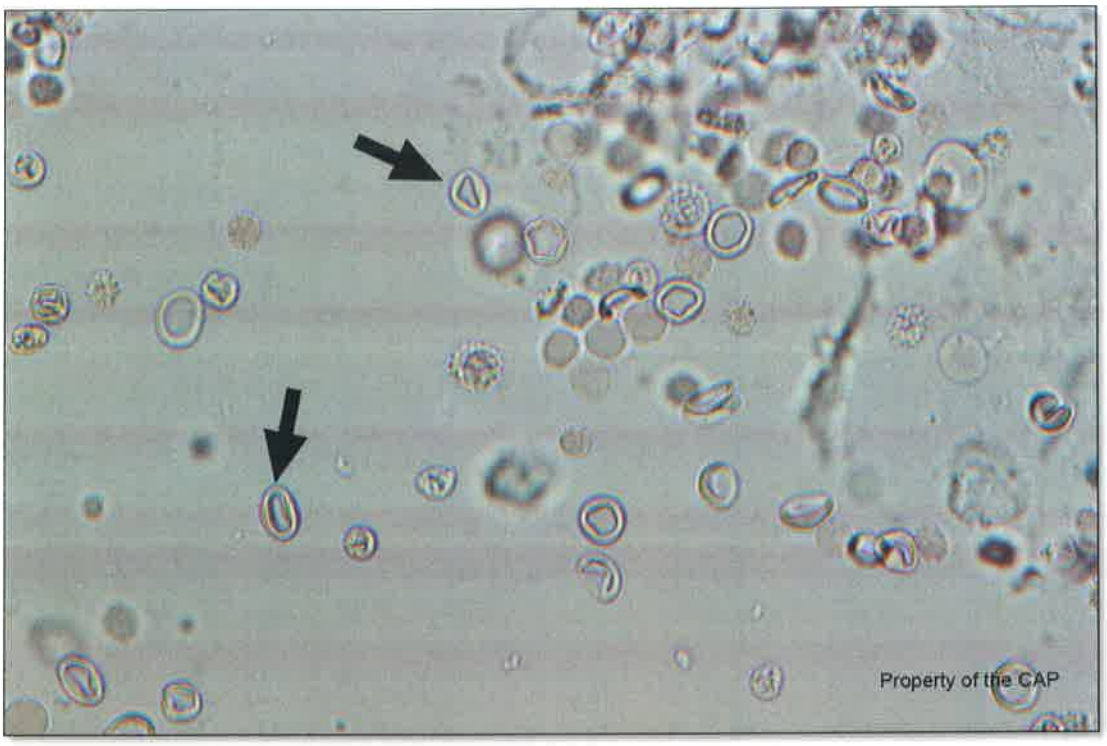
Urine Sediment Photographs

Case History CMP-04 through CMP-06

This urine sample is obtained from a 13-year-old girl experiencing painful urination. Laboratory data include: specific gravity = 1.012; pH = 5.0; blood, protein, nitrite, and leukocyte esterase = positive; glucose, ketones, bilirubin, and urobilinogen = negative. Identify the arrowed object(s) on each image.

(URINE, UNSTAINED, 40X OR HIGHER POWER)

