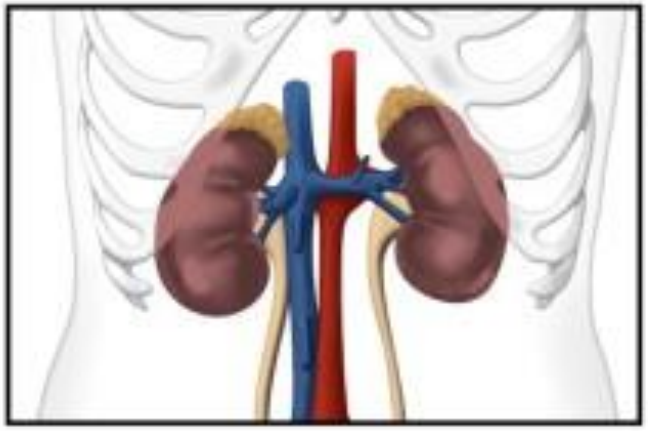
Universidade de São Paulo
Faculdade de Odontologia de Ribeirão Preto
Faculdade de Ciências Farmaceuticas de Ribeirão Preto

Regulação do Volume e da Osmolaridade do Líquido ExtraCelular (LEC)

Luiz Guilherme de Siqueira Branco

Localização estratégica e fluxo sanguíneo



Débito cardíaco = 5 l/min

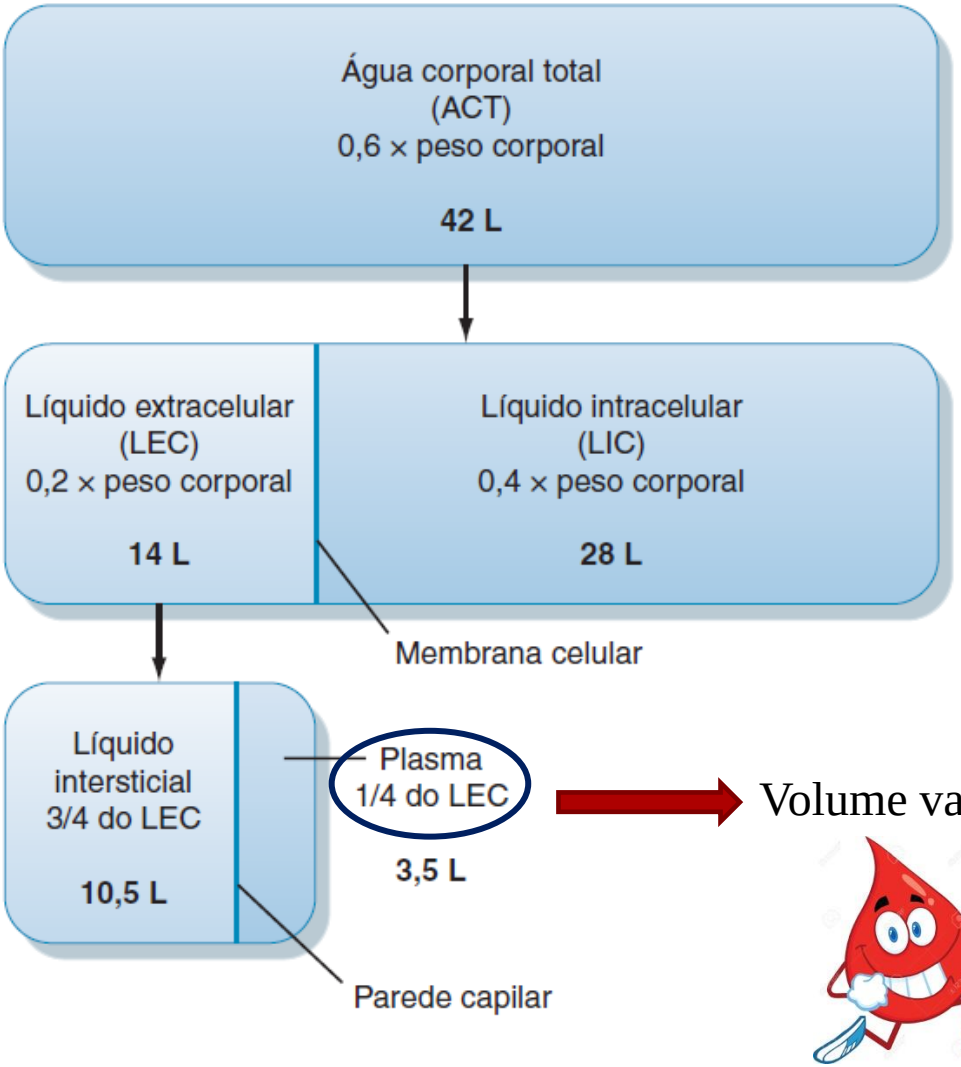
→ 25% → 1,25 l/min

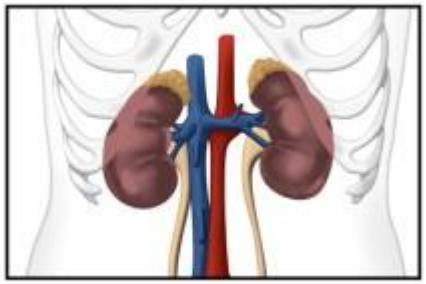
Massa corporal = 70 kg

→ < 0,5% → 115 – 170 g

Massa rim

Anatomia do rim. Ilustração: OpenStax College / Rice University. Disponível em: http://www.infoescola.com/sistema-urinario/rim/. Acesso em maio/2017.



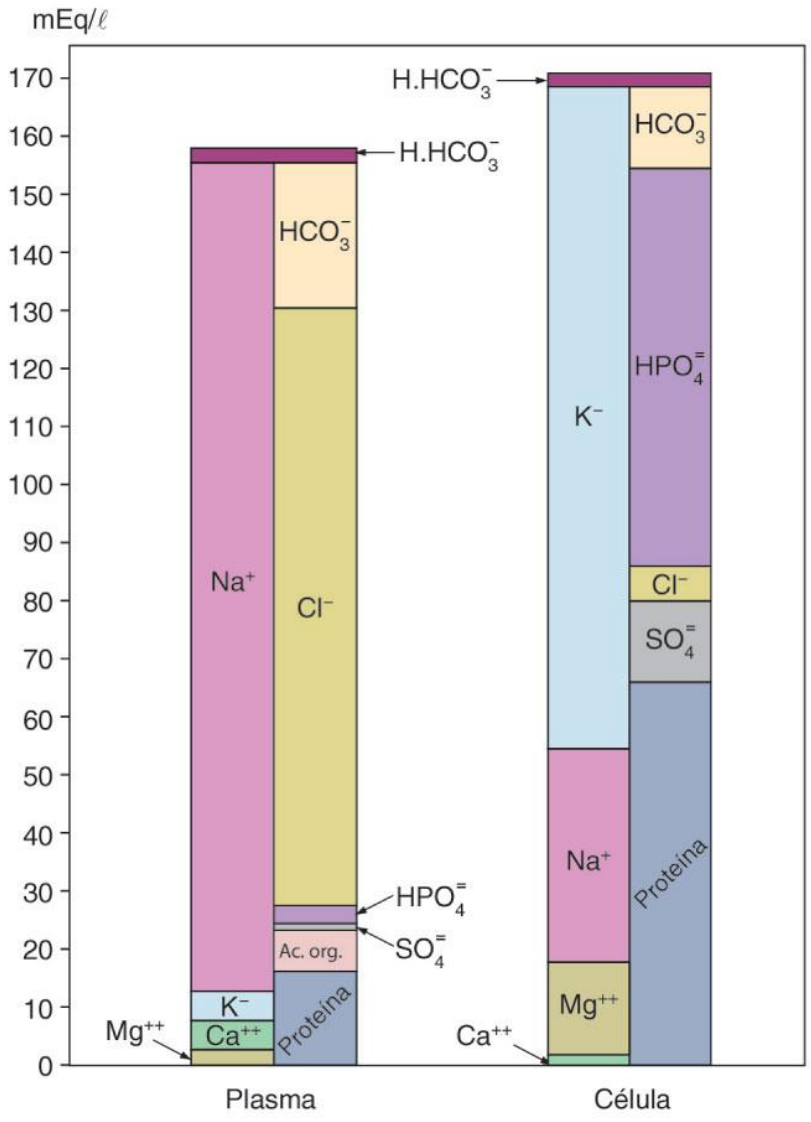


PA = DC x RVP

DC = FC x VS

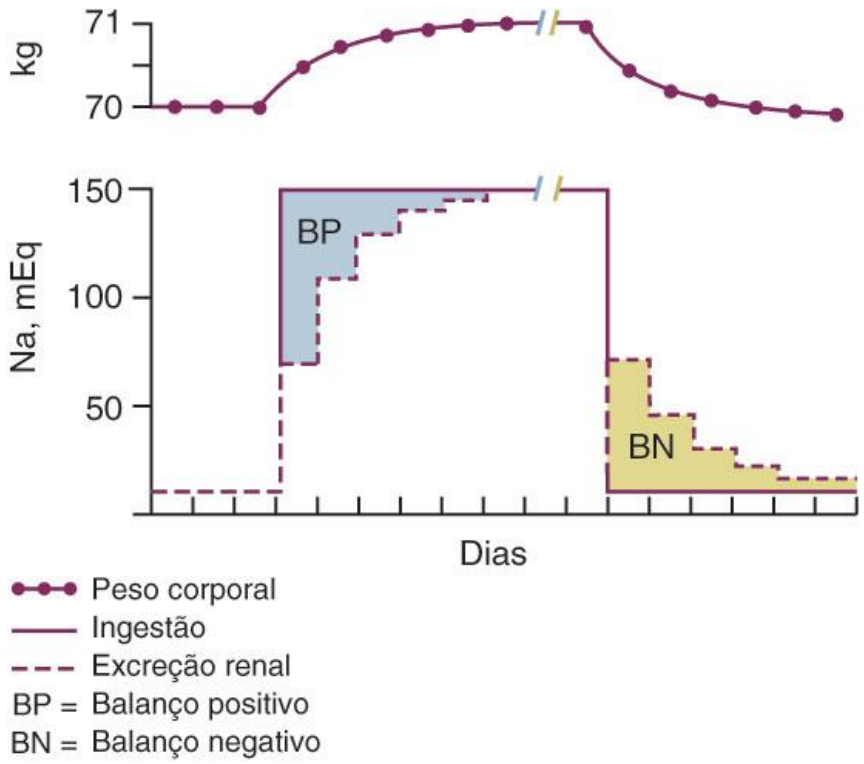
Volume vascular

Fisiologia. Berne e Levy, 6ª ed.

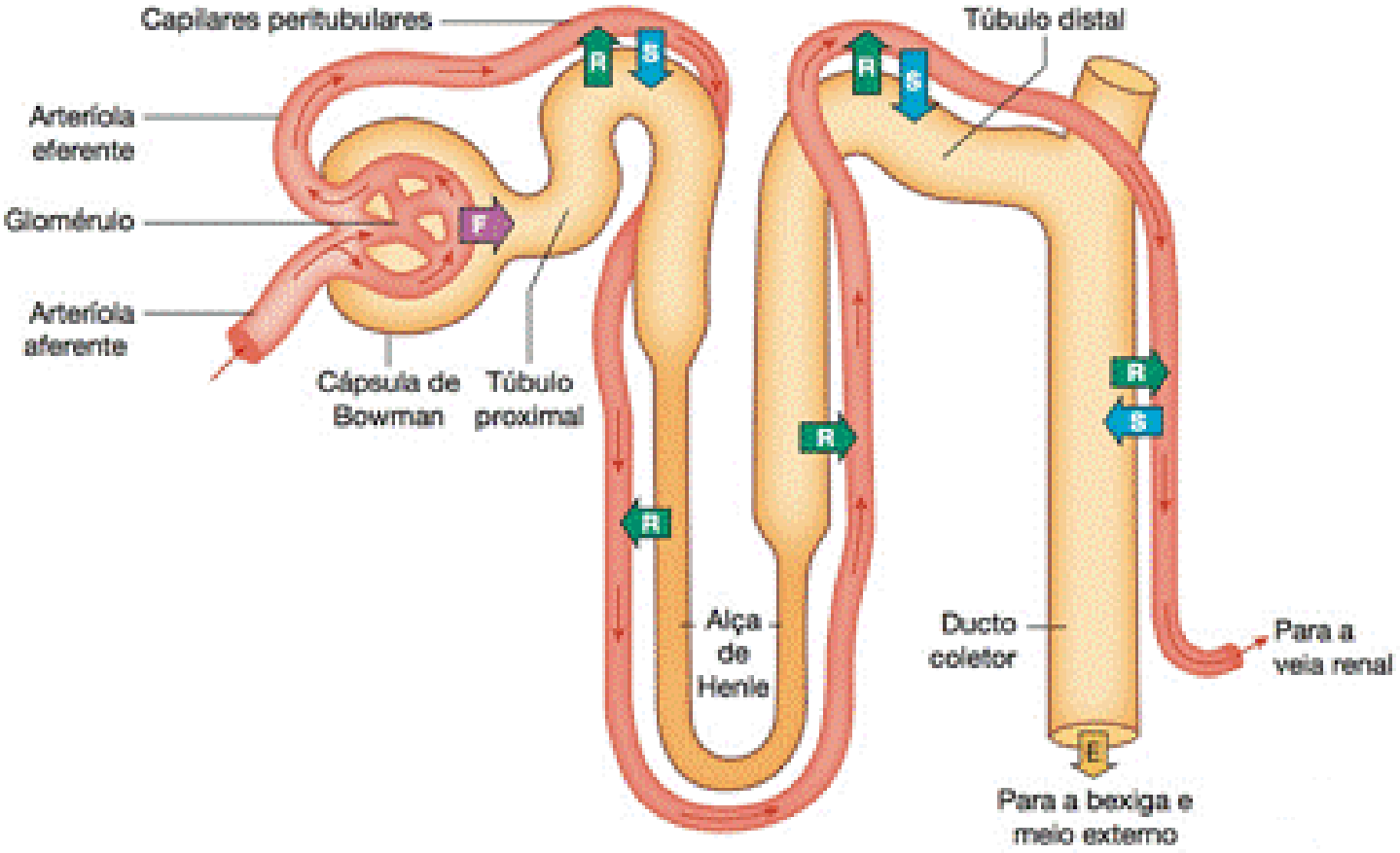

mEq/ℓ
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
H.HCO3−
H.HCO3−
HCO3−
Na+
Cl−
HPO4=
SO4=
Ac. org.
K−
Mg++
Ca++
Proteína
Plasma
H.HCO3−
HCO3−
HPO4=
K−
Cl−
SO4=
Na+
Proteína
Mg++
Ca++
Célula

- Ingestão > excreção (balanço positivo de sódio) = ↑ VLEC
  → rins ↑ eliminação de sal e água pela urina

- Ingestão < excreção (balanço negativo de sódio) = ↓ VLEC
  → rins ↓ eliminação de sal e água pela urina (↑ retenção)



Filtração, reabsorção, secreção e eliminação

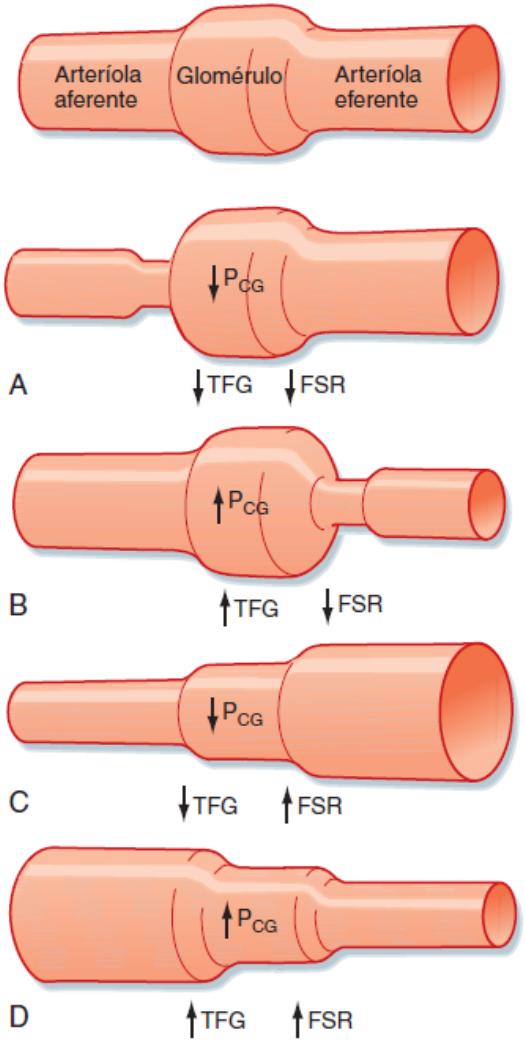


Disponível em: https://nutrisdoexercicio.files.wordpress.com/2013/06/1.gif . Acesso em: maio/2017.

