

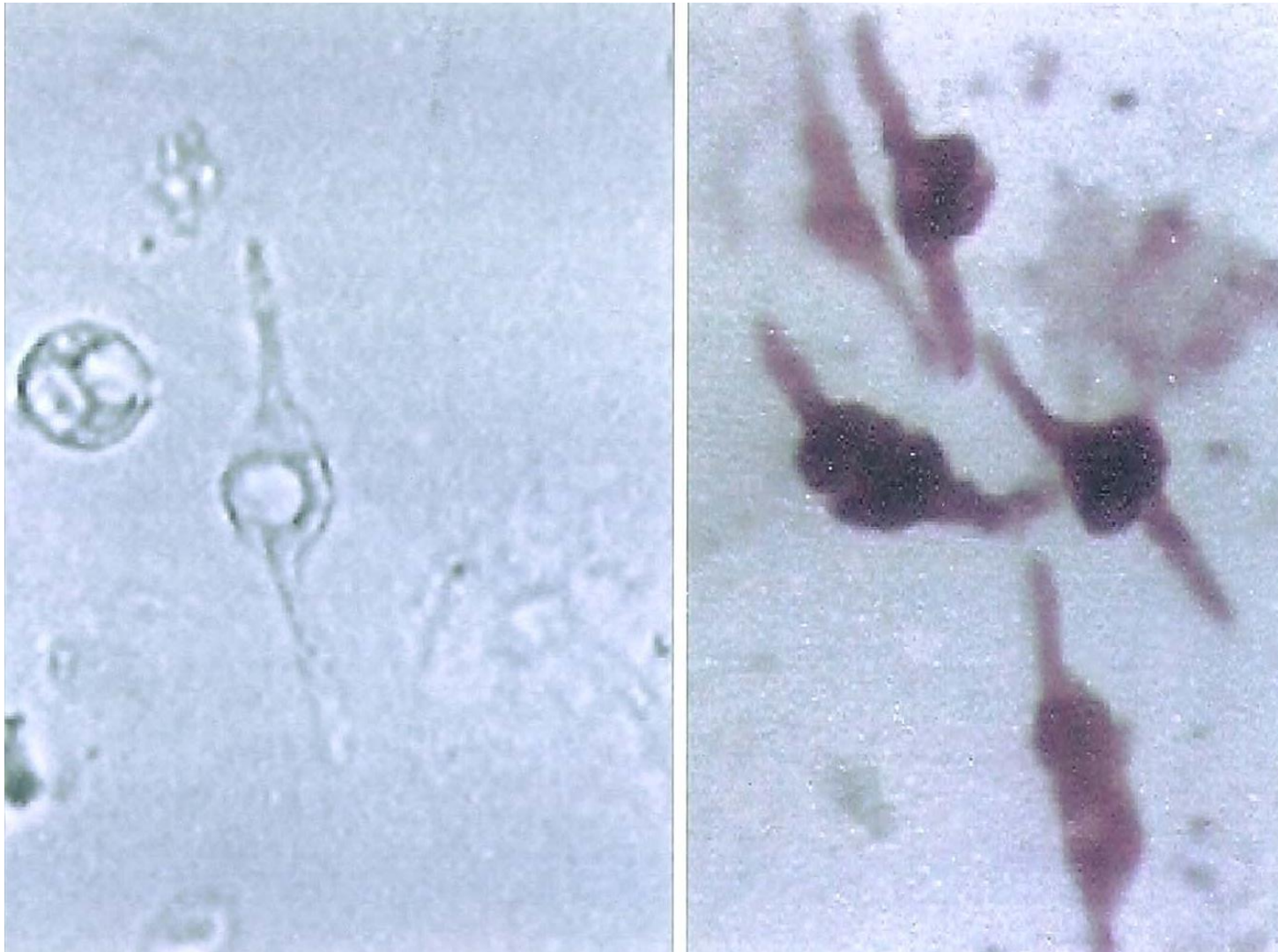
Pathogens in urine

A variety of pathogens can be observed in the urine cytology specimens. Examples are as follows.

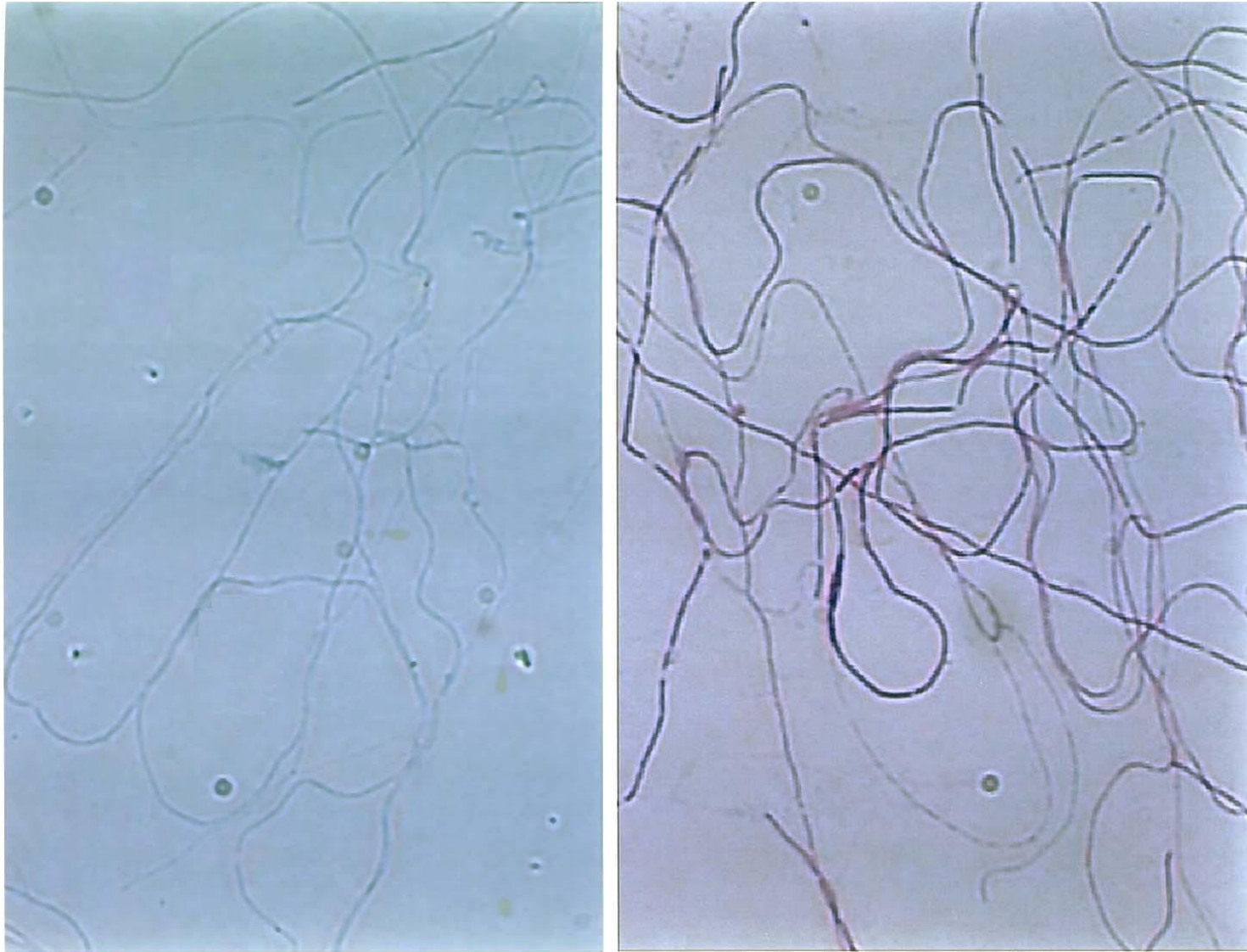
- 1) *E. coli*-infected pyuria (acute bacterial cystitis)
- 2) Spheroplasts and filamentous transformation
- 3) *Enterococcus*-infected pyuria (acute bacterial cystitis)
- 4) *Streptococcus pneumoniae*
- 5) *Neisseria gonorrhoeae*
- 6) *Chlamydia trachomatis*
- 7) Candidal cystitis
- 8) BK virus infection
- 9) *Trichomonas vaginalis*
- 10) *Ciliated protozoa*
- 11) Ova of *Enterobius vermicularis* (pinworm)
- 12) Ova of *Schistosoma haematobium* (bilharziasis)
- 13) Nematoda larva
- 14) Bdelloida (*Rotaria rotatoria*)



