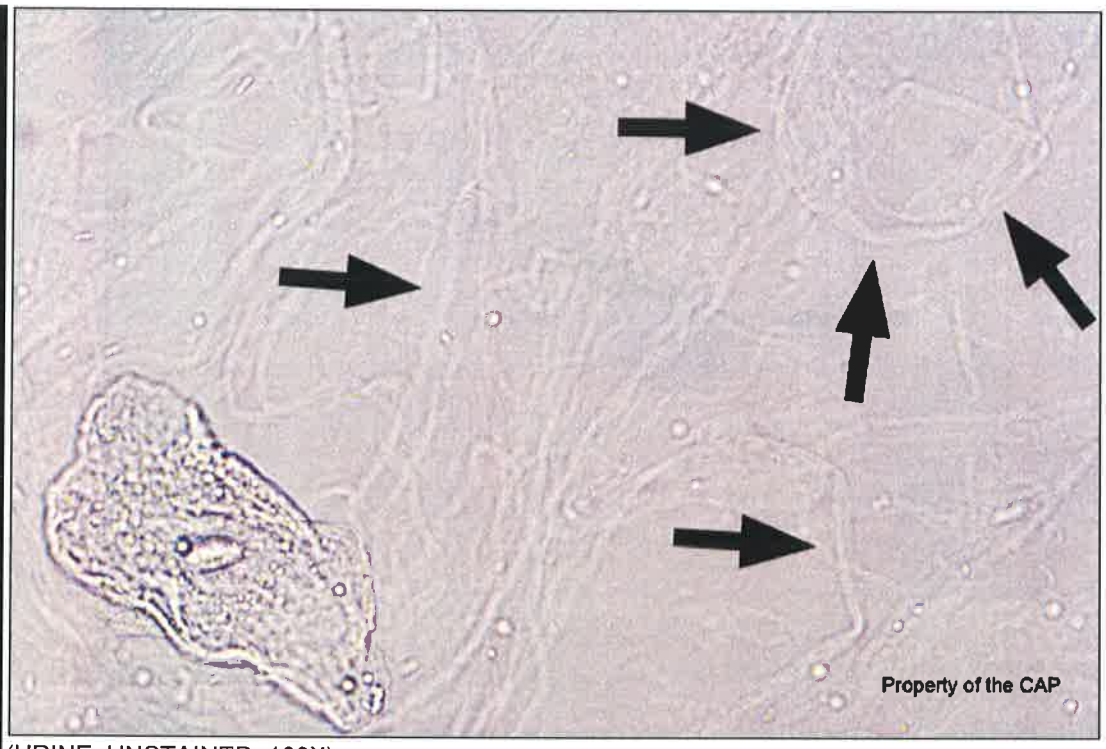

(URINE, UNSTAINED, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Squamous epithelial cell | 4873 | 90.9 | Good |

The arrowed object is a squamous epithelial cell as correctly identified by 90.9% of participants. Squamous epithelial cells are the most common lining cells of the urinary tract. These cells line the distal male urethra, female urethra, vagina and external genitalia. Squamous epithelial cells are thin polygonal or rectangular cells. They average 30 to 50 µm with a single central nuclei. If there are large numbers present, they indicate that the specimen was contaminated and not a "clean catch" midstream specimen.

