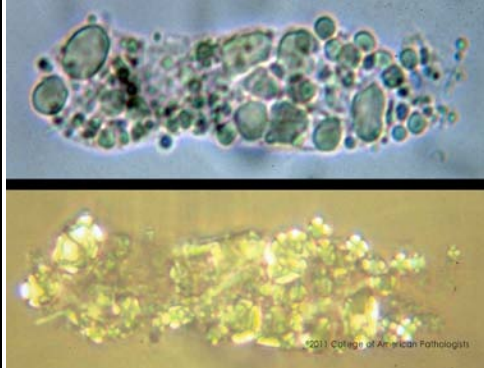


Urine Sediment Photomicrographs/Photographs

Case History CMP-04

This urine sample is from a 20-year-old with minimal change disease. Laboratory data include: specific gravity = 1.025; pH = 7.0; protein = positive (large); blood, leukocyte esterase, ketones, and nitrite = negative.



CMP-04

Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Fatty cast	40	93.3	4446	93.3	Good

The object is a fatty cast, with a non-polarized image in the upper frame and a polarized image in the lower frame.

Fatty casts are an uncommon finding that is always abnormal. They vary in length and width and are composed of irregular refractile droplets of fat which show a “Maltese cross” polarization pattern bound by matrix. There also may be free globules of fat in the urine.

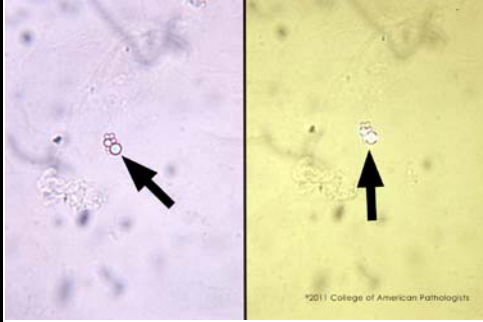
They are seen in nephrotic syndrome, acute tubular necrosis and hepatorenal syndrome.

They may be confused with cellular casts (especially renal tubular epithelial and RBC) and coarse granular casts. Differentiation is accomplished with polarized light examination. The fat globules also lack pigmentation and internal structures.

Urine Sediment Photomicrographs/Photographs

Case History CMP-05

This urine sample is from a 20-year-old with minimal change disease. Laboratory data include: specific gravity = 1.025; pH = 7.0; protein = positive (large); blood, leukocyte esterase, ketones, and nitrite = negative.



Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Fat droplets	39	90.7	4399	92.3	Good

CMP-05

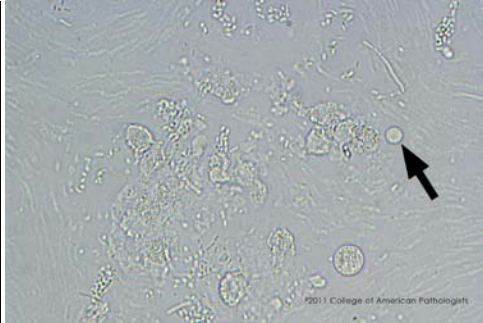
The arrowed objects are Fat globules. Fat globules are colorless, round, highly refractile and vary in size from 2 to 20 microns. They are an infrequent finding and always abnormal, occurring in the same tubular diseases as fatty casts. They occur singly and in small groups, appearing dark on low power and clear on high power. They may be accompanied by fatty casts or oval fat bodies. Polarization reveals a “Maltese cross” pattern if cholesterol is present. Neutral fats will stain with Sudan Black or Oil Red O.

Mimics include red cells, encapsulated fungi, starch and contaminating lubricants. Polarization will differentiate red cells and fungi. Red cells are also more uniform and may be faintly pigmented. The polarization pattern of starch granules is similar to fat, but the granules tend to have irregular margins and a central slit or depression. Urines contaminated with lubricants will not have oval fat bodies or fatty casts indicating tubular damage.