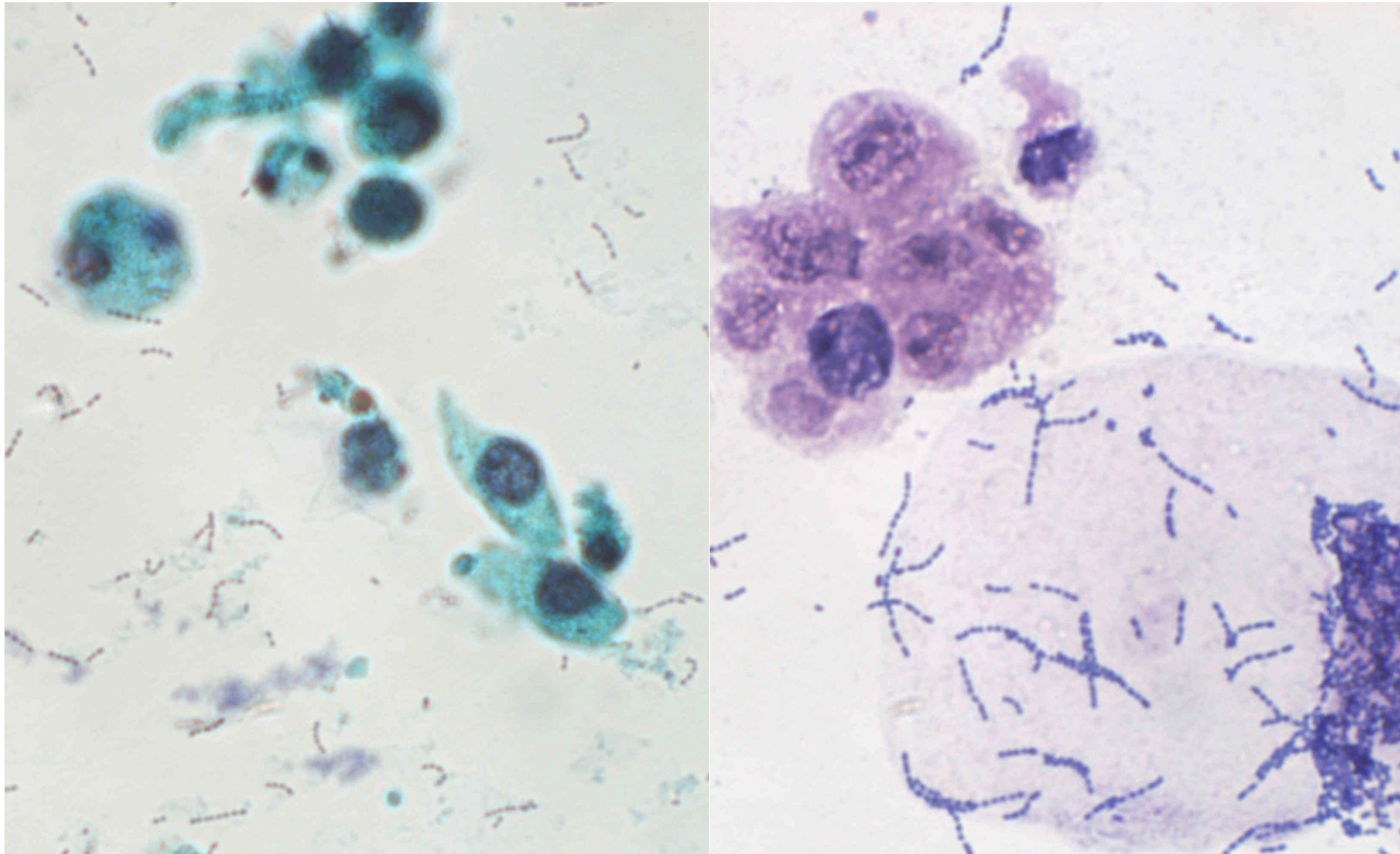
Pyuria due to bacterial cystitis (left: urine sediment, right: Giemsa staining). *E. coli* is the causative pathogen.



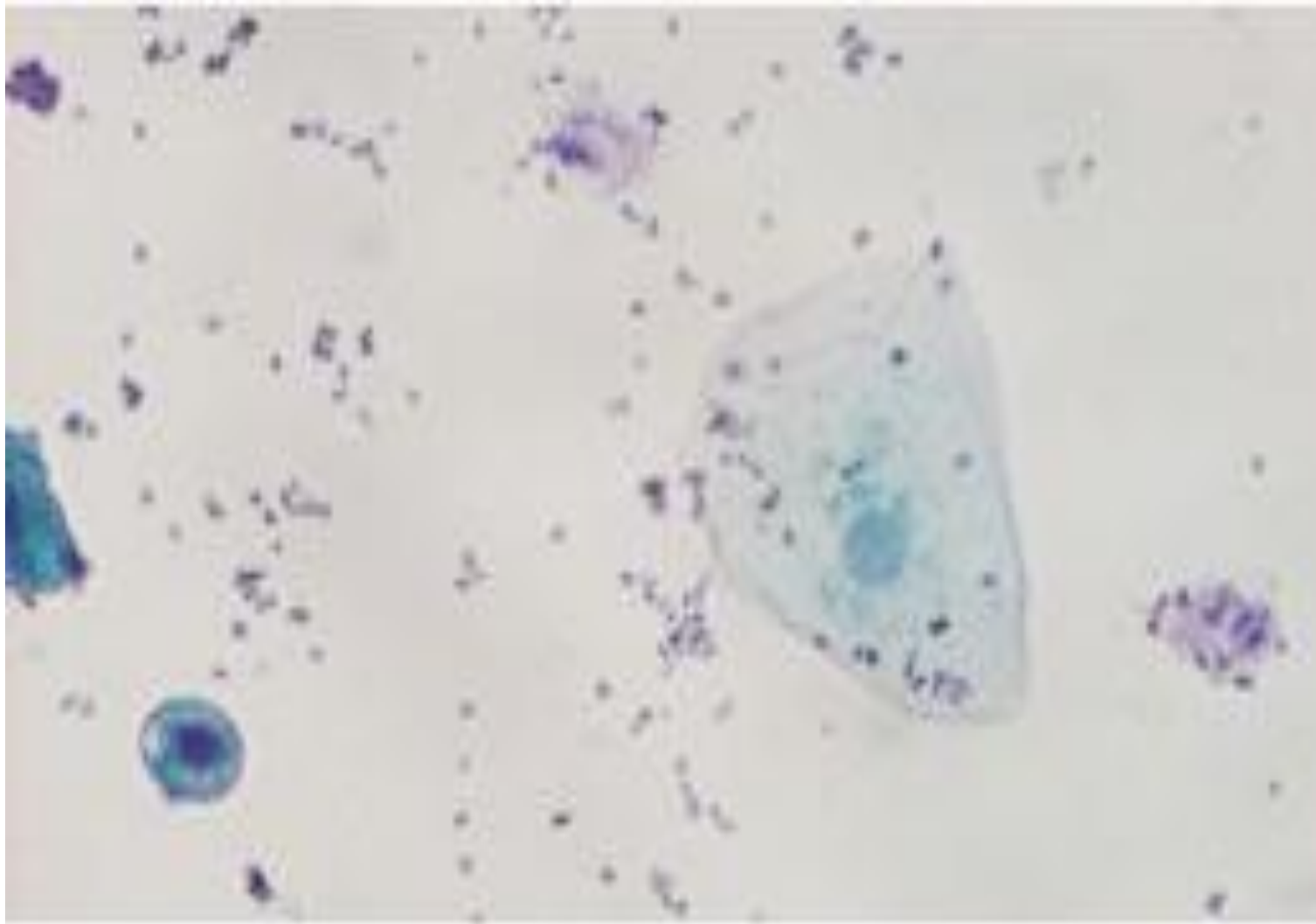
Deformed Gram-negative rods in urine (1). Filamentous change with spheroplast formation is caused by antibiotics treatment. (left: unstained, right: Gram). *Klebsiella pneumoniae* was isolated from the urine.



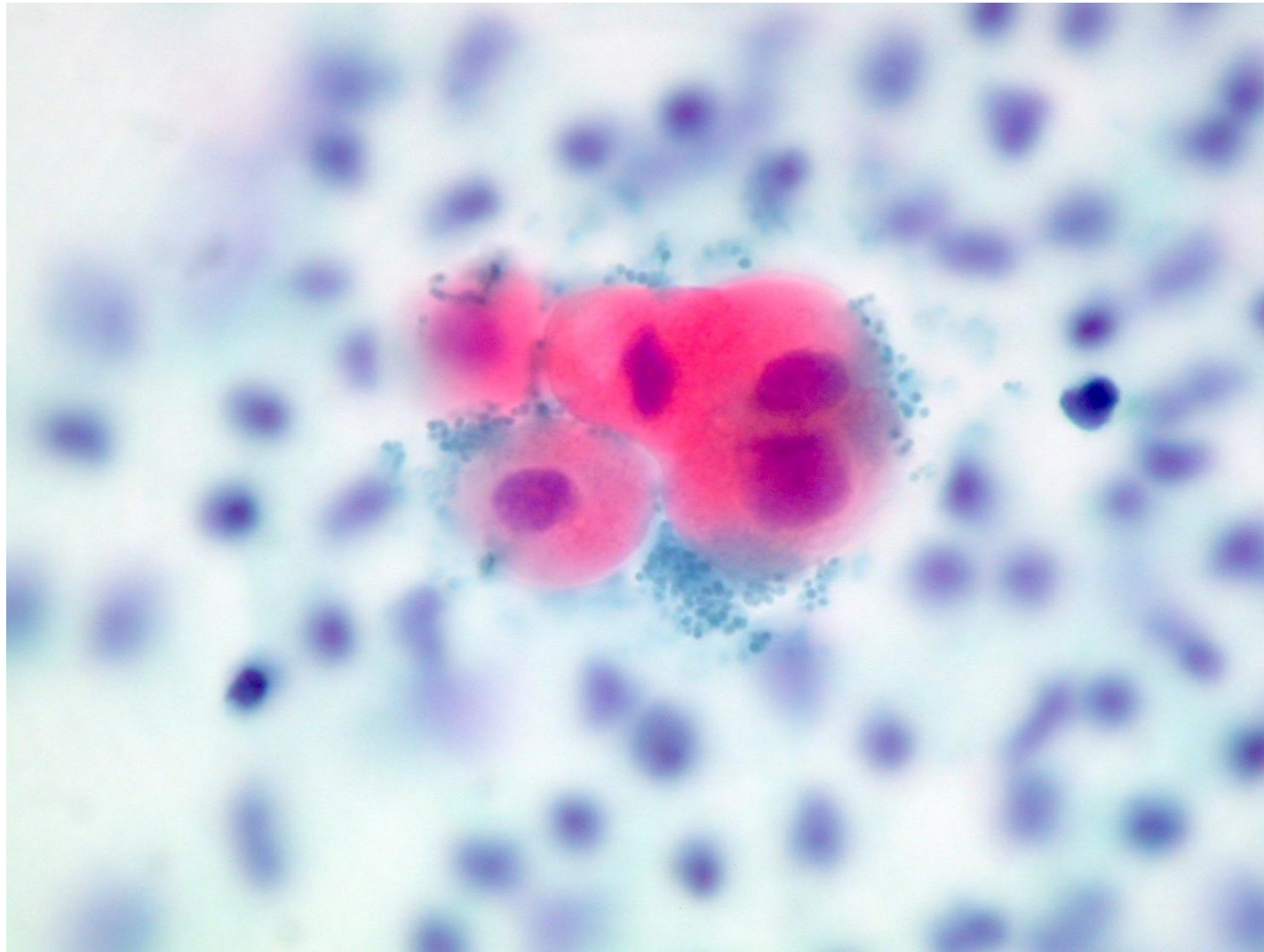
Deformed Gram-negative rods in urine (2). Long filamentous change is caused by antibiotics treatment. (left: unstained, right: Gram). *Pseudomonas aeruginosa* was isolated from the urine.



