

CLINICAL BIOCHEMISTRY

**Clinical laboratory diagnosis of kidney
and urinary tract disorders**

Nitrogen balance

Energy expenditure and energy supply

Oxygen metabolism in the body

**Clinical laboratory diagnosis of liver and
biliary tract disorders**

Clinical laboratory diagnosis of kidney and urinary tract disorders

- diagnostically important urine investigation
- correct indication and interpretation of non-protein nitrogen substances in plasma and urine (urea, creatinine, uric acid)
- functions tests - glomerular filtration rate (GFR)
 - concentrations capability of kidney
- urinary proteins - proteinuria

Urinalysis

Biochemical

- urine analysis by test strips

Morfological

- microscopy of urine sediment
- flow cytometry
- direct digital microphotography

Urine samples

random specimen

first morning or 8h specimen

second morning urine

urine collected over a 24-h period

Test strips for chemical investigation

Blood (erythrocytes; hemoglobin)

Leukocytes

Nitrite

Protein

pH

Specific gravity

(Glucose, Ketones, Bilirubin, Urobilinogen)



Microscopic examination of the urine (urinary sediment)

cells

erythrocytes

leukocytes

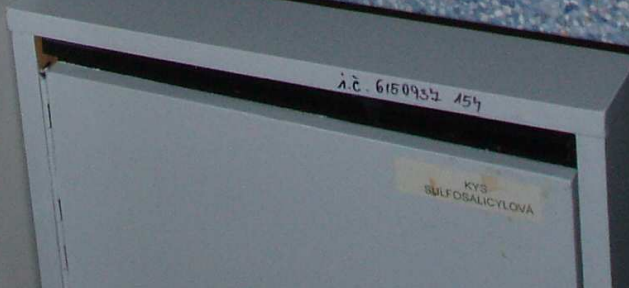
epithelial cells (spheric, flat)