Urine Sediment Photomicrographs/Photographs

Case History CMP-06

This urine sample is from a 13-year-old with recent history of strep throat now presenting with bloody urine, malaise and decreased urine output. Laboratory data include: specific gravity = 1.020; pH = 7.2; protein, leukocyte esterase, ketones and nitrite = negative; blood = positive (large).



CMP-06

Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Erythrocyte, mature	41	95.4	4666	97.9	Good

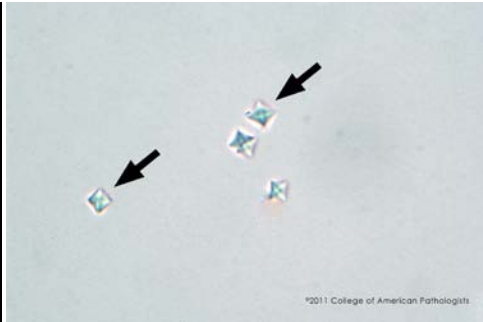
The arrowed object is a red blood cell. Red blood cells are uniform round, oval or biconcave discs measuring 7-8 microns. They may become crenated in hypertonic urine or “ghosts” in hypotonic urine. Faint hemoglobin pigment may be visible. They are a normal finding if less than 5 are seen per high power field. In greater numbers, they indicate disease, such as glomerular disease, trauma, infection, neoplasm, urinary tract stones and coagulopathy.

They may be confused with yeast, pollen, starch, sperm heads, fat droplets and monohydrate calcium oxalate crystals. Red cells can be differentiated because they are uniform, non-refractile, lack a cell wall, have no internal structure and do not polarize.

Urine Sediment Photomicrographs/Photographs

Case History CMP-07

This urine sample is from a 54-year-old who had a routine urinalysis with microscopic examination as part of annual physical exam. Laboratory data include: specific gravity = 1.015; pH = 7.10; blood, leukocyte esterase, ketones, protein and nitrite = negative.



Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Calcium oxalate crystal	43	100.0	4750	99.7	Good

CMP-07

The arrowed objects are calcium oxalate crystals. Calcium oxalate is most often seen in acid urine, but may occur at neutral and weakly alkaline pH also. These are the more common dihydrate (or weddelite) forms. They are 3 to 12 microns across and form colorless octahedrons (envelopes) or bipyramidal forms. They are strongly birefringent on polarized light exam, and unique, with no mimics. Although considered a “normal” finding, they may be significant in that 75% of renal stones contain calcium oxalate and numerous calcium oxalate crystals are seen in ethylene glycol and methoxyflurane poisoning. Modest numbers are seen with ingestion of certain foods (tomatoes, apples, rhubarb, asparagus, and spinach), carbonated beverages and large doses of vitamin C.

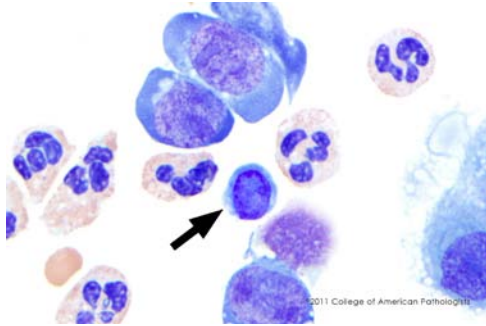
The less common monohydrate (whewellite) forms include dumbbell, oval and elongated hexagon forms. They are usually accompanied by the classic “envelope” dihydrate forms, allowing differentiation from possible mimics.

Roberta L. Zimmerman, MD
Hematology and Clinical Microscopy Resource Committee

Body Fluid Photomicrographs/Photographs

Case History CMP-08

The patient is a 58-year-old male who presents with cough for the past 20 days and fevers. He was found to have a left pleural effusion. Laboratory data include: Nucleated cells = 15,700/ μ L; RBC = 40,000/ μ L.