CMP-04

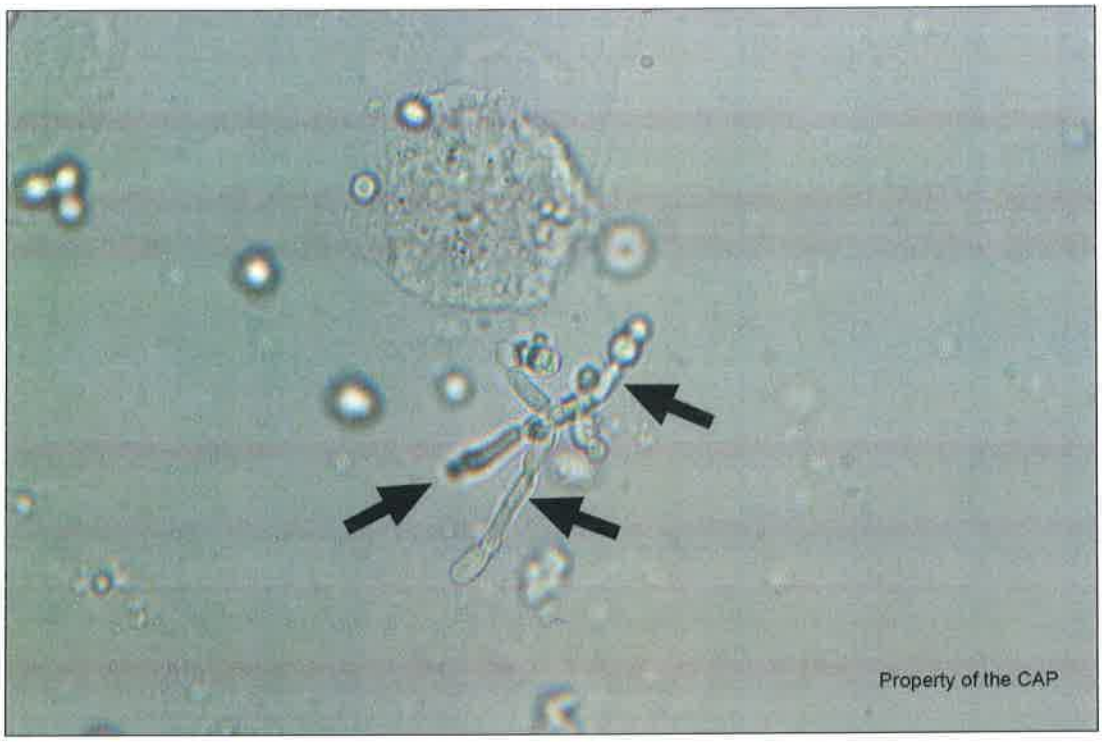


Identification	Participants		Evaluation
	No.	%	
Erythrocyte	5585	90.5	Good

The arrowed cells are erythrocytes, also known as red blood cells (RBCs), as correctly identified by 90.5% of participants. The red blood cells in this unstained wet preparation are identified by their size, biconcave disc-shape, and absence of a nucleus. These erythrocytes display the distinctive area of central pallor that results from its biconcave shape. The red cells appear to be normally hydrated consistent with the normal specific gravity of 1.012. Absent is the swelling or dehydration that results from hypotonic and hypertonic urine, respectively. Red blood cells are often seen in patients with a urinary tract infection (UTI).

