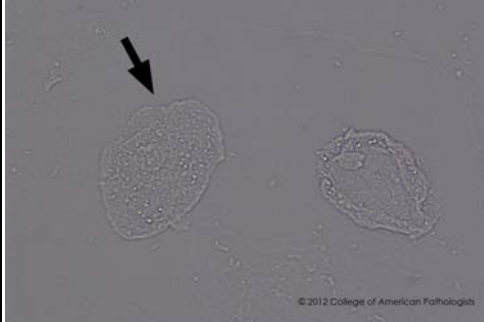


## Urine Sediment Photographs

### Case History CMP-04

This urine sample is from a 35-year-old female as part of a routine exam. Laboratory data include: Specific Gravity = 1.015; pH = 7.0; ketones, glucose, protein, blood, nitrite, leukocyte esterase = negative. Identify the arrowed object(s) on each image.



Identification	CMP Participants		Performance Evaluation
	No.	%	
Squamous Cells	4439	89.1	Good

CMP-04

The arrowed object was correctly identified as a squamous cell by 89.1% of participants. Squamous cells are large, flat, thin cells averaging 30-50 microns in diameter. They may be round, polygonal, rectangular or rolled into a tube. The nucleus is about the size of a red blood cell and centrally located. There may be a few keratohyaline granules in the cytoplasm.

Squamous cells line the female urethra, bladder trigone, distal male urethra and vagina. They form a protective barrier, and are a normal finding. If there are a large number present, it may indicate that the specimen is not a clean voided midstream specimen.

Other cells somewhat resembling squamous cells include transitional cells, cervical parabasal cells and renal tubular epithelial cells. All of these other types of epithelial cells are smaller, are not flat and thin, and have a larger nucleus.

## Urine Sediment Photographs

### Case History CMP-05

This urine sample is from a 35-year-old female as part of a routine exam. Laboratory data include: Specific Gravity = 1.015; pH = 7.0; ketones, glucose, protein, blood, nitrite, leukocyte esterase = negative. Identify the arrowed object(s) on each image.



CMP-05

Identification	CMP Participants		Performance Evaluation
	No.	%	

Fiber	4944	99.2	Good
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The arrowed object was correctly identified as fiber by 99.2% of participants. Fibers may be muscle fibers, plant material, or wood/paper fibers. Fecal contamination is a frequent source. They contaminate the specimen during collection or processing.

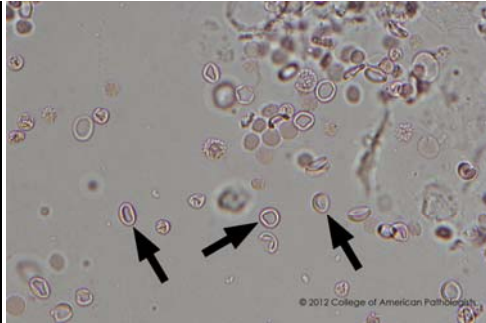
Size varies, with most being elongated with twisted, non-parallel sides and frayed ends. Polarized light exam usually shows birefringence. Fibers have no clinical significance.

Fibers may be confused with casts, mucus threads, fungi or parasites. Important differentiating features of fibers include their variability, non-parallel sides, frayed ends, non-cylindrical shapes and birefringence on polarized light exam.

## Urine Sediment Photographs

### Case History CMP-06

This urine sample is from a 60-year-old male with a history of kidney stones. Laboratory data include: Specific Gravity = 1.020; pH = 5.5; urine is yellow and cloudy; protein, leukocyte esterase, blood, bacteria = positive; glucose, ketones, nitrite = negative. Birefringence was absent on a polarized light exam. Identify the arrowed object(s) on each image.



