

# Typification of proteinuria

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 purpose. Electrophoretic partitioning of urinary proteins according to their molecular weight allows semiquantitative evaluation of individual diagnostically significant proteins and **classification of proteinuria**. Electrophoresis in agarose or polyacrylamide gel has gradually become the method of choice for urinary protein analysis.

In order to separate the proteins by size (rather than charge), a polyacrylamide gel can be used, the density of which increases from the cathode to the anode (i.e., the mesh or pore size in the gel gradually decreases). Small molecules in such a gel travel further than large molecules.

Another, more commonly 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 separated **according to relative molecular weight**: smaller molecules travel through the gel faster than large ones (molecular sieve technique). It moves the fastest  $\beta_2$ -microglobulin, albumin lies about midway along the partition pathway; between the start and albumin are proteins with Mr greater than 70 000.

## Urinary protein electrophoresis evaluation

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

Proteins observed in glomerular proteinuria

	Mr		
Albumin	68 000	selective	non-selective
Transferrin	77 000	selective	non-selective
IgG	150 000		non-selective
IgA	160 000		non-selective
Haptoglobins	85 000–1 000 000 (tel:85+000–1+000+000)		non-selective

**Tubular proteinuria** are characterized by the presence of protein between albumin and the anodic end of the electrophoreogram (i.e. Mr < 70 000).

Proteins observed in tubular proteinuria

	Mr
$\beta_2$ -microglobulin	11 800
Lysozyme	15 000
Retinol binding protein (RBP)	21 000
Ig free light chains	25 000
$\alpha_1$ -microglobulin	33 000
Dimeric Ig free light chains	50 000
Albumin	68 000

Proteins observed in tubular proteinuria

Presence of  **$\alpha_2$ -macroglobulin** (Mr = 800 000) with other findings is similar to mixed proteinuria suggest **postrenal proteinuria**.

## Links

### Related articles

- Plasma and urine proteins
- Proteinuria

### External links

- Video about electrophoretical methods used in clinical biochemistry for diagnostic of proteins in plasma and urine ([https://el.lf1.cuni.cz/elektroforeticke\\_metody/](https://el.lf1.cuni.cz/elektroforeticke_metody/))