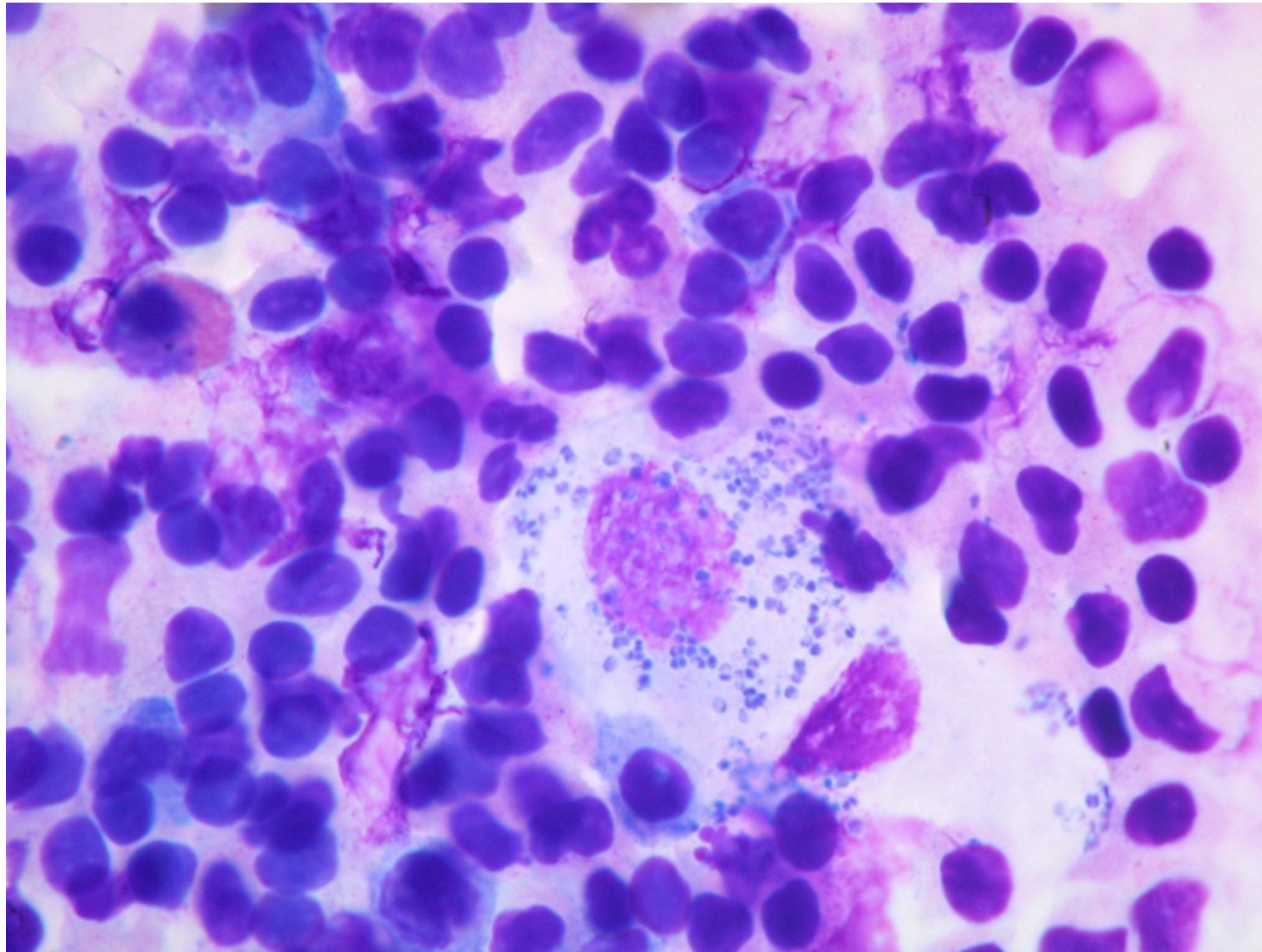
Enterococcus faecalis-infected cystitis (left: Papanicolaou, right: Giemsa).
Chained Gram-positive cocci are observed.



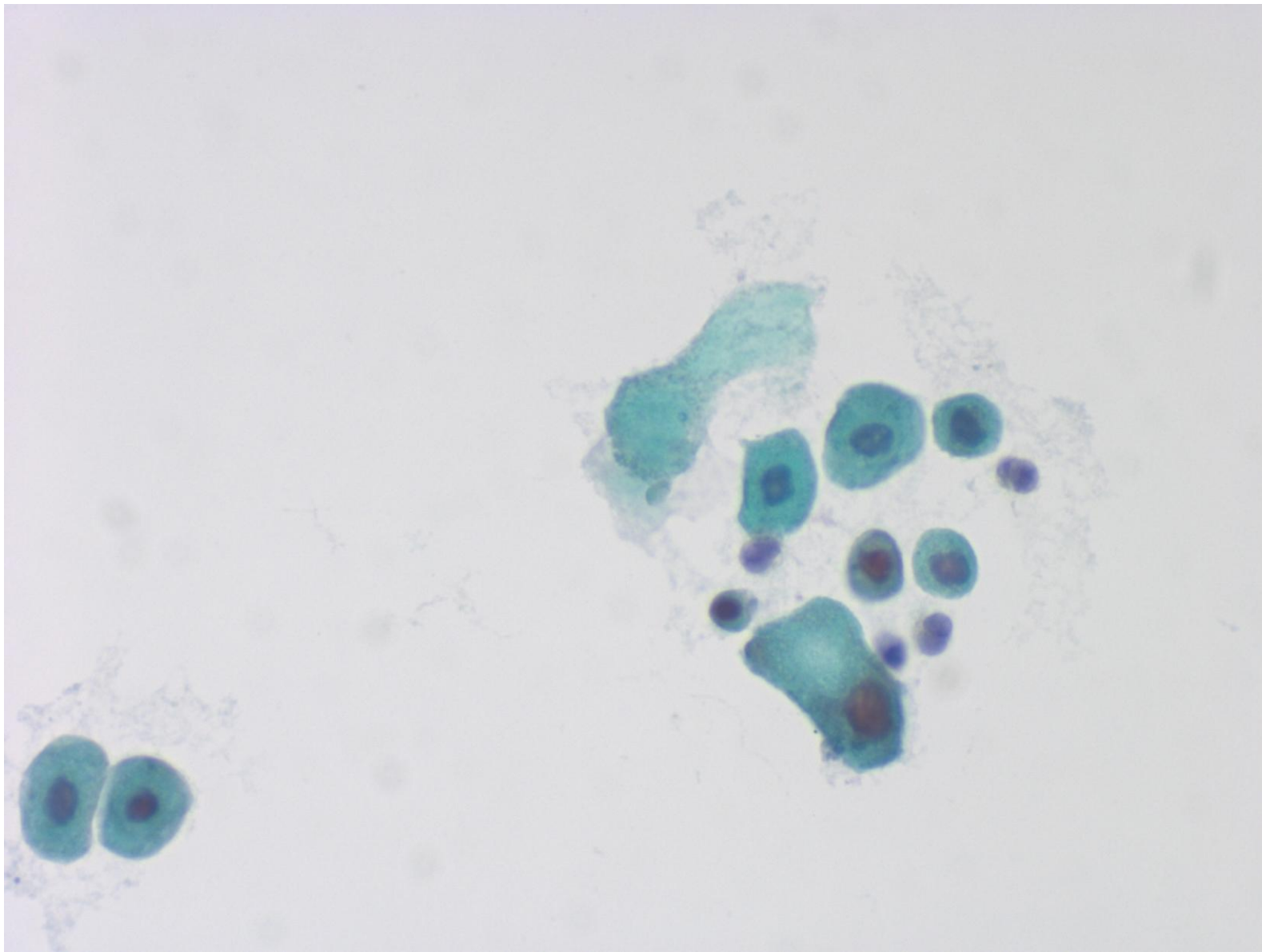
Streptococcus pneumoniae rarely causes bacterial cystitis (Papanicolaou). Diplococci are observed in the urine of 51-year-old female patient.



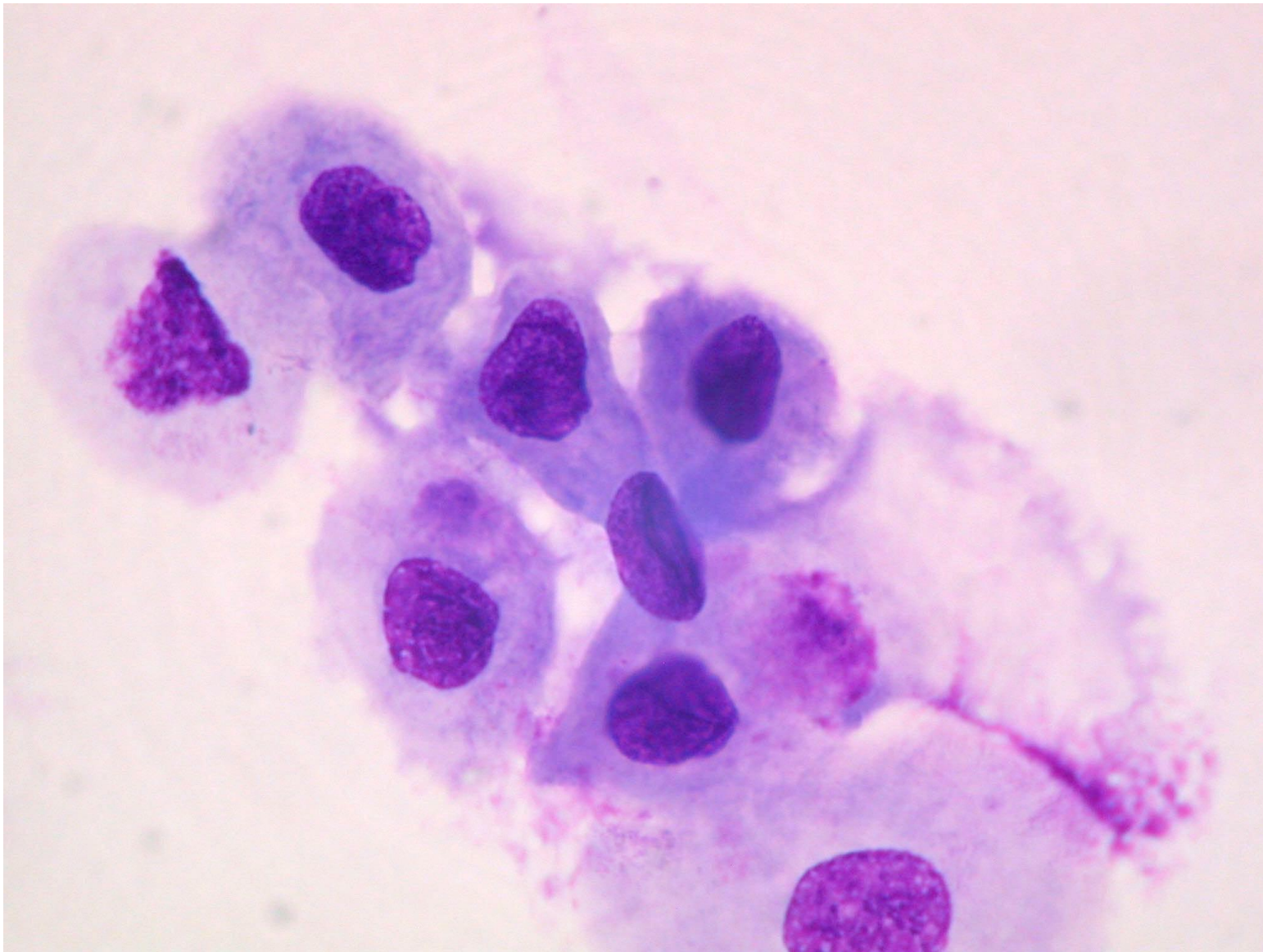
Gonorrhoeal urethritis seen in a 28-year-old male patient (Papanicolaou). *Neisseria gonorrhoeae* shows strong affinity to squamous epithelial cells of urethral origin. The diplococci adhere the squamous cells, while the surrounding urothelial cells are not infected.