Urine Sediment Photographs

CMP-05

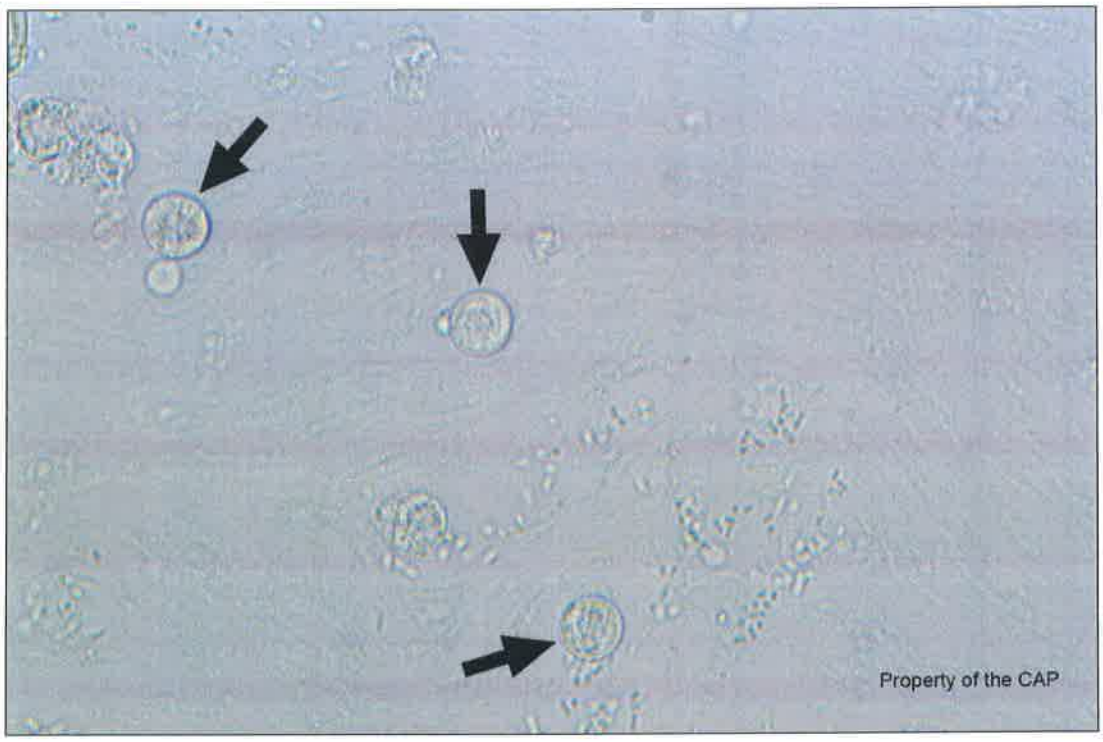


Identification	Participants		Evaluation
	No.	%	
Yeast/fungi	6102	98.9	Good

The arrowed elements are yeast/fungi, as correctly identified by 98.9% of participants. The yeast in this unstained wet preparation are identified by their refractile cell walls, size and shape variation, and branches and terminal buds. The elongated forms are pseudohyphae. The finding of yeast may be due to vaginal contamination or may be a clinically significant cause for this patient's UTI symptoms. Therefore, urine culture should be performed with speciation of yeast isolates when pure or the predominant organism. Mixed flora on urine culture indicates contamination. Concomitant squamous epithelial cells and absence of leukocytes also favors contamination. Many laboratories reflex a urine culture when yeast is identified in the urinalysis.

Urine Sediment Photographs

CMP-06



Identification	Participants		Evaluation
	No.	%	
Leukocyte (neutrophil, eosinophil, lymphocyte)	6029	97.7	Good

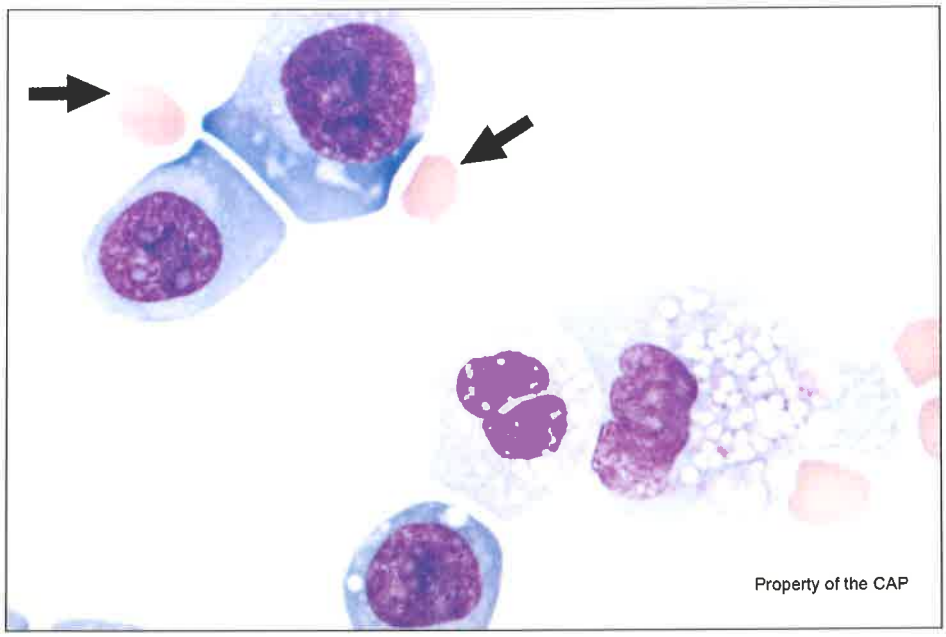
The arrowed cells are leukocytes, as correctly identified by 97.7% of participants. The white blood cells in this unstained wet preparation are identified as nucleated round cells approximately 10 to 12 µm, or nearly twice the size of a red cell. In this image, nuclear detail is preserved suggesting freshly voided urine. Increased numbers of leukocytes in the urine, principally neutrophils, are seen in most urinary tract disorders, particularly acute infections. Small numbers of neutrophils, usually less than five per high power field (hpf), may be found in the urine of normal patients. Many laboratories reflex a urine culture for moderate to many leukocytes, such as more than ten per high power field (hpf).

Body Fluid Photographs

Case History CMP-07 through CMP-09
This patient is a 28-year-old woman with a ruptured ectopic pregnancy. Peritoneal fluid sample laboratory findings include: WBC = 562/µL (0.562 x 10E3/µL); RBC = 111,300/µL (111.3 x 10E3/µL). Identify the arrowed object(s) on each image.

