

M U N I
M E D

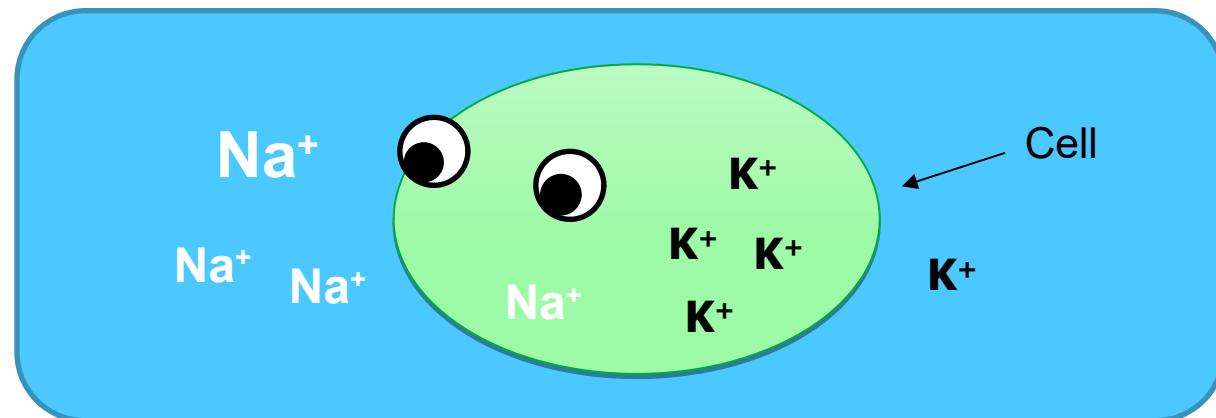
Electrolytes disturbances – Na, K

Martin Janků

Learning outcomes

- ❑ Student identifies Na & K disturbance
- ❑ Student names symptoms and possible causes of these disturbances
- ❑ Student is able to discuss the basic principles of Na & K disturbances therapy

The norm



Na^+

135-145 mmol/l

Mostly extracellular

K^+

3,5-5,3 mmol/l

Mostly intracellular

Hydratation

pH

Hyponatremia

!Correction too fast – pontine myelinolysis risk!

Na < 135 mmol/l

Na < 125mmol/l → symptoms (neuromuscular, CNS)

⌚ muscle weakness

Diff. diagnostics, careful treatment (p.o./IV)

⌚ nausea

⌚ vomiting

Aggresive treatment – 3%NaCl IV → till sympt. subside

⌚ loss of consciousness, cramps

+

causal therapy (eg.)

- water restriction
- thiazide withdrawal
- mineralocorticoids substitution

HYPOONATREMIA HIPPO-SALT-SHAKER

HYPOVOLEMIA
HIPPO-VOLUME-CUP

Na⁺

H₂O

RENAL LOSSES
KIDNEY LOSS

DIURETICS
DIE-ROCKET

MINERALCORTICOID
MINERALS BROKEN

RENAL TUBULAR ACIDOSIS
KIDNEY TUBA ACIDIC-LEMON

CEREBRAL SALT
WASTING
BRAIN WASTING SALT

EXTRARENAL LOSSES
OUTSIDE KIDNEY LOSS

DIARRHEA
TOILET

VOMITING
VOMIT

PANCREATITIS
PANCREAS-ON-FIRE

POOR INTAKE
EMPTY SALT-SHAKER

EUVOLEMIA
EVEN-VOLUME-CUP

H₂O

VEN

GLUCOCORTICOID DEFICIENCY
GLUE-QUARTER ON STEROIDS BROKEN

TEA AND TOAST
TEA AND TOAST

PSYCHOGENIC POLYDIPSIA
POLLY-DIPPER

CHRONIC MALNUTRITION
(RESET OSMOSTAT)
CRONE WITH NUTRITIONAL-MALLET

HYPOTHYROIDISM
HIPPO-THIGH-DROID

SIADH
INAPPROPRIATE ANT-TIE
DIE-ROCKET

BEER POTOMANIA
BEER POT

NEPHROTIC SYNDROME
NERD-FROG

CARDIAC FAILURE
DEAD HEART

CIRRHOsis
C-ROSES LIVER

HYPERVOLEMIA
HIKER-SALT-SHAKER

Na⁺

H₂O

ACUTE RENAL FAILURE
DEAD ACUTE-ANGLE KIDNEY

CHRONIC RENAL FAILURE
DEAD CRONE KIDNEY

Hypernatremia

Na > 145mmol/l → **symptoms** (thirst → confusion, nausea)