## Urine Sediment Photographs

CMP-19



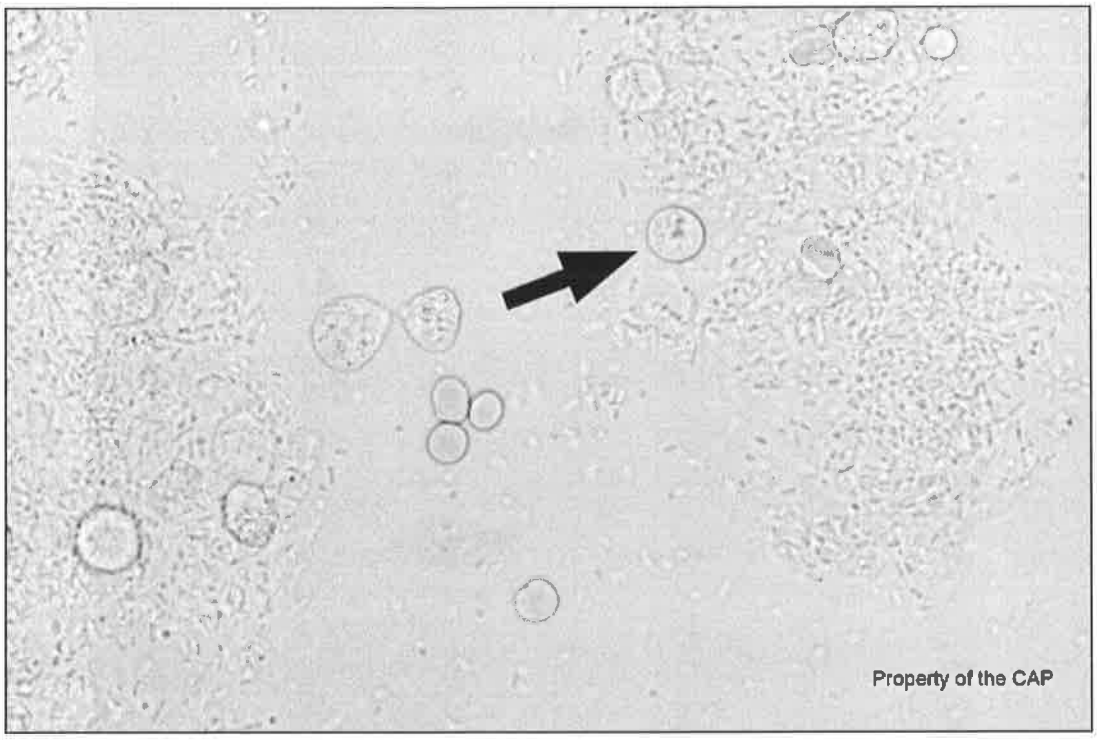

(URINE, UNSTAINED, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Mucus strands | 5323 | 99.3 | Good |

The arrowed material is mucus threads as correctly identified by 99.3% of participants. Mucous strands are a normal product of the glands of the lower urinary tract, and may be a contaminant of urine specimens. Mucus forms delicate, translucent threads that lack birefringence under polarized light. Mucus strands can be distinguished from casts and fibers by their irregular, asymmetrical nature and translucency.

## Urine Sediment Photographs

CMP-20




(URINE, UNSTAINED, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Leukocyte (neutrophil, eosinophil, lymphocyte) | 5256 | 98.1 | Good |

The arrowed objects are leukocytes as correctly identified by 98.1% of participants. The most common leukocyte found in urine is the neutrophil. Leukocytes in urine are 10-12 µm in diameter, round, oval or amoeboid, with a segmented, lobulated or fused nucleus. The chromatin is coarsely granular or clumped and the cytoplasm is granular. Small numbers of leukocytes (up to 5) are normal with larger numbers signifying inflammation, both infectious and non-infectious.

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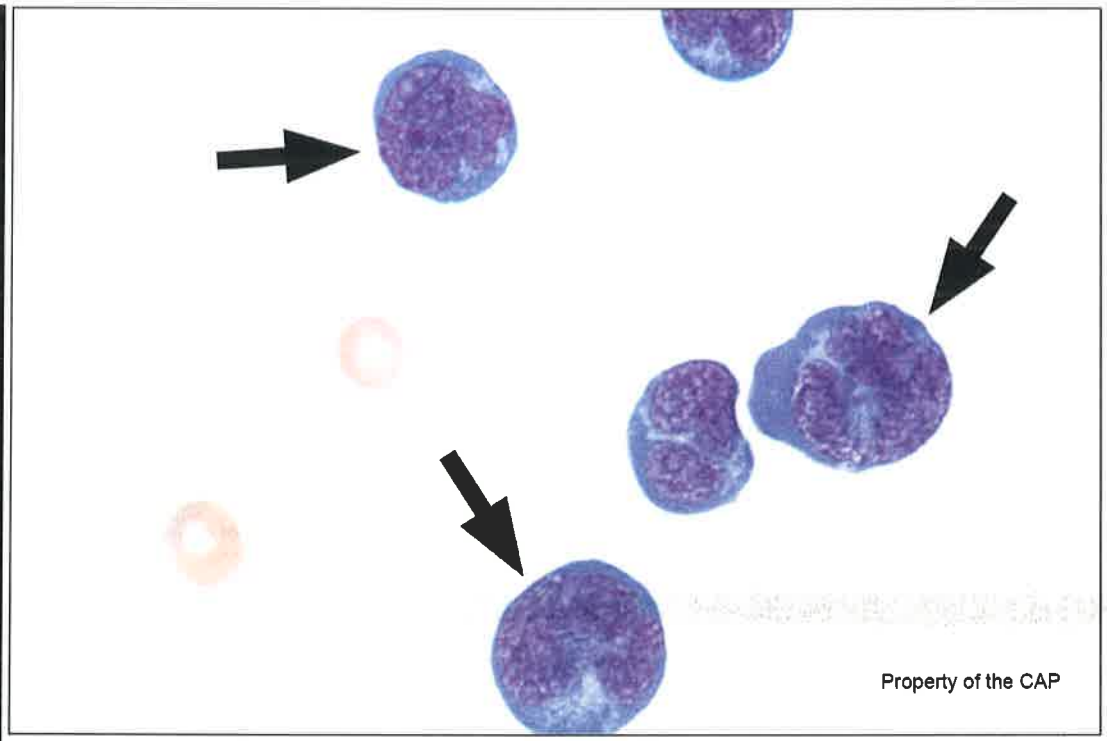
Hematology and Clinical Microscopy Resource Committee

## Body Fluid Photographs

**Case History CMP-21 through CMP-26**

The patient is a 60-year-old man with history of lymphoma. Laboratory cerebrospinal fluid (CSF) findings include: WBC = 98/µL (0.098 x $10^3$ /µL); RBC = 291/µL (0.291 x $10^3$ /µL).