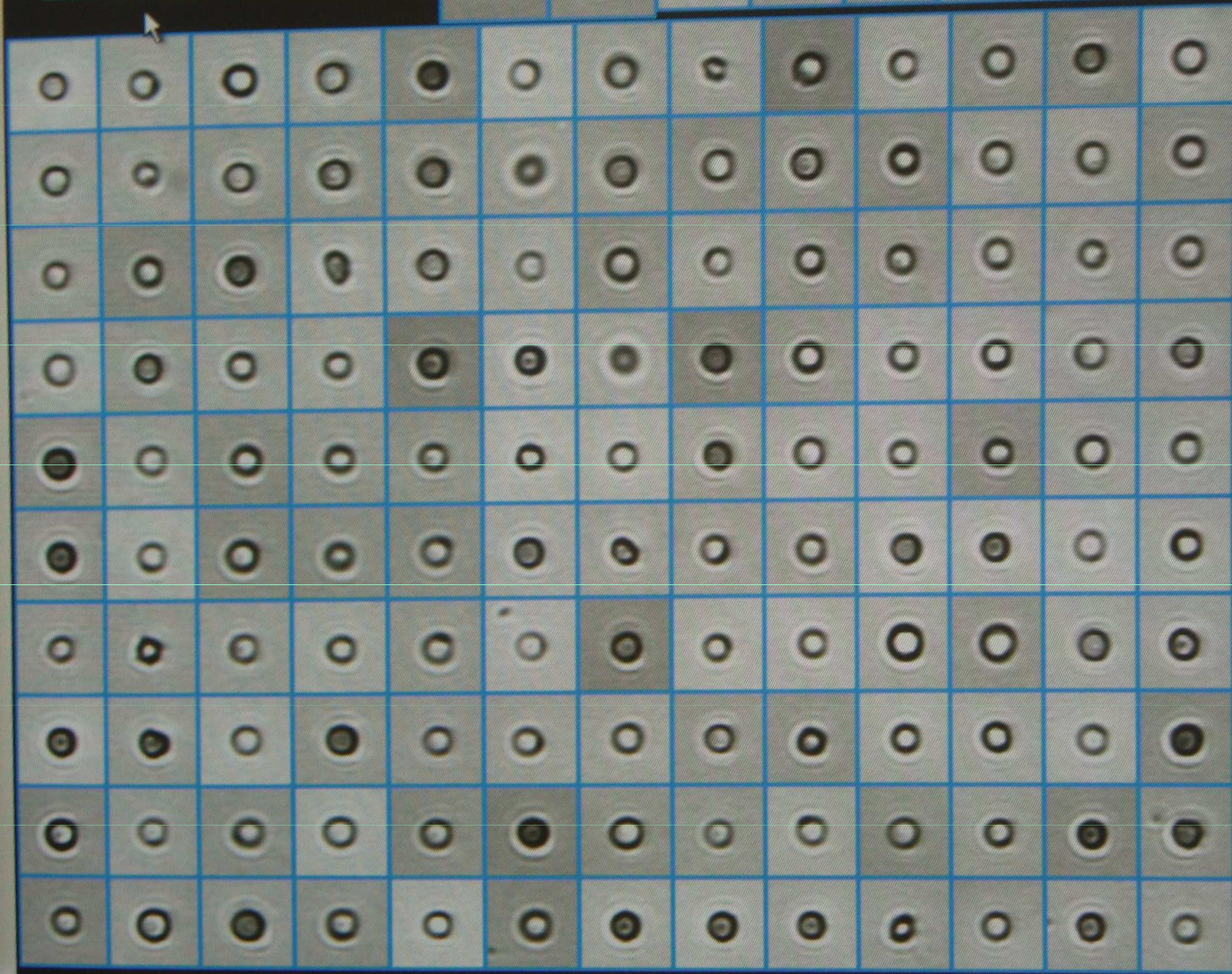
casts

hyalin casts

granular casts

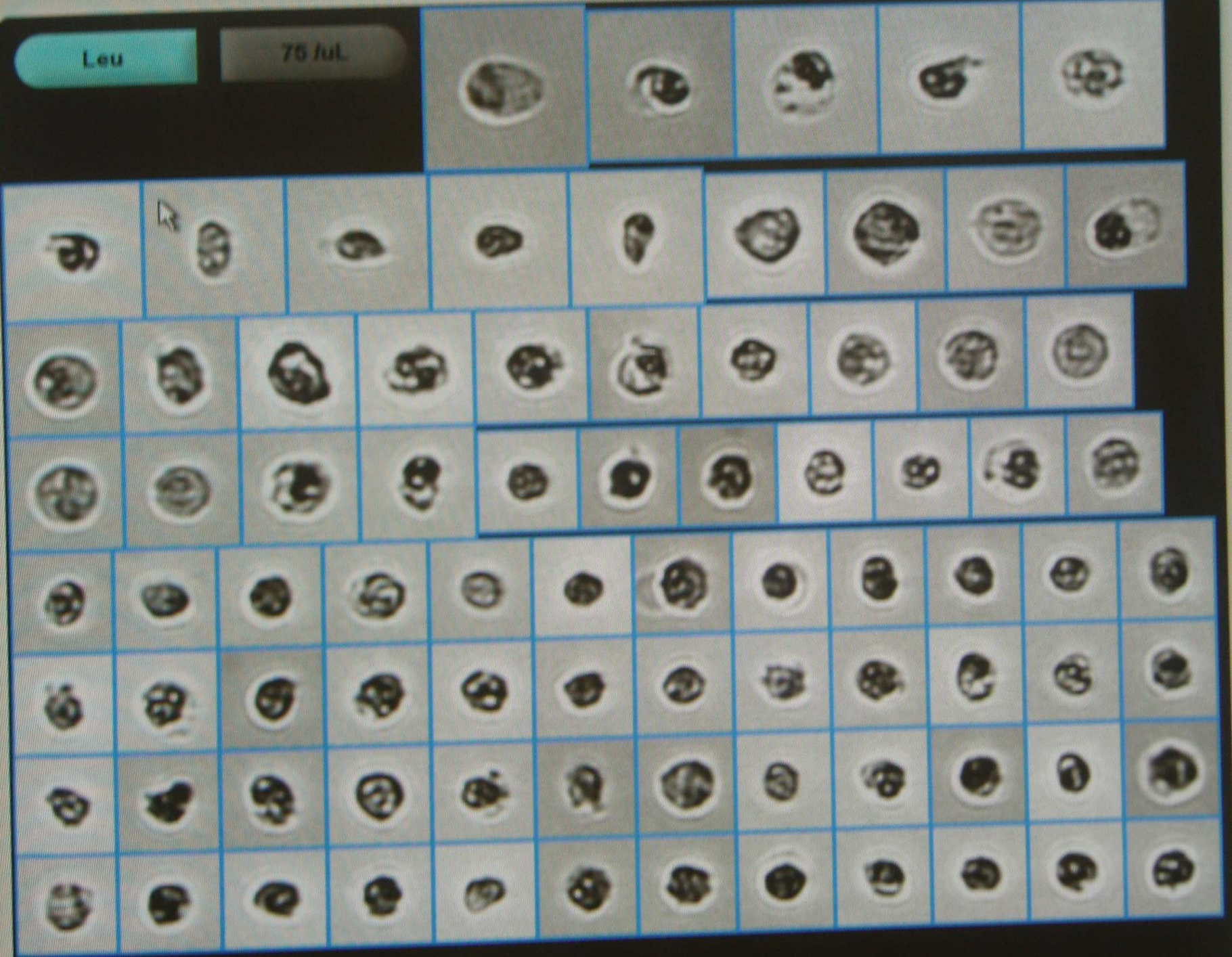
OPRAKOVATELNOST NA IQ200
 Močové moči se měří za pomoci optického měřicího systému a přenosného měřicího systému. Z výsledků měření je vhodné změnit vzorky do hodiny.
RYCHLOST ZPRACOVÁNÍ
 Měření moči lze provést v průběhu několika minut od okamžiku získání vzorku. Z výsledků měření je vhodné změnit vzorky do hodiny.
VÝZNAM ZKOUŠKY S KYSELINOU SULFOSALICYLOVOU
 Měření kyseliny kyseliny sulfosalicylové je vhodné s výsledkem bílkoviny stanoveno přístrojem AUTION Max zachyceno 1% vzorků.
ZÁVĚR
 • měření IQ 200 s měřicím systémem AUTION MAX IQ 4200 lze provádět za měření laboratorní
 • měření a výsledek měření lze poslat rovněž mikroprocesorem
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 • měření a výsledek měření lze poslat rovněž mikroprocesorem