As funções renais são dependentes do movimento de fluido e solutos pelos e através dos túbulos glomerulares. Tal movimento é dependente das FORÇAS DE STARLING!

Filtr. Glom. = Kf [Phcg – (Phcb + π)]

A TFG é diretamente dependente da Phcg!

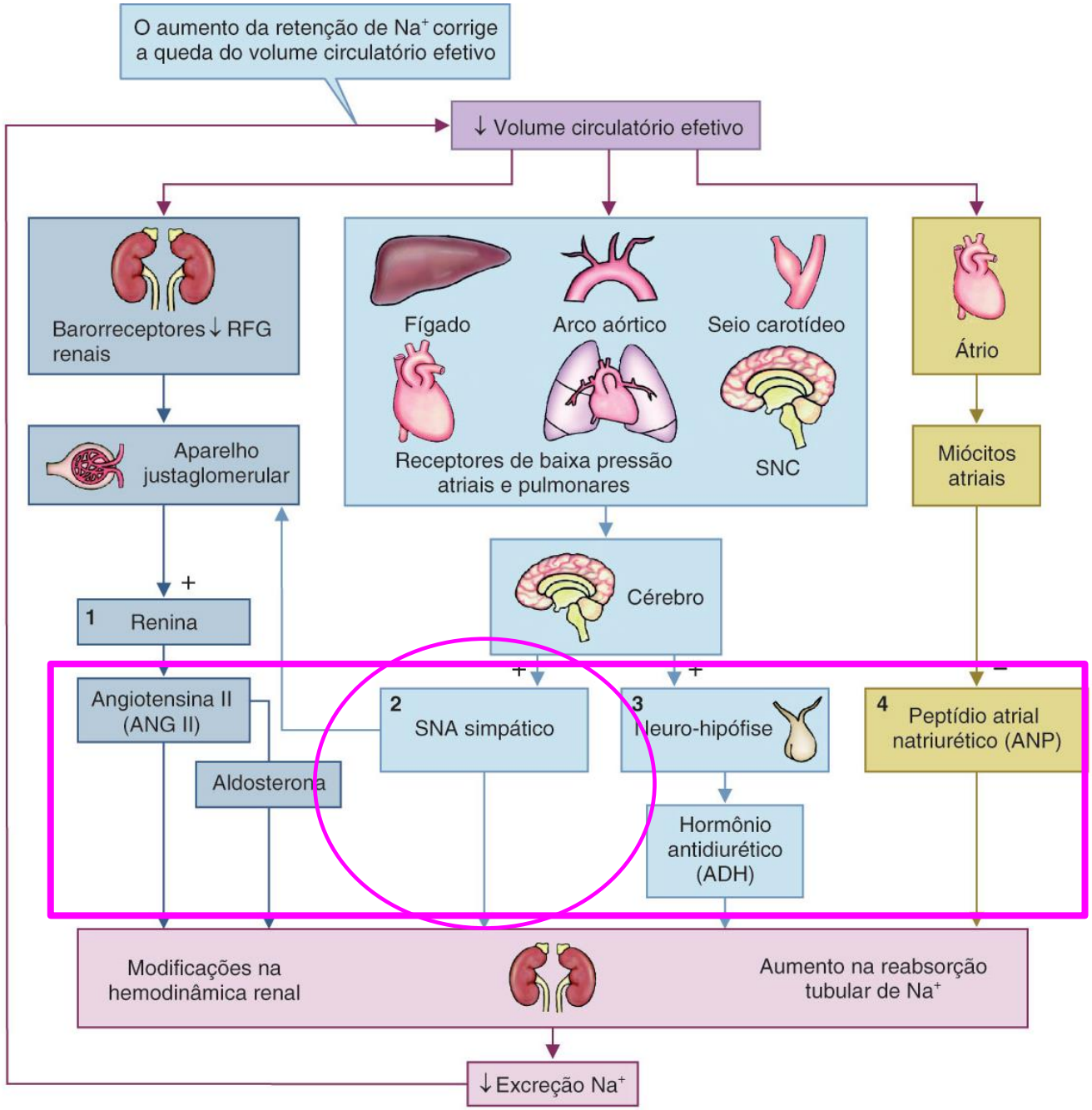


Fisiologia. Berne e Levy, 6ª ed.

SENSORES

Tabela 34-4. Volume e Sensores de Na^+

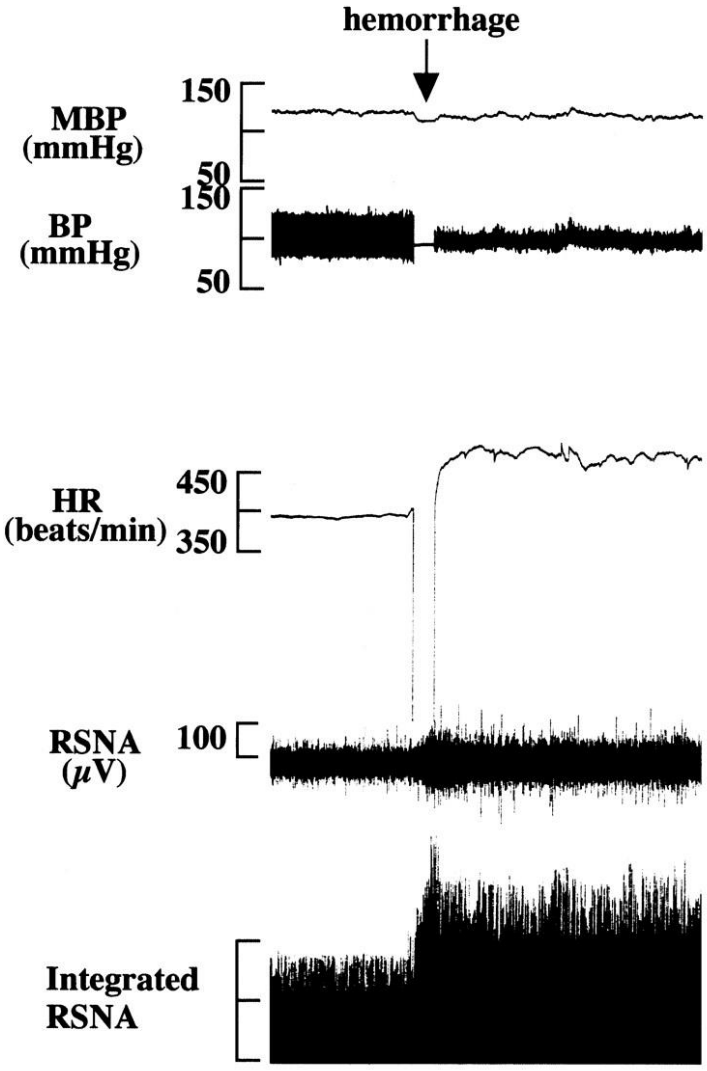
I. Vascular
A. Pressão baixa
1. Átrio cardíaco
2. Vasculatura pulmonar
B. Pressão alta
1. Seio carotídeo
2. Arco aórtico
3. Aparelho justaglomerular do rim
II. Sistema nervoso central
III. Hepático



SENSORES

EFETORES

Atividade simpática renal



Yoshihide Fujisawa, et.al. 1999.

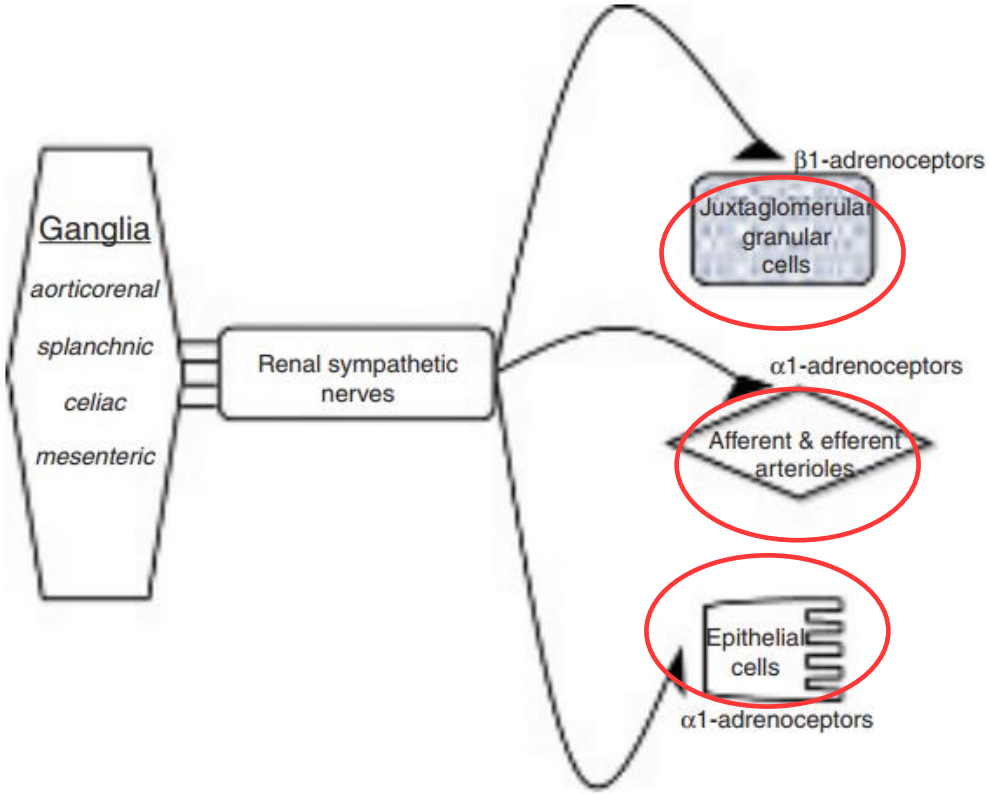
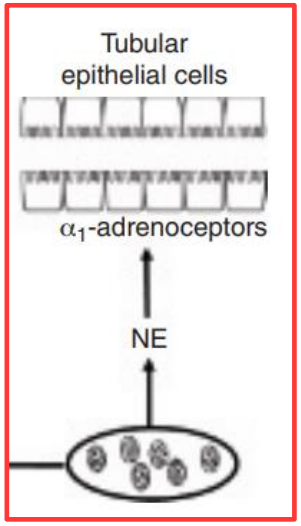
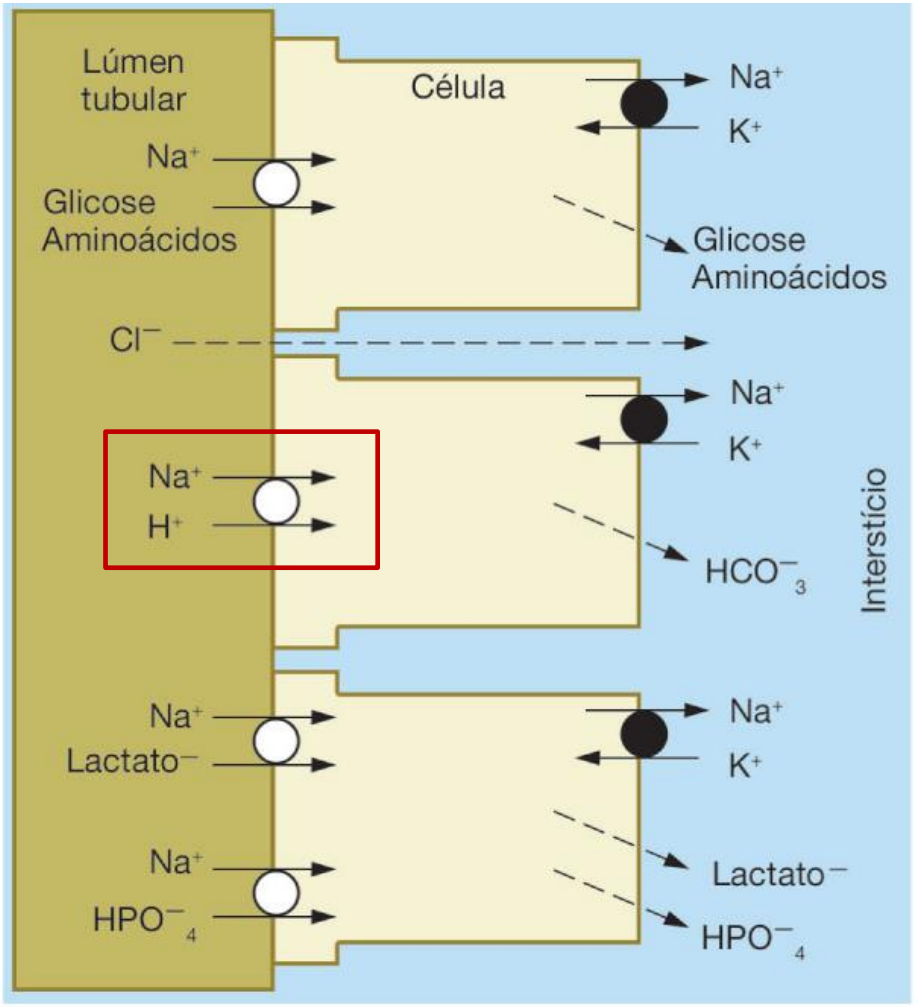


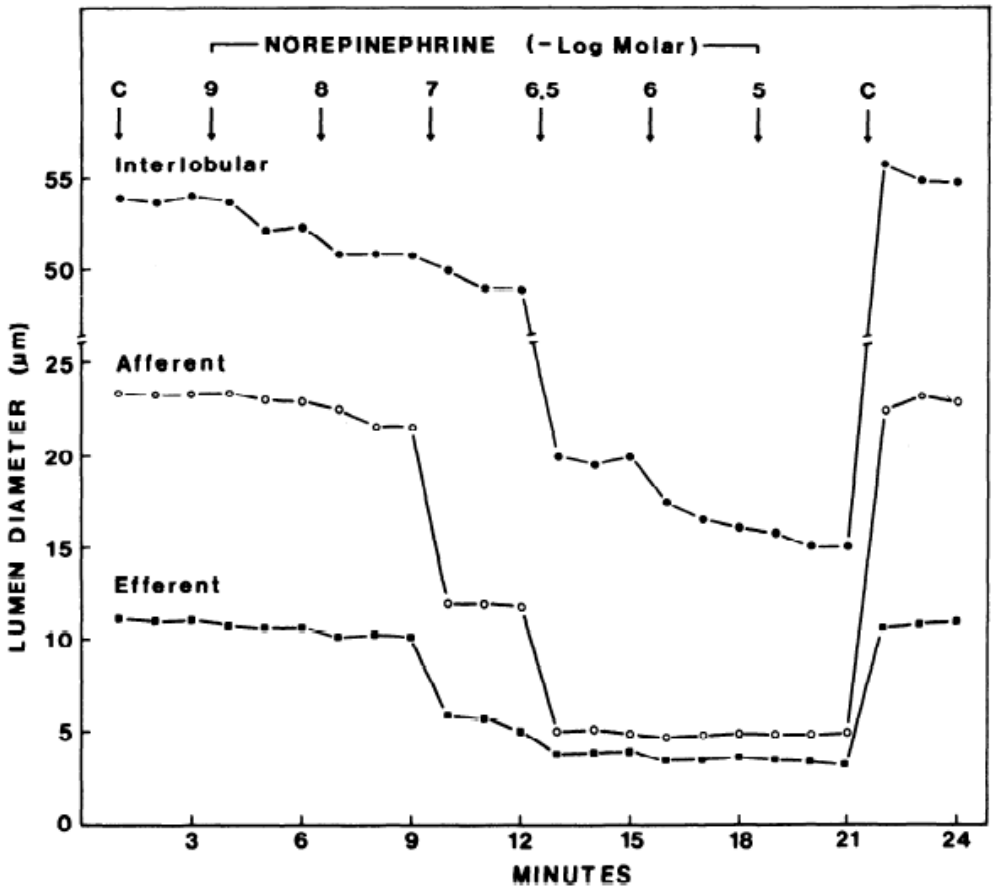
Figure 1 Neural pathways of the efferent renal sympathetic nerves.