CMP-08

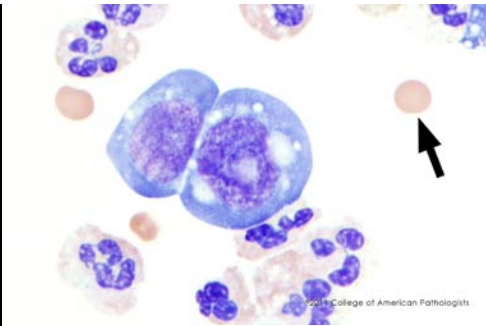
Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Lymphocyte	43	100.0	3013	94.9	Good

The arrowed cell is a lymphocyte which is surrounded by neutrophils and tumor cells. Normal mature lymphocytes are small and demonstrate rounded or oval nuclear contours with dense nuclear chromatin and scant cytoplasm. They are slightly larger than erythrocytes (compare with the erythrocyte in the lower left corner in the image), but are smaller than neutrophils, as in this image, or monocytes. Lymphocytes can be seen in virtually all normal body fluids and can be of B- or T-cell lineage. Additional studies, such as flow cytometry or immunocytochemical staining, would be required to determine the lineage of the lymphocytes. Centrifugation can often alter the morphologic features of the lymphocytes and can result in cytoplasmic spreading, prominent nucleoli or nuclear convolutions. It is important to be aware of these features when determining the presence of lymphoma in a body fluid. Increased numbers of lymphocytes in a body fluid can be seen in conditions such as chronic inflammatory states, viral infection or congestive heart failure.

Body Fluid Photomicrographs/Photographs

Case History CMP-09

The patient is a 58-year-old male who presents with cough for the past 20 days and fevers. He was found to have a left pleural effusion. Laboratory data include: Nucleated cells = 15,700/ μ L; RBC = 40,000/ μ L.



CMP-09

Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	

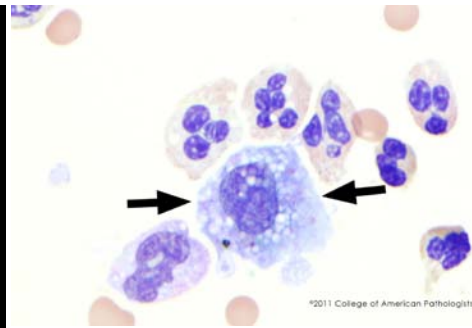
Erythrocyte, mature	43	100.0	3174	99.8	Good
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The arrowed cell is a mature erythrocyte with a very pale central pallor. Neutrophils, other erythrocytes and tumor cells are also present in the image. Erythrocytes in body fluids are morphologically similar in size and shape to normal erythrocytes in the peripheral blood. Erythrocytes are not normally found in body fluids and if present, can be indicative of a traumatic tap with associated hemorrhage, postoperative effusion, or secondary to disease states such as malignancy, as in this case, or pulmonary infarction.

Body Fluid Photomicrographs/Photographs

Case History CMP-10

The patient is a 58-year-old male who presents with cough for the past 20 days and fevers. He was found to have a left pleural effusion. Laboratory data include: Nucleated cells = 15,700/ μ L; RBC = 40,000/ μ L.



Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Monocyte/macrophage	18	41.8	1660	52.5	Educational
Macrophage with small lipid vacuoles/droplets	18	41.8	910	28.7	Educational
Neutrophil/macrophage w/phagocytized bacteria	4	9.3	247	7.8	Educational