Leu

75 μ L



STANDBY

Specimens

Found List

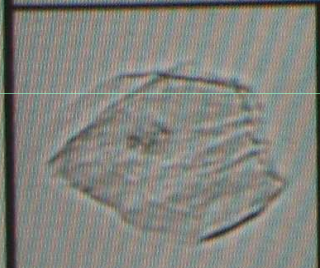
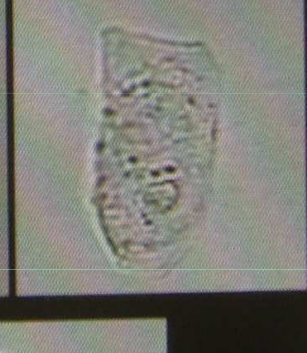
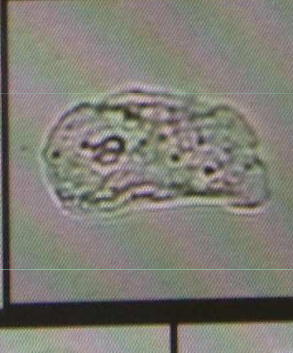
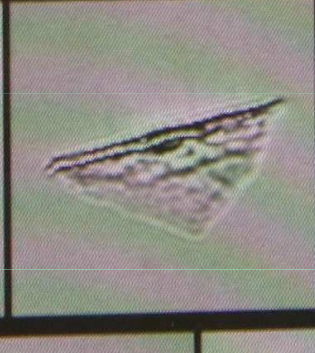
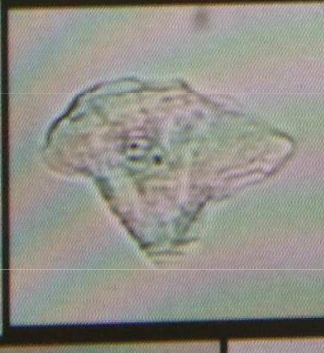
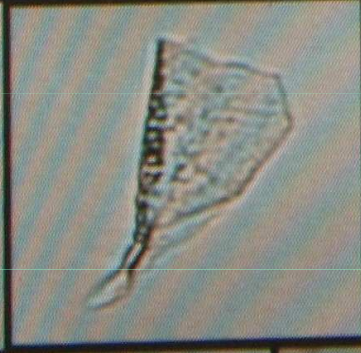
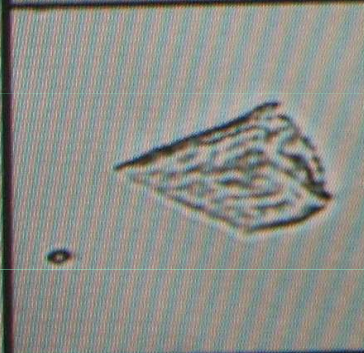
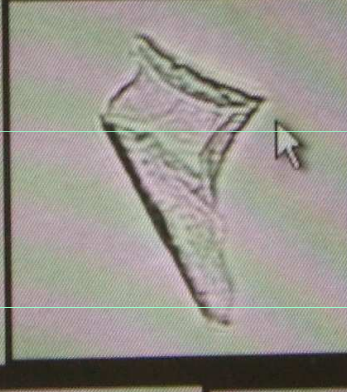
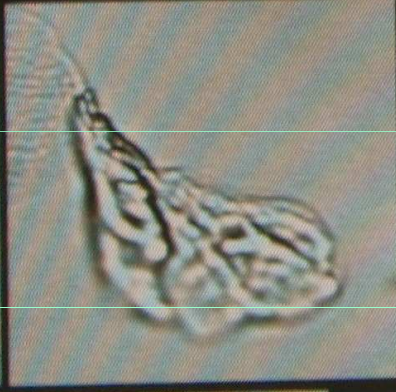