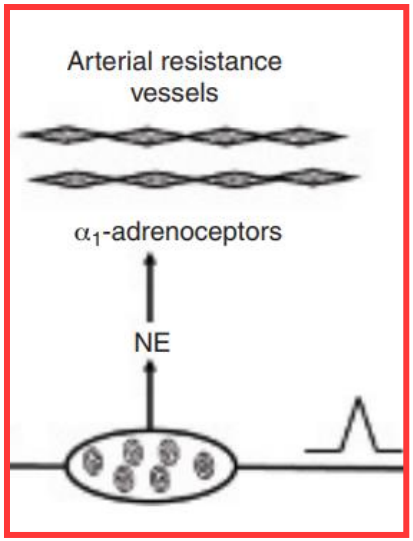
Atividade simpática renal

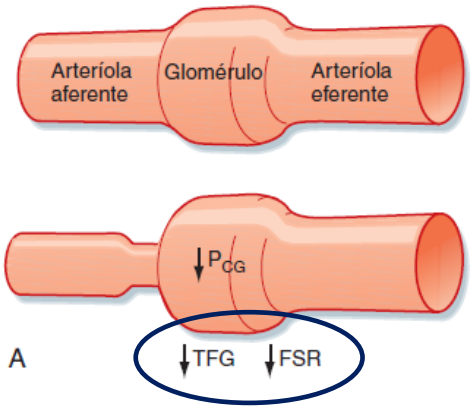




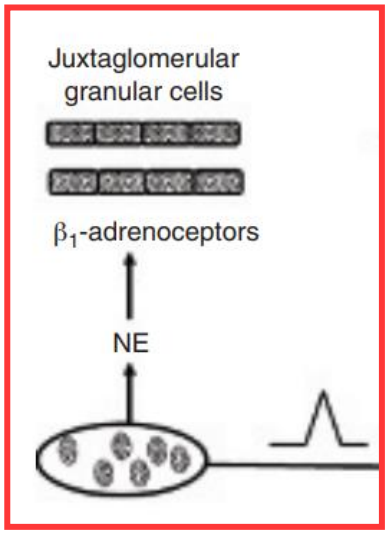
Atividade simpática renal

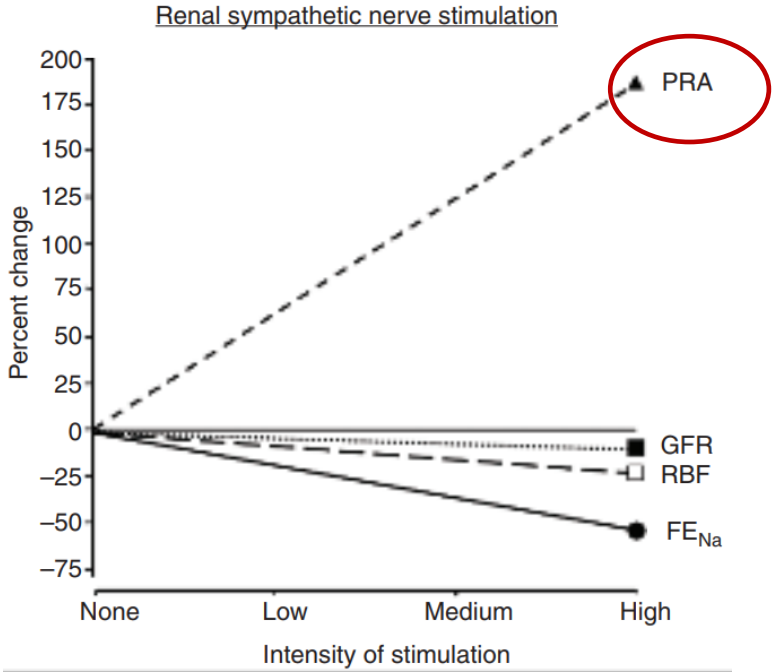


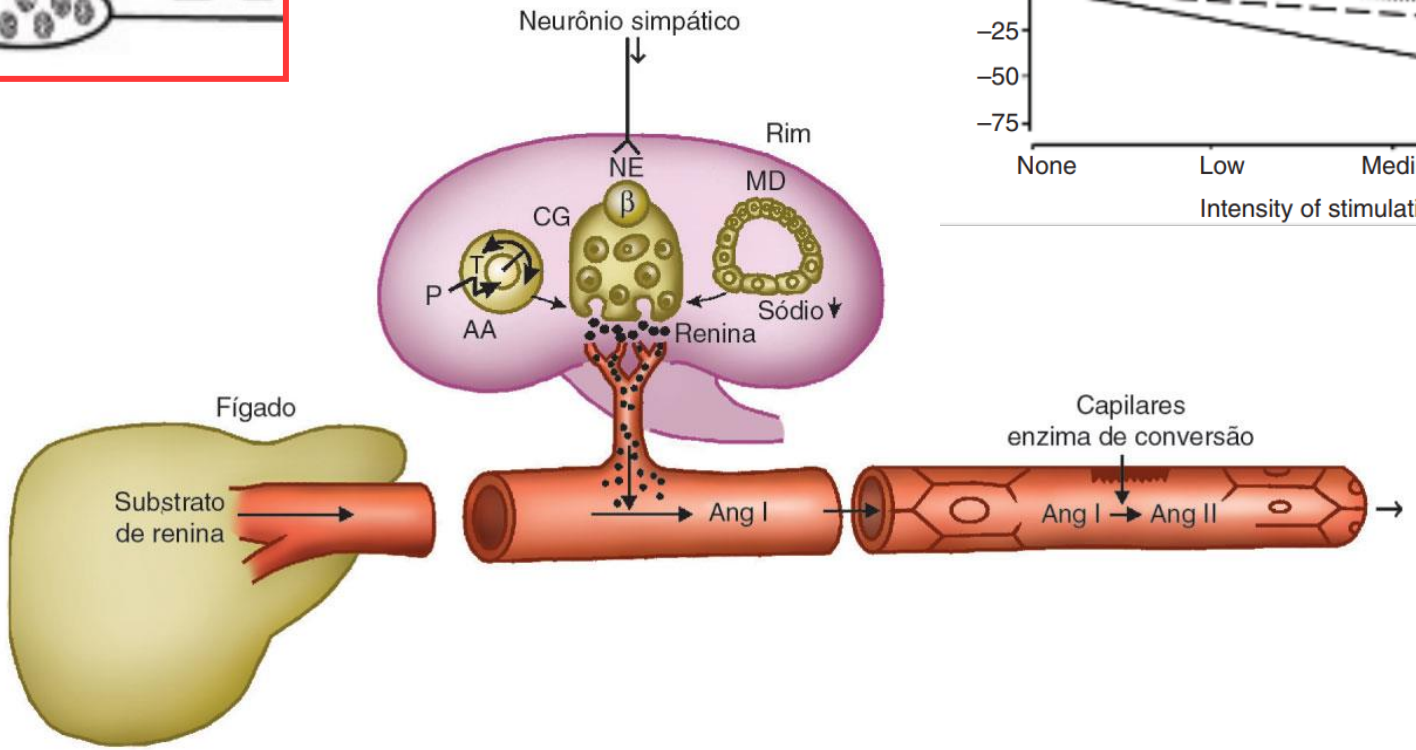


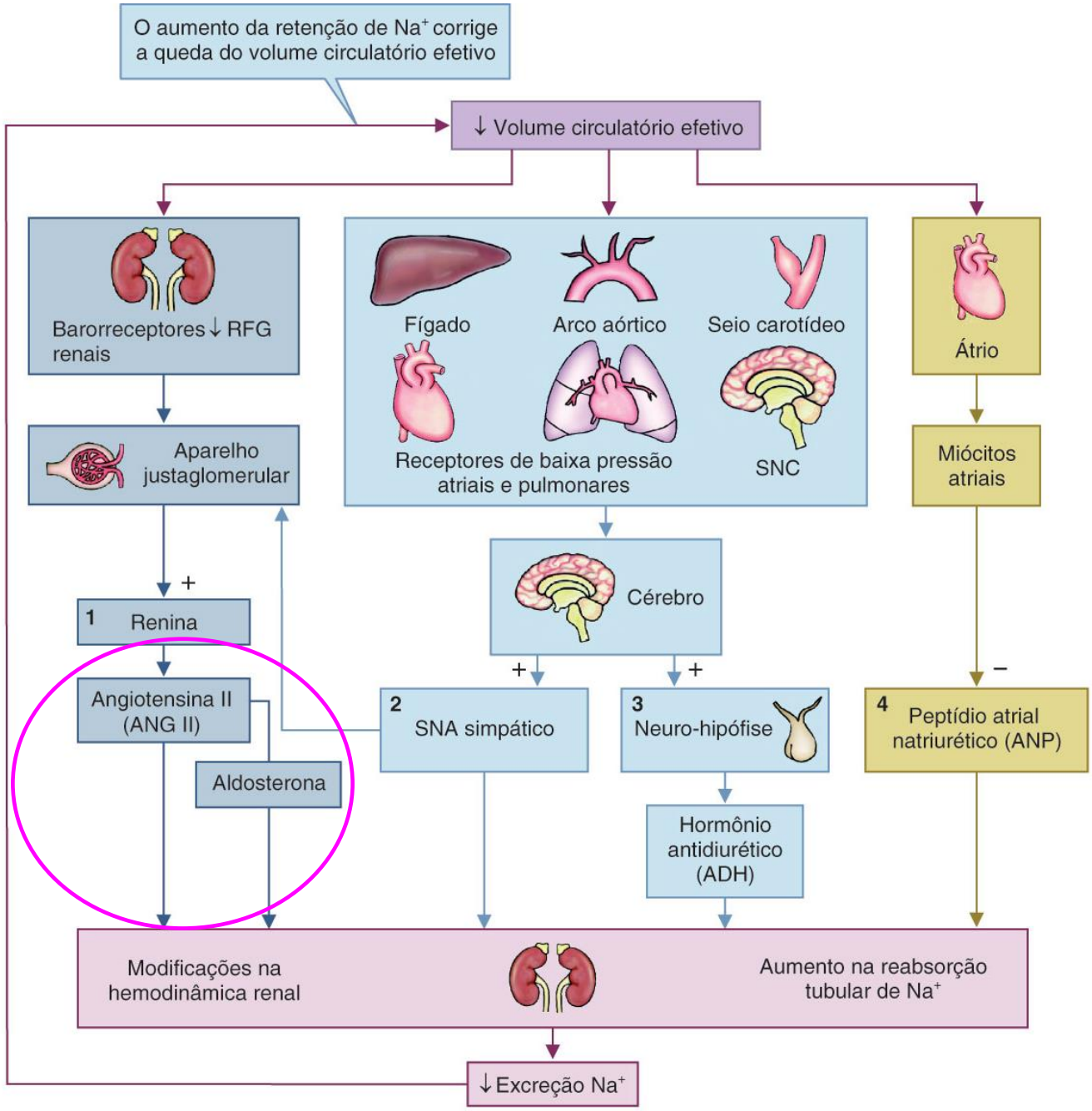


Atividade simpática renal





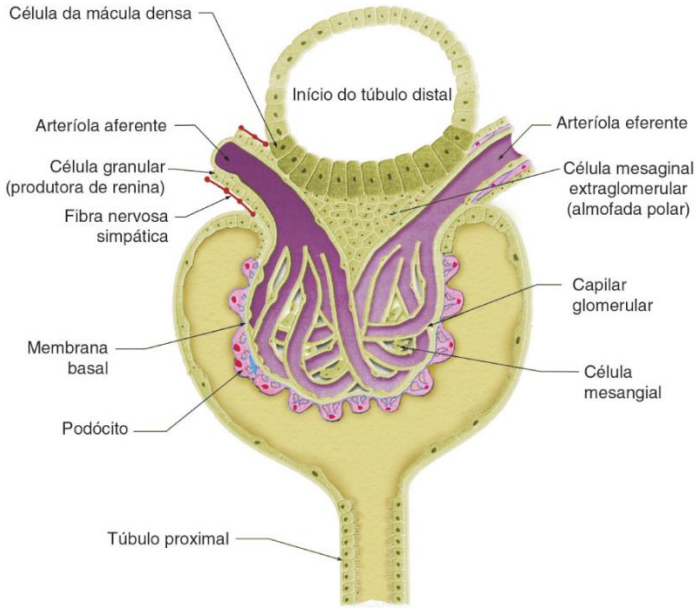


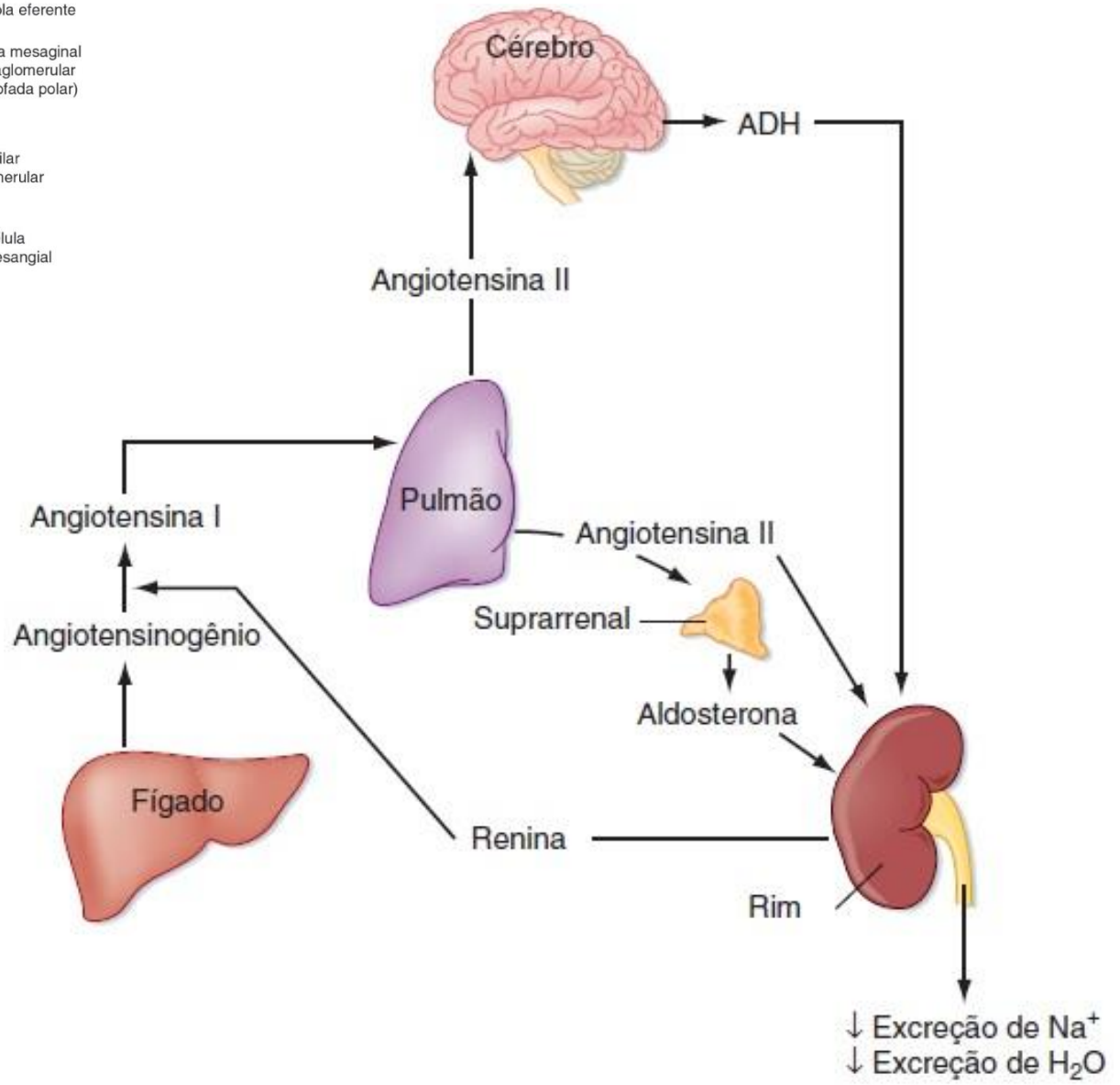


SENSORES

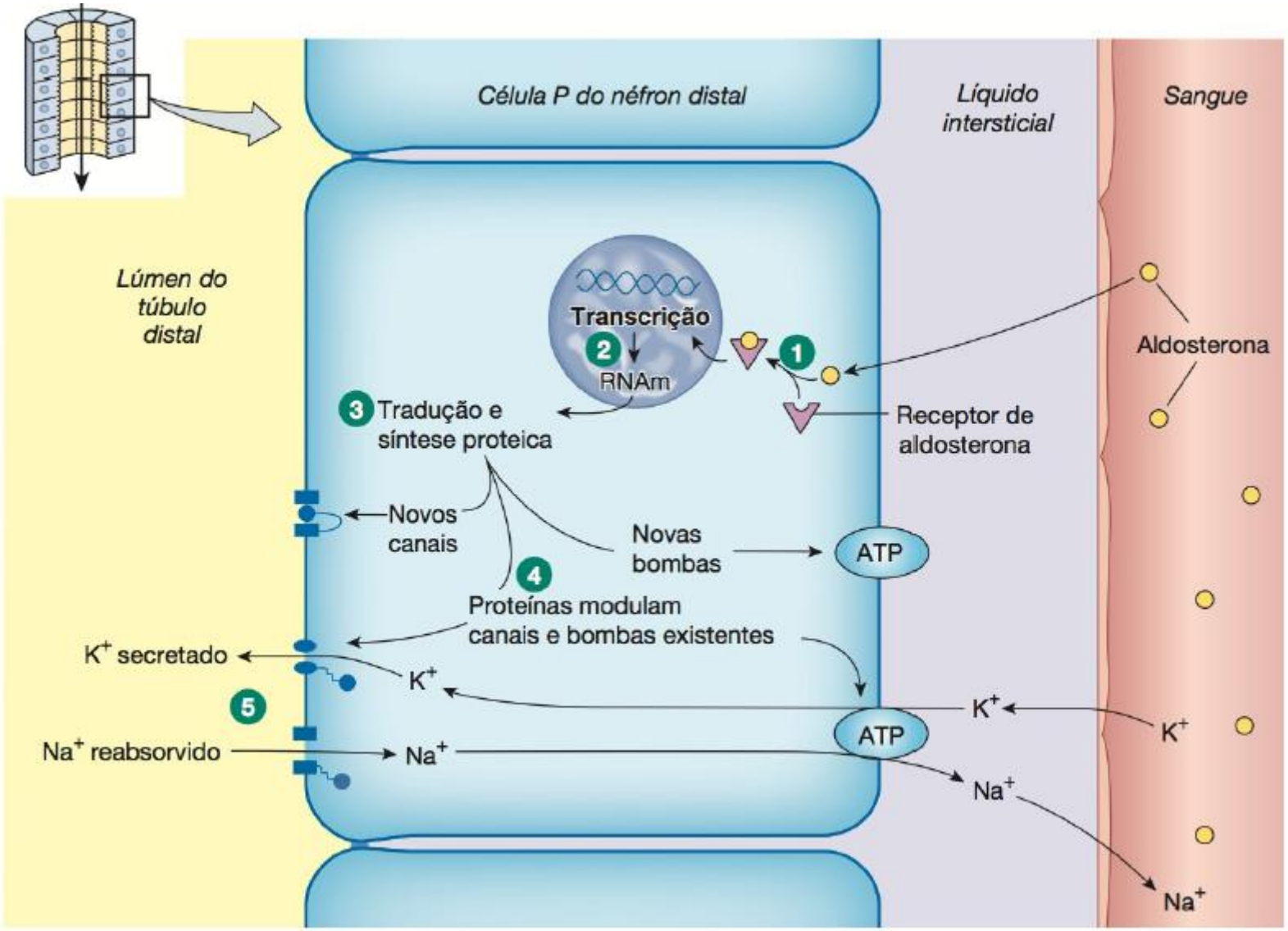
EFETORES

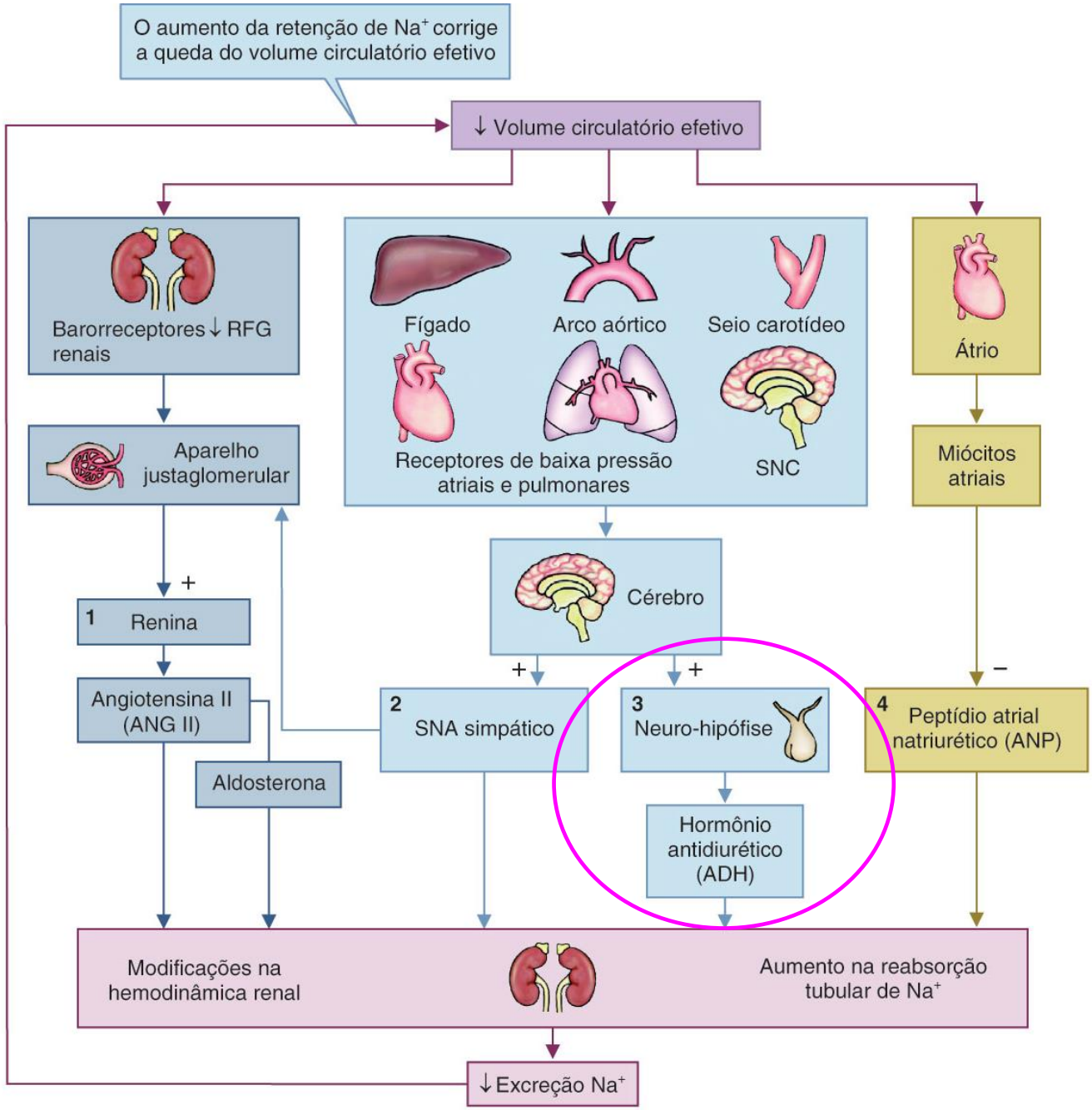