CMP-21



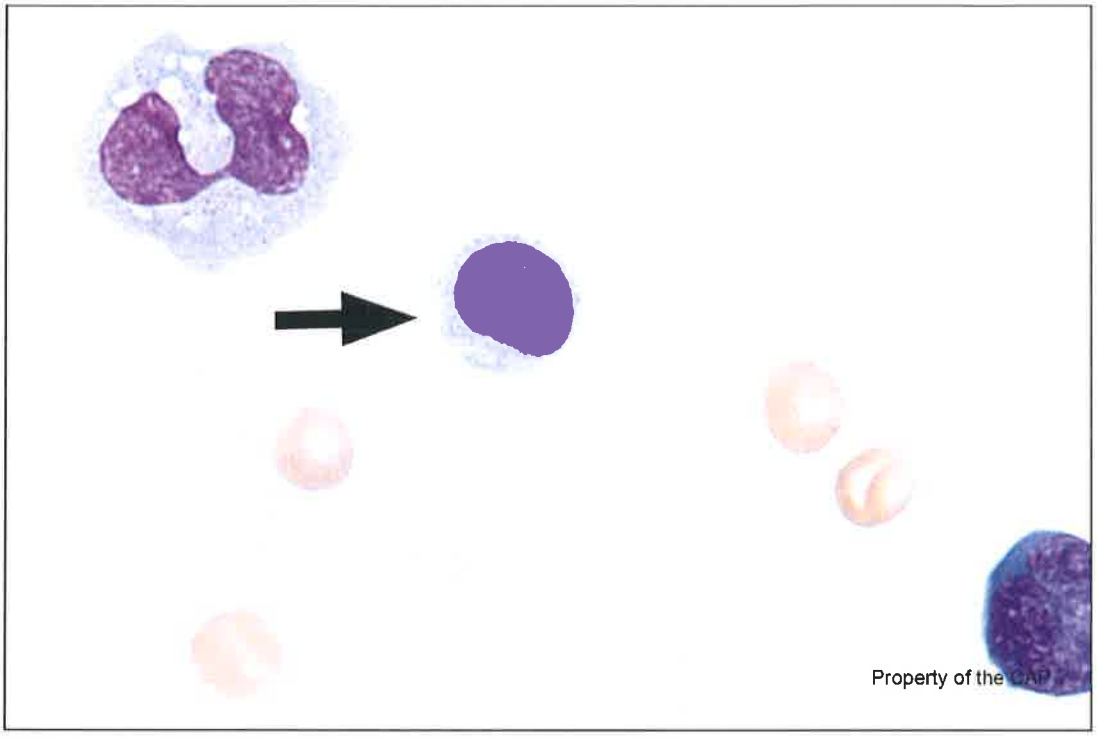

(CSF FLUID, CYTOCENTRIFUGE, WRIGHT-GIEMSA, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Lymphoma cell | 3041 | 82.4 | Educational |
| Blast cell | 267 | 7.2 | Educational |

The arrowed cells are lymphoma cells/blasts as correctly identified by 89.6% of participants. In this case these abnormal cells are Burkitt lymphoma cells; although in some cases these calls can be difficult morphologically to distinguish from the blasts seen in lymphoblastic leukemia/lymphoma. Burkitt lymphoma cells are intermediate to large in size and usually contain deeply basophilic cytoplasm and round to oval nuclei with somewhat dispersed chromatin and multiple small nucleoli. In most preparations of Burkitt lymphoma cytoplasmic vacuoles are evident; although sometimes this feature is less prominent in body fluid sample preparations. In this image, the lymphoma cells also show nuclear irregularity which may be due at least in part to the cytocentrifuge preparation.

