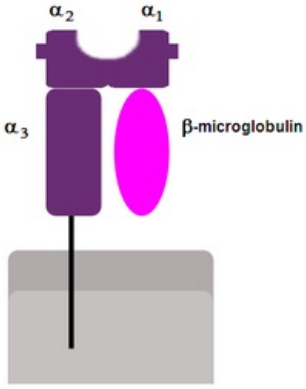
Beta-2-microglobulin

Beta-2-microglobulin *(β_2-microglobulin)* is a glycoprotein with a relative molecular mass of 11815 Da. It is part of the histocompatibility antigen (HLA) on the cell surface and is homologous to the constant region of immunoglobulin heavy chains. HLA antigens are major histocompatibility antigens that have an important role in intercellular interactions and cell recognition.



Structure of MHC I. class molecule

β_2-microglobulin is present on the surface of **all nuclear cells**, most frequently on **white blood cells** (mainly B lymphocytes. During cellular breakdown, β_2-microglobulin is released into blood plasma and excreted from the circulation mainly by glomerular filtration.

Examinated specimen

For the determination of β_2-microglobulin, **serum** (coagulable venous blood) is most commonly used. In addition, **urine** is examined (first-morning urine with a pH below 6.0 is not suitable). Eventually, cerebrospinal fluid is examined.

β_2-microglobulin stability

Urinary β_2-microglobulin decreases significantly at low pH. To obtain reliable analysis results, we need to keep the pH above 6.0. For uncollected urine, the first-morning sample, which usually has a pH lower than 6.0, is not suitable. Urine and serum can be stored for 24 hours at +2 to +8 °C, with longer storage at -20 °C.

Serum values

- High serum values are found especially in *lymphocyte-derived tumours* (lymphomas, multiple myeloma, leukaemia).
- β_2-microglobulin is more released into the blood plasma **during cell breakdown** (e.g.: after chemotherapy, during the inflammatory process), therefore β_2-microglobulin cannot be used for screening of malignant diseases.
- Serum β_2-microglobulin levels are also dependent on renal function. β_2-microglobulin is filtered by the glomerulus into the urine, where it is almost completely absorbed in the proximal tubule of the kidney. Thus, any **damage to the glomerulus** will cause a decrease in β_2-microglobulin filtration and this will be reflected in an increased serum concentration. On the other hand, in **tubular system** failure, β_2-microglobulin is not efficiently reabsorbed and its concentration in urine increases.
- Long-term elevated concentrations in serum, e.g. in dialysis patients, can be caused by **amyloidosis**.

Clinical importance of the determination

- **Cannot** be used as screening for malignant disease.
- Establishing a diagnosis - while searching for an unknown original tumour location.
- When a cancerous blood disease is suspected.
- Prognostic relevance in multiple myeloma - patients with elevated β_2-microglobulin concentrations have several times lower survival times than patients with normal concentrations.
- Monitoring the progress of the malignant disease and the success of its treatment.
- When renal failure is suspected.
- Monitoring patients after kidney transplantation - serum β_2-microglobulin concentration increases in renal allograft rejection.

Differential diagnosis of elevated values

- Multiple myeloma - a malignant disease caused by the malignant transformation of B-lymphocytes, their uncontrolled proliferation and differentiation into plasma cells.
- Chronic lymphocytic leukemia - a cancer disease characterized by proliferation and accumulation of clonal B-lymphocytes in the bone marrow, lymph nodes, spleen, liver and occasionally in other organs.
- Non-Hodgkin's lymphoma is a malignant cancer of B-lymphocytes.
- [[Renal insufficiency].
- Some systemic diseases - rheumatoid arthritis, Sjogren's syndrome, systemic lupus erythematosus.
- Sign of rejection after transplantation of the kidney.
- Some viral diseases - infectious mononucleosis, hepatitis.
- Seeding of some solid tumours.

Reference values

Male, Female:

- serum: 1,0–2,4 mg/l
- urine: 0–400 µg/l

The values are dependent on age and gender.

Methods of determination

- ELISA (Enzyme-Linked ImmunoSorbent Assay)

- RIA (Radio Immuno Assay)
- FIA (Fluorescence Immuno Assay)

Sources

Bibliography

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External links

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- Autor kapitoly: MUDr. Pavel Pick, Ústav klinické biochemie VFN a 1.LF UK Praha. Aktualizováno: 16. května 2012. Zdroj dostupný z WWW: http://www1.lf1.cuni.cz/~kocna/biochem/text4.htm