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

CMP-07

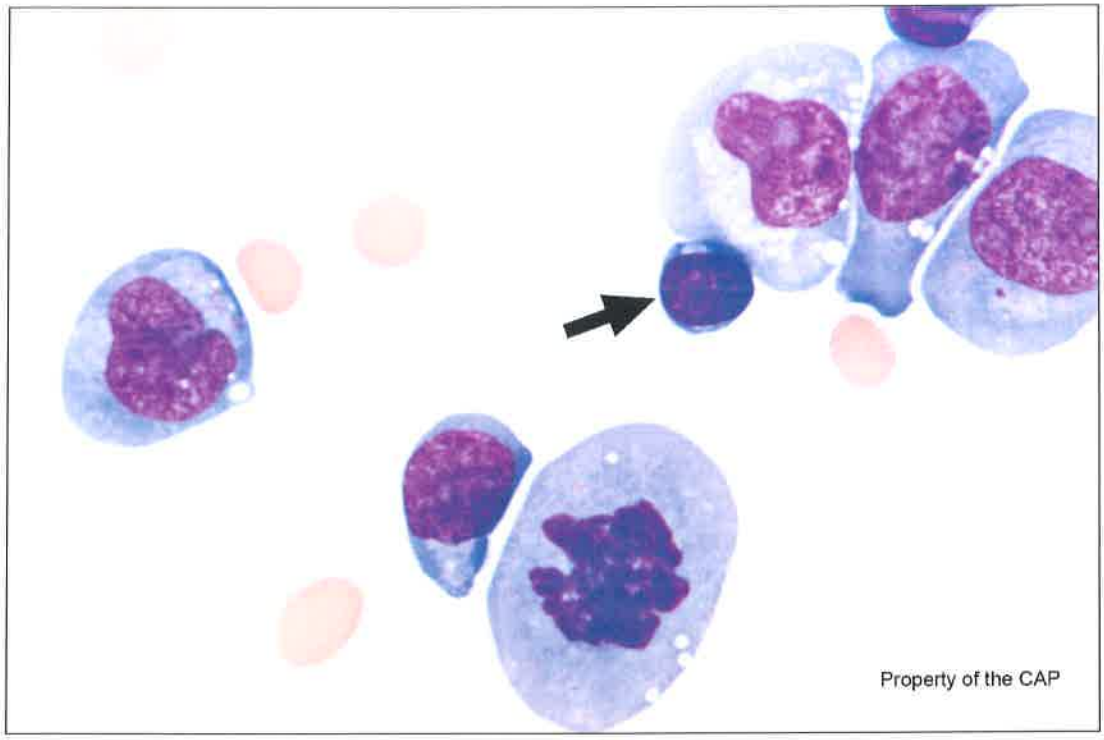


Identification	Participants		Evaluation
	No.	%	
Erythrocyte	3850	99.6	Good

The arrowed cells are erythrocytes, as correctly identified by 99.6% of participants. Erythrocytes identified in body fluids such as these are anucleate and similar to those present in the peripheral blood. Erythrocytes are not typically found in normal body fluid specimens and reflect hemorrhage or traumatic contamination.