## Body Fluid Photographs

CMP-22



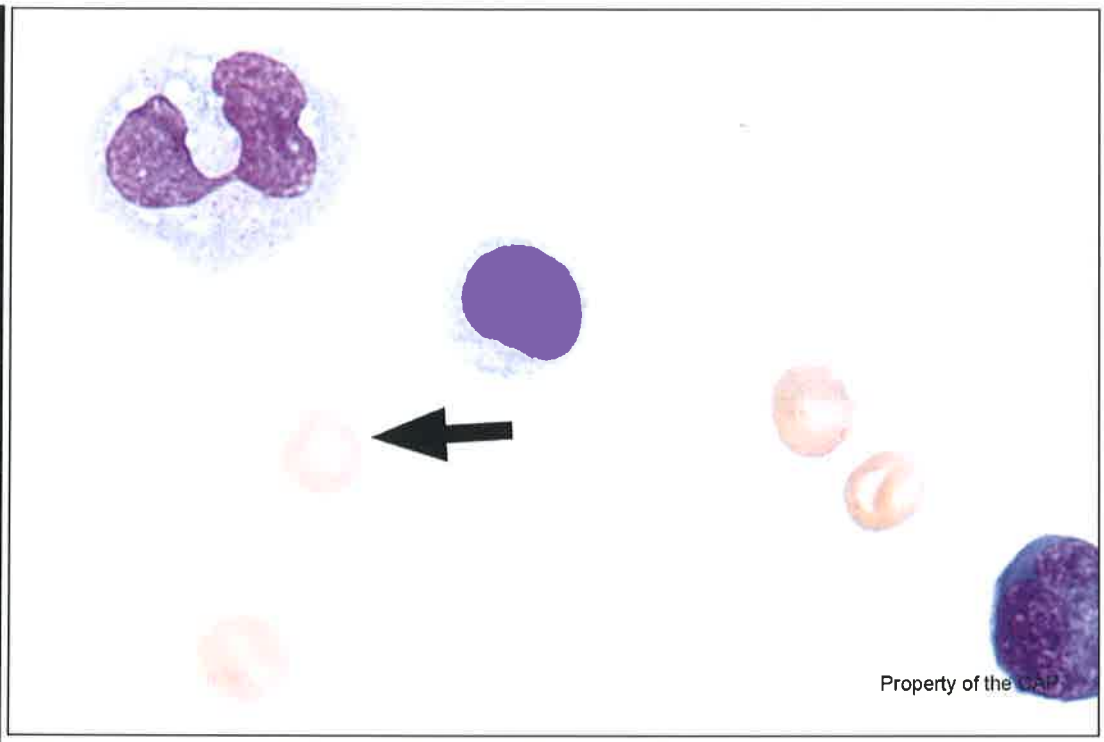

(CSF FLUID, CYTOCENTRIFUGE, WRIGHT-GIEMSA, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Lymphocyte | 3682 | 99.6 | Good |

The arrowed cell is a lymphocyte as correctly identified by 99.6% of participants. Small lymphocytes are usually only slightly larger than erythrocytes and contain a round to oval nucleus with clumped chromatin and relatively sparse lightly basophilic cytoplasm. Small lymphocytes usually have an inconspicuous nucleolus; although cytocentrifuge preparation can result in increased nucleolar prominence. Note the smaller size and differing morphologic features of this normal lymphocyte as compared to the lymphoma cells seen in CMP-21.

## Body Fluid Photographs

CMP-23



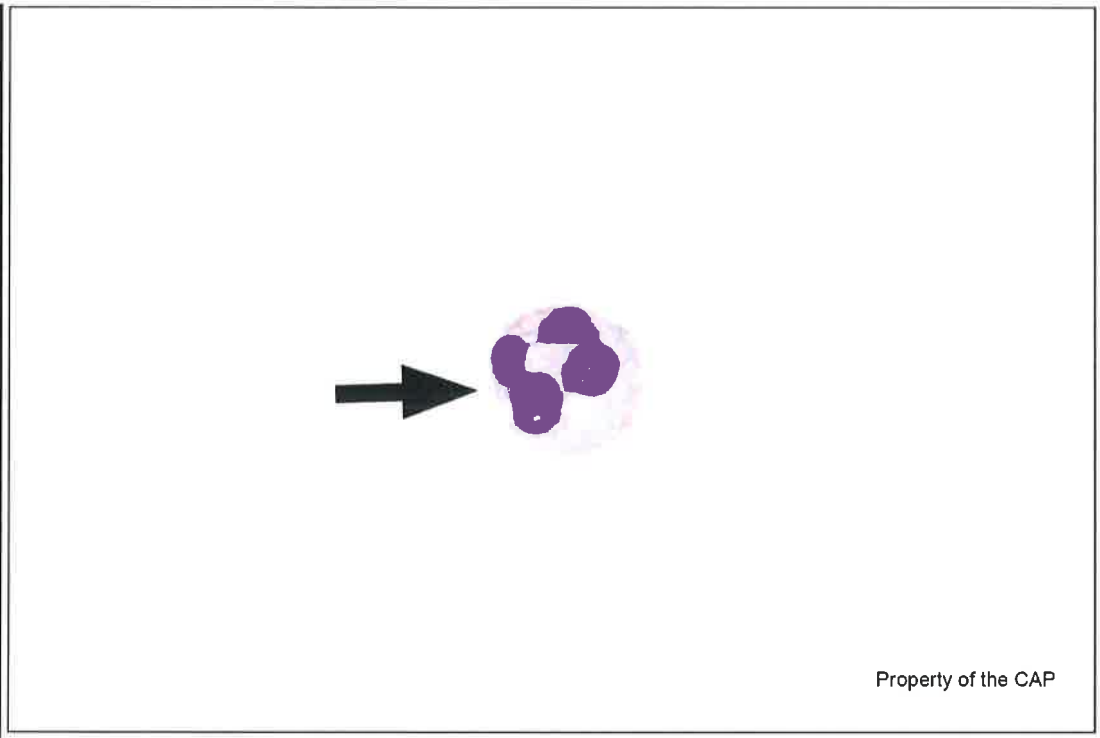

(CSF FLUID, CYTOCENTRIFUGE, WRIGHT-GIEMSA, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Erythrocyte | 3695 | 99.9 | Good |

The arrowed cell is an erythrocyte as correctly identified by 99.9% of participants. Mature erythrocytes are similar in size and appearance to those present in peripheral blood. Erythrocytes are round to oval disc shaped cells measuring ~7 µm in diameter. They contain central pallor occupying less than one-third of the cell diameter; although in some cases the central pallor can be difficult to visualize in body fluids. Erythrocytes are not normal in body fluids but can be introduced as a contaminant when there is difficulty obtaining the sample or as a result of a pathologic process such as hemorrhage, trauma, or malignancy.