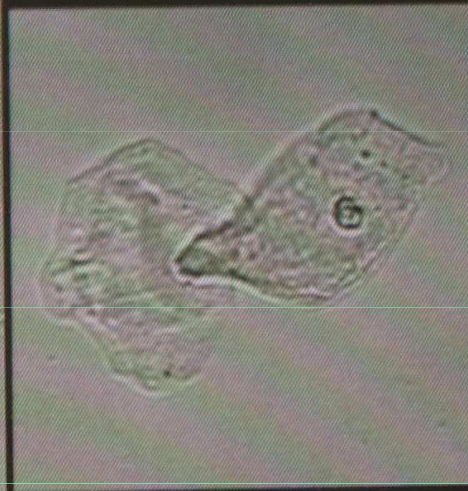
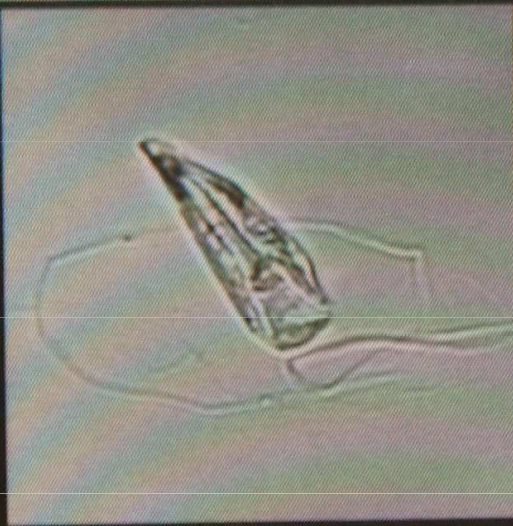
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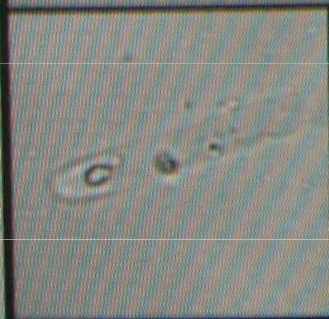
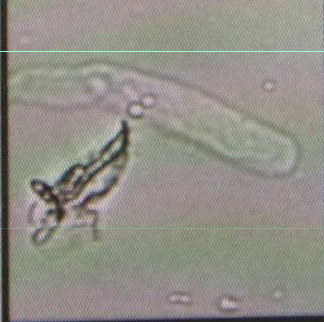
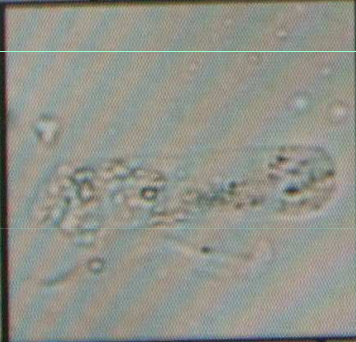
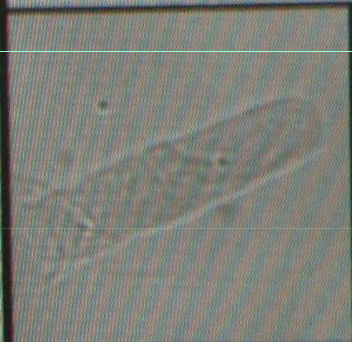
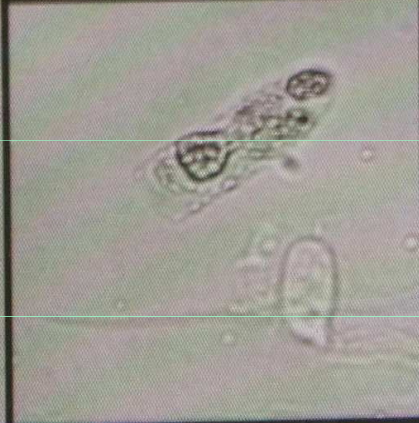
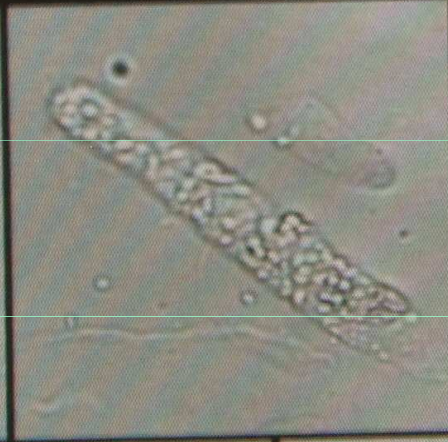
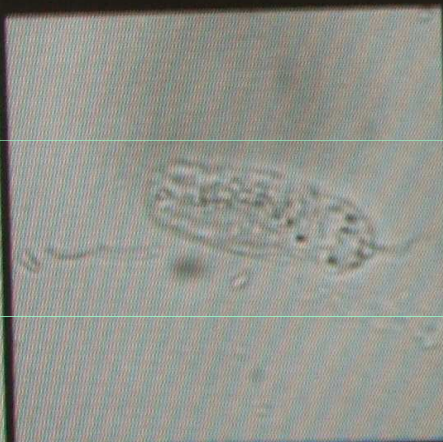
5 /uL



DI. epi.