Sistema Renina-Angiotensina-Aldosterona





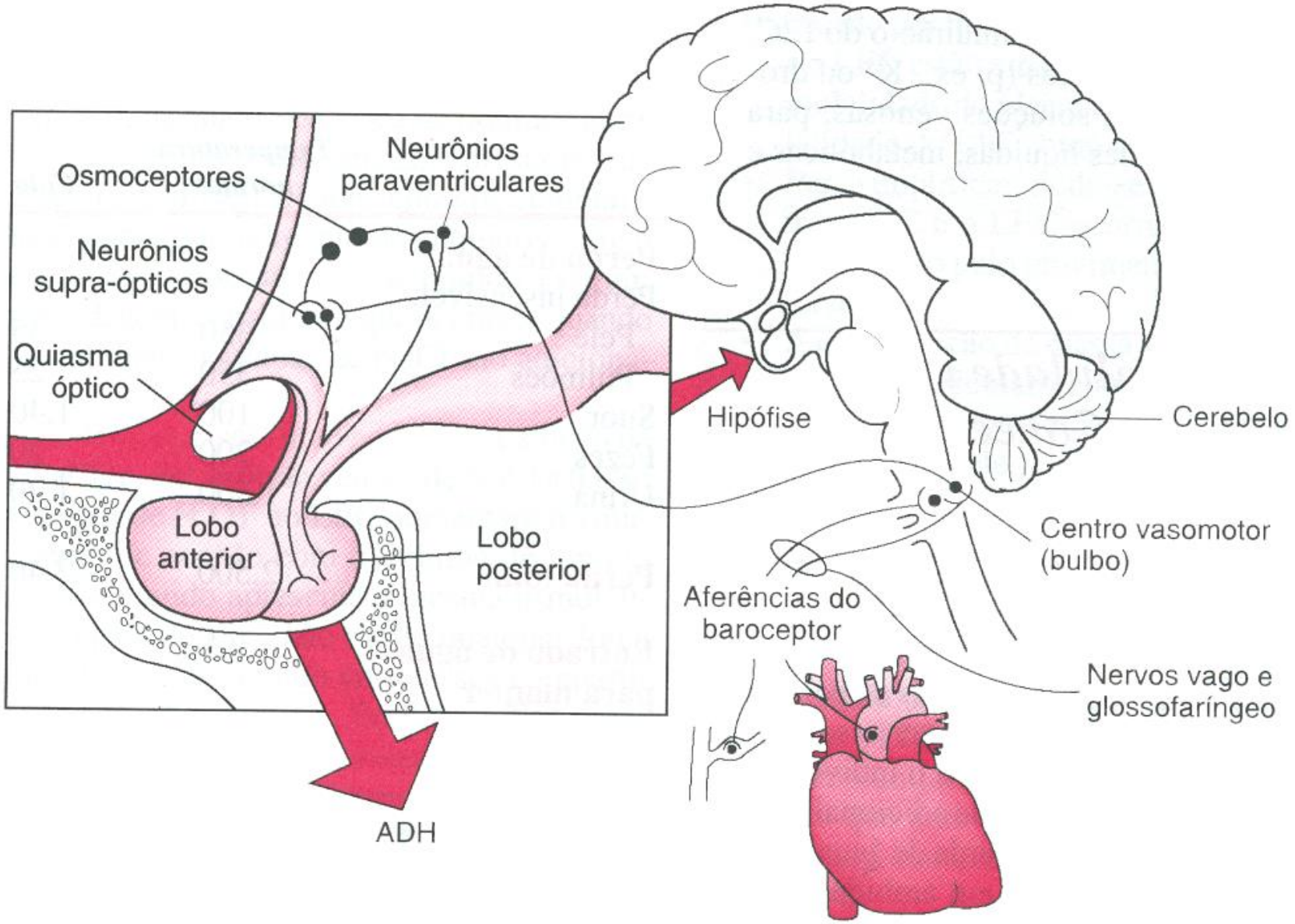
ALDOSTERONA





SENSORES

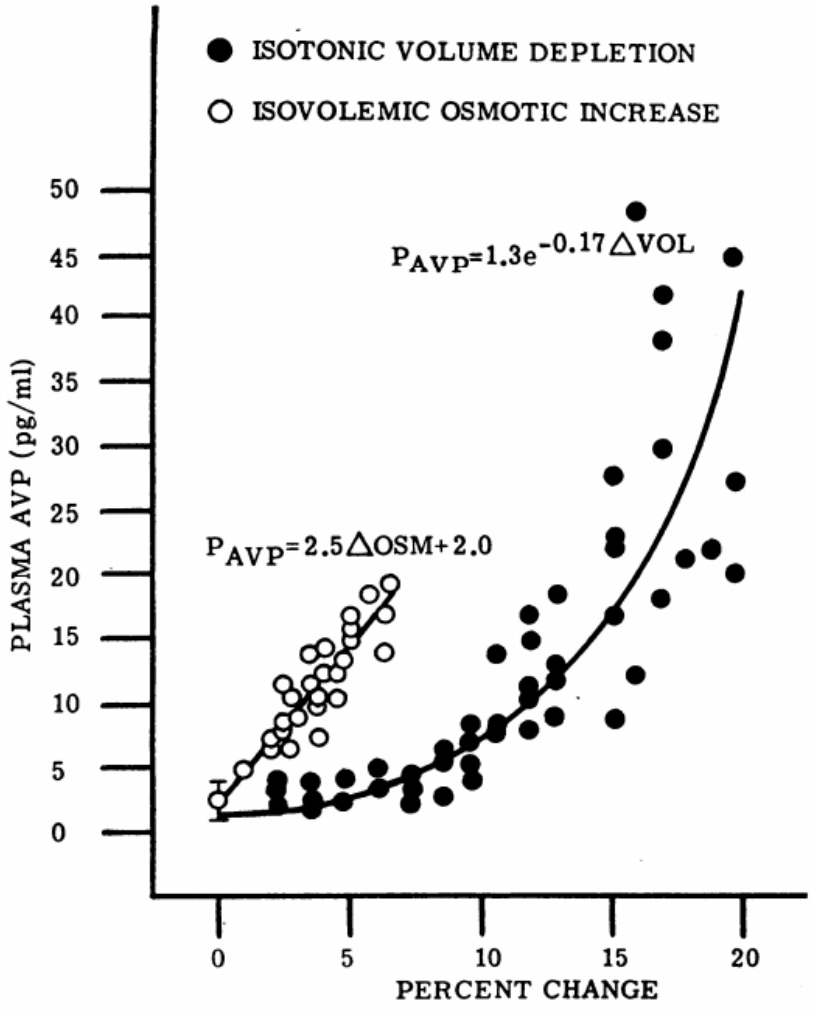
EFETORES

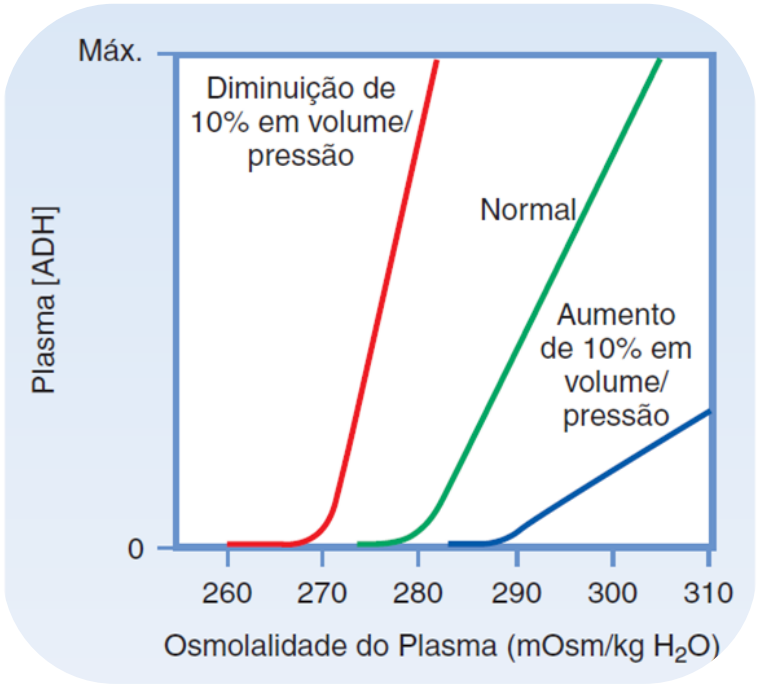

Osmoceptores
Neurônios paraventriculares
Neurônios supra-ópticos
Quiasma óptico
Lobo anterior
Lobo posterior
ADH
Hipófise
Cerebelo
Centro vasomotor (bulbo)
Aferências do baroceptor
Nervos vago e glossofaríngeo

The Role of Blood Osmolality and Volume in Regulating Vasopressin Secretion in the Rat

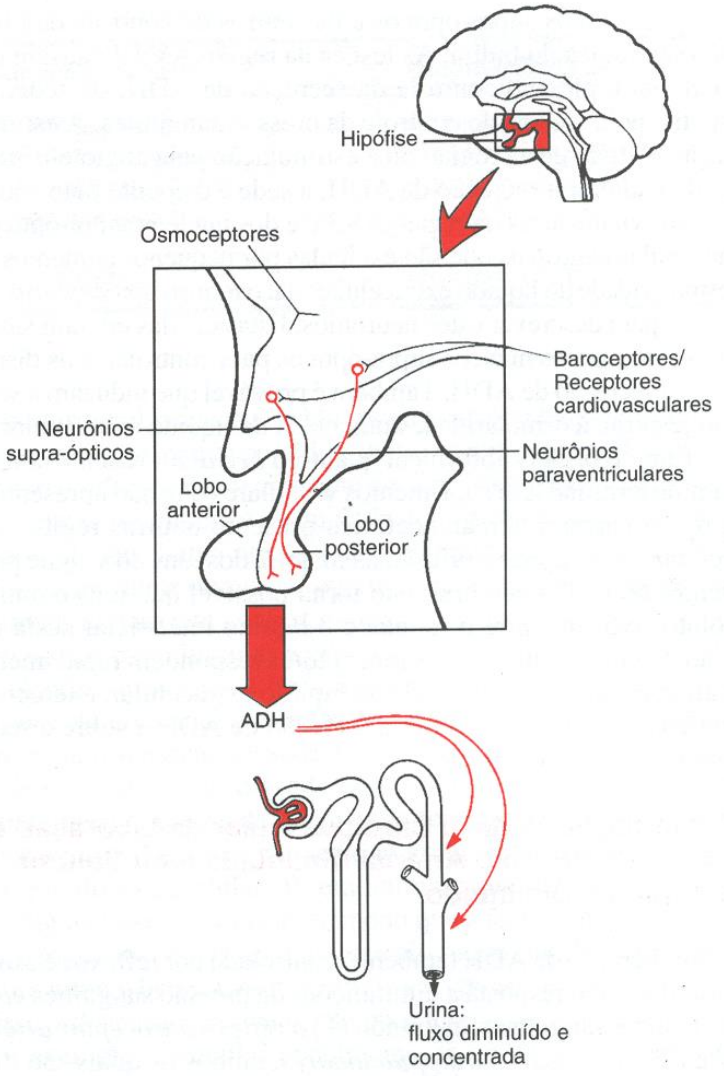