## Body Fluid Photographs

CMP-24



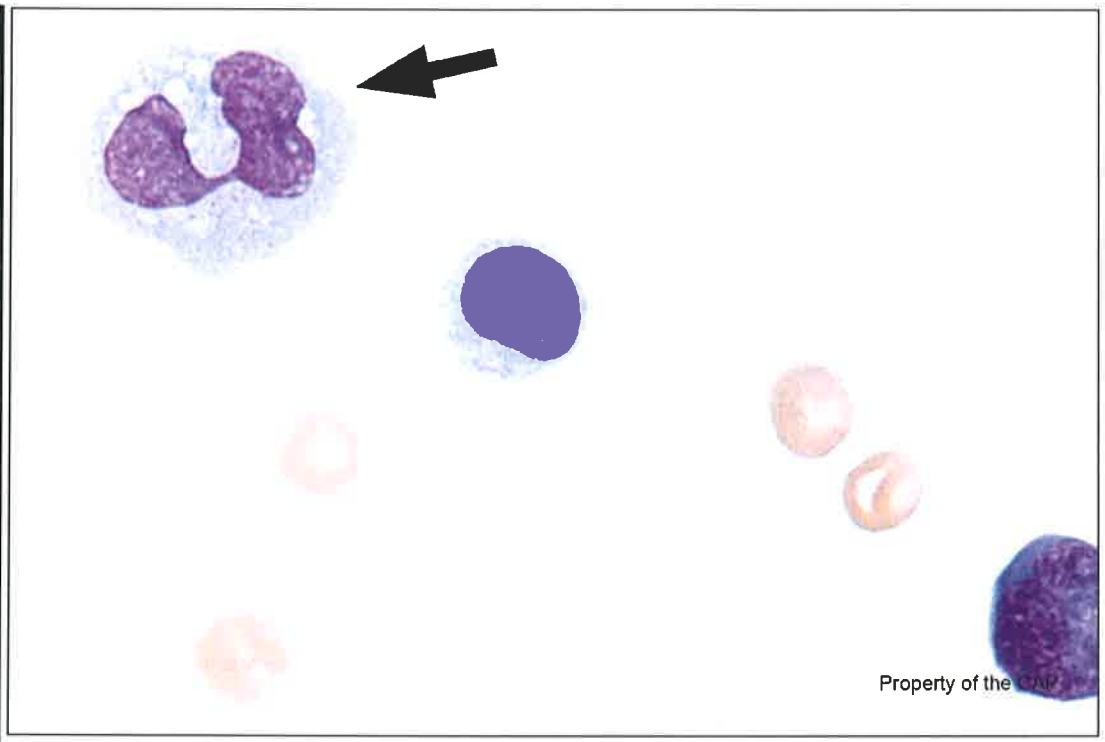

(CSF FLUID, CYTOCENTRIFUGE, WRIGHT-GIEMSA, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Neutrophil, segmented or band | 3653 | 98.8 | Good |

The arrowed cell is a neutrophil as correctly identified by 98.8% of participants. The appearance of neutrophils in body fluids may be similar to those seen in peripheral blood; although in some cases degenerative changes may also be present. Neutrophils are 10-15 µm in size and contain moderate pale pink cytoplasm with specific granules. The mature neutrophil contains a segmented nucleus usually comprised of two to five lobes with condensed nuclear chromatin.