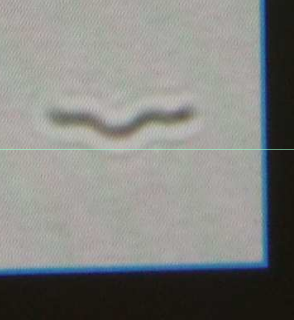
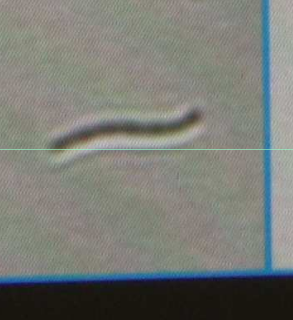
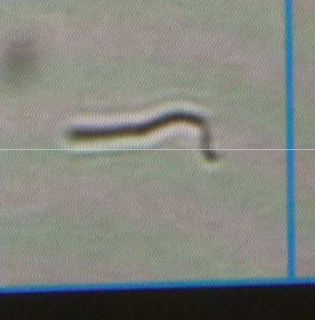
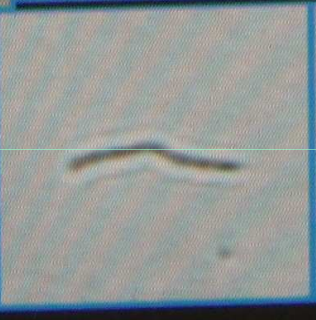
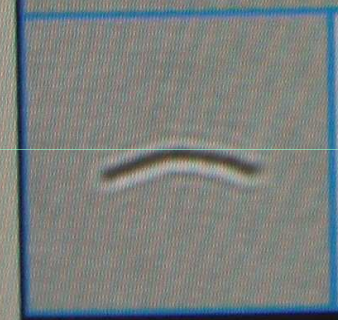
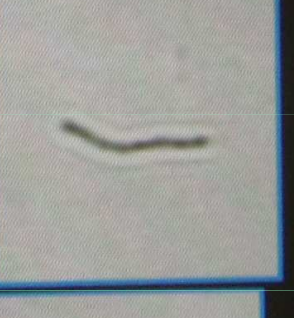
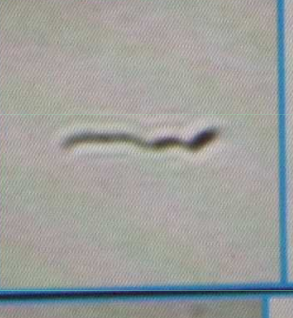
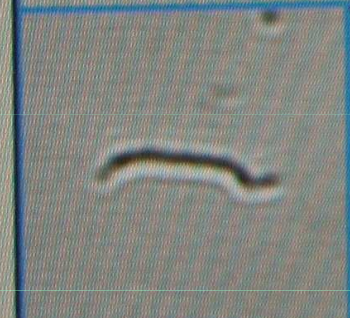
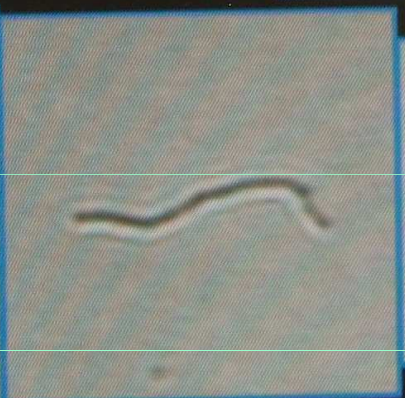
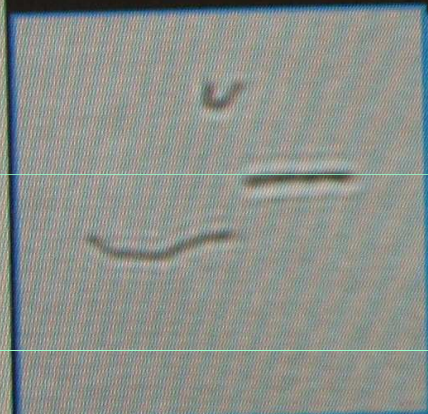
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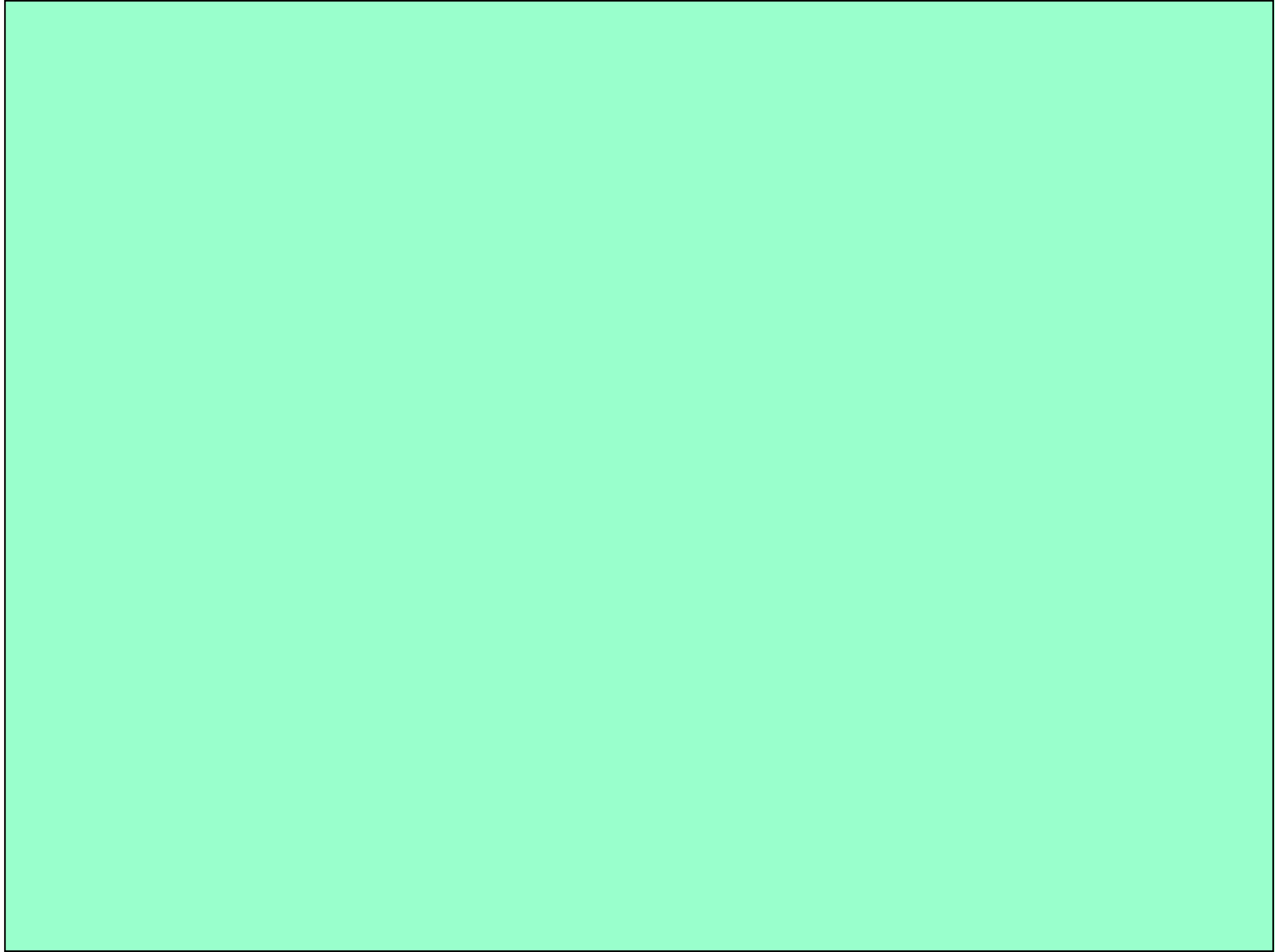