FREDRICK L. DUNN, THOMAS J. BRENNAN, AVERIAL E. NELSON, and GARY L. ROBERTSON

From the Department of Medicine, Indiana University Medical Center and the Veterans Administration Hospital, Indianapolis, Indiana 46202 and the Abraham Lincoln School of Medicine and Veterans Administration West Side Hospital, Chicago, Illinois 60680

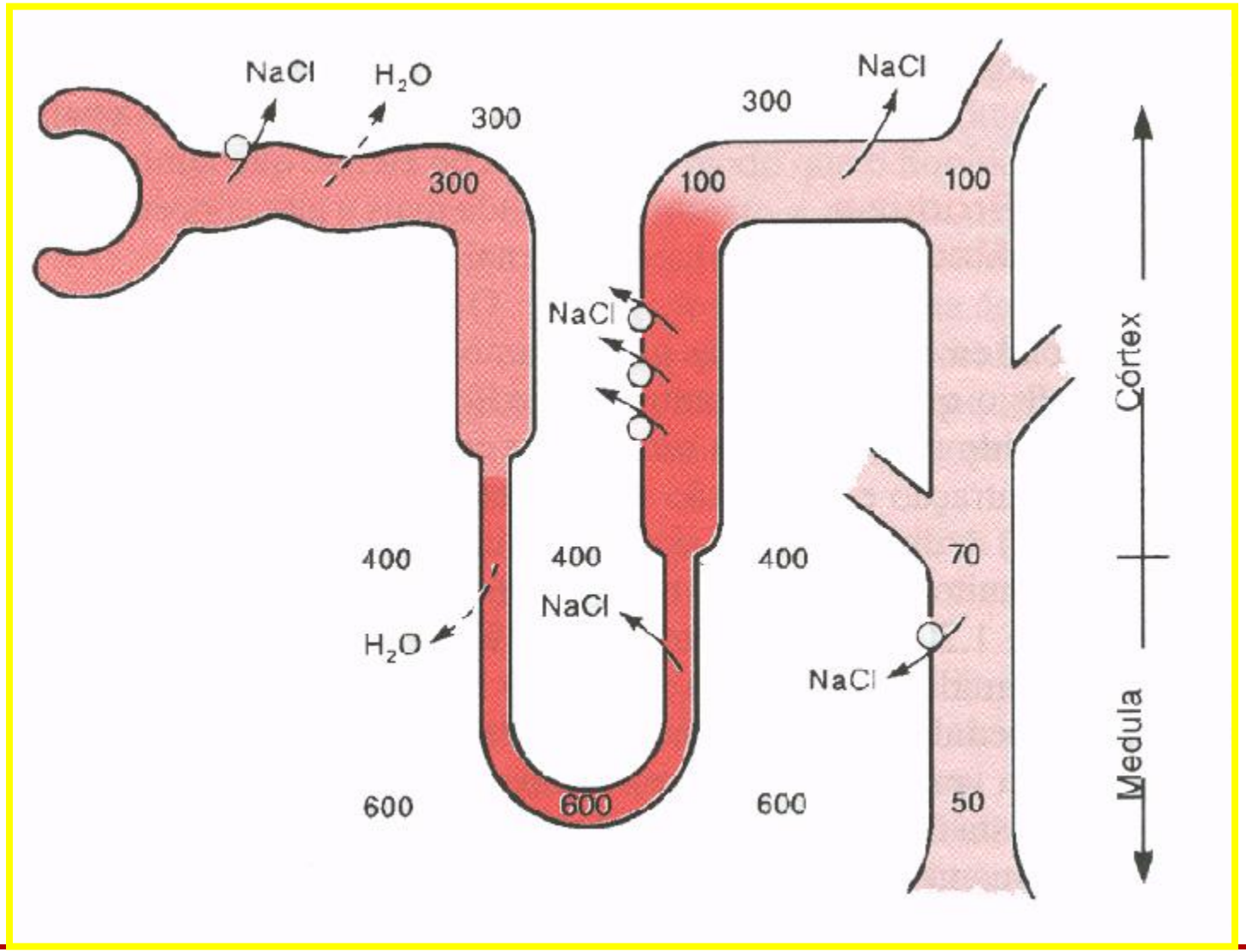




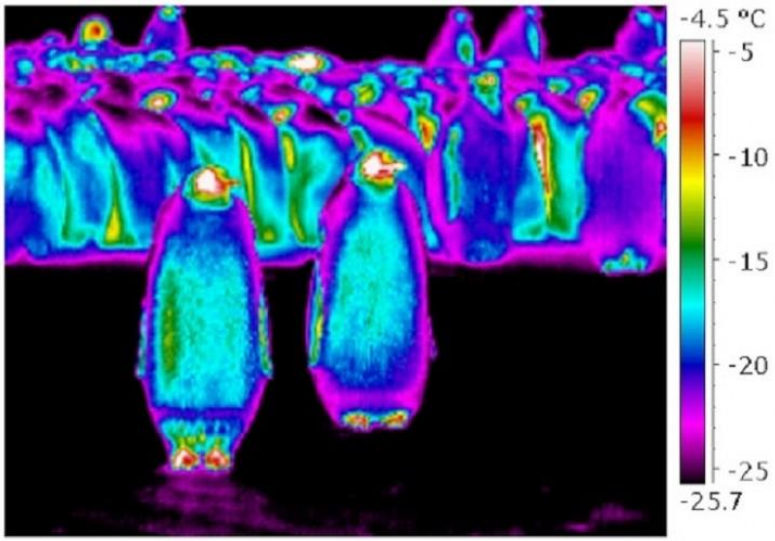
Hipotálamo - ADH é sintetizado
Hipófise - ADH é liberado

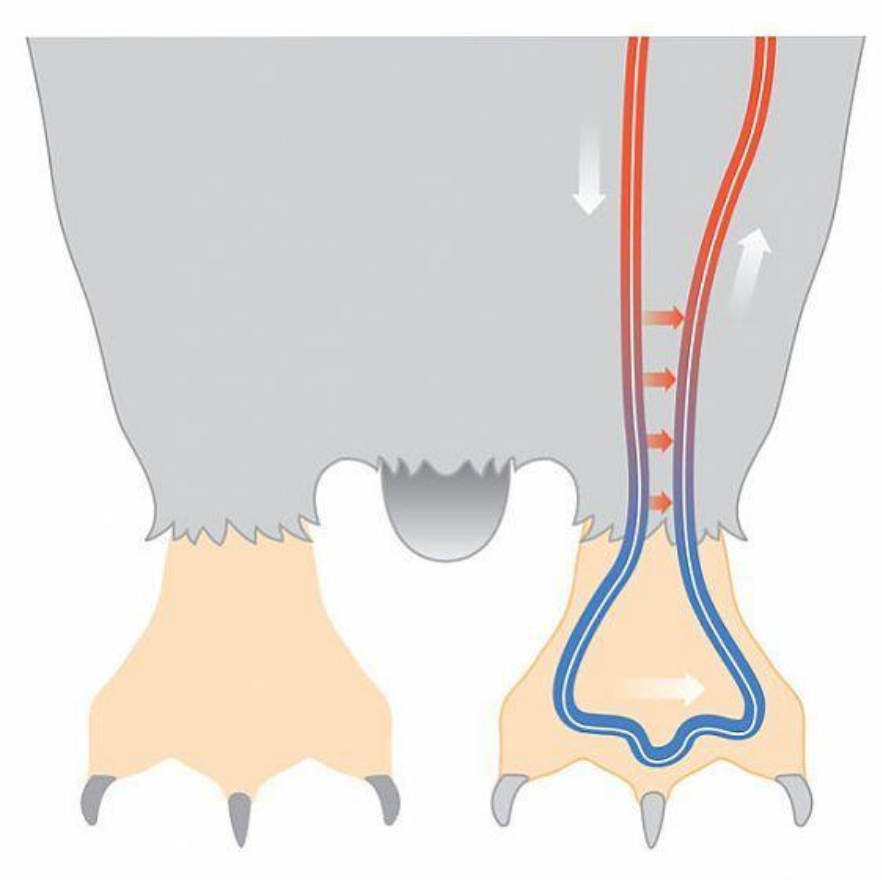


Formação de urina diluída (sem ADH)