Body Fluid Photographs

CMP-08

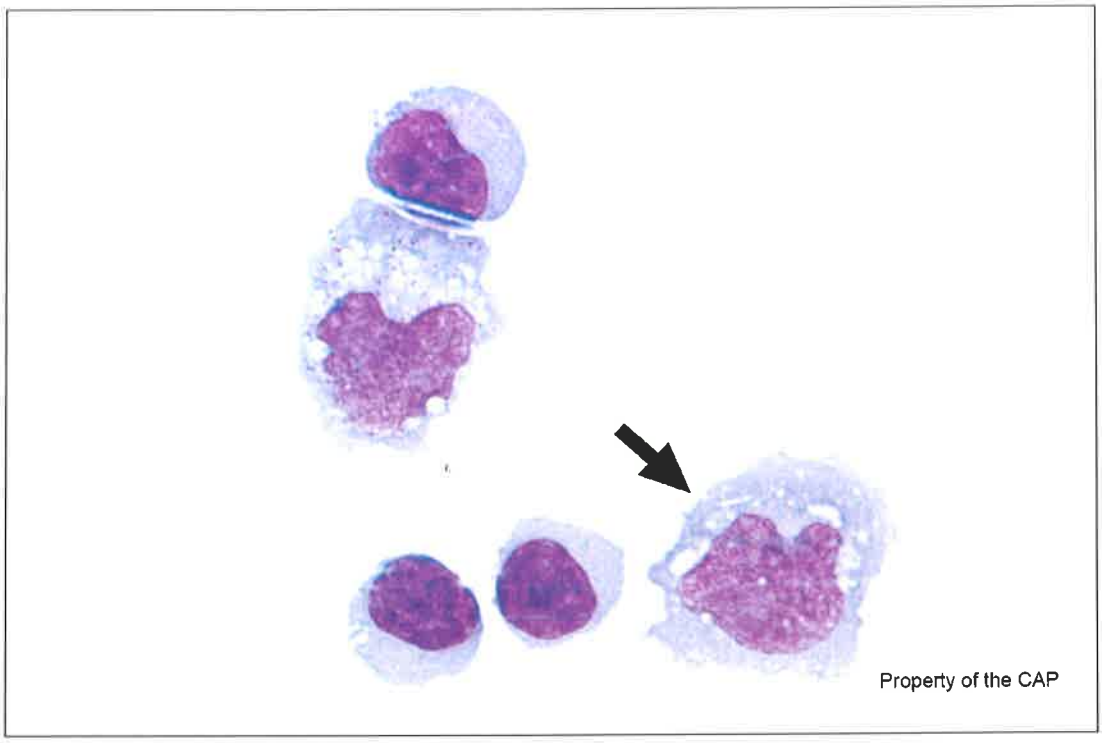


Identification	Participants		Evaluation
	No.	%	
Lymphocyte	3802	98.4	Good

The arrowed cell is a lymphocyte, as correctly identified by 98.4% of participants. Owing to the process of cytocentrifugation, mature/quiescent lymphocytes such as these seen in fluid preparations may appear slightly larger than their blood smear counterparts. In contrast to mature/quiescent lymphocytes, moreover, reactive lymphocytes tend to be larger, with even greater increases in nuclear and cytoplasmic volume.

Body Fluid Photographs

CMP-09



Identification	Participants		Evaluation
	No.	%	
Monocyte/macrophage	3696	95.7	Good

The arrowed cell is a monocyte/macrophage, as correctly identified by 95.7% of participants. Monocytes are bone marrow derived cells that circulate in the blood; in contrast, macrophages arise from bone marrow derived cells that migrate into tissues. Monocyte/macrophage morphology in fluids may be variable, ranging along a continuum from the typical blood monocyte of the peripheral blood to a vacuolated, activated stage with the morphology of a typical macrophage.

Clinical Presentation:
This patient is a 28-year-old woman with a ruptured ectopic pregnancy. Peritoneal fluid sample laboratory findings include: WBC = 562/µL (0.562 x 10E3/µL); RBC = 111,300/µL (111.3 x 10E3/µL).

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

CASE DISCUSSION: Ruptured Ectopic Pregnancy

Ectopic pregnancy refers to the pathologic occurrence of embryonic implantation outside of the uterine cavity. If an ectopic pregnancy proceeds to the point of physical disruption of surrounding tissues, with attendant risk of massive hemorrhage, this is referred to a ruptured ectopic pregnancy. Ectopic implantation most commonly occurs in the ampullary region of the fallopian tube, however ectopia at a myriad of abdominal sites has been reported, including such distant sites as the spleen and liver. The incidence of ectopic pregnancy is substantial, estimated at over 100,000 per annum in the U.S. While modern-day mortality associated with ectopic pregnancy has improved markedly relative to estimated historic numbers, some 6% of current maternal mortality relates to ectopic pregnancy. As such, ectopic pregnancy, especially one in which rupture is present or imminently suspected, is a surgical emergency.

Several epidemiologic risk factors for ectopic pregnancy have been proposed, including advanced age at time of pregnancy, smoking, previous ectopic pregnancy, previous abdominopelvic (especially fallopian tube) surgery, history of pelvic infection and medically-assisted reproduction. In most patients, however, an evident risk factor cannot be identified. Interestingly, while pregnancies in patients with intra-uterine devices (IUDs) in situ are frequently ectopic, the presence of an IUD does not itself seem to increase the risk of ectopia.

The diagnosis of an ectopic pregnancy typically requires the combination of an elevated beta-HCG level in combination with evidence of a gestational sac outside the uterine cavity. In patients with extreme pain or with evidence of hemodynamic compromise, rupture should be assumed and surgical intervention arranged emergently. In cases of ectopic pregnancy without evidence of rupture, medical intervention (such as with methotrexate treatment) may be sufficient, with careful surveillance of beta-HCG levels as an indication of resolution.

The procurement of peritoneal fluid for analysis is not generally required for the work-up of a known or potential ectopic pregnancy, whether ruptured or otherwise. Indeed, the cytological findings in peritoneal fluids in these contexts are non-specific and may include variable degrees of hemorrhage and inflammation. Surgical pathology specimens, by contrast, in which fetal materials are identified in extra-uterine specimens, are diagnostic of ectopic pregnancy.