Bact

zaplava-B





Non-protein nitrogen substances

urea

creatinine

uric acid

Urea

(the end product of protein catabolism)

Conditions associated with increases of urea concentration in blood plasma

- high-protein diet
- high protein catabolism in the body
- decreases glomerular filtration from extrarenal causes
 - **kidney diseases**

Conditions associated with decreases of urea concentration in blood plasma

- hyperhydratation
- protein malnutrition
- liver failure

Creatinine

concentration in serum depends on:

- creatinine formation in muscles
- glomerular filtration in kidney

Uric acid

the end product of purine metabolism
(adenin, guanin)

Hyperuricaemia

- acute attack of gout
- increased nutritional purin uptake (entrails in diet)
- decreased uric acid excretion associated with renal insufficiency
- massive cellular breakdown (myeloproliferative disease under chemotherapy)

Functions tests

glomerular filtration rate (GFR)

concentrations capability of kidney

Glomerular filtration rate (GFR)

Creatinine clearance

$$Cl_{Kr} = \frac{U_{Kr} \times V_{[ml/s]}}{S_{Kr}} \times (1,73 / \text{body surface})$$

1,1 - 2,3 ml/s

Glomerular filtration rate (GFR)

M D R D

(Modification of Diet in Renal Disease)

- S-creatinine
- S-urea
- S-albumin
- age
- sex

Glomerular filtration rate (GFR)

CYSTATIN-C

All nucleated cells produce cystatin C
(cysteine proteinase inhibitor; protein 13,3 kDa)