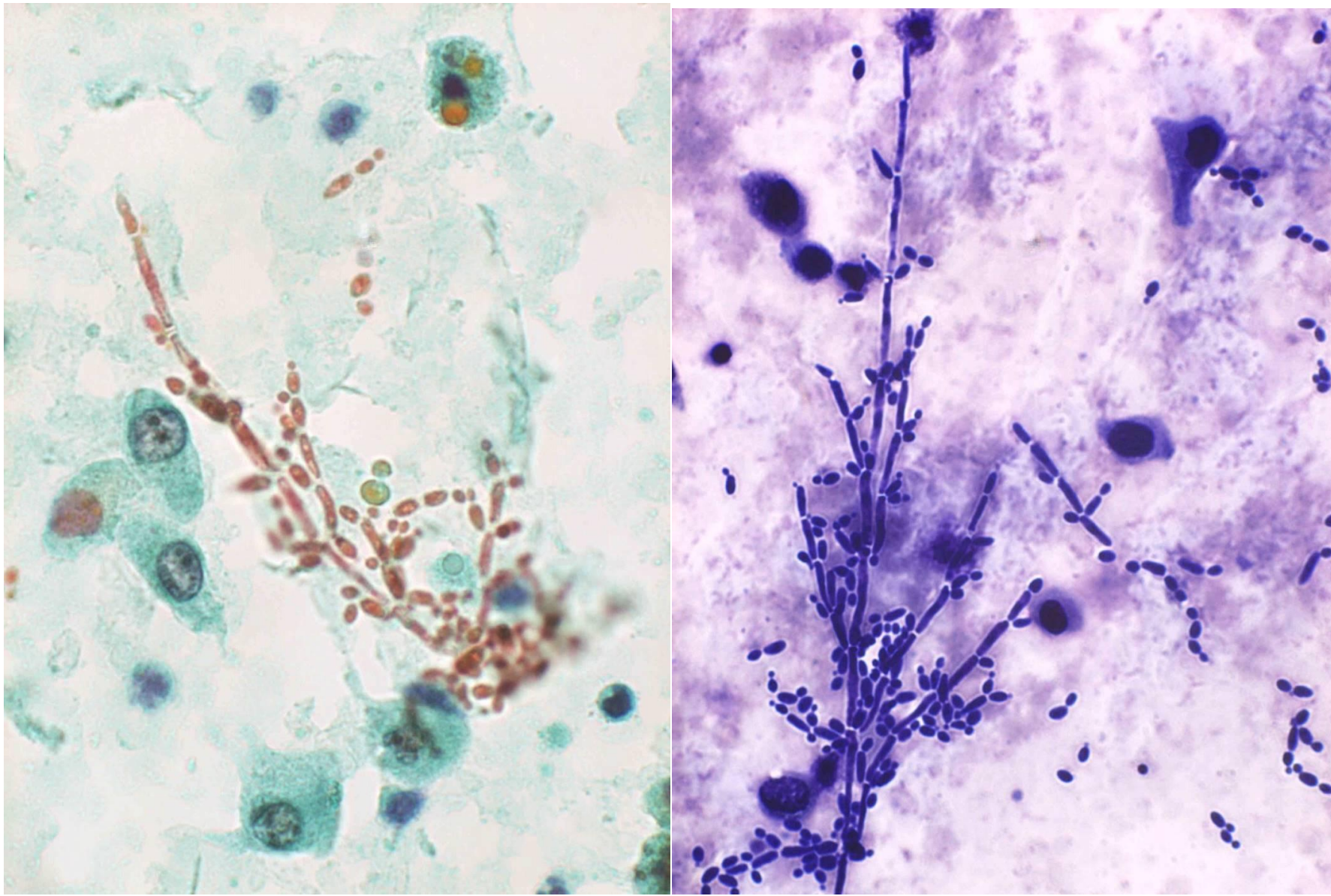
Gonorrhoeal urethritis seen in a 28-year-old male patient (Giemsa). *Neisseria gonorrhoeae* shows strong affinity to squamous epithelial cells of urethral origin. The diplococci adhere the squamous cells, while the surrounding urothelial cells are not infected.



Chlamydial urethritis seen in a 21-year-old male patient (Papanicolaou). A cytoplasmic inclusion is seen in a columnar cell.



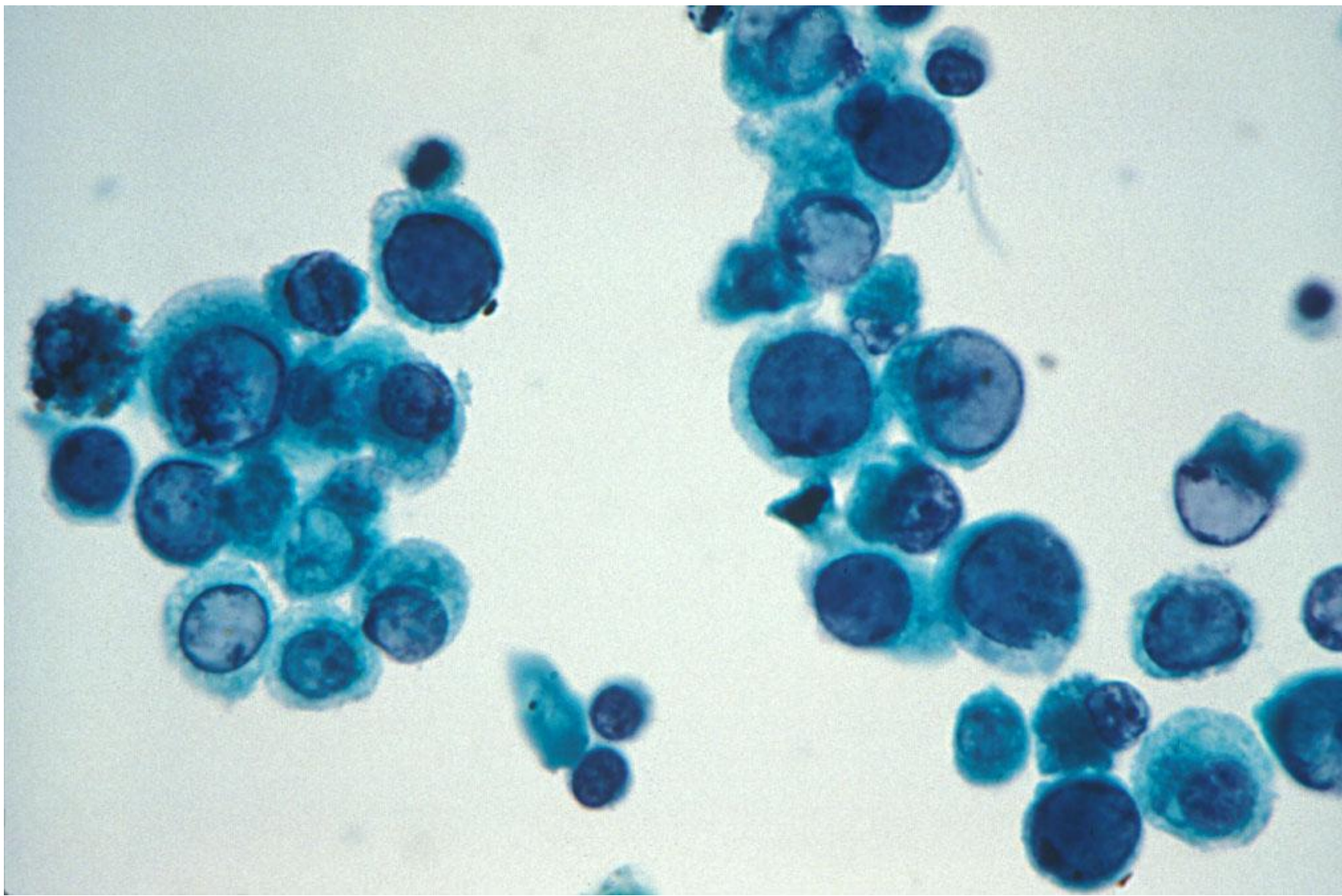
Chlamydial urethritis seen in a 21-year-old male patient (Giemsa). A cytoplasmic inclusion is seen in a columnar cell. *Chlamydia trachomatis* was cultured from the urine.