Identification	CMP Participants		Performance Evaluation
	No.	%	
Erythrocytes	4680	94.0	Good

CMP-06

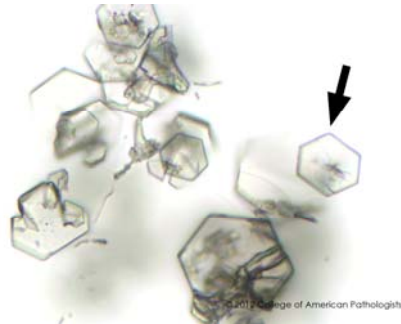
The arrowed objects were correctly identified as erythrocytes (red blood cells) by 94.0% of participants. Red blood cells in urine are round or oval biconcave discs measuring 7-8 microns in diameter. They lack nuclei and may have a faint yellow-orange or red color. They may become crenated in hypertonic urine and swell to “ghost” forms in hypotonic urine. Small numbers (< 5 per hpf) are normal, with larger numbers seen in glomerular disease, trauma, infection, tumor, and with urinary tract stones.

Other structures in urine resembling red blood cells include yeast, pollen, starch, sperm heads, air bubbles, fat droplets, small white blood cells and monohydrate forms of calcium oxalate. Characteristics of red blood cells that help separate them from these mimics include uniformity of size and shape, lack of nuclei or other internal structures, presence of hemoglobin pigment, absence of budding and no darkly refractile periphery. The latter is typical of air bubbles. In the case of monohydrate calcium oxalate crystals, careful examination generally reveals more typical calcium oxalate crystals elsewhere in the sample.

## Urine Sediment Photographs

### Case History CMP-07

This urine sample is from a 60-year-old male with a history of kidney stones. Laboratory data include: Specific Gravity = 1.020; pH = 5.5; urine is yellow and cloudy; protein, leukocyte esterase, blood, bacteria = positive; glucose, ketones, nitrite = negative. Birefringence was absent on a polarized light exam. Identify the arrowed object(s) on each image.



Identification	CMP Participants		Performance Evaluation
	No.	%	

Cystine crystal	4831	97.0	Good
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The arrowed object was correctly identified as a cystine crystal by 97.0% of participants. Cystine crystals are clear, colorless hexagonal plates resembling “stop signs” that vary in size. They may be partially laminated and occur in acid urine with a pH of  $\leq 5.5$ . Birefringence is absent with polarized light, unless they are stacked.

Cystine crystals in urine (cystinuria) are significant. Cystine constitutes 1-2% of all urinary tract stones and 6-8% of those in children. Cystinuria is an autosomal recessive genetic disorder, occurring in 1 in 7000 people. Cystine is not reabsorbed by the kidneys, resulting in high levels in the urine and subsequent stone formation.

Cystine crystals may be mistaken for uric acid, hippuric acid and cholesterol crystals. Uric acid crystals show polychromatic birefringence. Hippuric acid crystals are elongated, and not equilateral. Cholesterol crystals typically have notched or broken corners. The confirmatory test for cystine is the cyanide nitroprusside test.

CMP-07

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

## Body Fluid Photographs

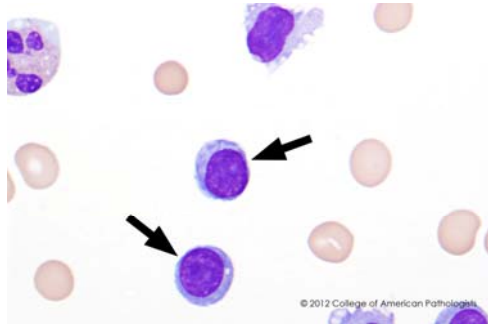
### Case History CMP-08

The patient is a 68-year-old male with pancreatitis and shortness of breath.

Pleural fluid sample laboratory findings include: Nucleated Cells = 165/ $\mu\text{L}$  ( $0.165 \times 10^3/\mu\text{L}$ );

RBC = 2185/ $\mu\text{L}$  ( $2.185 \times 10^3/\mu\text{L}$ ).

Identify the arrowed object(s) on each image.