Etienne Mahé, MD, MSc, FRCPC, FCAP
Hematology and Clinical Microscopy Committee

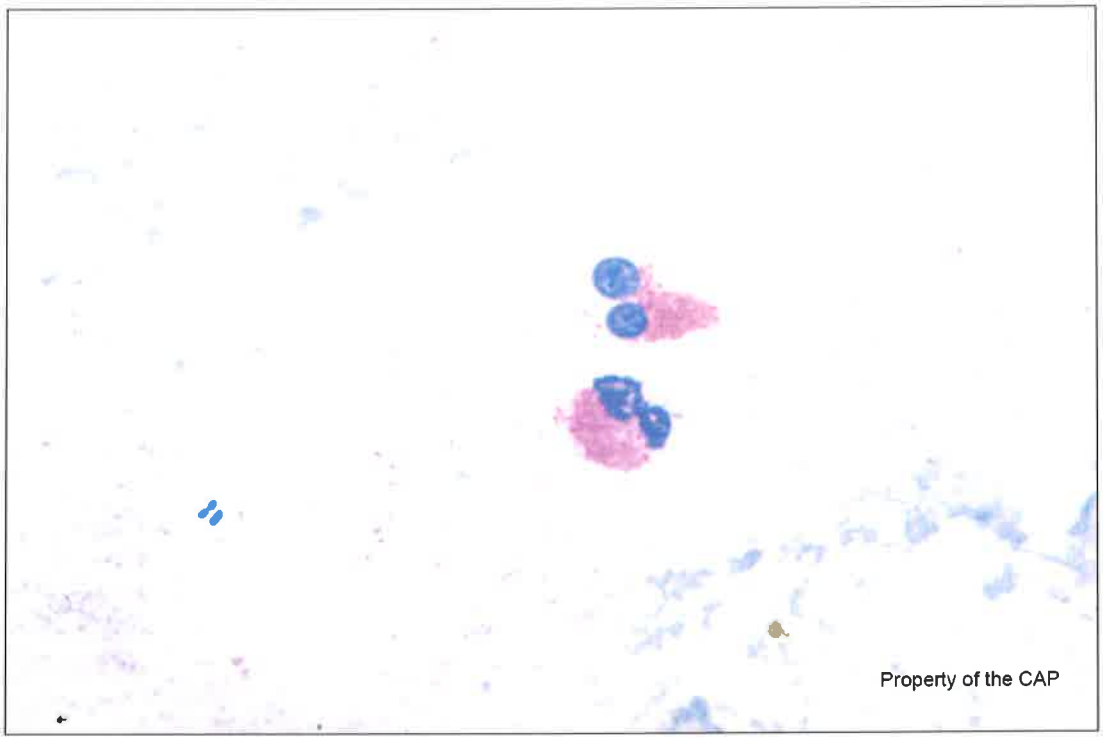
References:

1. The Practice Committee of the American Society for Reproductive Medicine. Medical treatment of ectopic pregnancy: a committee opinion. *Fertil Steril.* 2013;100(3): 638–644. doi.org/10.1016/j.fertnstert.2013.06.013
2. Panelli DM, Phillips CH, Brady PC. Incidence, diagnosis and management of tubal and nontubal ectopic pregnancies: a review. *Fertil Res Pract.* 2015;1:15. doi.org/10.1186/s40738-015-0008-z

CMMP – Clinical Microscopy Miscellaneous Photographs

(NASAL, WRIGHT-GIEMSA)

CMMP-22



Identification	Participants		Evaluation
	No.	%	
Eosinophils are present	1986	99.8	Good

This nasal smear has eosinophils present, which exhibit the typical bilobed nucleus and numerous 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 tests, serum IgE levels, and RAST tests may be used in conjunction with the clinical presentation to differentiate allergic and non-allergic rhinitis.