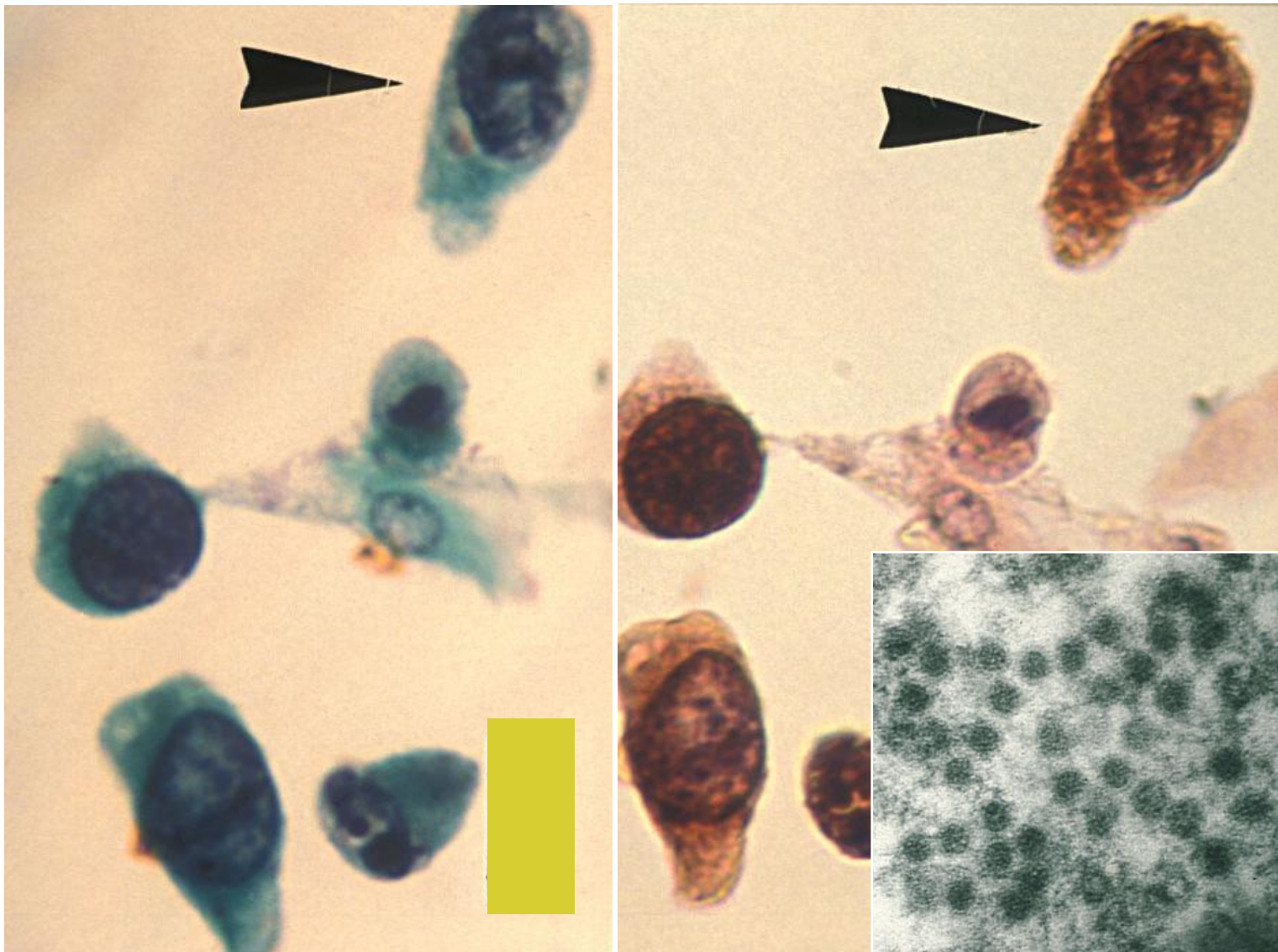
Candidal cystitis in a young female patient (left: Papanicolaou, right: Giemsa). Pseudohyphae with yeasts-form fungi are characteristic. *Candida albicans* was cultured from the urine.



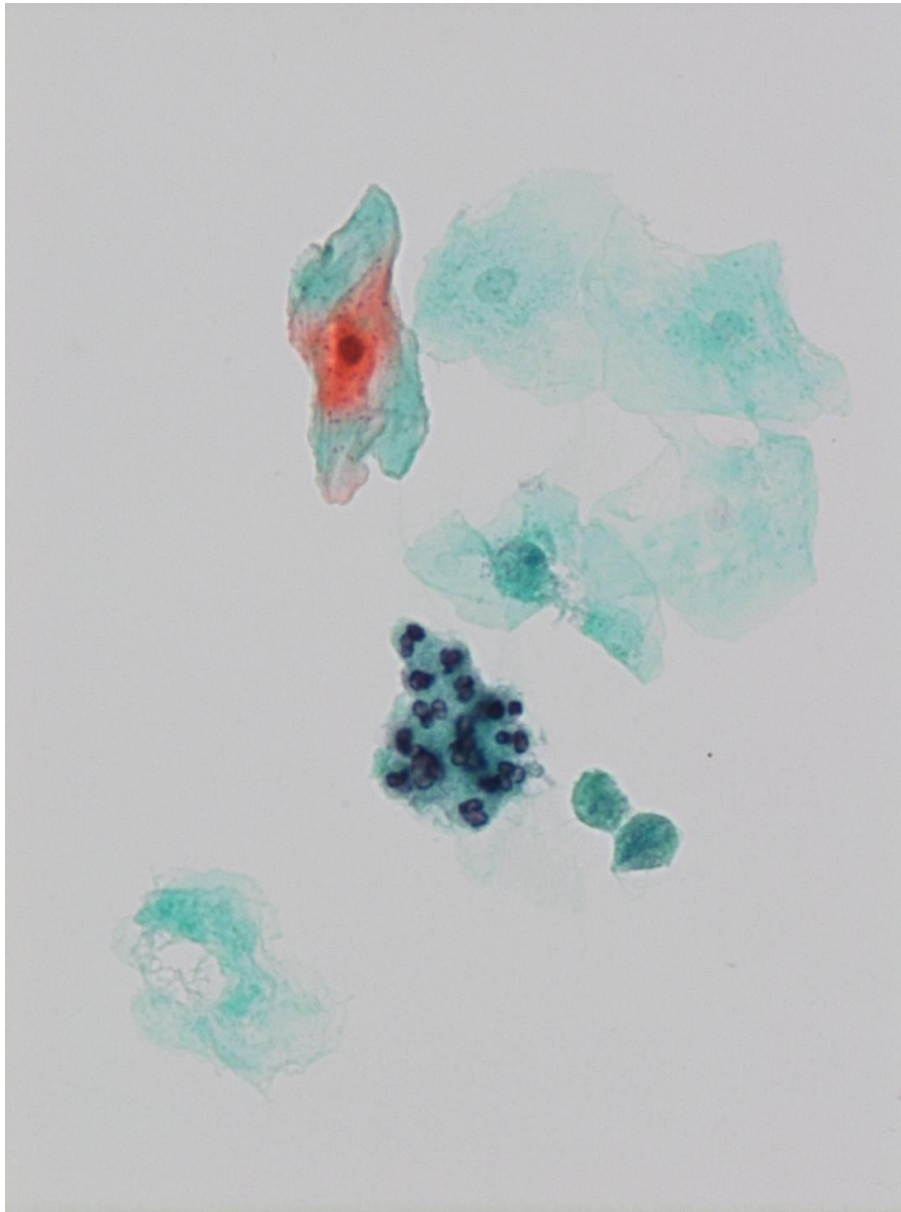
Contamination of *Alternaria alternata* in urine cytology specimen (Papanicolaou). *A. alternata*, a non-pathogenic black fungus often floating in the air, may be contaminated during cytology specimen preparation.



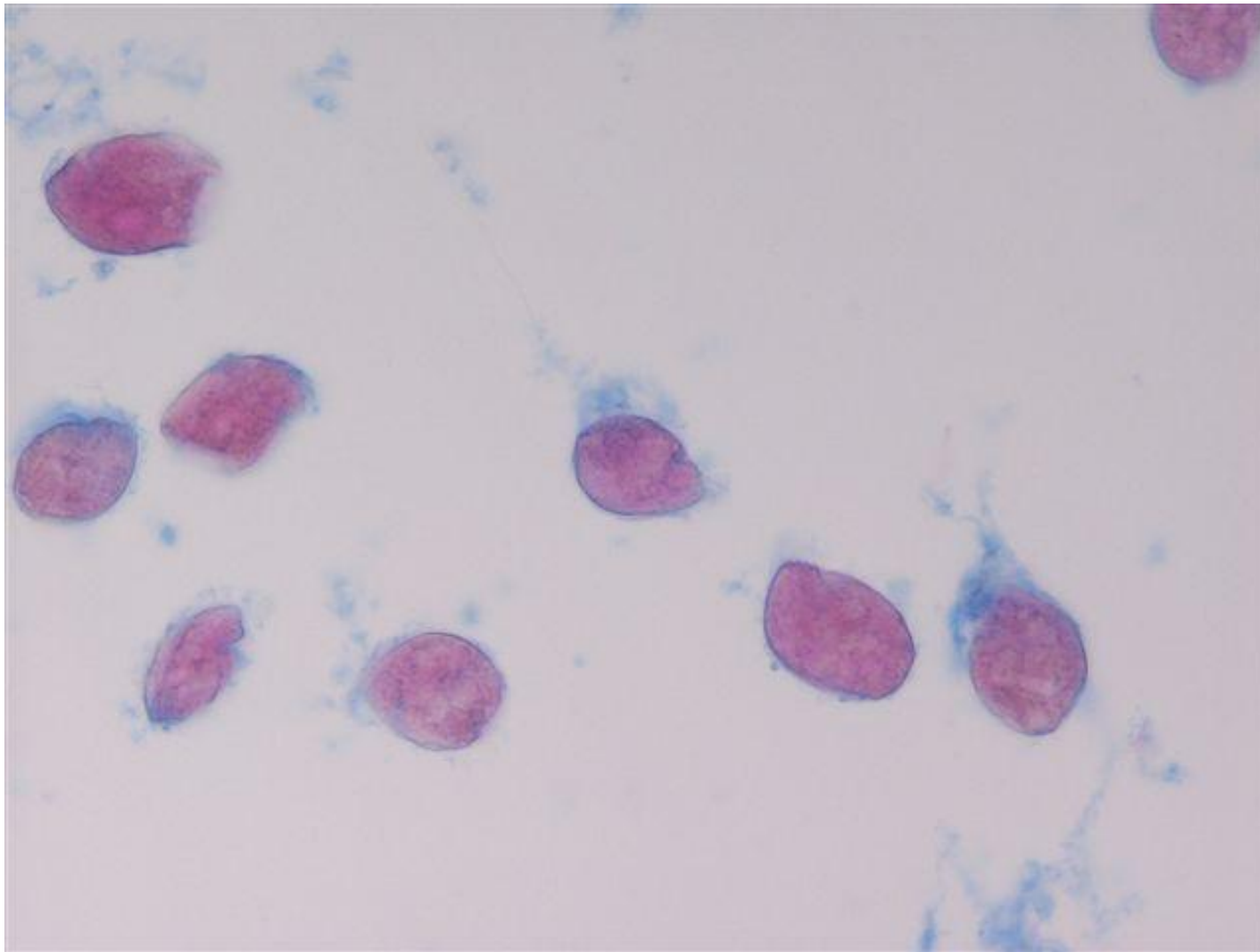
Decoy cells in the urine in a male patient aged 30's who received bone marrow transplantation for acute lymphoblastic leukemia. BK virus infection has caused intranuclear inclusion body formation. Papanicolaou staining



Decoy cells in the urine in a male patient aged 30's who received bone marrow transplantation for acute lymphoblastic leukemia (left: Papanicolaou). BK virus infection is proven by re-immunostaining for BK virus Ag (right). Compare the same cells (arrows). EM study demonstrates small viral particles in the nucleus (inset).