CMP-08

Identification	CMP Participants		Performance Evaluation
	No.	%	

Lymphocyte

3314

97.8

Good

The arrowed cells are lymphocytes, as correctly identified by 97.8% of participants. The nuclei of these small lymphocytes are round to oval and contain clumped nuclear chromatin. The cytoplasm is light blue and somewhat clear with no granules, although a few cytoplasmic granules may be present. These cells do not show features of reactive lymphocytes, which would exhibit more abundant basophilic cytoplasm and larger size. The majority of small lymphocytes in body fluids are mature B and T cells. A neutrophil and a degenerating cell are also present in this field.

## Body Fluid Photographs

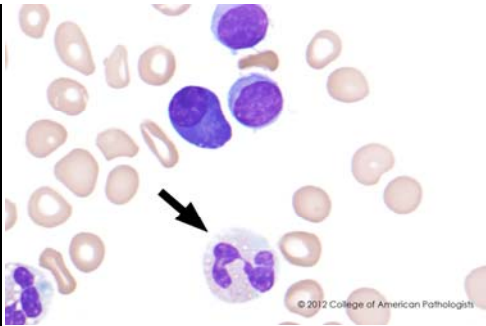
### Case History CMP-09

The patient is a 68-year-old male with pancreatitis and shortness of breath.

Pleural fluid sample laboratory findings include: Nucleated Cells = 165/ $\mu\text{L}$  ( $0.165 \times 10^3/\mu\text{L}$ );

RBC = 2185/ $\mu\text{L}$  ( $2.185 \times 10^3/\mu\text{L}$ ).

Identify the arrowed object(s) on each image.



CMP-09

Identification	CMP Participants		Performance Evaluation
	No.	%	

Neutrophil, segmented or band	3371	99.4	Good
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The arrowed cell is a neutrophil, as identified by 99.4% of participants. This mature neutrophil shows the characteristic nuclear segmentation with thin condensed chromatin filaments connecting the lobes. The cytoplasm contains fine pale pink granules filling most of the cytoplasm, which is otherwise pale blue. Neutrophils are commonly identified in fluids from patients with infections and inflammatory conditions. It is not necessary to differentiate between band and segmented forms. Also present in this field are two small mature lymphocytes and a plasma cell.

## Body Fluid Photographs

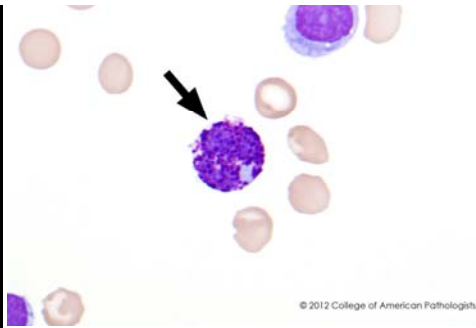
### Case History CMP-10

The patient is a 68-year-old male with pancreatitis and shortness of breath.

Pleural fluid sample laboratory findings include: Nucleated Cells = 165/ $\mu\text{L}$  ( $0.165 \times 10^3/\mu\text{L}$ );

RBC = 2185/ $\mu\text{L}$  ( $2.185 \times 10^3/\mu\text{L}$ ).

Identify the arrowed object(s) on each image.



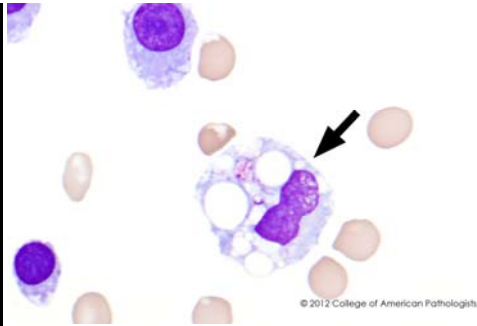
CMP-10	Identification	CMP Participants		Performance Evaluation
		No.	%	
	Basophil, mast cell	3373	99.5	Good

The arrowed cell is a basophil, as correctly identified by 99.5% of participants. The cytoplasm contains somewhat unevenly distributed coarse dark red-purple staining granules that obscure the nucleus. Intervening pale blue cytoplasm is seen. Barely perceptible segmentation of the underlying nuclear can be appreciated. Basophils are not normally identified in body fluids, but may occur in small numbers in inflammatory conditions. The basophil granules contain mediators of immediate hypersensitivity reactions including histamine, heparin, and slow-reacting substance of anaphylaxis. The cell in the upper part of the field is a mesothelial cell showing vacuolated cytoplasm.