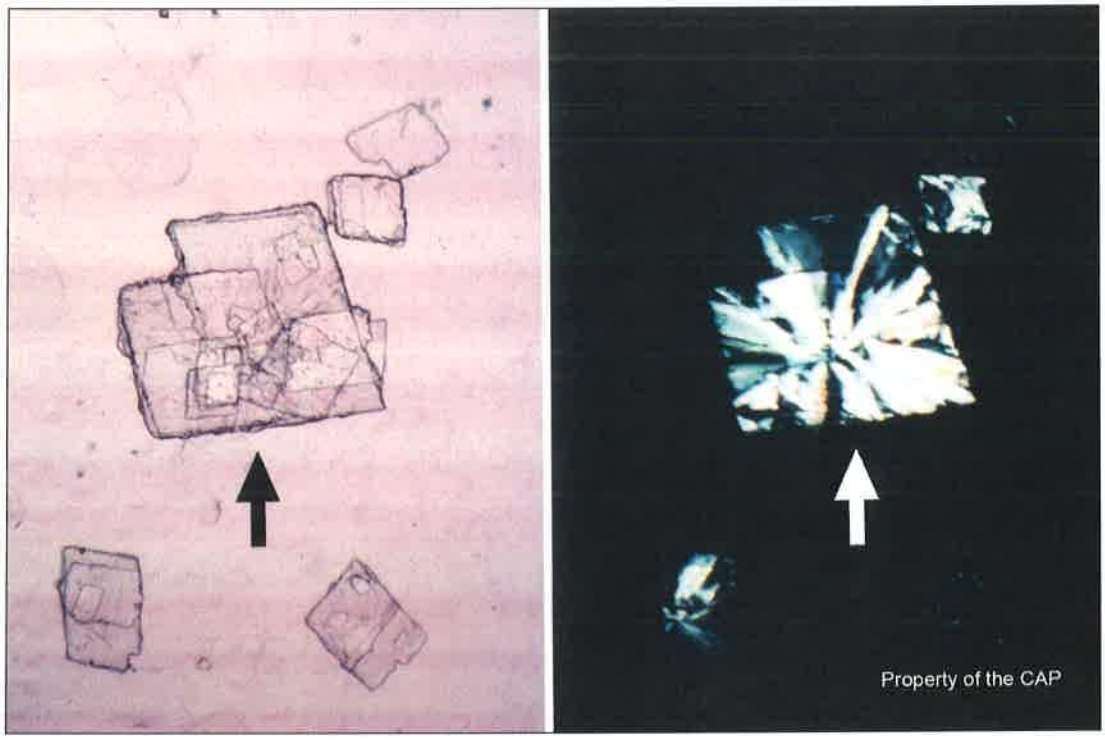
Urine Sediment Color Photographs

Case History USP-01 through USP-03

This urine sample is from a 64-year-old diabetic woman with glomerulosclerosis. Laboratory data include: specific gravity = 1.040; pH = 6.0; glucose and protein = positive; ketones, blood, nitrite, and leukocyte esterase = negative. Identify the arrowed image(s).

(URINE, UNSTAINED, 40X OR HIGHER POWER)

USP-01

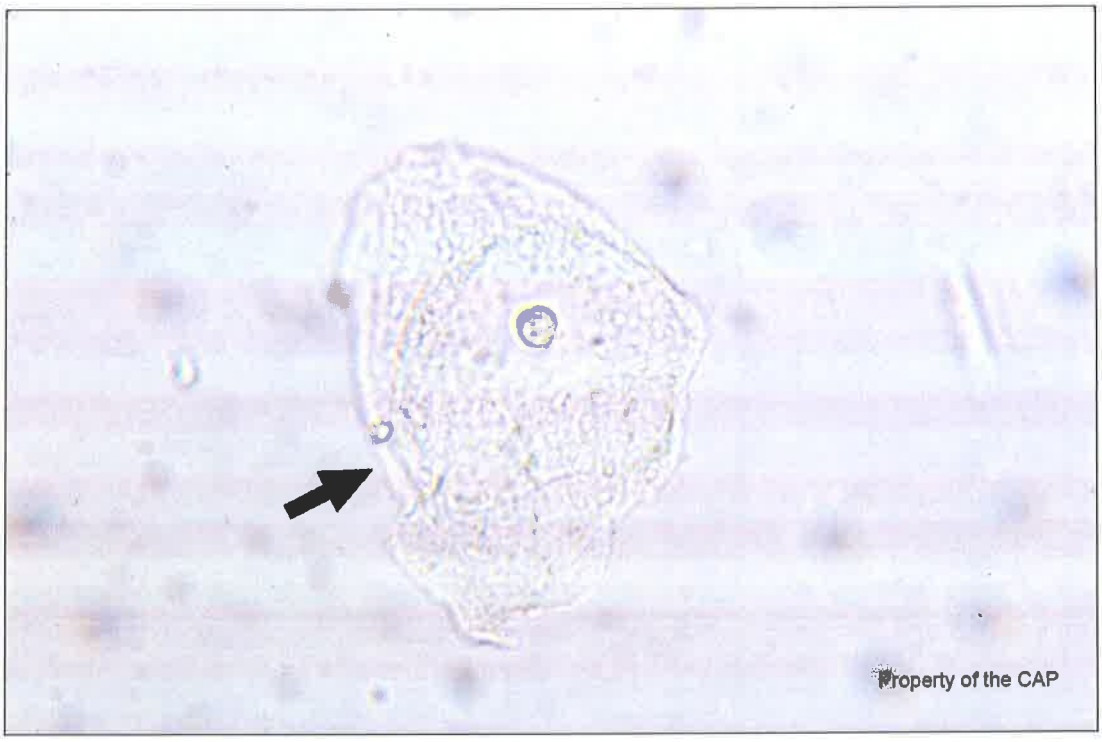


Identification	Participants		Evaluation
	No.	%	
Cholesterol crystal	3855	95.0	Good

The arrowed element is a cholesterol crystal, as correctly identified by 95.0% of participants. The cholesterol crystal in the bright field image of this unstained wet preparation is identified by its large flat rectangular overlapping plates with notched corners. The cholesterol crystal is also identified by its birefringence under polarized light. These crystals are rare in fresh urine but form after refrigeration of urine containing droplets of free fat, oval fat bodies, and/or fatty casts. When these other findings of fat in urine are absence, another crystal should be considered such as radiographic contrast material. Cholesterol crystals are not associated with a high urinary specific gravity or alkaline urine. This urine had a low specific gravity (1.040) and acidic pH (6.0); ideal conditions for crystal formation. Fat in urine is associated with severe kidney disease.