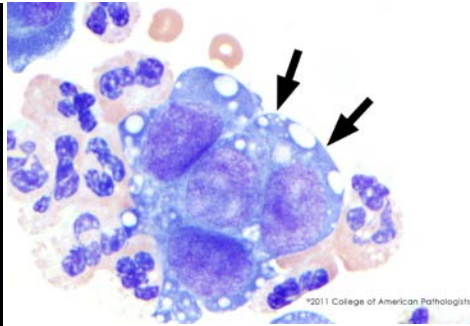
CMP-10

The arrowed cell is a macrophage. These cells are smaller than mesothelial cells in body fluids, with less cytoplasmic basophilia. Macrophages are derived from circulating monocytes. Monocytes originate in the bone marrow and upon maturation subsequently enter the circulation. Monocytes enter tissues and body fluids in response to conditions such as infection or inflammation. In body fluids, monocytes can be present, but can also differentiate into macrophages, as depicted with the arrowed cell. Macrophages are typically larger than monocytes (15-80 μ m), with a round to oval nucleus, dense to coarsely clumped chromatin, occasionally with prominent nucleoli, irregular cytoplasmic contours and abundant pale blue cytoplasm. The cytoplasm can contain coarse azurophilic granules, vacuoles and phagocytized debris, as in the arrowed cell. Macrophages can also contain erythrocytes (especially after hemorrhage), neutrophils, platelets as well as bacteria, fungi or hemosiderin.

Body Fluid Photomicrographs/Photographs

Case History CMP-11

The patient is a 58-year-old male who presents with cough for the past 20 days and fevers. He was found to have a left pleural effusion. Laboratory data include: Nucleated cells = 15,700/ μ L; RBC = 40,000/ μ L.



Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Mesothelial cell	27	62.8	1576	49.9	Educational
Malignant cell	12	27.9	1040	32.9	Educational
Macrophage with small lipid vacuoles/droplets	2	4.7	226	7.2	Educational

CMP-11

The arrowed cells represent a cluster of non-hematopoietic malignant tumor cells. These tumor cells are large with abundant basophilic cytoplasm, vacuoles and large nuclei with nucleoli. Tumor cells can be found in serous body fluids from virtually any neoplasm, although very rarely in synovial fluid. Tumor cells in a body fluid can be numerous, occur singly or in tight clusters with nuclear molding. Identifying the origin of the tumor cells, such as from the lung or breast, cannot be made from the cytologic features alone, and requires additional studies, such as immunohistochemical or immunocytochemical stains, to confirm the non-hematopoietic nature of the cells. Differentiating benign cells, such as reactive mesothelial cells, from malignant cells in a body fluid can be challenging. Cytologic features of malignant cells on cytocentrifuge preparations can include: high nuclear-to-cytoplasmic ratio, increased cell and nuclear size, irregularly shaped nuclei, atypical nuclear chromatin patterns, large nucleoli, and a tendency to form large clusters, frequently with nuclear molding. Occasionally, a cell cluster may recapitulate an organoid structure, such as pseudo-gland formation with adenocarcinoma.

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Hematology and Clinical Microscopy Resource Committee

Body Fluid Photomicrographs/Photographs

Case History CMP-12

The patient is a 56-year-old HIV-positive man who presents with intermittent headache for two months, which has worsened in the last two weeks, and low grade fevers. His partner has also noticed recent personality changes. Lumbar puncture demonstrated an elevated opening pressure. Lab data include: CSF Cell count RBC = 8/ μ L; WBC = 40/ μ L; Lymphs = 75%; Polys = 25%; Glucose = 22mg/L (nl = 50-70); Protein = 90mg/L (nl = 12-60).



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CMP-12

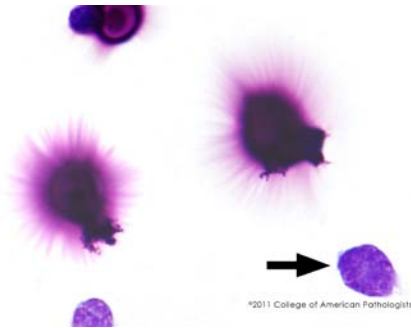
Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Yeast/Fungi, extracellular	43	100.0	3226	98.0	Good

The object identified by the arrow is a yeast/fungi, extracellular. Fungal organisms are usually basophilic on Wright-Giemsa stain and may occur as yeast or pseudohyphal forms. The organism identified in this image is a budding yeast form with narrow based budding.