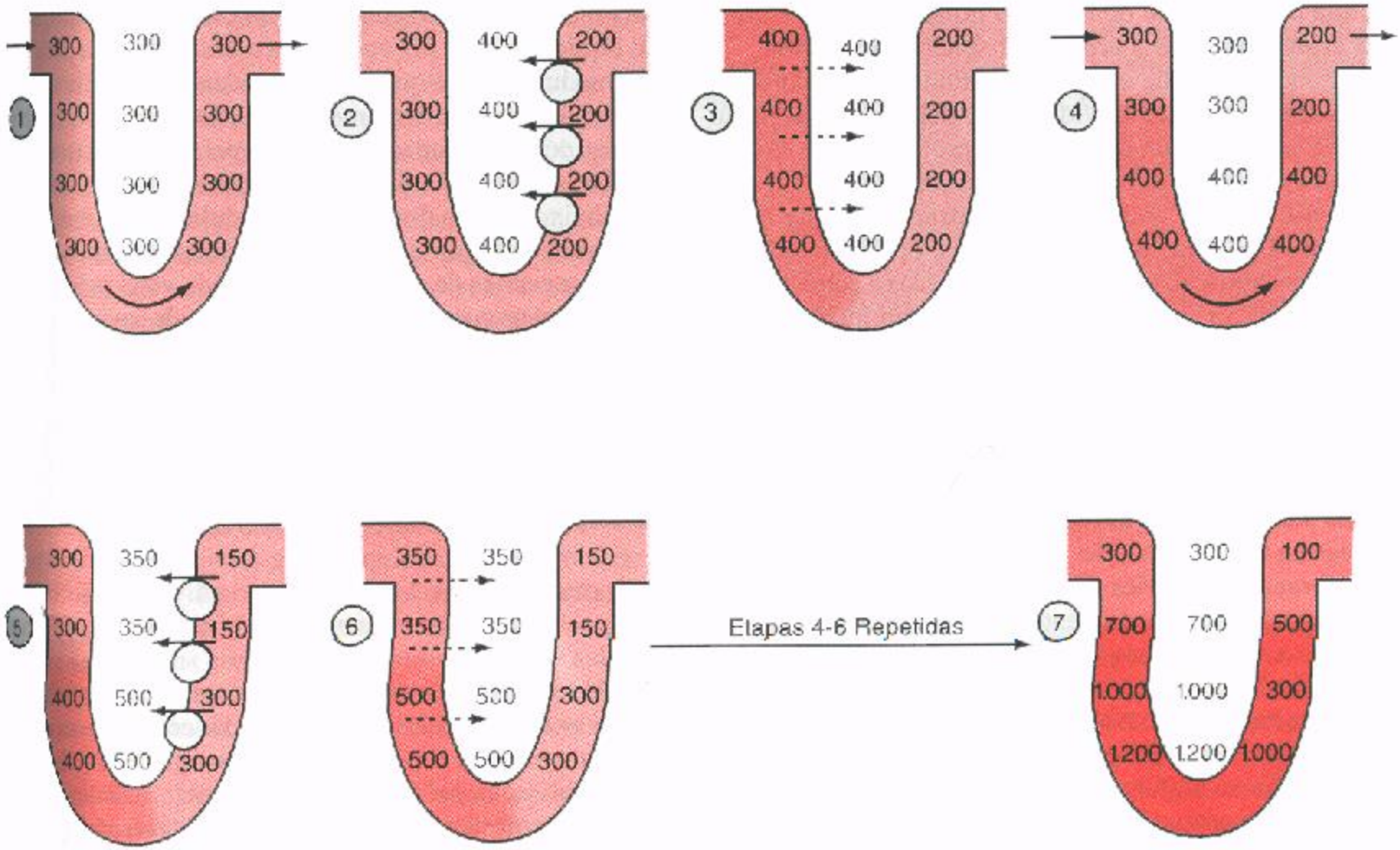
Counter current mechanism: pinguim



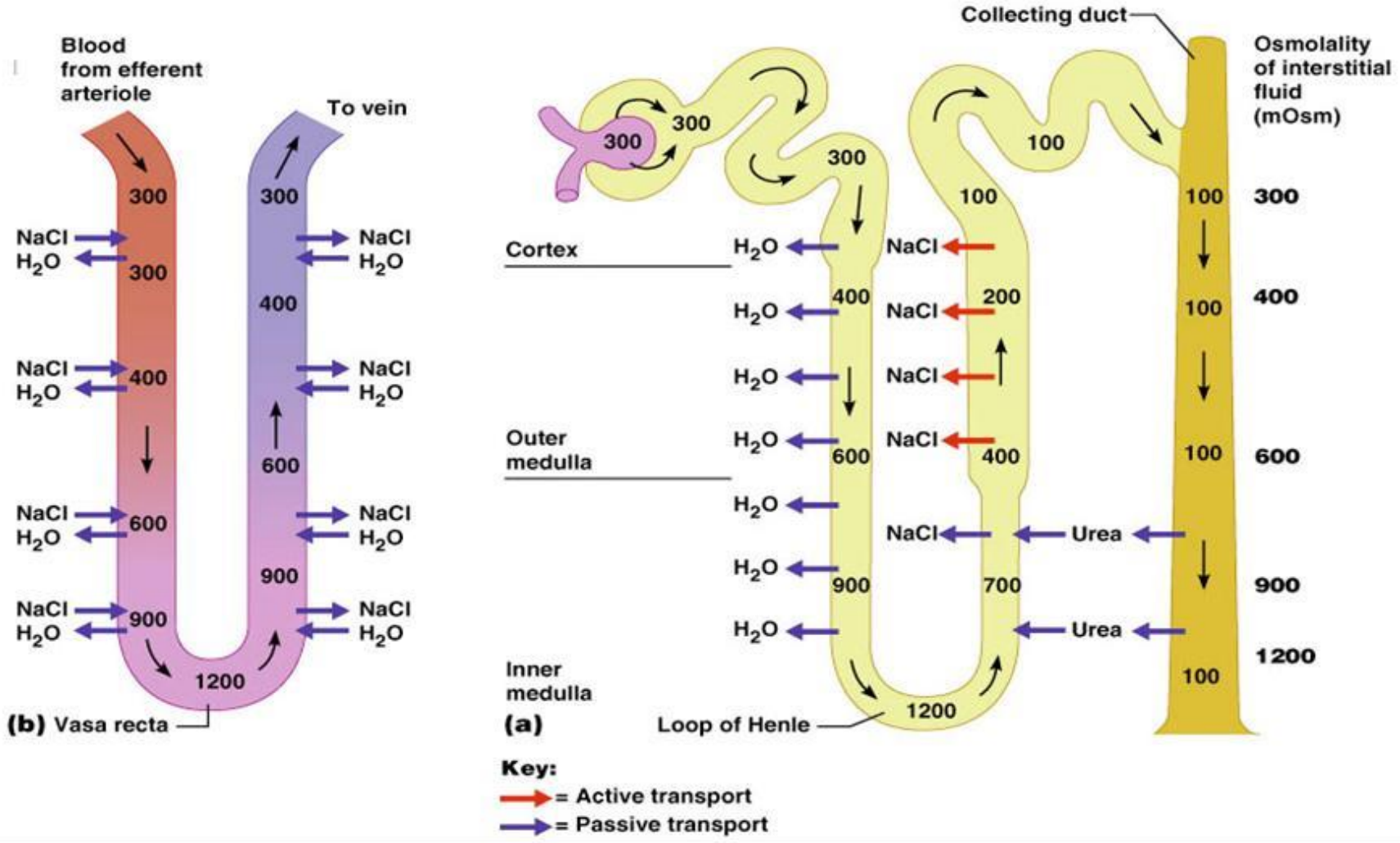


https://interestingengineering.com/why-dont-penguins-feet-freeze-evolutionary-adaptation

Sistema Multiplicador de Contracorrente na Alça de Henle

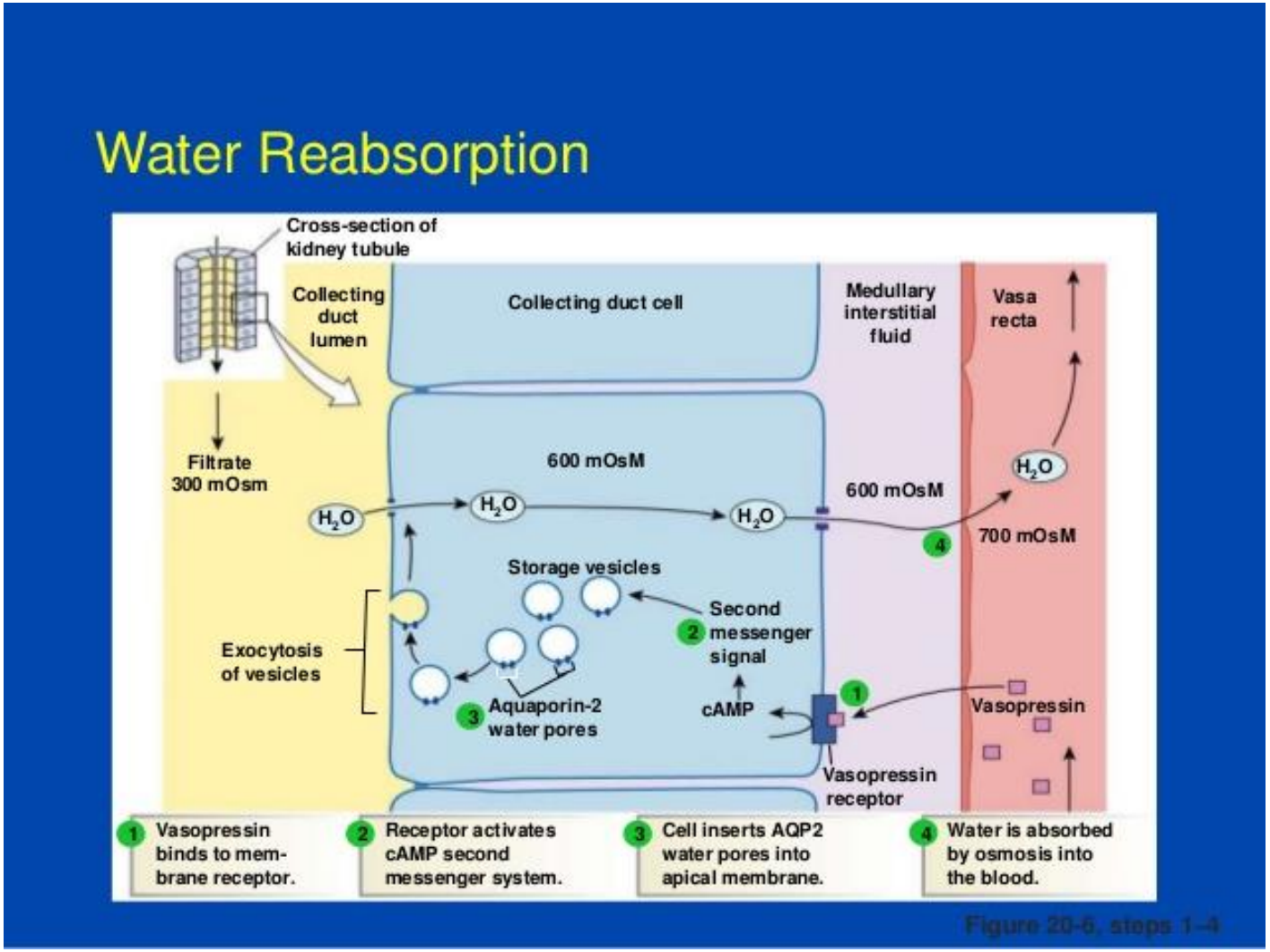


Formação de urina diluída (sem ADH)



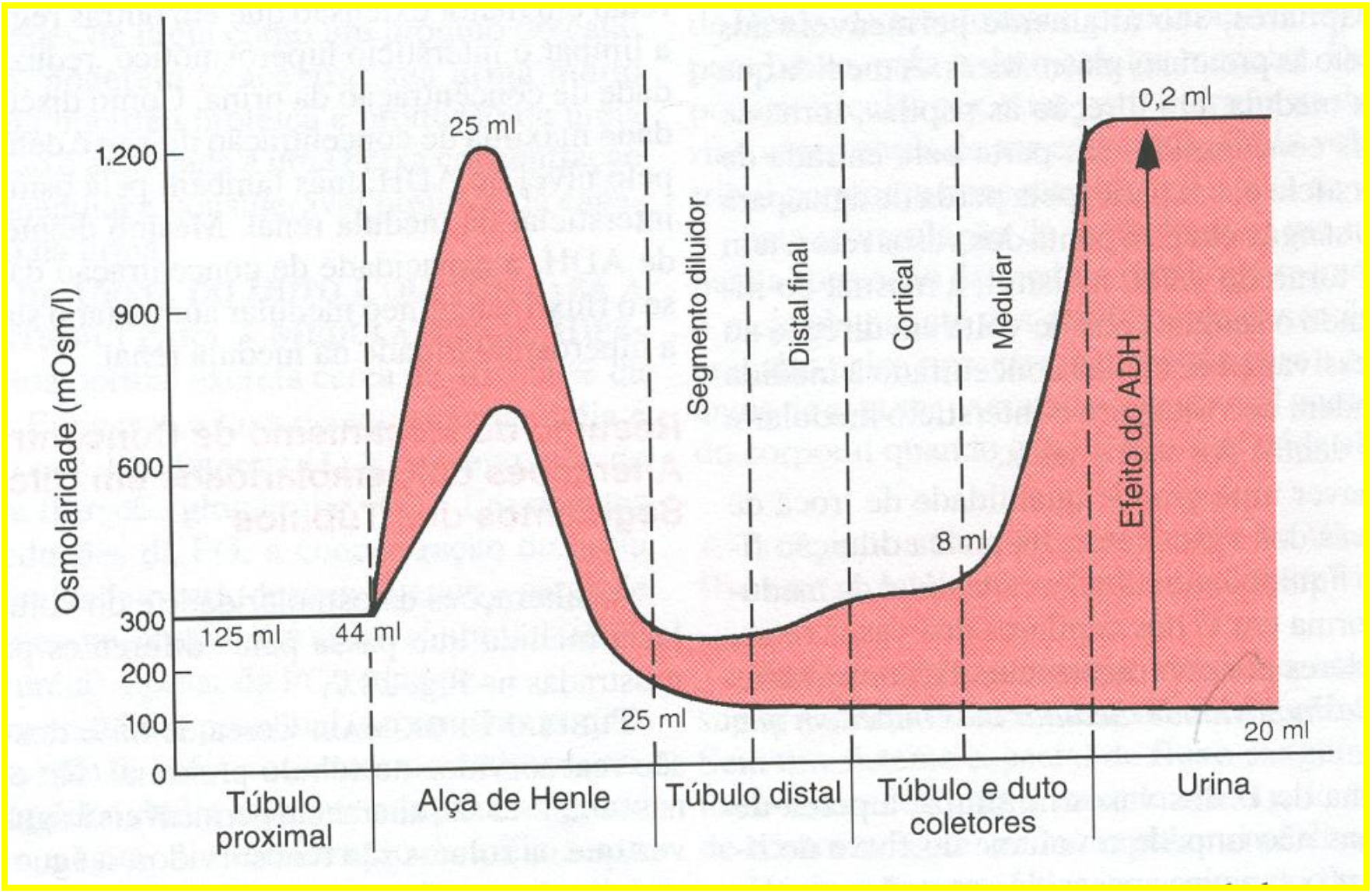
https://www.slideshare.net/Wisit661/renal-handling-of-water

