

# Perspiratio insensibilis

**Perspiratio insensibilis** (*insensible perspiration*, *insensible water loss*, IWL) is the patient's unperceived fluid loss. It is mainly evaporation of water from the airways and evaporation of water through the skin. In contrast, easily observable (*sensible*) fluid losses are urination, stool, sweating, vomiting or drainage.

In a spontaneously ventilating person, perspiratio insensibilis consists of 60% skin and 40% airways. In a normally digesting person, perspiratio insensibilis is approximately equal to metabolic water (water produced chemically during nutrient processing). **It is therefore not necessary to account for perspiratio insensibilis in the water balance of such patients**<sup>[1]</sup>.

## Respiratory component

Respiratory vapour is produced when ambient air unsaturated with water vapour enters the moist airways, where it is heated and saturated with water vapour, then exhaled, cooled, the dew point drops and water precipitates out.

At an ambient air temperature of 24 °C and a relative humidity of 40 %, there is 8 g of water vapour in 1 m<sup>3</sup> of air. When this air enters the lungs it warms to 37 °C and becomes completely saturated with water vapour, but during the upper respiratory tract it cools to approximately 34 °C and retains its 100% humidity, leaving the body with approximately 36 g of water in 1 m<sup>3</sup>. Thus, for every m<sup>3</sup> of air exhaled under these conditions, the body loses 28 g of water<sup>[1]</sup>. For an accurate calculation, the minute tidal volume, ambient relative humidity, ambient air temperature and patient temperature matter.

With artificial pulmonary ventilation, the loss from the airways is reduced by precipitation of water in the tracheostomy or endotracheal cannula, and with the use of a humidifier it is practically minimized, since the air entering the airways is practically saturated with water vapour<sup>[1]</sup>.

## Skin component

Evaporation of water through the skin is the greater part of *perspiratio insensibilis*. It is related to *transepidermal water loss* (TEWL)<sup>[2]</sup>, but these are also affected by sweating and skin secretion in skin affections. It is mainly determined by body surface area (250 ml per m<sup>2</sup> of body surface per day) and ambient temperature (average patient in 24 hours 400 ml at 22 °C and 700 ml at 30 °C)<sup>[1]</sup>. It does not depend on the sex, age or temperature of the patient. However, if the patient's temperature is higher, fluid losses through sweat, which are not counted in perspiratio insensibilis, must be taken into account<sup>[1]</sup>.

## Measuring

Direct measurement is difficult. Daily measurements of the patient's weight can be made and the difference in perspiratio insensibilis determined. Furthermore, multifrequency bioelectrical impedance can be used.

## Calculation

Heat evaporation costs the body energy, so there is a relationship between metabolism and water loss. This is more appropriate in children and assumes a water consumption of 50 ml/100 cal a day<sup>[3]</sup>. For the average renal water loss, this is then 66.7 ml/100 cal/day, giving a total daily water intake in children of 116.7 ml for every 100 calories of energy intake. Approximately 16.7 ml of water per day is produced by the metabolism of 100 calories of nutrients (metabolic water), so a total water loss of approximately 100 ml/100 calories per day is required. Since the caloric intake is weight dependent, with 100 calories/kg/day for children 0-10 kg, 1000 calories + 50 calories/kg/day for children 10-20 kg, and 1500 calories + 20 calories/kg/day for children weighing more than 20 kg, the "4-2-1" rule was developed<sup>[4]</sup>:

- for the first 10 kg of the child, 4 ml/kg per hour of fluids are covered,
- for the second 10 kg of the child, 2 ml/kg per hour of fluids
- plus 1 ml/kg per hour of fluid.

In an adult patient, however, this approach is impractical and inaccurate. Approximately 250 ml per m<sup>2</sup> of body surface per day can be calculated. **As the body surface area to weight ratio does not vary much in adult patients, a value of 10 ml per kg per day can be used as a guide.**<sup>[1]</sup>

## Links

### Related articles

- Multifrequency bioelectrical impedance

- Effects of high temperatures on the body
- Water metabolism disorders
- Water in organism
- Internal environment (paediatrics)

## External links

- w:en:Transepidermal water loss

## Reference

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3. HOLLIDAY, M A – SEGAR, W E. The maintenance need for water in parenteral fluid therapy. *Pediatrics* [online]. 1957, vol. 19, no. 5, p. 823-32, Available from <<https://www.ncbi.nlm.nih.gov/pubmed/13431307>>. ISSN 0031-4005.
4. MCNEIL-MASUKA, J – BOYER, TJ. *StatPearls : Insensible Fluid Loss* [online] . July 10, 2019 edition. StatPearls Publishing, 2019. Available from <<https://www.ncbi.nlm.nih.gov/books/NBK544219/>>. ISBN NBK544219.