Body Fluid Photomicrographs/Photographs

Case History CMP-13

The patient is a 56-year-old HIV-positive man who presents with intermittent headache for two months, which has worsened in the last two weeks, and low grade fevers. His partner has also noticed recent personality changes. Lumbar puncture demonstrated an elevated opening pressure. Lab data include: CSF Cell count RBC = 8/ μ L; WBC = 40/ μ L; Lymphs = 75%; Polys = 25%; Glucose = 22mg/L (nl = 50-70); Protein = 90mg/L (nl = 12-60).



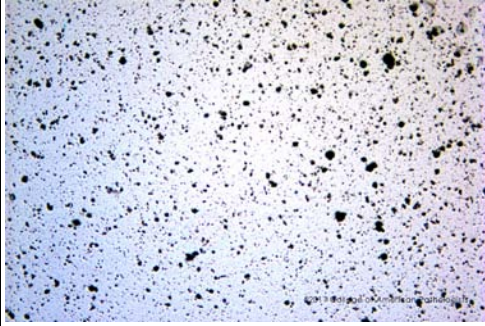
Identification	Referees		CMP Participants		Performance Evaluation
	No.	%	No.	%	
Lymphocyte	25	58.1	1916	58.4	Non-consensus
Lymphocyte, reactive	4	9.3	246	7.5	Non-consensus
Neutrophil/macrophage w/phagocytized fungi	2	4.6	214	6.5	Non-consensus
Yeast/Fungi, extracellular	2	4.6	164	5.0	Non-consensus

The cell identified by the arrow is a lymphocyte, as correctly identified by 58.1% of the referees and 58.4% of the participants. The lymphocyte has an oval nucleus, dense and clumped nuclear chromatin and scant cytoplasm. In cytocentrifuged body fluid specimens lymphocytes may appear larger than lymphocytes in the peripheral blood and may appear to have more cytoplasm as well. Lymphocytes in body fluids may also have small nucleoli. These changes should not be interpreted as lymphoma.

Joel F. Gradowski, MD
Hematology and Clinical Microscopy Resource Committee

Clinical Microscopy Miscellaneous Photomicrographs/Photographs

CMMP-30



Identification	Referees		CMMP Participants		Performance Evaluation
	No.	%	No.	%	
Ferning absent	28	96.5	1919	99.6	Good

A vaginal sample collected to evaluate for the presence or absence of ferning is negative for ferning in this specimen. Fern test is used to detect ruptured amniotic membranes and early onset of labor. A vaginal pool sample is collected and the fluid is allowed to air dry on a glass slide. Ferning, in conjunction with the Nitrazine test and the medical history, is highly sensitive for the detection of ruptured membranes.

Clinical Microscopy Miscellaneous Photomicrographs/Photographs

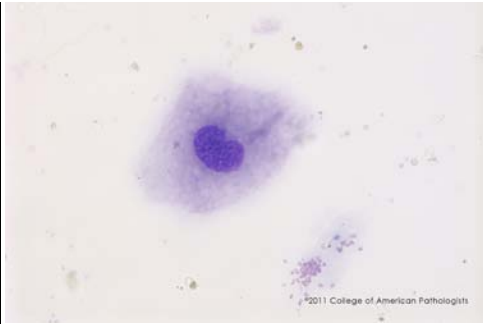


CMMP-31

Identification	Referees		CMMP Participants		Performance Evaluation
	No.	%	No.	%	
Yeast/Fungi present	40	97.6	2880	97.9	Good

This photograph shows an unstained smear containing pseudohyphae with branching and is consistent with Candida infection. A 10% KOH (potassium hydroxide) preparation is performed by collecting the sample using the edge of a glass slide or a scalpel on skin which appears to be infected. If a characteristic “ring” is present on the skin, the sample should be collected from the outer margin of the lesion. Otherwise, collect sample from where the skin appears to be scaling. Mix the specimen with 10% KOH and apply a coverslip. Allow KOH to dissolve the background proteinaceous material and examine under the microscope for the presence of yeast, hyphae, conidia, etc.