Na > 155mmol/l → higher mortality rates

Therapy – free water substitution

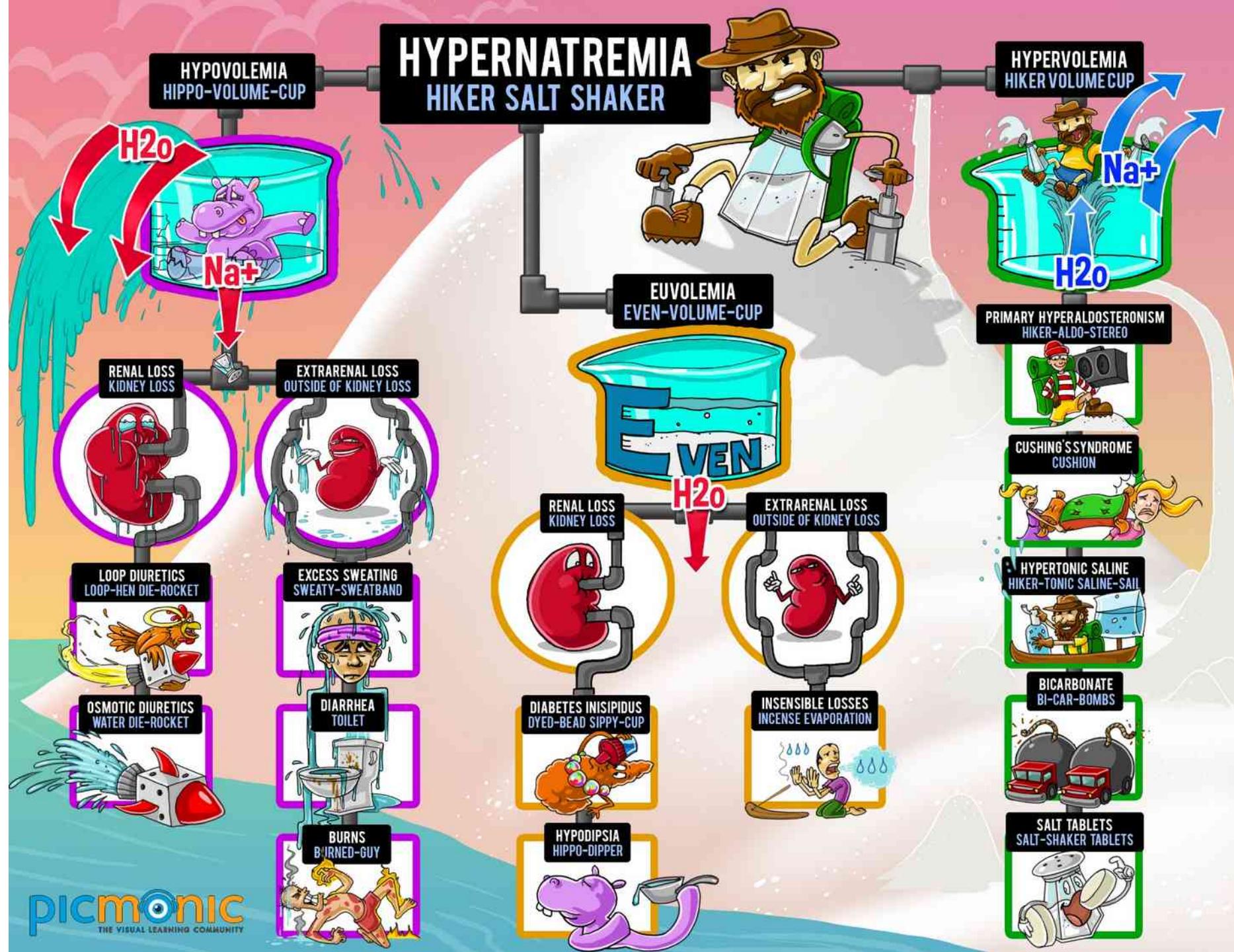
p.o. / 5%G / N/S ½

$$\text{Deficit H}_2\text{O} = \text{CTV} \left(\frac{1-140}{\text{S Na}^+} \right)$$

(CTV = men 0,6 x BW, women 0,5 x BW)

slowly – max. ↓Na by 0,5mmol/l/h

https://cdn.picmonic.com/pages/wp-content/uploads/2016/04/electrolyte_abnormalities_hyponatremia.jpg