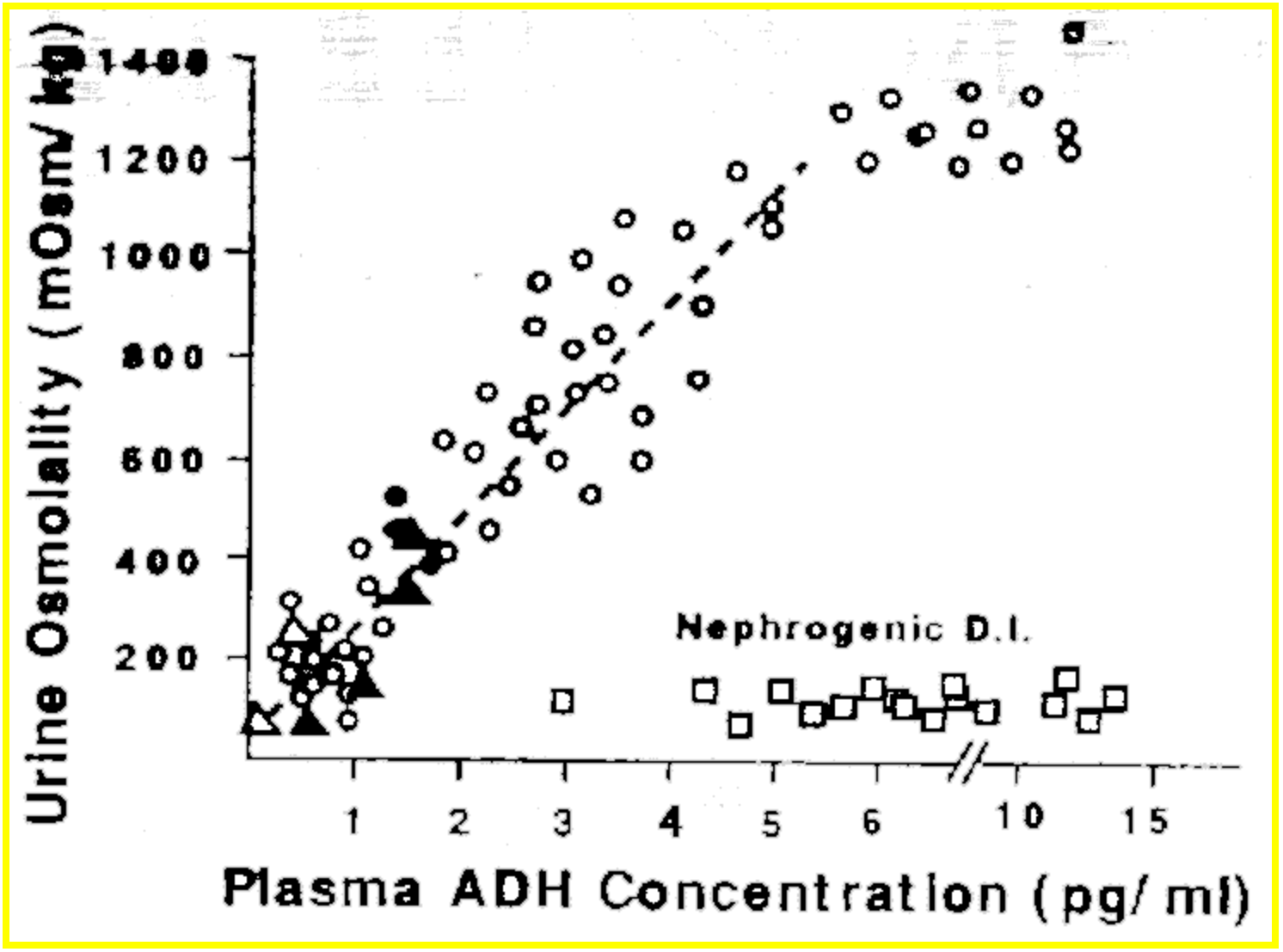
Formação de urina concentrada (com ADH)

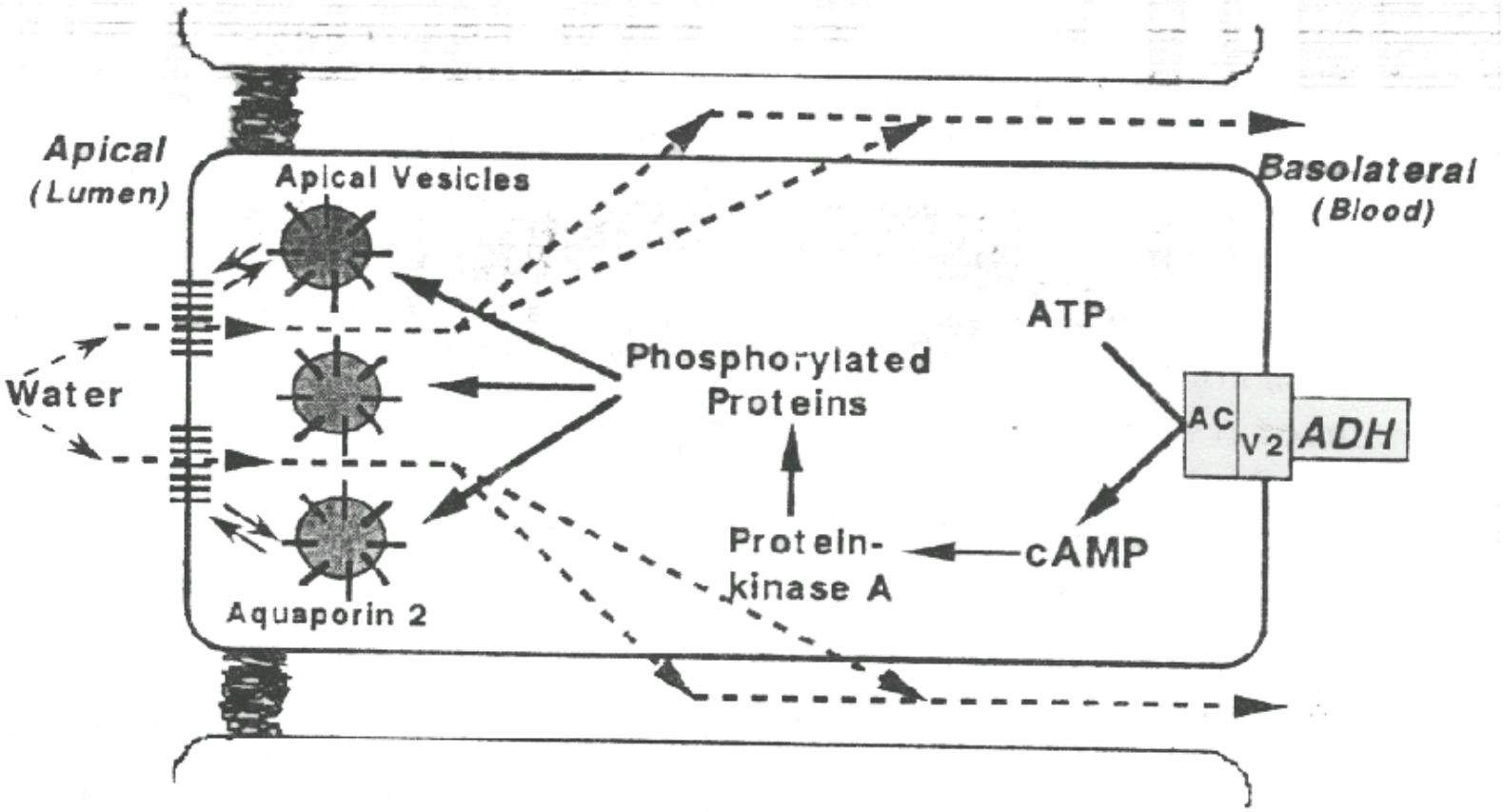


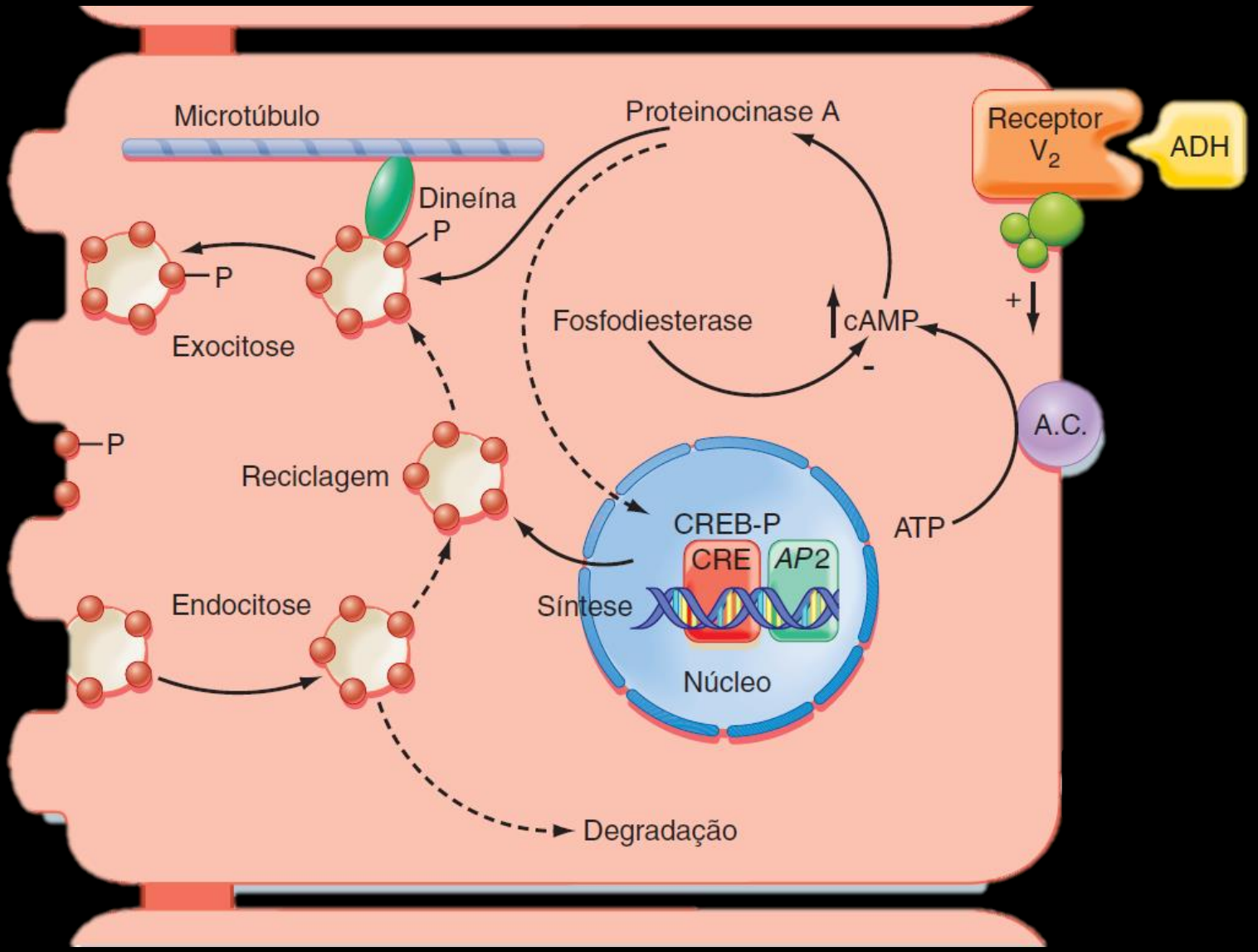
https://www.slideshare.net/Wisit661/renal-handling-of-water

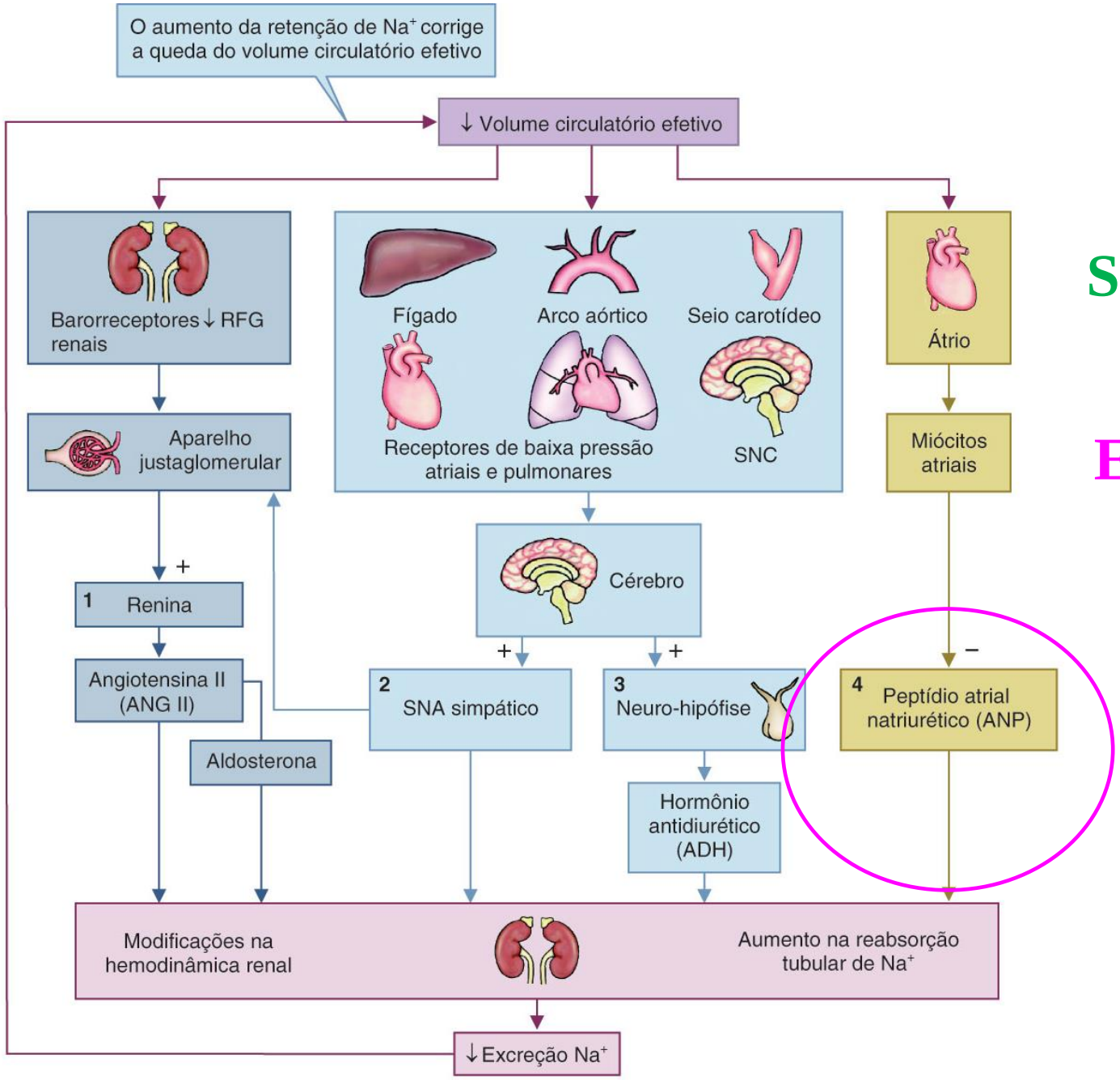
Alterações na Osmolaridade do Líquido Tubular




Urine Osmolality (mOsm/kg)
1400
1200
1000
800
600
400
200
Nephrogenic D.I.
1
2
3
4
5
6
10
15
Plasma ADH Concentration (pg/ml)


Apical
(Lumen)
Apical Vesicles
Basolateral
(Blood)
ATP
Water
Phosphorylated
Proteins
AC
V2
ADH
Protein-
kinase A
cAMP
Aquaporin 2