## Body Fluid Photographs

### Case History CMP-11

The patient is a 68-year-old male with pancreatitis and shortness of breath. Pleural fluid sample laboratory findings include: Nucleated Cells = 165/ $\mu\text{L}$  ( $0.165 \times 10^3/\mu\text{L}$ ); RBC = 2185/ $\mu\text{L}$  ( $2.185 \times 10^3/\mu\text{L}$ ). Identify the arrowed object(s) on each image.



Identification	CMP Participants		Performance Evaluation
	No.	%	
Monocyte/macrophage	1951	57.6	Educational
Macrophage containing abundant small lipid vacuoles/droplets (Lipophage)	1212	35.8	Educational

The arrowed cell is a monocyte or macrophage, as correctly identified by 57.6% of participants. Monocytes and macrophages are part of the reticuloendothelial system and show overlapping morphologic features. The monocyte is derived from the bone marrow and circulates in the peripheral blood. Macrophages are derived from monocytes that have migrated into tissues and body fluids, where they undergo differentiation into phagocytic histiocytes, or macrophages. Macrophages are larger than monocytes and have more abundant clear cytoplasm containing azurophilic granules, vacuoles and phagocytized material, as seen in this cell. Note the typical shaggy margin to the cytoplasm and the indented nucleus, which is often present. A mesothelial cell with vacuolated cytoplasm is seen in the upper part of the field and a small mature lymphocyte is seen in the lower left.

Martha R. Clarke, MD  
Hematology and Clinical Microscopy Resource Committee



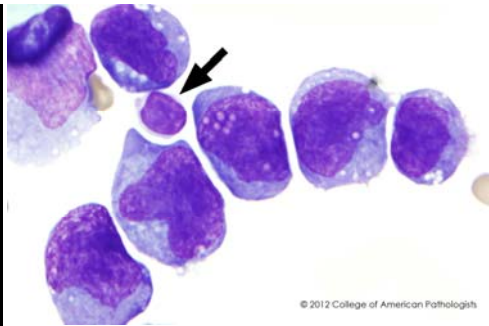
## Body Fluid Photographs

### Case History CMP-12

The patient is a 61-year-old female with a history of severe idiopathic pulmonary hypertension. She presents with rapidly progressive shortness of breath and decreasing oxygen saturations. Now displays a new large left pleural effusion causing compressive atelectasis.

Lab data shows: Nucleated cells = 7800/ $\mu$ L; RBCs = 3365/ $\mu$ L.

Identify the arrowed object(s) on each image.



CMP-12

Identification	CMP Participants		Performance Evaluation
	No.	%	

Lymphocyte

3284

96.9

Educational

This cell represents a lymphocyte, as correctly identified by 96.9% of participants. Lymphocytes are small, round to ovoid cells ranging from 7 to 15  $\mu$ m. Their N:C ratio ranges from 5:1 to 2:1. Some normal lymphocytes are medium sized due to increased amounts of cytoplasm. The chromatin is diffusely dense or coarse and clumped. Note the much larger, ovoid cells with irregular nuclear contours and vacuoles representing malignant cells. The lack of cohesiveness suggests that these are of hematopoietic origin. These large atypical lymphoid cells represent large cell lymphoma.