## Body Fluid Photographs

CMP-25



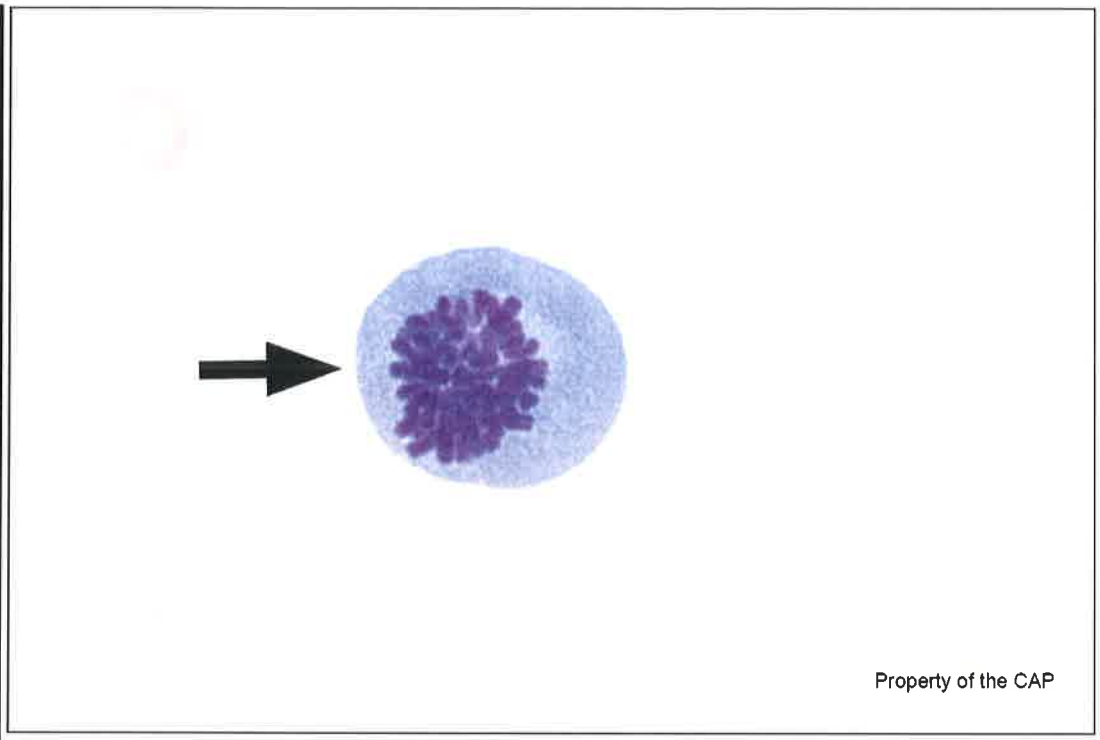

(CSF FLUID, CYTOCENTRIFUGE, WRIGHT-GIEMSA, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Monocyte/macrophage | 3525 | 95.3 | Good |

The arrowed cell is a monocyte/macrophage as correctly identified by 95.3% of participants. In this case, the cell is best considered a monocyte based on the morphologic features. Monocytes are usually large (12-20 µm) with abundant blue-grey cytoplasm that often contains vacuoles and/or sparse azurophilic granulation. The monocyte nucleus is typically round, oval, or indented (as in this case) with lacy chromatin and sometimes small nucleoli.

## Body Fluid Photographs

CMP-26




(CSF FLUID, CYTOCENTRIFUGE, WRIGHT-GIEMSA, 100X)

| Identification | CMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Mitotic figure | 3554 | 96.3 | Educational |

The arrowed cell contains a mitotic figure as correctly identified by 96.3% of participants. When a cell undergoes mitosis, the regular features of the nucleus are no longer present. Instead, the nucleus appears as a dark irregular mass with daisy-like form or irregular projections. In some cases a mitotic figure can be difficult to distinguish from a degenerating cell, but in a degenerating cell the nucleus is often fragmented into a single or multiple purple, round, dark-staining structures.

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Joan E. Etzell, MD, FCAP, Chair
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**Case History:**
The patient is a 60-year-old man with history of lymphoma. Laboratory cerebrospinal fluid (CSF) findings include: WBC = 98/μL (0.098 x $10^3$ /μL); RBC = 291/μL (0.291 x $10^3$ /μL).

(CSF FLUID, CYTOCENTRIFUGE, WRIGHT-GIEMSA, 100X)

Case Discussion: Burkitt lymphoma of the central nervous system

Lymphomas are a diverse group of neoplasms with varying presentation, clinical course, and underlying disease biology. While they can arise from any lymphoid lineage (B-, T-, or NK-cell), the most common lymphomas are of mature B-cell origin. Conventionally, the B-cell lymphomas are further classified as Hodgkin or non-Hodgkin, but within the non-Hodgkin group, there are over 20 distinct B-cell neoplasms. Immunocompromised patient populations have a particularly high risk of developing B-cell lymphoma. HIV-positive patients, for example, have a several hundred-fold greater risk than HIV-negative individuals, and these patients are under careful watch for the development of these and other cancers.

Burkitt Lymphoma (BL), one of the most classic hematolymphoid neoplasms, is a high-grade tumor of follicle center B-cells, and associated with rearrangements of the *C-MYC* oncogene. The overexpression of *C-MYC* is typically associated with a translocation between chromosomes 8 and 14, which can be identified by routine karyotype or fluorescent in-situ hybridization (FISH). Two forms of BL are appreciated. The *endemic* variant is characteristically associated with Epstein-Barr Virus (EBV) and presents as jaw or neck masses in children living in malaria endemic regions (equatorial African and South America). In fact, EBV, the common virus responsible for infectious mononucleosis, was first identified in this patient population in the 1960s. The *sporadic* variant of BL is less often associated with EBV and more commonly presents as intra-abdominal tumor.

