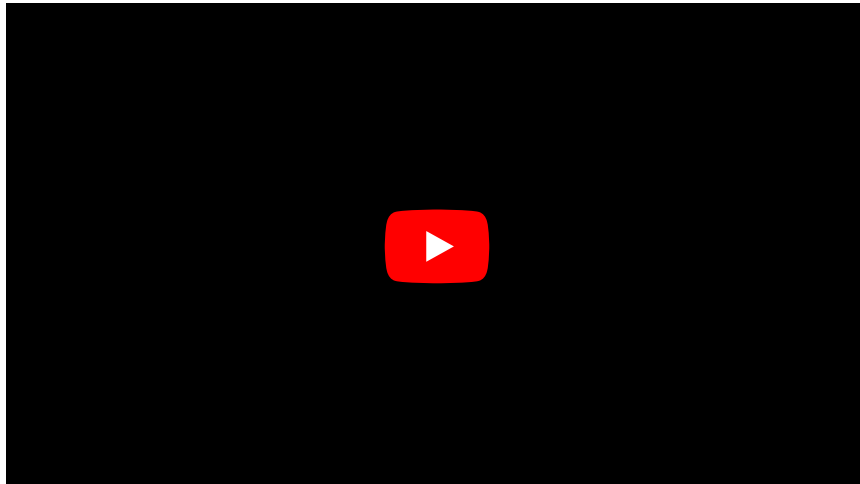


# Metabolic alkalosis

**MAL:**



Metabolic alkalosis is characterized by an increase in the concentration of standard bicarbonates. In principle, this may be due to:

- losses of an anion, usually chlorides or proteins, which are compensated in the ionogram by the addition of bicarbonates;
- an increase in the concentration of a cation, most often sodium.

## Alkalosis from anion losses

### Hypochloraemic alkalosis

It is accompanied, for example, by prolonged vomiting, in which a large amount of chloride anion is lost through vomiting gastric juice. Diuretics may be another cause of hypochloraemic alkalosis.

### Hypoproteinemia

Proteins behave like polyanions, so the decrease in their concentration is also compensated by the addition of bicarbonates. Typical examples may be liver proteosynthesis failure, protein loss in nephrotic syndrome, or malnutrition.

## Hypernatremic alkalosis

It is most often the result of hyperaldosteronism. Some adrenal tumors or other tumors producing this hormone lead to *primary hyperaldosteronism*. *Secondary hyperaldosteronism* is more common as a consequence of liver failure, as aldosterone is broken down in the liver. Another cause of secondary hyperaldosteronism may be overactivation of the renin-angiotensin-aldosterone system.

Elevated aldosterone levels cause the kidneys to retain more sodium, which is compensated in the ionogram by the addition of bicarbonate anion. In addition, sodium is being saved at the expense of increased urinary potassium and proton losses, leading to further deepening of alkalosis.

Sodium retention is also caused by corticosteroids, so metabolic alkalosis is accompanied by Cushing's syndrome.

## Alkalosis from an excess of other cations

Rarely, metabolic alkalosis can be caused by an excess of another cation, such as ionized calcium. It occurs, for example, in bone tumors (multiple myeloma, metastases of breast cancer, prostate cancer, etc.). During the breakdown of bone tissue, a large amount of  $\text{Ca}^{2+}$  as well as  $\text{HCO}_3^-$  is released.

## Liver failure

Liver failure is typically accompanied by metabolic alkalosis. Its causes are:

- hypoproteinemia in proteosynthesis failure;
- secondary hyperaldosteronism with sodium retention - aldosterone is normally broken down by the liver;
- slowing down the ureasynthetic cycle - a metabolic process that produces a proton for each molecule of urea formed.

## Links

## Related articles

- Parametry acidobazické rovnováhy
- Mechanismus udržování acidobazické rovnováhy
- Laboratorní vyšetření acidobazické rovnováhy
- Poruchy acidobazické rovnováhy
  - Metabolic acidosis
  - Respiratory acidosis
  - Respiratory alkalosis
  - Kombinované poruchy acidobazické rovnováhy
- Korekce a kompenzace poruch acidobazické rovnováhy
- Principy léčby poruch acidobazické rovnováhy
- Vztahy mezi acidobazickou rovnováhou a ionogramem

## References

- SCHNEIDERKA, Petr, et al. *Kapitoly z klinické biochemie*. 2. vydání. Praha : Karolinum, 2004. ISBN 80-246-0678-X.