CysC filters freely through the glomerular basement membrane

The serum concentration is dependent only
on the GFR

Concentrations ability of renal tubuli is tested by using of Adiuretin test.

two drops of Adiuretin are applicated intranasaly
urine is then collected in one-hour intervals (5h)
in urine samples is measured osmolality

age	urine osmolality (mmol/kg)
15-19	1090
20-29	1030
30-39	970
40-49	910
50-59	850
60-69	800

Common causes of acute renal failure

Prerenal

decreased intravascular volume

(dehydration, acute hemorrhages, acute heart failure, sepsis, shock)

Renal

acute tubular necrosis (drugs)

severe hemolysis, muscle trauma-crush syndrom

acute interstitial nephritis

Postrenal

ureteral or urethral obstruction

Diferencial diagnosis of oligoanuria

prerenal

renal

U-Na (mmol/l)	< 20	> 30 (70)
U-osmolality	> 400	< 350 (near S)
U-urea / S-urea	> 10	< 5

Differential diagnosis of acute and chronic renal insufficiency

	acute	chronic
S-urea	↑↑↑	↑↑
S-creatinine	↑	↑↑↑
B-hemoglobine	N	↓
S-anorg. P	↓	↑
S-calcium	N	↓

Laboratory indication to haemodialysis

S-potassium > 6.5 mmol/l

S-urea > 30 mmol/l

S-creatinine > 1000 μ mol/l

Anuria > 3-5 days

Serious metabolic acidosis

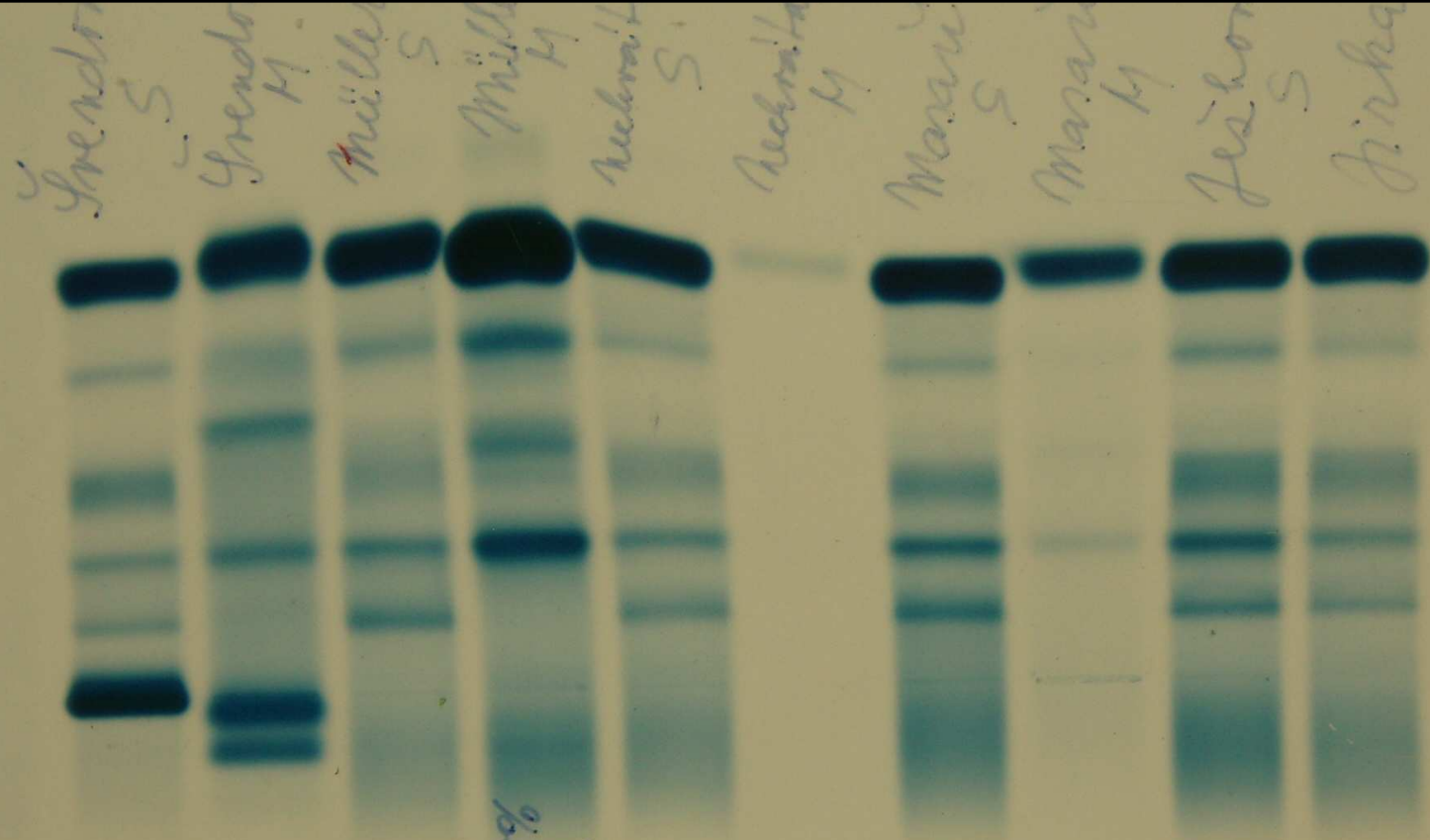
Hyperhydration with cardiac insufficiency