BL is both highly proliferative and apoptotic, imparting the characteristic "starry-sky" appearance on histologic sections (**Figure 1**). Cytologically, the neoplastic cells are intermediate in size, with cytoplasmic vacuolization being a common finding (**Figure 2**). The rapid proliferation and cell death with or without chemotherapy make the patients particularly susceptible to so-called tumor lysis syndrome. This complication is caused by the release of intracellular products, leading to, amongst other things, increased blood levels of potassium and uric acid. Without supportive intervention, patients can develop acute renal failure. Because of its rapid growth, BL is rapidly and uniformly fatal without treatment. However, chemotherapy can be curative, particularly in cases where the disease is localized. Intensive chemotherapy shows the greatest efficacy in BL, although the risks and side effects associated with these regimens are significant.

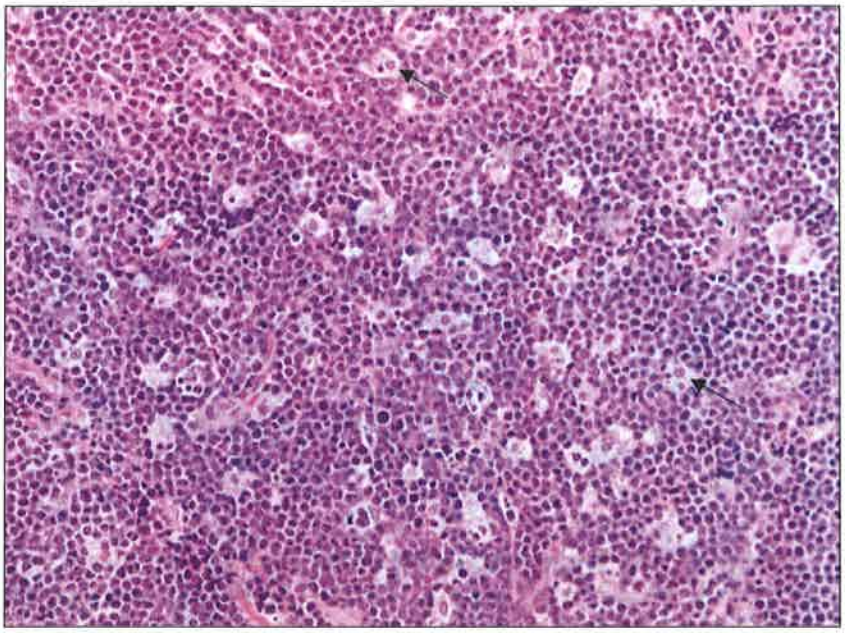

**Figure 1: Burkitt lymphoma in tissue sections at low magnification, H&E stain.** The lymphoma cells are uniform in size and contain round nuclei with sparse cytoplasm. In the background, macrophages (arrows) are present imparting a "starry-sky" appearance.

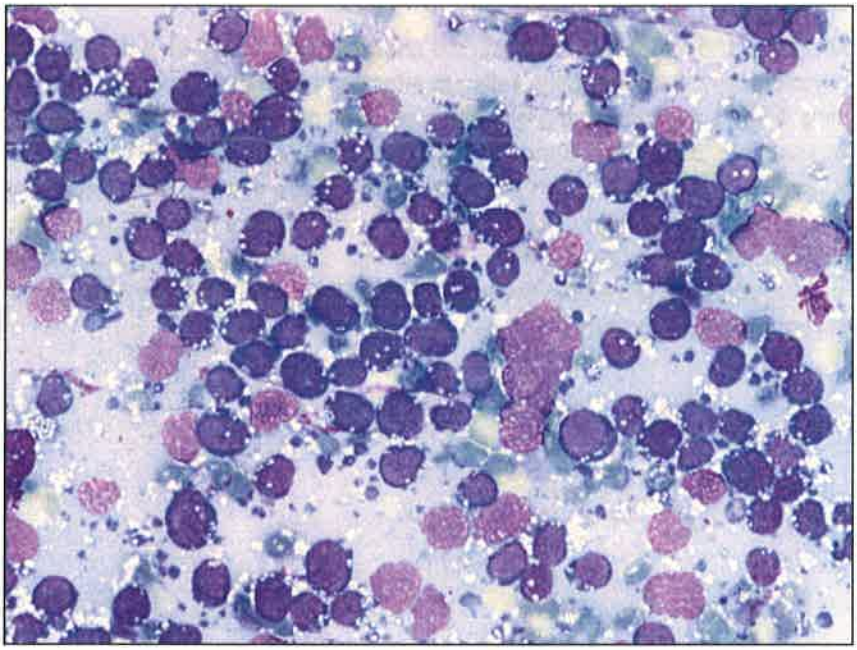

**Figure 2: Burkitt lymphoma on a cytologic preparation at intermediate magnification, Wright-Giemsa stain.** The Burkitt lymphoma cells are uniform in size with round nuclei, somewhat dispersed chromatin, few small nucleoli, and scant deeply basophilic cytoplasm containing multiple vacuoles.