Urine Sediment Photographs

USP-02

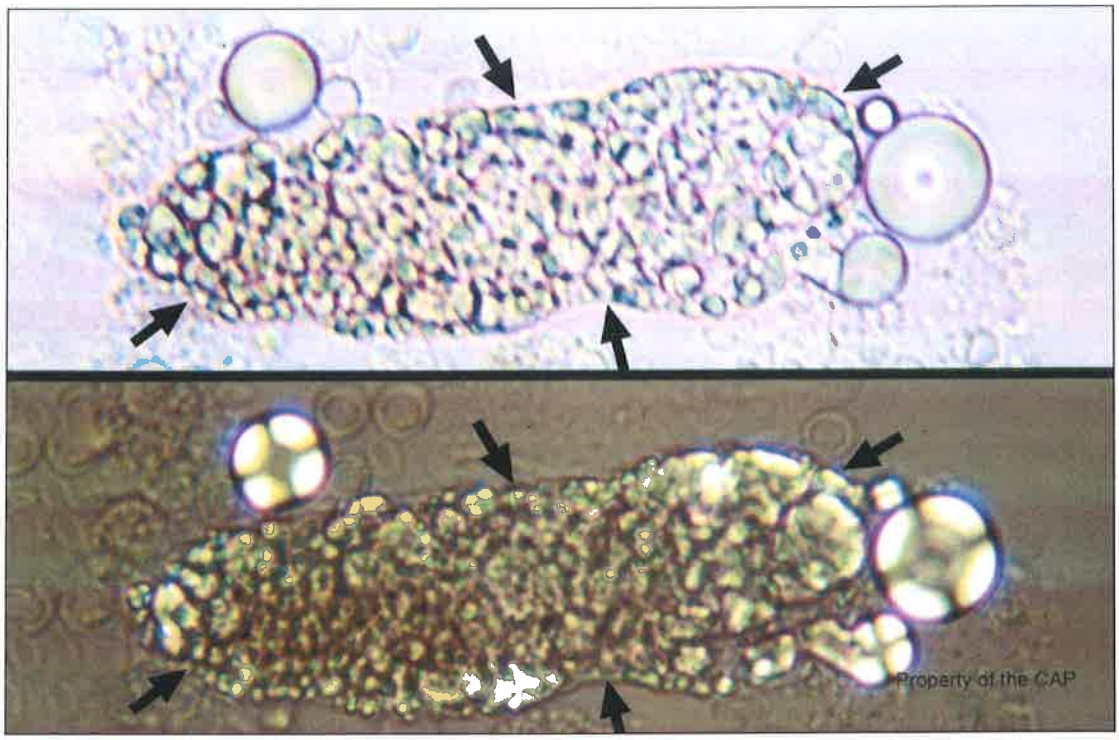


Identification	Participants		Evaluation
	No.	%	
Squamous epithelial cell	4006	98.7	Good

The arrowed cell is a squamous epithelial cell, as correctly identified by 98.7% of participants. The squamous epithelial cell in this unstained wet preparation is identified as a flat very large cell with irregular edges and a small condensed central nucleus. Squamous epithelial cells can be round or rectangular and are derived from the urethra or vaginal mucosa. Their presence in moderate or large numbers in a urinalysis sample suggests contamination from an improperly collected specimen. Properly collected mid-stream clean catch specimens are expected to have low numbers of squamous epithelial cells. Concomitant findings of mixed flora bacteria, yeast, and the absence of leukocytes with moderate or many squamous epithelial cells further supports contamination.

Urine Sediment Photographs

USP-03



Identification	Participants		Evaluation
	No.	%	
Fatty cast	3728	91.8	Good

The arrowed element is a fatty cast, as correctly identified by 91.8% of participants. The fatty cast in the bright field image of this unstained wet preparation is identified by the spherical, highly refractile fat droplets contained within the elongated cast. In the polarized light image, the typical Maltese cross pattern can be seen within the cast. Outside of the cast adjacent free fat droplets of varying size are observed that display dramatic Maltese crosses under polarized light. Free fat, oval fat bodies, and cholesterol crystals are often associated with fatty cast and are generated by the same disease process involving the kidneys. This sample was positive for protein a condition commonly associated with fatty casts, such as in nephrotic syndrome.