proteinuria

prerenal

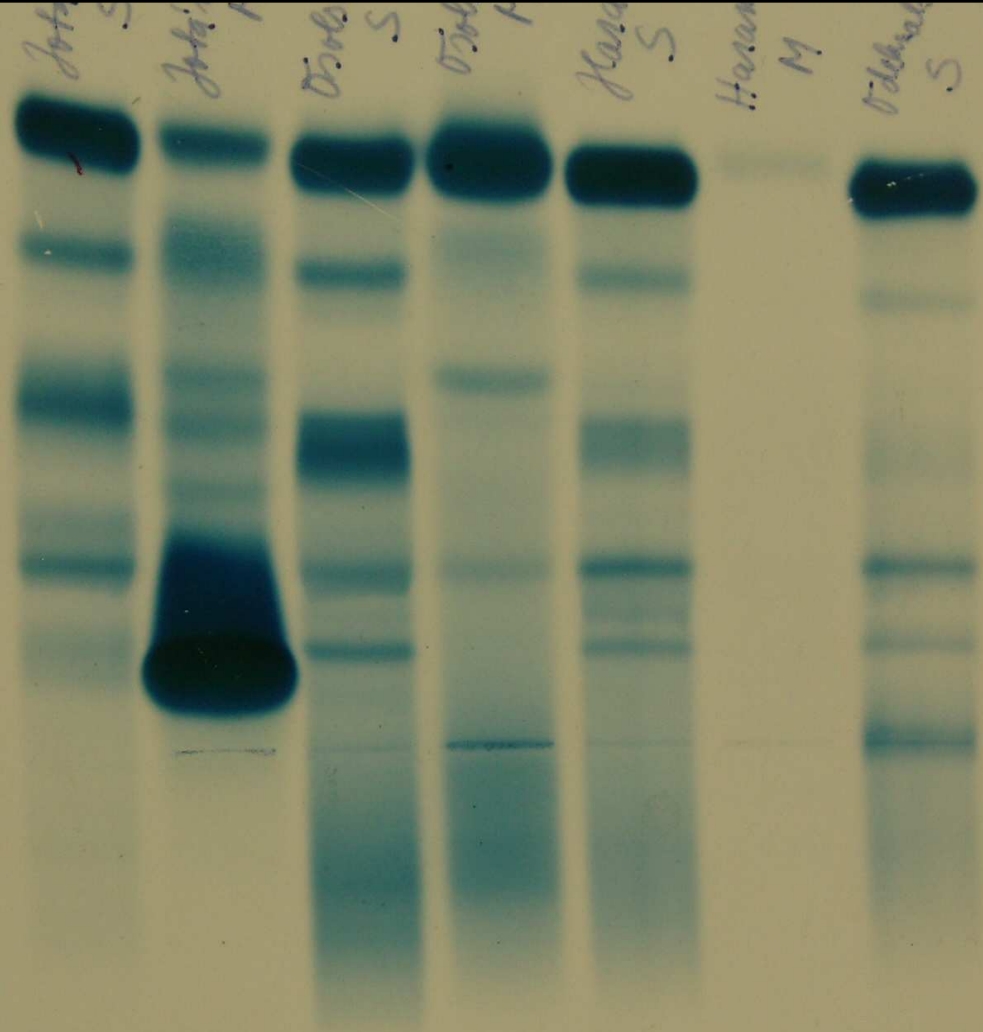
renal

postrenal



Sabüstenos 20%
 14 Monaster





	kind of proteinuria	typical proteins in urine
prerenal	over-flow	light chains κ, λ
renal	selective-glomerular	albumin.....transferin
	nonselective-glomerular	albumin.....transferin.... Ig....
	tubular	α_1 and β_2 mikroglobulin
postrenal	urinary tract inflammation	α_2 makroglobulin

Nitrogen balance

Energy expenditure and energy supply

Oxygen metabolism in the body

Nitrogen balance

$$\text{Proteins [g]} \times 0.16 = \text{Nitrogen [g]}$$

$$\text{Urea [mmol/24h]} \times 0.0336 = \text{Nitrogen [g]}$$

$$100\text{g protein} \times 0.16 = 16 \text{ g N}$$

$$\text{urea } 450 \text{ mmol/24h} \times 0.0336 = 15 \text{ g N}$$

extrarenal.....1-2 g N