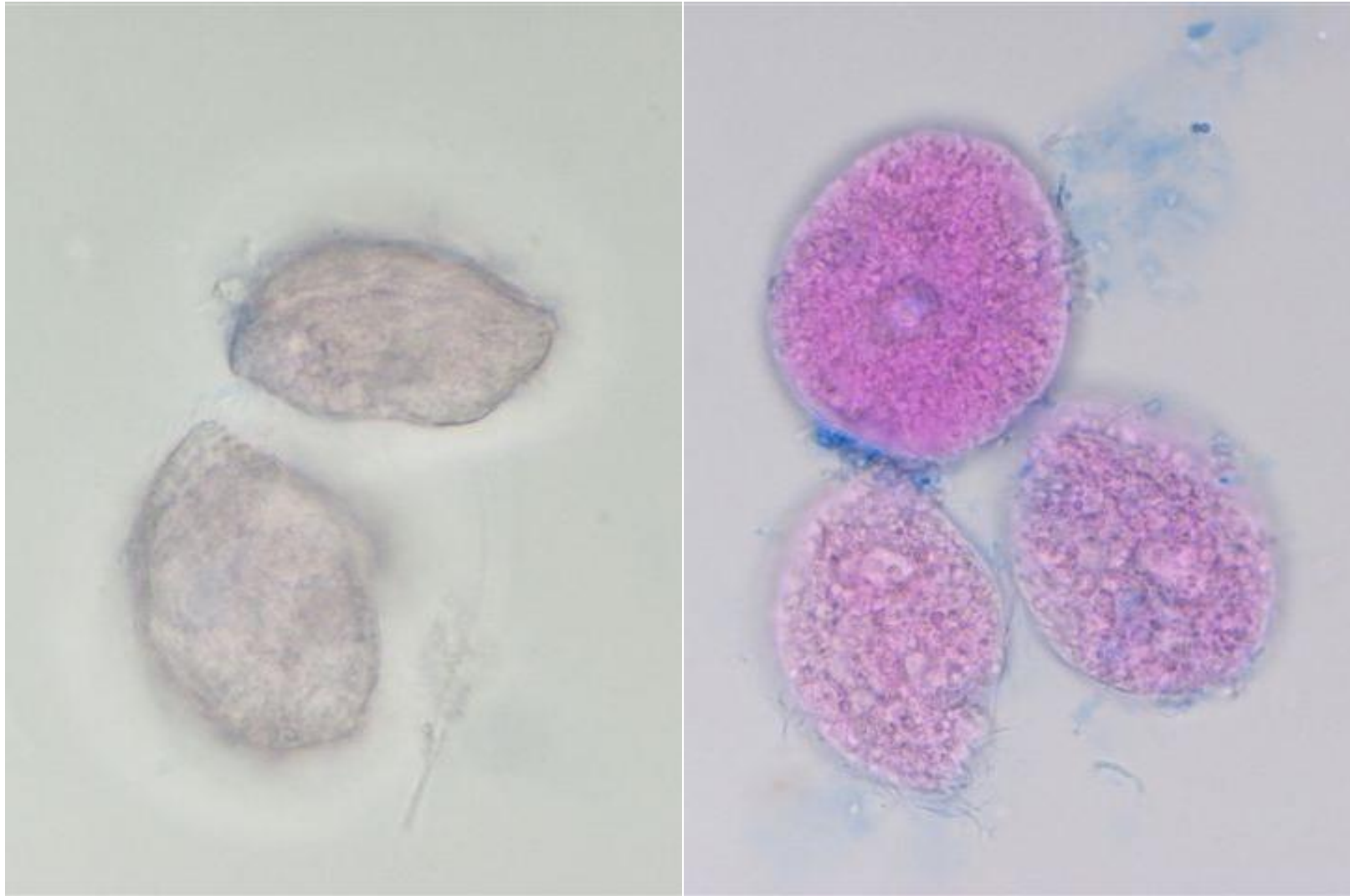


Trichomonas vaginalis seen in the urine in a 25-year-old female patient.
(left: Papanicolaou, right top: unstained, right bottom: Giemsa)

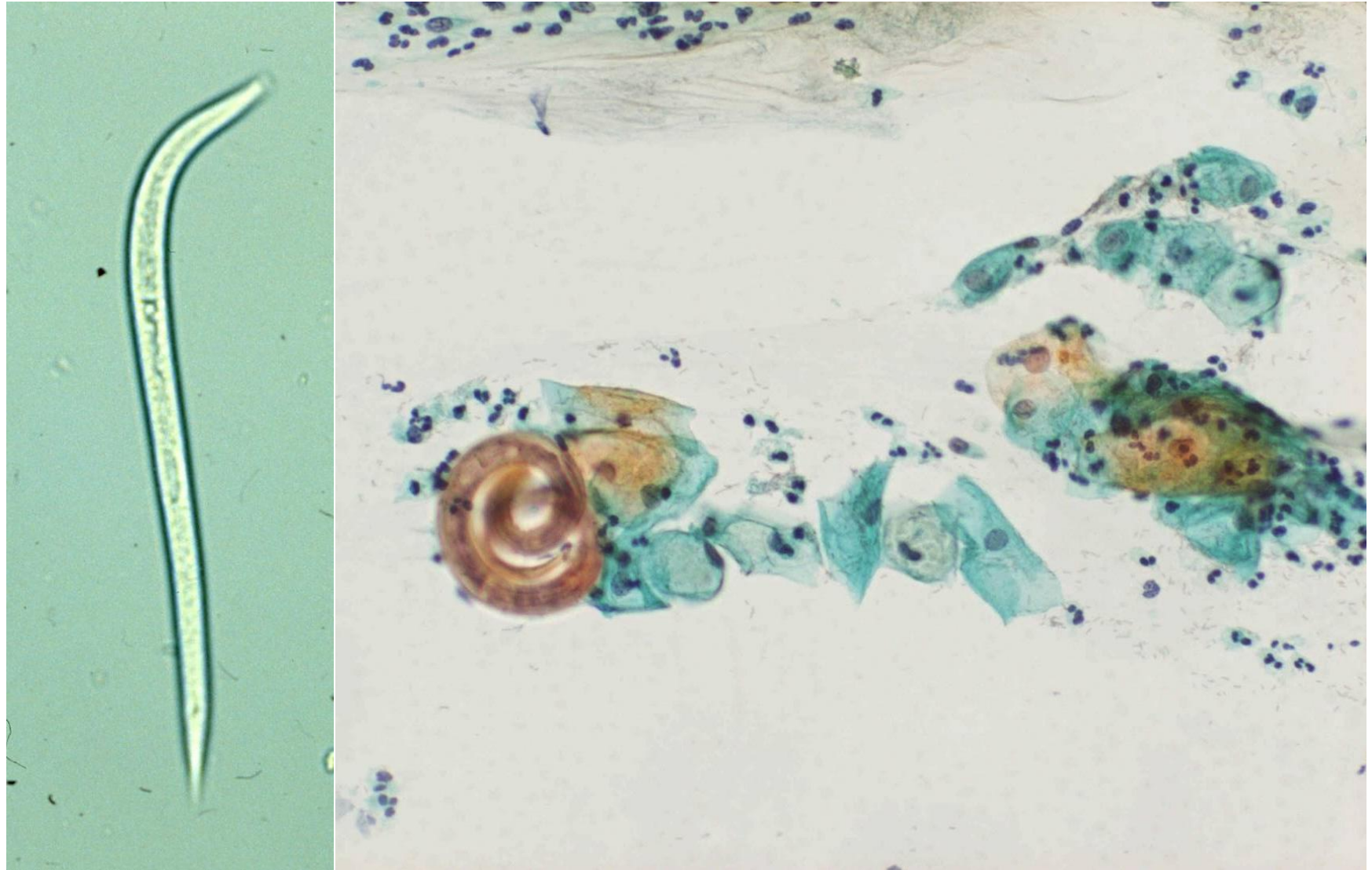


Ciliated protozoa (*Colpoda steini*) repeatedly found in urine of a 83-year-old male patient (Sternheimer staining). *C. steini*, measuring 25-35 μm is commonly found in soil.