MUNI
MED

Hyperkalemia

⌚ $K > 5,6 \text{ mmol/l}$ → symptoms

⌚ cardio

⌚ ECG

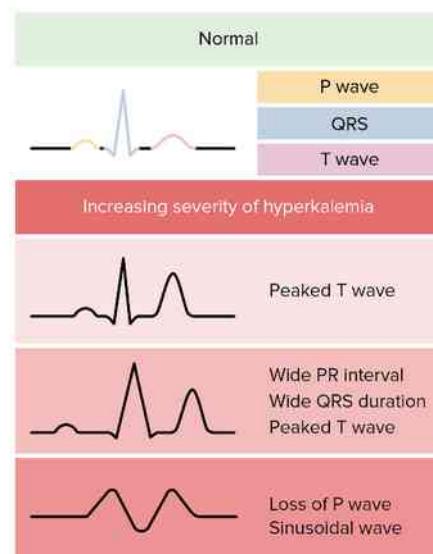
⌚ arrhythmias

⌚ bradycardia

⌚ muscle weakness

⌚ paresthesias

⌚ confusion



<https://cdn.lecturio.com/assets/Hyperkalemia-EKG-936x1200.png>

Therapy

⌚ calcium gluconicum/chloratum IV ❤️

⌚ salbutamol nebulization

⌚ furosemid IV + fluids

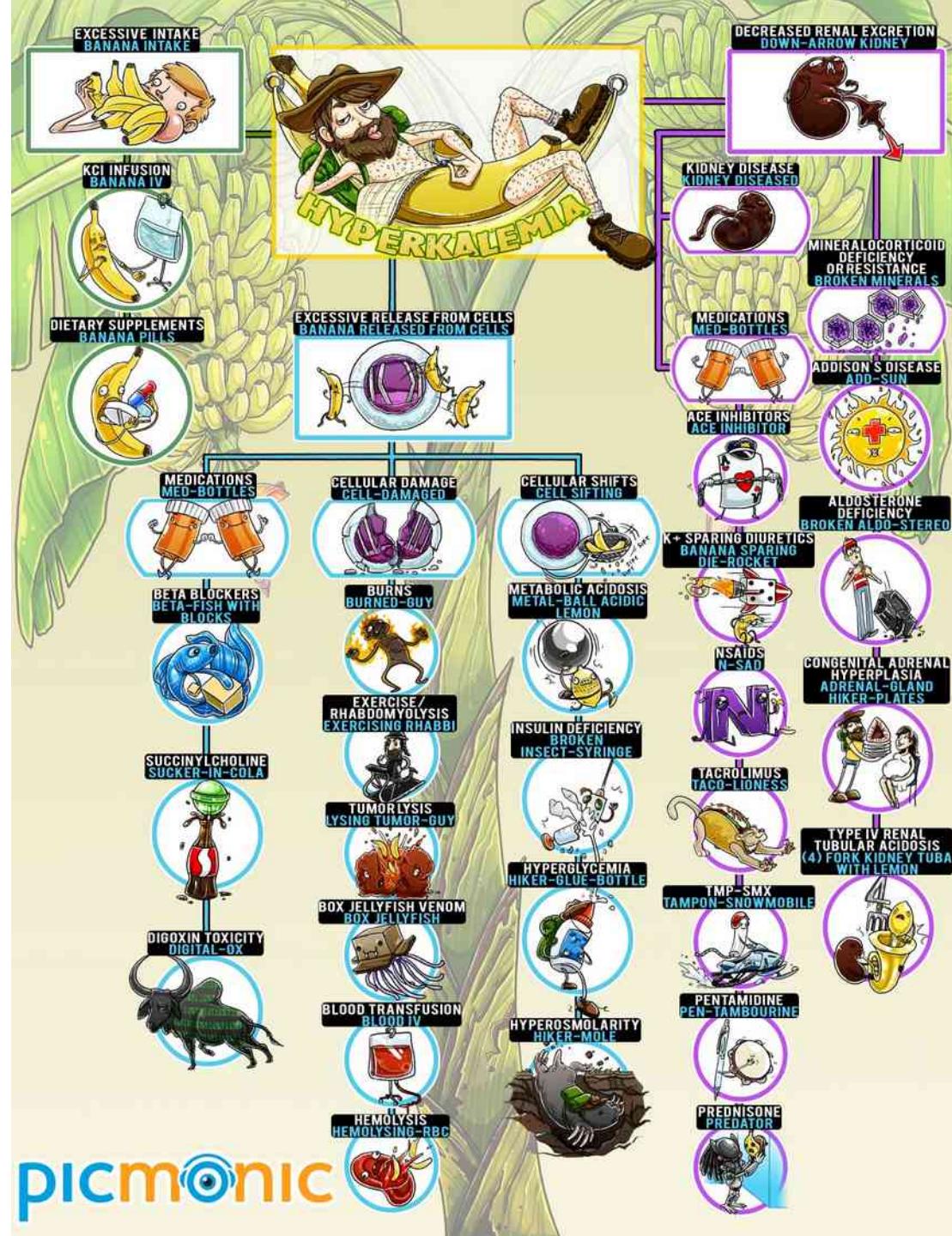
⌚ sodium bicarbonate (acidosis)

⌚ G10% + insulin

⌚ calcium resonium

⌚ hemodialysis

https://cdn.picmonic.com/pages/wp-content/uploads/2016/04/IM_INFO_Hyperkalemia_C1.7.jpg



