

# Combined disorders of acid-base balance

**A combination of more acid-base disorders** can be seen in clinical medicine quite often. The following types of acid-base disorders can be combined: *metabolic acidosis* and *alkalosis* and *respiratory acidosis* and *alkalosis*. Individual disorders can sum up or cancel out. When acidosis is combined with alkalosis, the resulting pH may be normal, but severe acid-base disorder may still be present.

**The combination of metabolic acidosis and metabolic alkalosis** is very important: in *the examination for acid-base disorder according to Astrup (blood gas test)*, every single parameter may be normal or only slightly deviated. Therefore, the combined acid-base disorder may not be recognized or it may be underestimated. But a medical intervention that affects only one part of the disorders can cause that the other disorder quickly outweighs. This can lead to a steep change in the pH of the internal environment and severe metabolic breakdown.

Conditions leading to combined acid-base disorders are not uncommon. Typical examples may be:

## **vomiting and diarrhea**

vomiting leads to hypochloremic alkalosis, diarrhea to acidosis due to loss of bicarbonates

## **prolonged vomiting**

hypochloremic alkalosis in vomiting is combined with ketoacidosis caused by fasting and lactic acidosis from insufficient tissue perfusion in hypovolemia

## **hepatorenal failure**

combines hepatic metabolic alkalosis with renal acidosis

## **liver failure with respiratory insufficiency**

severe hypoproteinemia in liver failure leads to pulmonary edema, lactic acidosis develops due to hypoxia

## **renal failure with nephrotic syndrome and severe hypoproteinemia**

renal acidosis from sulfate and phosphate accumulation is accompanied by alkalosis in hypoproteinemia

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