In the HIV-positive population, BL accounts for about one-third of diagnosed lymphomas, and presentation or involvement of the central nervous system is common. Additionally, the majority of central nervous system lymphomas in HIV-positive patients are EBV-positive. Imaging studies can often be the first to suggest brain involvement. However, some form of tissue biopsy or cytologic evaluation is necessary for diagnosis as infections can also produce similar imaging patterns. While not always involved, the cerebrospinal fluid can be a somewhat less invasive means to establish the diagnosis. Wright-Giemsa stained cytospin preparations can identify abnormally large lymphoid cells with irregular nuclear contours and even occasional mitotic figures. However, the classic morphology with cytoplasmic vacuolization and open chromatin pattern is not always appreciated in this preparation. If sufficiently cellular, the cerebrospinal fluid can also be used for flow cytometry and FISH analysis.

References:


1. Glassy EF, Agosti SJ, College of American Pathologists. Atlas Subcommittee, College of American Pathologists. *Color atlas of hematology : an illustrated field guide based on proficiency testing.* Northfield, IL: College of American Patholgists; 1998.
2. Swerdlow SH. International Agency for Research on Cancer, World Health Organization. *WHO classification of tumours of haematopoietic and lymphoid tissues.* 4th ed. Lyon, France: International Agency for Research on Cancer; 2008.
3. Dunleavy K, Wilson WH. How I treat HIV-associated lymphoma. *Blood.* 2012;119(14):3245-3255.
4. Perkins AS, Friedberg JW. Burkitt lymphoma in adults. *Hematology Am Soc Hematol Educ Program.* 2008;341-348.



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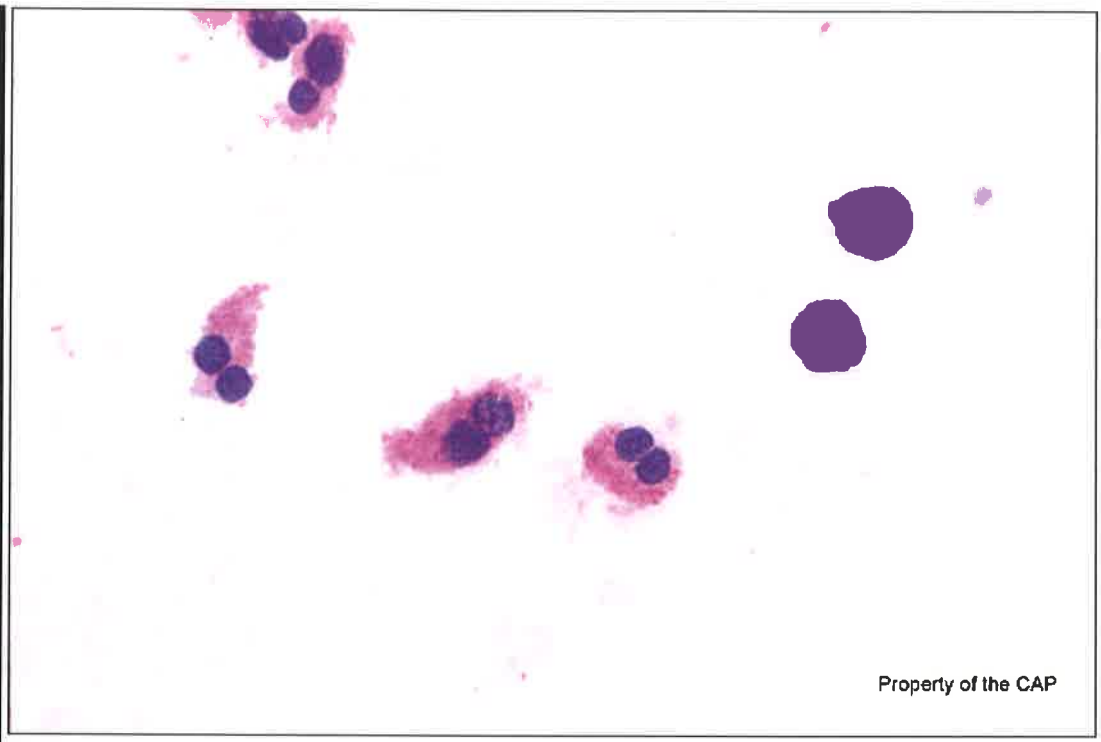
## CMMP – Clinical Microscopy Miscellaneous Photographs

CMMP-38




(NASAL, WRIGHT-GIEMSA)

| Identification | CMMP Participants No. | % | Performance Evaluation |
|---|---|---|---|
| Eosinophils are present | 2035 | 99.0 | Good |

Eosinophils are present on this nasal smear preparation. The finding of nasal eosinophils is supportive of the diagnosis of allergic rhinitis. The slide is prepared by having the patient blow his/her nose in a nonabsorbent material (waxed paper, plastic wrap). A swab is used to transfer the mucus to a glass slide. After the slide is air dried, it can be stained with either a Wright-Giemsa or a Hansel stain and then evaluated.