Clinical Microscopy Miscellaneous Photomicrographs/Photographs



CMMP-32

Identification	Referees		CMMP Participants		Performance Evaluation
	No.	%	No.	%	
Eosinophils absent	31	100.0	2402	99.5	Good

This nasal smear is negative for eosinophils. Nasal eosinophils are seen in patients with clinical allergic rhinitis. In non-allergic causes of nasal discharge, either acellular mucus or neutrophils will be present on the nasal smear. Nasal smears for eosinophils are prepared by having the patient blow his/her nose in a non-absorbent material (wax paper, plastic wrap). The swab is then used to transfer mucus to a slide. A thin smear is prepared and let air dry. Staining may be performed using a Wright-Giemsa stain or a Hansel stain. The advantage to the Hansel stain is of the eosinophils being bright red, whereas with a Wright-Giemsa stain the eosinophil granules may take on a more bluish appearance. However, the eosinophilic granules are generally larger and more eosinophilic than neutrophilic granules.

Clinical Microscopy Miscellaneous Photomicrographs/Photographs



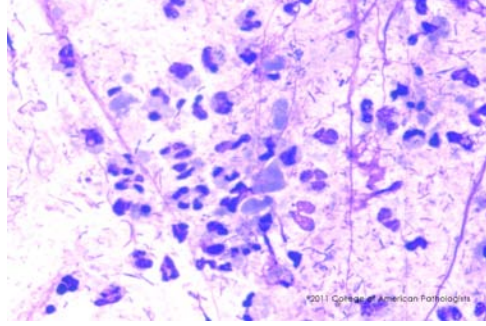
CMMP-33

Identification	Referees		CMMP Participants		Performance Evaluation
	No.	%	No.	%	
Pinworms present	36	100.0	2425	99.9	Good

This stool specimen has enterobius vermicularis (pinworm) present. Pinworm is the most common worm infection in the United States. School-age children, followed by preschoolers, have the highest rates of infection. In some groups nearly 50% of children are infected. Infection often occurs in more than one family member. Childcare centers and other institutional settings often have cases of pinworm infection.

The most typical symptom is perianal pruritis, especially at night, which may lead to excoriations and bacterial superinfection. Occasionally invasion of the female genital tract with vulvovaginitis can occur. Measures to prevent reinfection such as personal hygiene and laundering of bedding should be discussed.

Clinical Microscopy Miscellaneous Photomicrographs/Photographs



CMMP-34

Identification	Referees		CMMP Participants		Performance Evaluation
	No.	%	No.	%	
Neutrophil present	34	100.0	2776	99.8	Good

This stool specimen demonstrates many neutrophils. Assessment of stool specimens for neutrophils is a test that is sometimes used in conjunction with a bacterial culture in the evaluation of enterocolitis. While the presence of neutrophils is consistent with bacterial infection, the findings are not specific. A stool culture is necessary for the complete evaluation of enteric pathogens. Stool specimens for neutrophils may be collected for the evaluation of diarrhea. Neutrophils have a segmented or lobated (2 to 5 lobes) nucleus and pale or colorless cytoplasm. Cytoplasmic granules are difficult to see in this preparation.

Clinical Microscopy Miscellaneous Photomicrographs/Photographs



CMMP-35

Identification	Referees		CMMP Participants		Performance Evaluation
	No.	%	No.	%	
Trichomonas present	42	100.0	3246	99.1	Good
Sperm absent	33	100.0	2383	99.7	Good
Clue cells absent	37	100.0	2846	98.9	Good
Epithel cells absent	35	100.0	2535	98.6	Good

Sperm, clue cells, and epithelial cells are absent in this specimen. *Trichomonas vaginalis* is present in this vaginal prep as a trophozoite up to 23 microns in length with an undulating membrane that extends only half the length of the body. *Trichomonas vaginalis* is a flagellate that is spread by sexual intercourse, often by males who have an asymptomatic infection. Occasionally, males have symptomatic prostatitis or urethritis. *Trichomonas vaginalis* infections are usually diagnosed in a physician's office by direct examination of vaginal fluid, prostatic fluid or sediments of freshly passed urine.

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Hematology and Clinical Microscopy Resource Committee