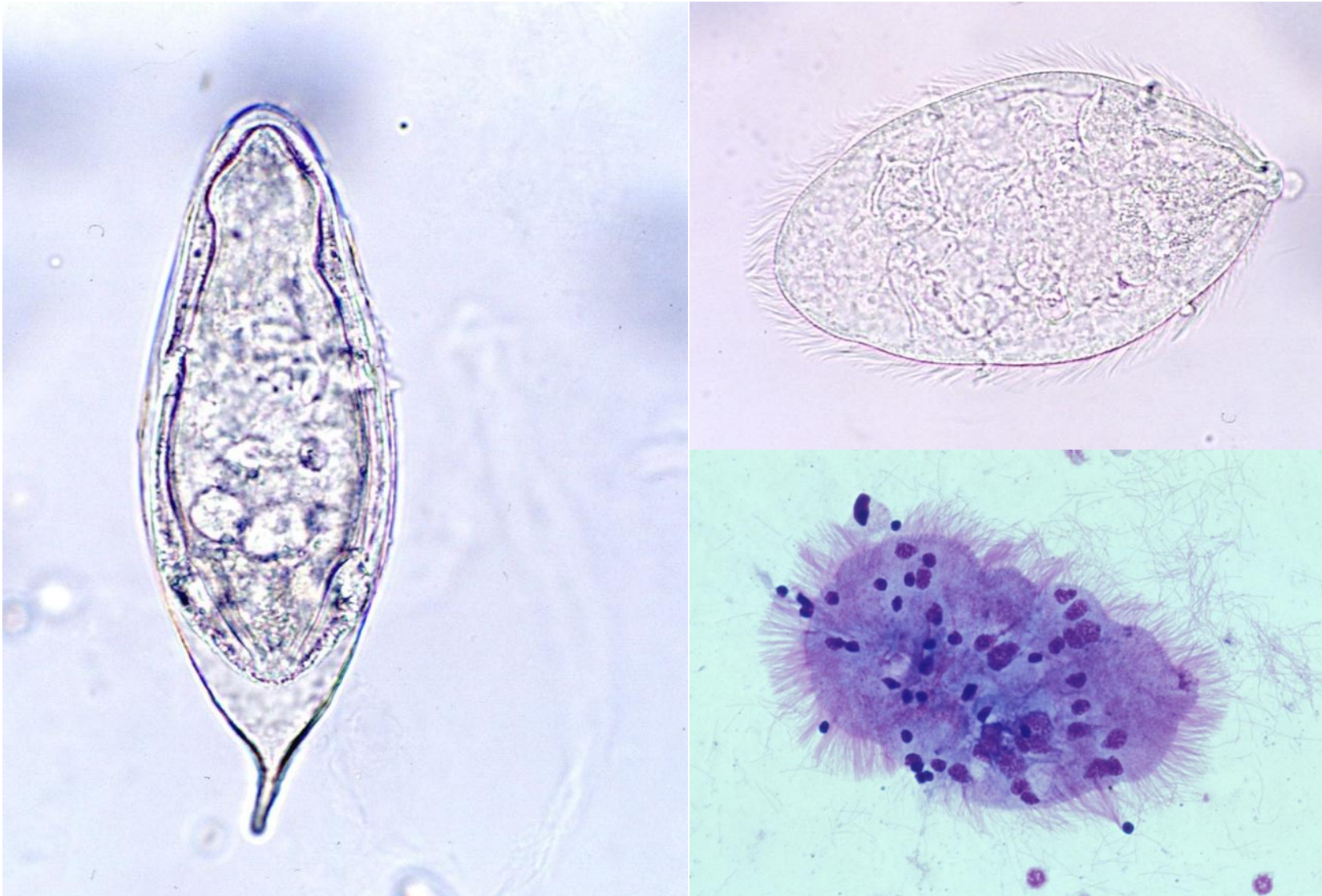
Ref. Yoshibe T, et al. A case of *Colpoda steini* living long time in the urinary bladder. Nihon Rinsho Biseibutsugaku Zasshi 2003; 13(1): 23-30 (in Japanese with English abstract).



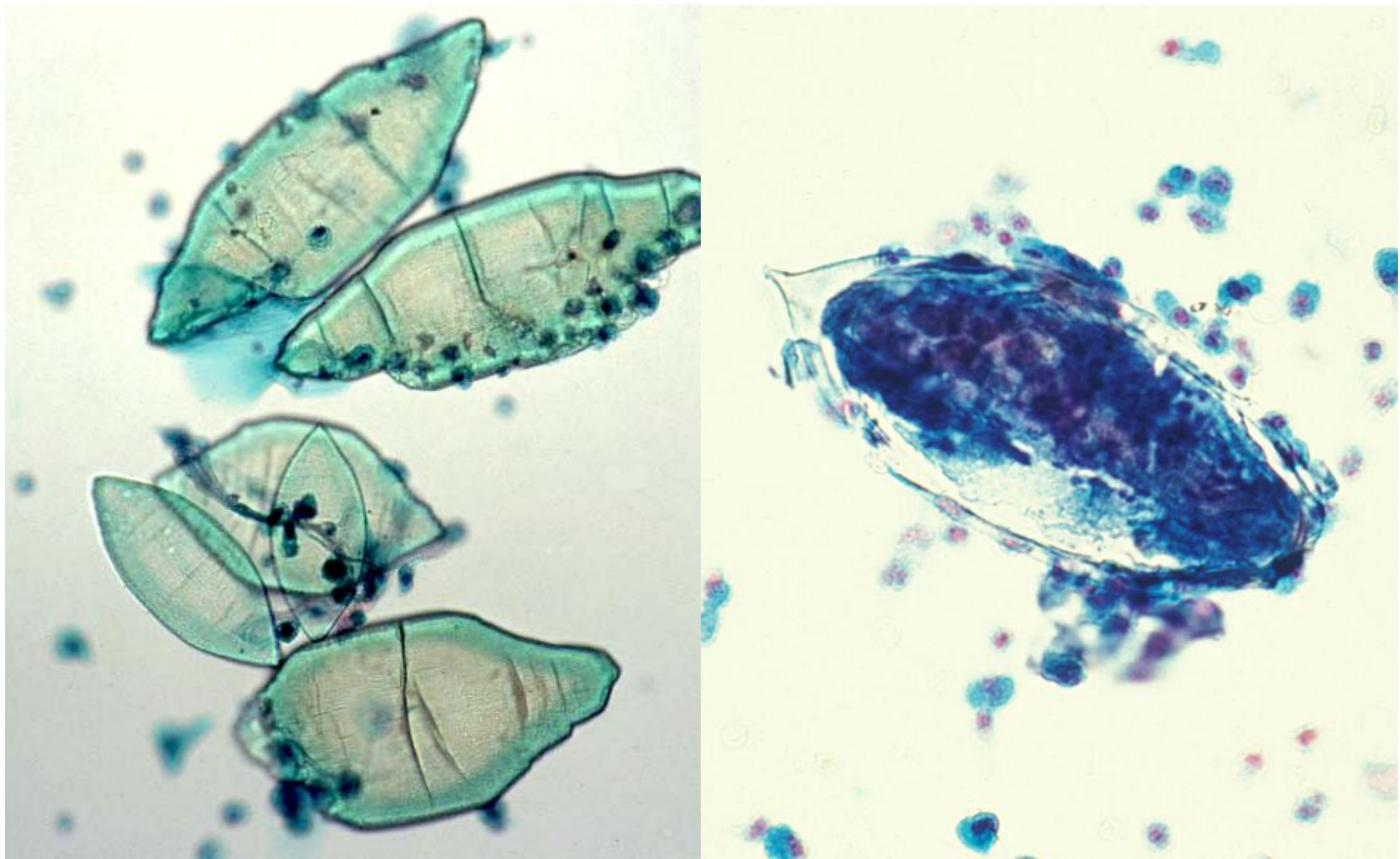
Ciliated protozoa (*Colpoda steini*) repeatedly found in urine of a 83-year-old male patient (left: unstained, right: Sternheimer staining). *C. steini*, measuring 25-35 μm is commonly found in soil. The protozoa were actively moving in the urine. No specific symptoms were recorded, but their repeated appearance in the urine indicated infection in the urinary bladder.



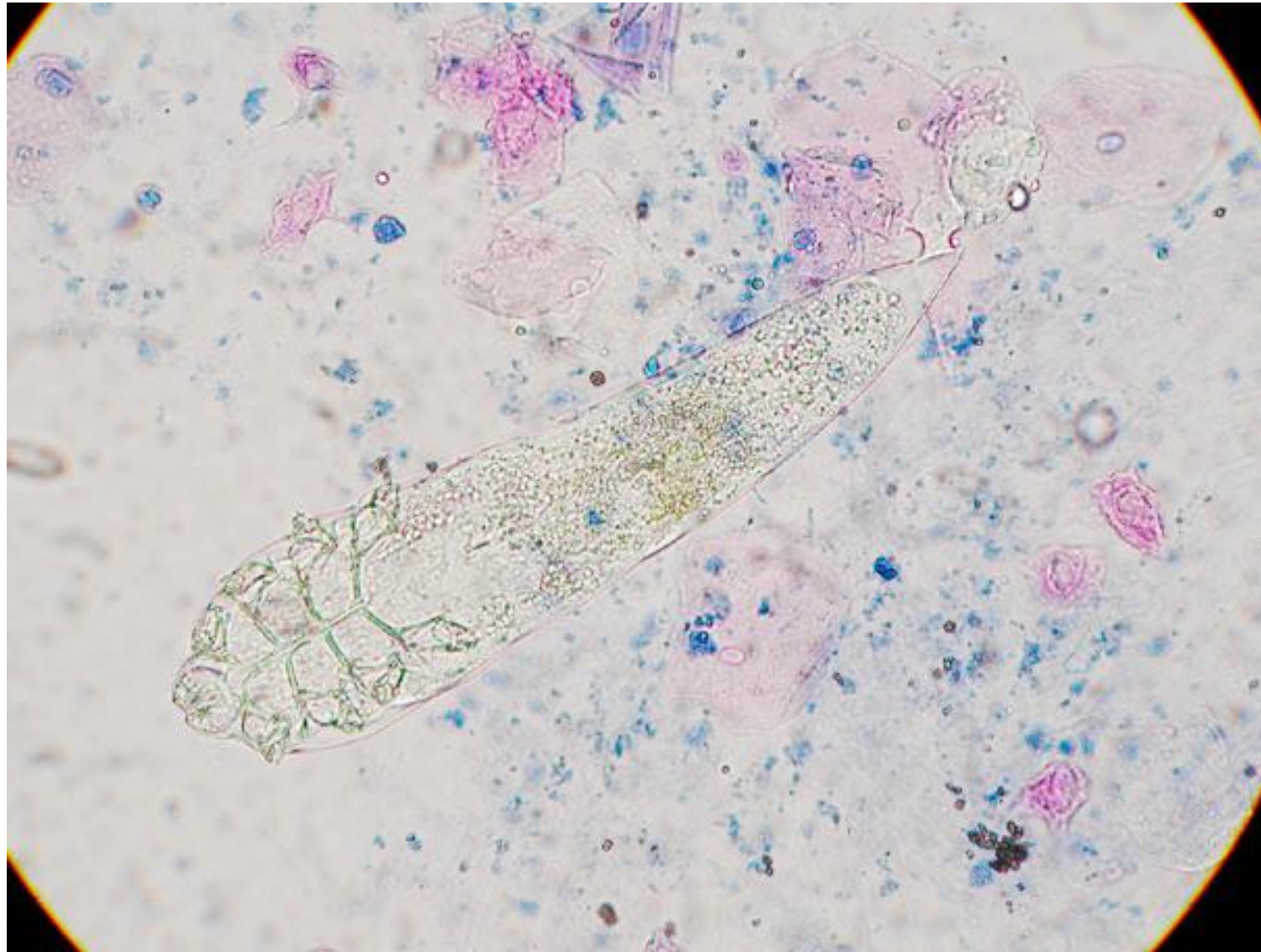
Incidental identification of a small larval nematode in the urine (left: unstained, child case, right: Papanicolaou). It should be regarded as a contamination from the environment. Free-living nematodes are commonly found in soil.