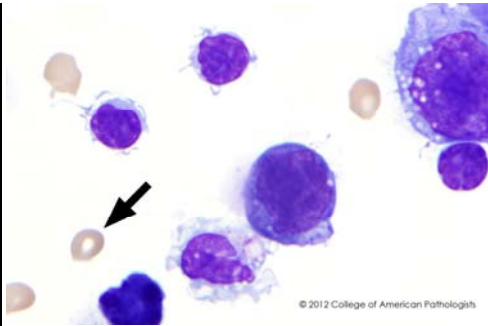
## Body Fluid Photographs

### Case History CMP-13

The patient is a 61-year-old female with a history of severe idiopathic pulmonary hypertension. She presents with rapidly progressive shortness of breath and decreasing oxygen saturations. Now displays a new large left pleural effusion causing compressive atelectasis.

Lab data shows: Nucleated cells = 7800/ $\mu$ L; RBCs = 3365/ $\mu$ L.

Identify the arrowed object(s) on each image.



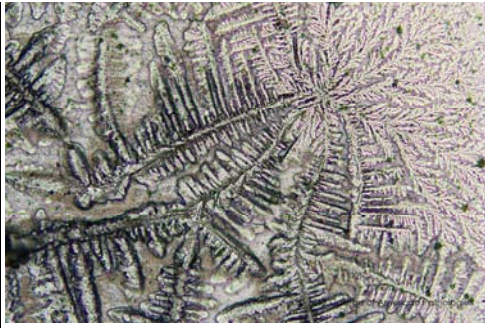
CMP-13

Identification	CMP Participants		Performance Evaluation
	No.	%	
Erythrocyte, mature	3381	99.7	Good

The arrowed cell is a normal erythrocyte as correctly identified by 99.7% of participants. This is a mature, non-nucleated cell of fairly uniform size (6.7 to 7.8  $\mu$ m in diameter) and shape (biconcave disc, appearing as round to slightly ovoid on smear). It contains hemoglobin and stains pink red. A zone of central pallor due to the biconcavity of the cell occupies approximately one third (2 to 3  $\mu$ m) of the cell diameter. Note a macrophage, lymphocytes, and malignant cells on the slide. The malignant cells are large cell lymphoma.

Alice L. Werner, MD  
Hematology and Clinical Microscopy Resource Committee

## Clinical Microscopy Miscellaneous Photographs



CMMP-30

Identification	CMMP Participants		Performance Evaluation
	No.	%	

Ferning present

1925

99.9

Good

This vaginal wet preparation exhibits ferning. The fern test is used to detect ruptured amniotic membranes in early onset of labor. A vaginal pool sample is collected and the fluid is allowed to air dry on a glass slide. The slide is examined and the microscope used to detect ferning and elaborate arborized crystallization pattern. Ferning, in conjunction with Nitrazine test and the medical history, is highly sensitive for the detection of ruptured membranes. The "fern test" was initially described in 1955 and its ease of use and clinical utility has been confirmed by multiple published studies.

## Clinical Microscopy Miscellaneous Photographs

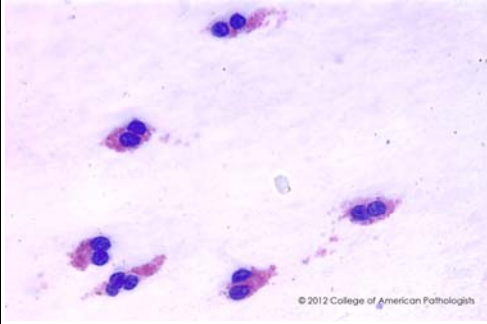


CMMP-31

Identification	CMMP Participants		Performance Evaluation
	No.	%	
Yeast/Fungi present	2974	98.3	Good

This KOH wet preparation demonstrates pseudohyphae which exhibit branching and are consistent with Candida species. A vaginal wet prep is often collected in the evaluation of vaginitis. The three most common types of acute vaginitis are bacterial vaginosis, vulvovaginal candidiasis, and trichomoniasis. Most cases of Candida infection are caused by the person's own Candida organisms. Candida yeast usually lives in the mouth, gastrointestinal tract and vagina without causing symptoms. Symptoms develop only when Candida becomes overgrown in these sites. Nearly 75% of all adult women have had at least one genital "yeast infection" in their lifetime. On rare occasions men may also experience genital candidiasis. There are many approved topical antifungal treatments and one oral agent, Fluconazole (150 mg) in a single dose. 80-90% of women will have relief with either the topical or oral therapy.

