Proteinuria typing

To determine the type of proteinuria, it is necessary to know the spectrum of proteins excreted in the urine; **Electrophoretic methods** are used for this. Electrophoretic distribution of urinary proteins according to their molecular weight enables semi-quantitative evaluation of individual diagnostically significant proteins and **classification of proteinuria**. Agarose or polyacrylamide gel electrophoresis gradually became the method of choice for urine protein analysis.

In order to separate proteins according to size (and not according to charge), a polyacrylamide gel can be used, the density of which increases from the cathode to the anode (i.e. the "eyes" or "pores" in the gel gradually decrease). Small molecules in such a gel travel further than large molecules.

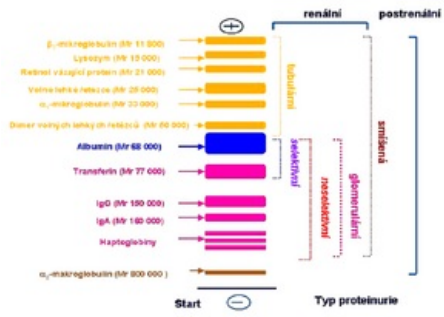
Another, more frequently used option is to treat the sample with the detergent **sodium lauryl sulfate** (sodium dodecyl sulfate – SDS), which "surrounds" the protein and replaces its own charge with its negative charge. The resulting complexes have approximately the same charge (more precisely: they have the same surface charge density). If electrophoresis is then carried out in a relatively dense gel, it is divided **depending on the relative molecular weight**: smaller molecules travel through the gel faster than large ones (molecular sieve technique). β_2-microglobulin moves the fastest , albumin lies about in the middle of the dividing path; between start and albumin, proteins with Mr higher than 70,000 are located 70 000.

Urine protein electrophoresis evaluation

In **glomerular proteinuria**, we find proteins in the electrophorogram between the start and albumin inclusive (i.e. Mr > 70 000).

Proteins seen in glomerular proteinurias

Mr			
Albumin	68 000	selective	non-selective
Transfferin	77 000	selective	non-selective
IgG	150 000		non-selective
IgA	160 000		non-selective
Haptoglobiny	85 000–1 000 000		non-selective



Typing of proteinuria by agarose gel electrophoresis in the presence of SDS

Tubular proteinuria is characterized by the presence of protein between albumin and the anodic end of the electrophorogram (ie, Mr < 70 000).

Protein seen in tubular proteinurias

	Mr
Beta-2-microglobulin	11 800
Lysozyme	15 000
Retinol binding protein (RBP)	21 000
Free Ig light chains	25 000
α_1-microglobulin	33 000
Dimer of free Ig light chains	50 000
Albumin	68 000

Mixed proteinurias are characterized by the presence of proteins demonstrated in both glomerular and tubular proteinurias, located both cathodically and anodically from the albumin strip.

The presence of **α_2-macroglobulin** (Mr = 800 000) with other findings similar to mixed proteinuria is suggestive of **postrenal proteinuria**.

Links

Related articles

- Proteinuria
- Proteins in serum and urine

External links

- Video on electrophoretic methods used in clinical biochemistry for the examination of proteins in serum and urine (https://el.lf1.cuni.cz/elektroforeticke_metody/)