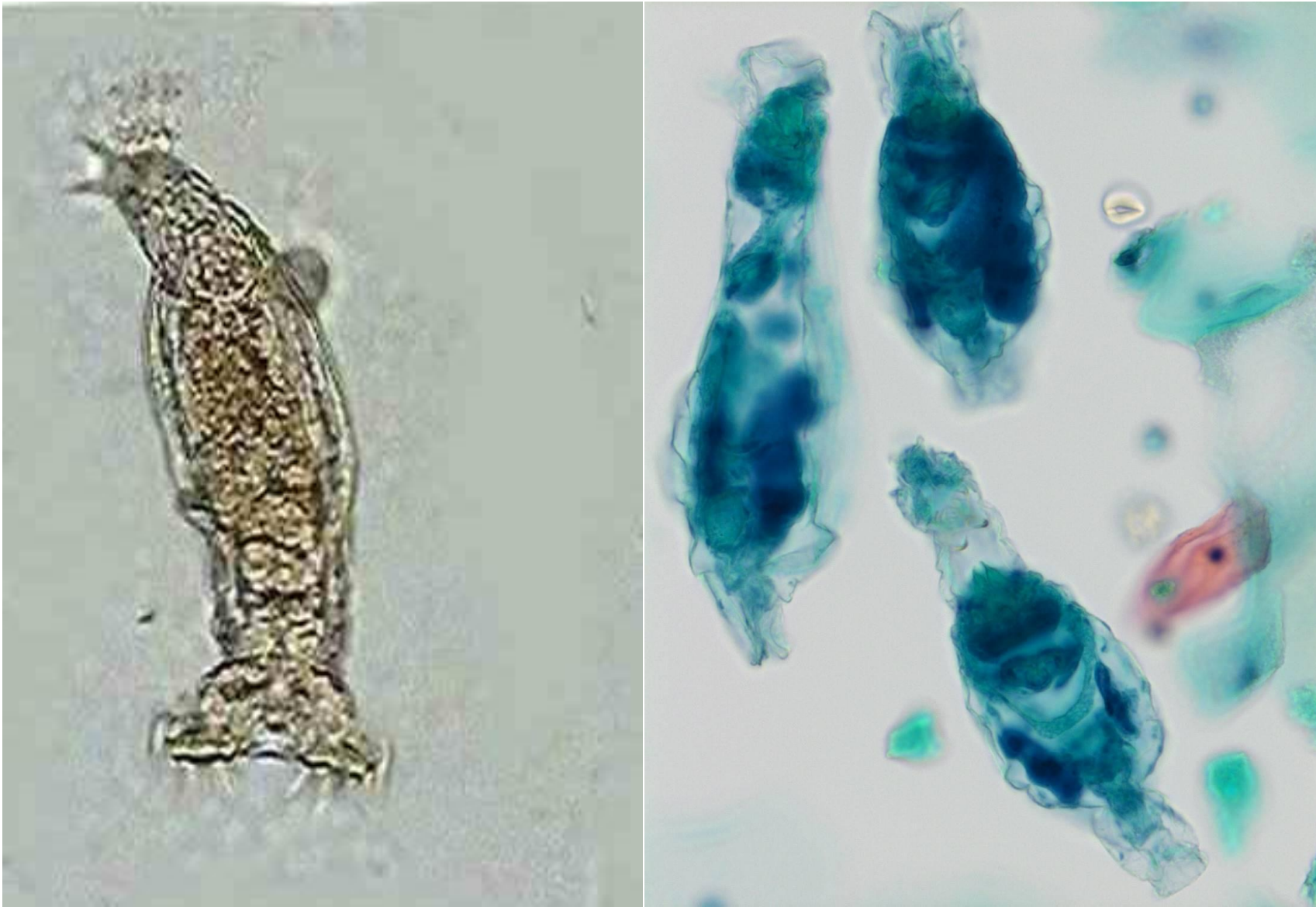
Ova of *Schistosoma haematobium* in the urine (left and right top: unstained, right bottom: Giemsa). A large ovum with a spicule at one end contains moving miracidium. Miracidia are often hatched during sediment preparation as indicated in the right panels. The miracidium is a ciliated multinucleated larva.



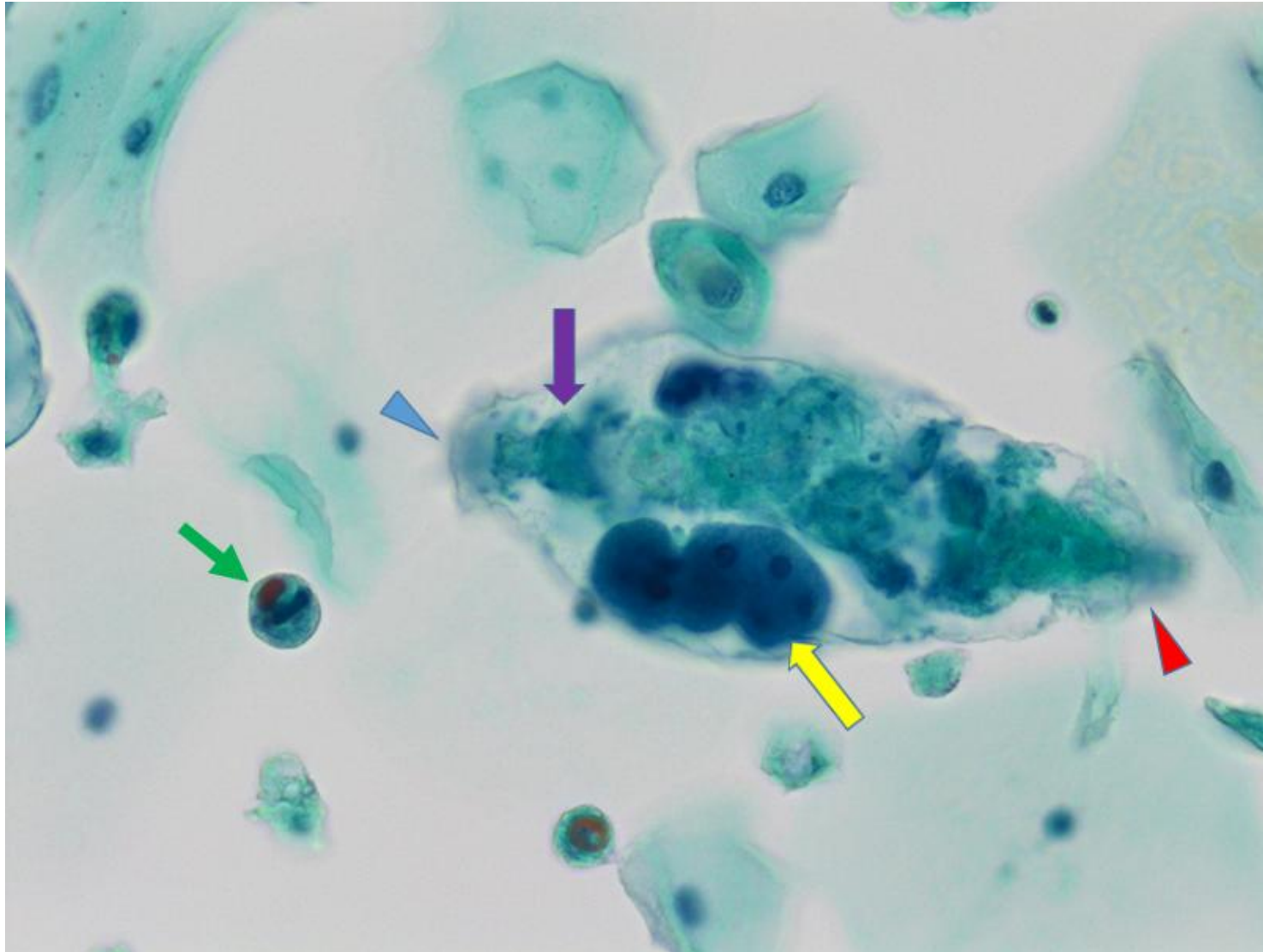
Papanicolaou-stained urine cytology of calcium urate crystals (left) and a spiculated ovum of *Schistoma haematobium* (right). The size and shape of urate crystals are similar to those of the fluke egg.



An unstained living adult house dust mite (*Dermatophagoides*), about 400 μm in length, is seen in the urine sediment (Sternheimer staining). The mite, rich in a carpet and bed, should be a contaminant. Four pairs of short legs are noted.



Bdelloida (*Rotaria rotatoria*) around 300 μm in length seen in the urine (left: unstained, right: Papanicolaou). The zooplankton is rich in the water of vase or water tank. Before urine analysis, the male patient aged 66 must have added water of vase or water tank to his urine. Bdelloid does not infect the human being.



Bdelloidea (*Rotaria rotatoria*) around 300 μm in length seen in the urine (Papanicolaou). The digestive tract is seen along the central axis. Blue arrowhead: head, red arrowhead: tail, purple arrow: mastax (chewing organ), and yellow arrow: ovary. Chlamidomonas (green arrow) is seen in the same specimen.