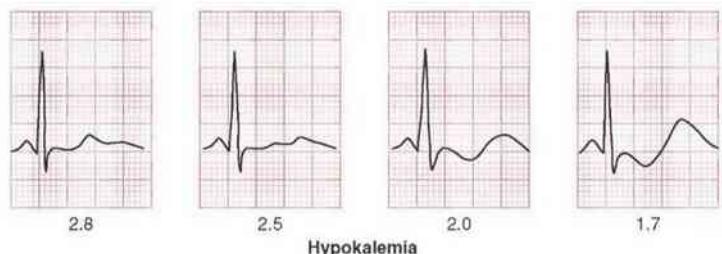
MUNI
MED

Hypokalemia

↳ K < 3,5 mmol/l → symptoms

↳ cardio

↳ ECG



↳ muscle weakness, cramps

↳ GIT motility disturbances

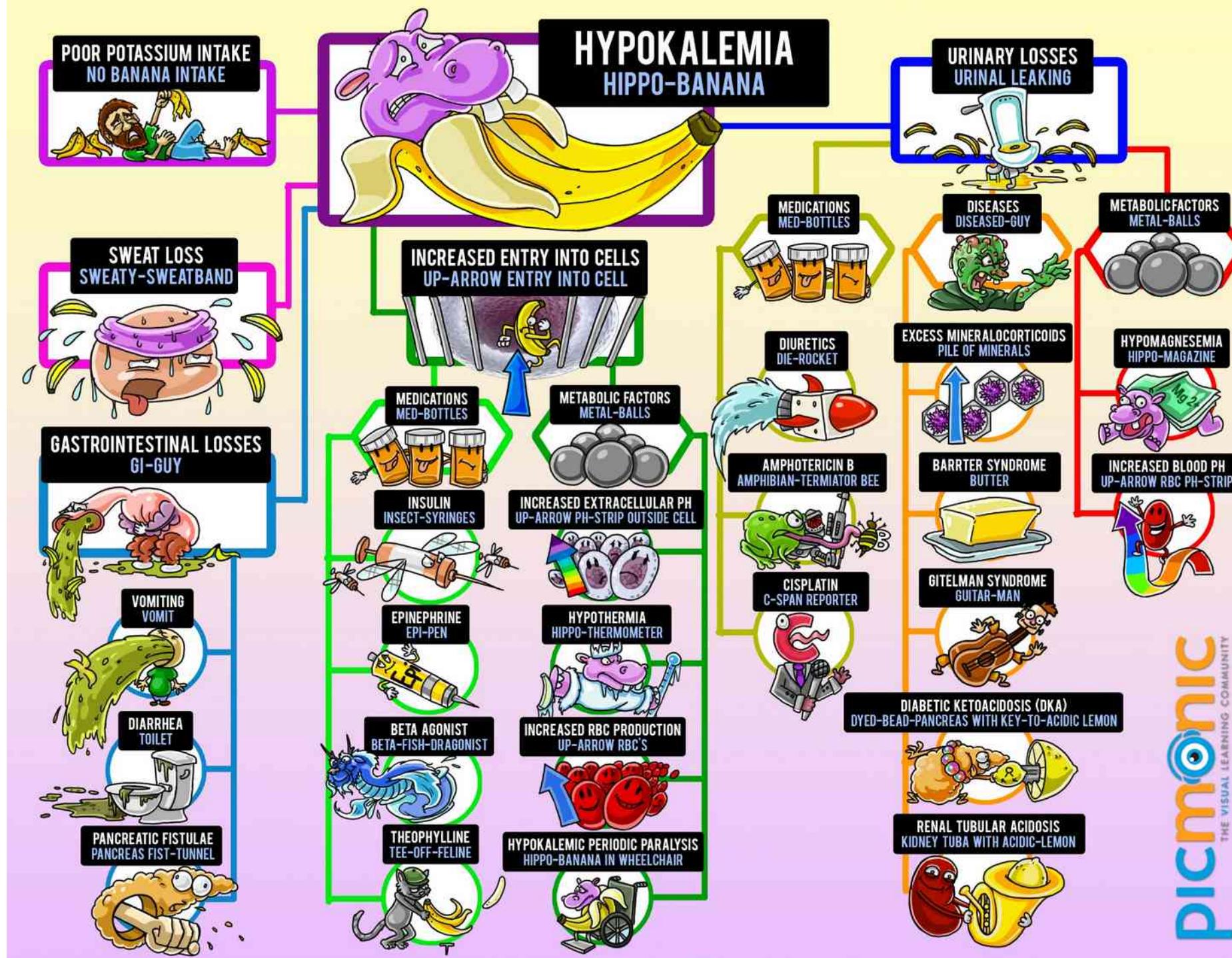
↳ fatigue

<http://what-when-how.com/wp-content/uploads/2012/04/tmp1421111.jpg>

Therapy

↳ p.o. Kalnormin

↳ IV KCl 7,45% max 30ml/1000ml N/S



Take home message

- Normal **natremia** is 135-145 mmol/l
- Normal **kalemia** is 3,5-5,6 mmol/l
- Natremia is highly dependent on **hydratation** of the body
- Kalemia is tightly associated with plasmatic **pH**
- Acute symptomatic hyponatremia should be treated aggressively till the symptoms subside, chronic/asymptomatic slowly and carefully
- Patients with hypo/hyperkalemia have characteristic ECG changes

MUNI MED

Lékařská fakulta Masarykovy univerzity
2021