## Clinical Microscopy Miscellaneous Photographs



CMMP-32

Identification	CMMP Participants		Performance Evaluation
	No.	%	
Eosinophils present	2429	99.4	Good

This nasal smear has eosinophils present, which exhibit the typical bi-lobed nucleus and numerous large cytoplasmic eosinophilic granules. Nasal smears for eosinophils are an aid to distinguishing allergic rhinitis, where eosinophils are present, from non-allergic rhinitis. The clinical differential diagnosis of non-allergic rhinitis and allergic rhinitis is difficult due to the significant overlap of clinical symptomatology. In addition to the nasal smear, skin prick test, serum IgE levels and other serum tests for specific allergens may be used in conjunction with the clinical presentation to differentiate these two forms of rhinitis.

## Clinical Microscopy Miscellaneous Photographs



CMMP-33

Identification	CMMP Participants		Performance Evaluation
	No.	%	

Pinworm absent

2058

86.0

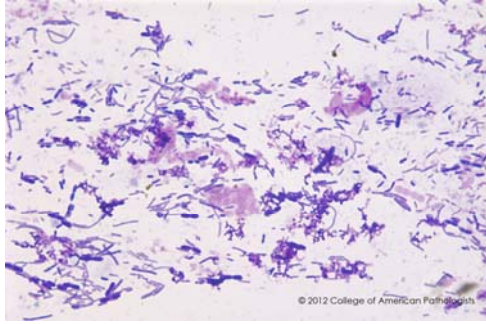
Good

This stool smear demonstrates debris and is negative for pinworm (*Enterobius vermicularis*).

Though the structure shown is somewhat similar to pinworm there is no thin smooth refractile shell along one side to encase the larvae. In addition, the object is much larger than a pinworm, which measures 50-60 μm x 20-30 μm and lacks internal structure. Pinworm infection is seen in children 5 to 14 years of age who present with anal pruritis. To exclude pinworm infection, either cellophane tape collection or an anal swab collection onto a glass slide is acceptable for microscopic examination.

## Clinical Microscopy Miscellaneous Photographs

CMMP-34



Identification	CMMP Participants		Performance Evaluation
	No.	%	

Neutrophils absent

2765

99.3

Good

This stool specimen does not contain neutrophils. The presence of neutrophils is consistent with, but not diagnostic of, a bacterial infection. Stool cultures are much more sensitive and specific for the evaluation of enteric pathogens. This smear contains numerous bacteria and amorphous debris.

## Clinical Microscopy Miscellaneous Photographs



CMMP-35

Identification	CMMP Participants		Performance Evaluation
	No.	%	
Trichomonas absent	3409	99.4	Good
Sperm present	2698	99.9	Good
Clue cells absent	3136	99.7	Good
Epithelial cells absent	2821	98.7	Good

This photomicrograph demonstrates an unstained vaginal wet preparation. The wet preparation is often examined to diagnose causes of vaginal discharge or a postcoital wet preparation can be used to assess for sperm and the interaction between sperm and cervical mucus. A sample of vaginal secretions is taken from the posterior vaginal pool using a cotton or Dacron tipped swab. It is mixed with non-bacteriostatic saline on a slide. A spermatozoa is identified in this photo. The sperm head is 4-6  $\mu\text{m}$  long, while the slender tail is approximately 40-60  $\mu\text{m}$  long.

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Hematology and Clinical Microscopy Resource Committee