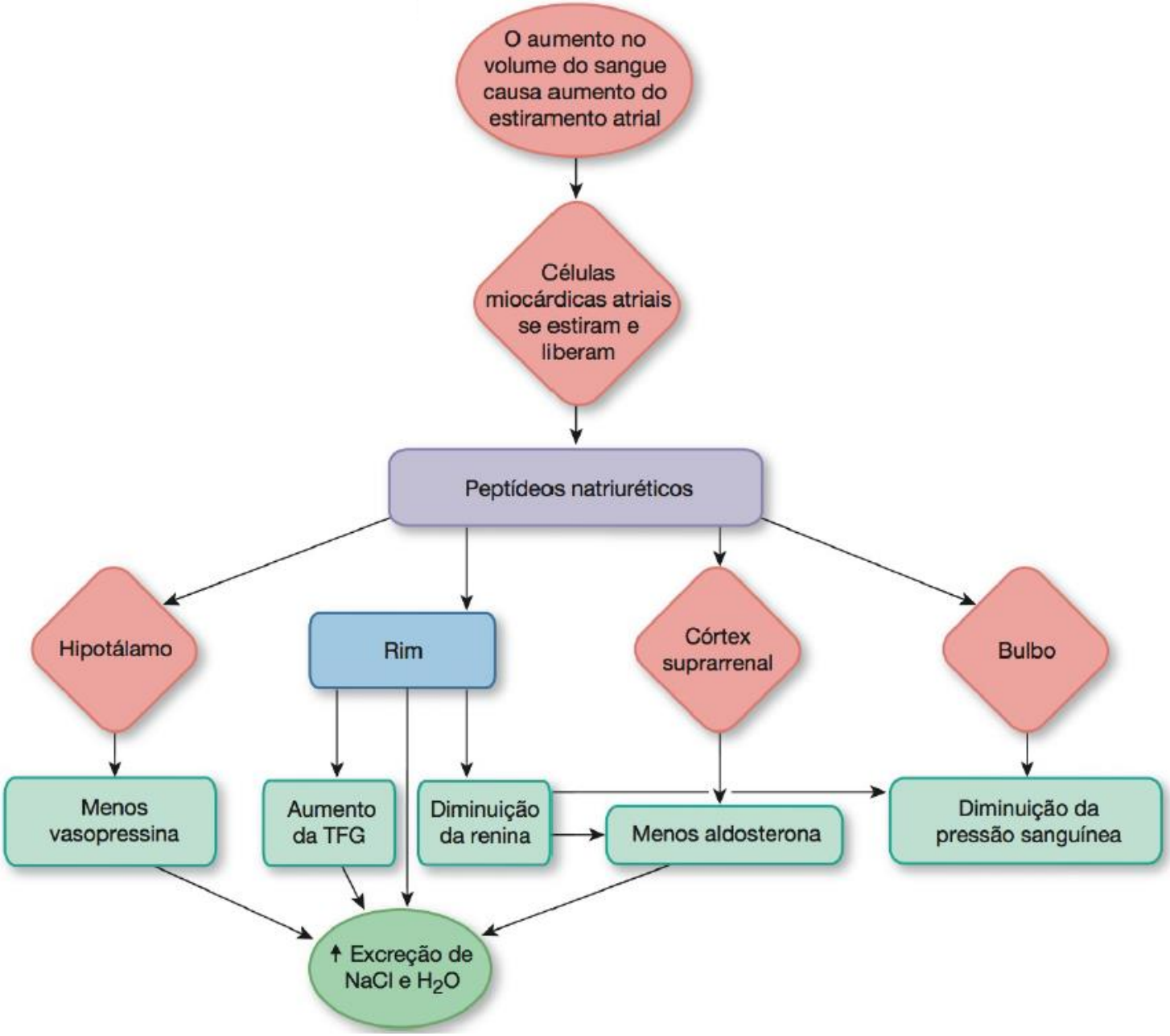

Microtúbulo
Proteinocinase A
Receptor
V_2
ADH
Dineína
P
P
Exocitose
Fosfodiesterase
cAMP
+
-
A.C.
P
Reciclagem
CREB-P
CRE
AP2
ATP
Endocitose
Síntese
Núcleo
Degradação

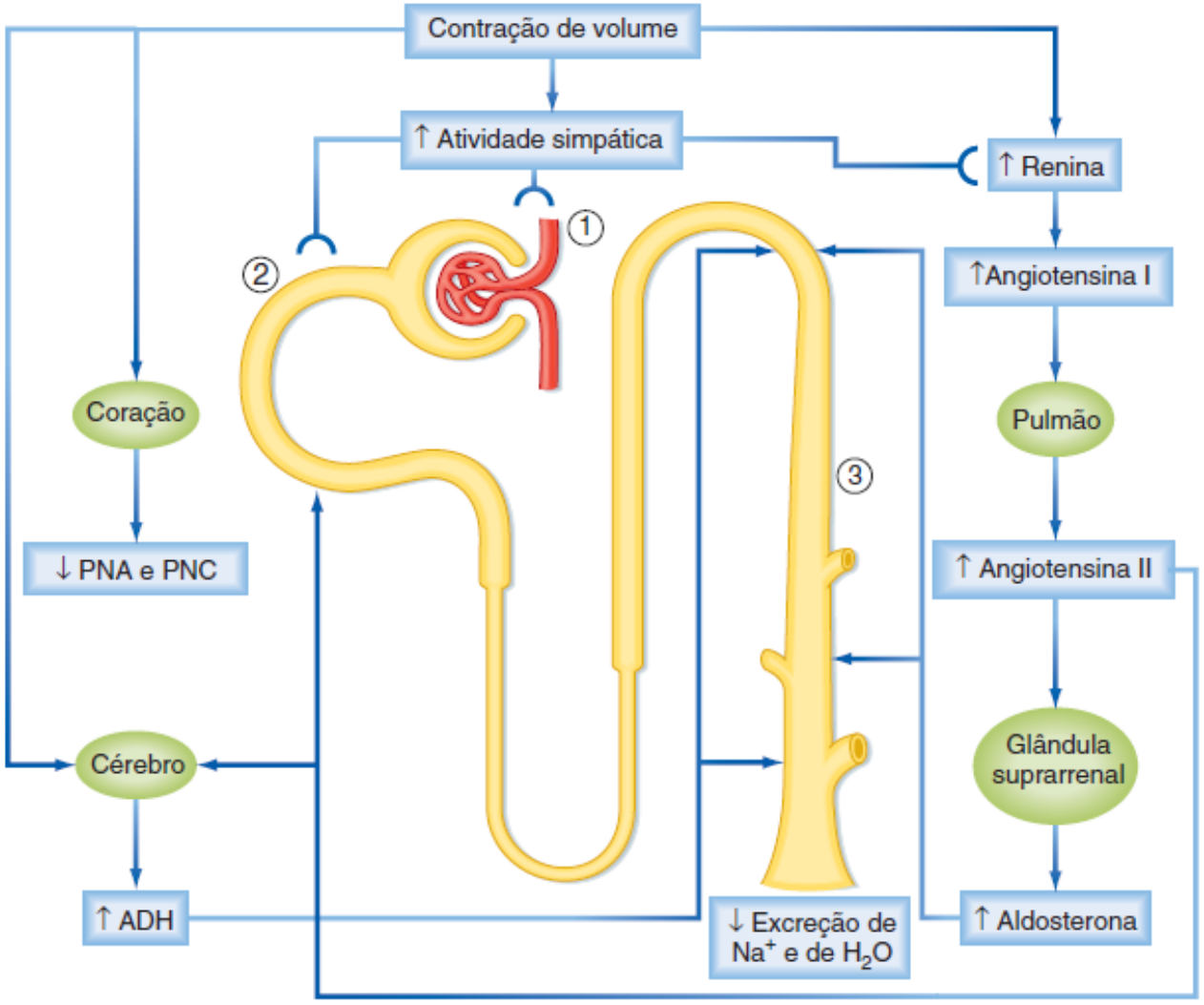


SENSORES

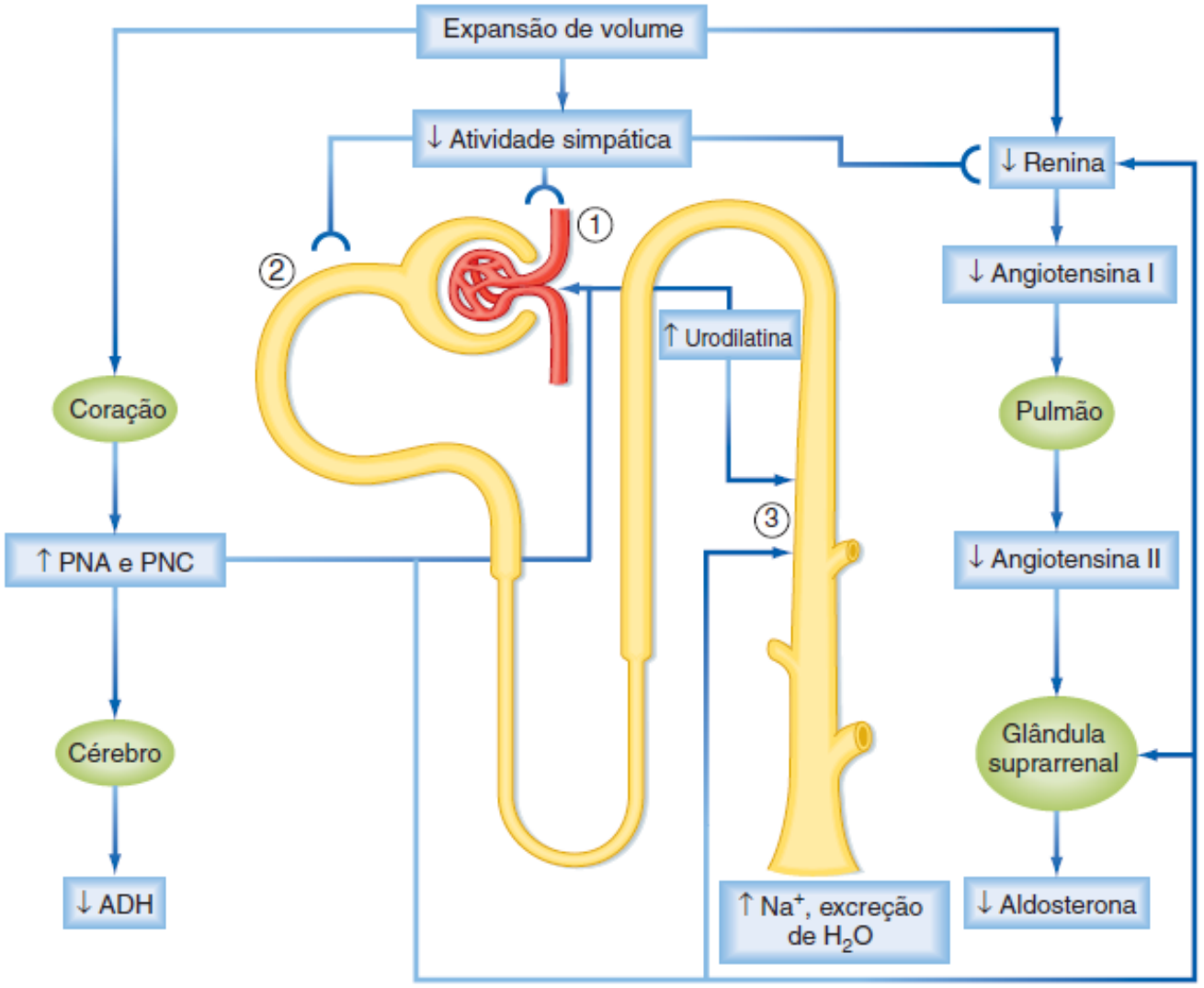
EFETORES

Peptídeos natriuréticos

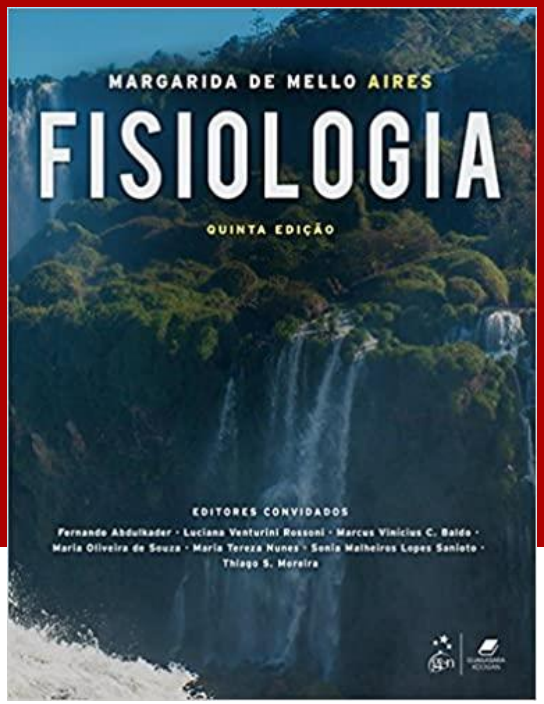


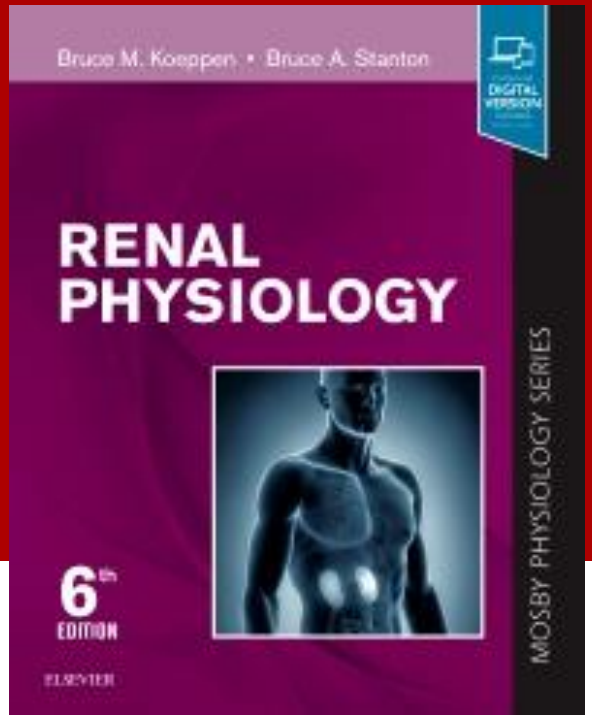


Fisiologia. Berne e Levy, 6ª ed.



Fisiologia. Berne e Levy, 6ª ed.





BIBLIOGRAFIA

Obrigado

Angiotensina

ANG II

Resistência das arteríolas:
↑Aferente
↑↑Eferente

↓Fluxo sanguíneo renal

↑Fração de filtração

↑Pressão oncótica no capilar peritubular

↓Pressão hidrostática no capilar peritubular

↑Reabsorção de Na^+ no túbulo proximal

↓Excreção renal de Na^+ e de H_2O

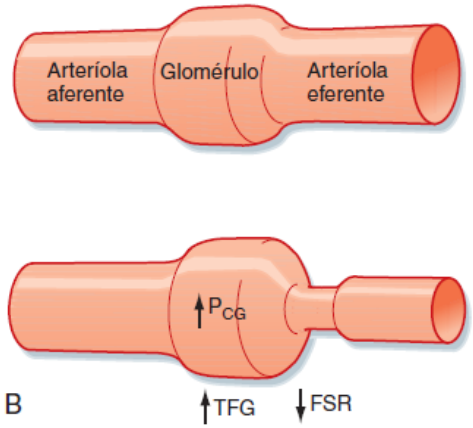
↓Fluxo de sangue nos vasos retos

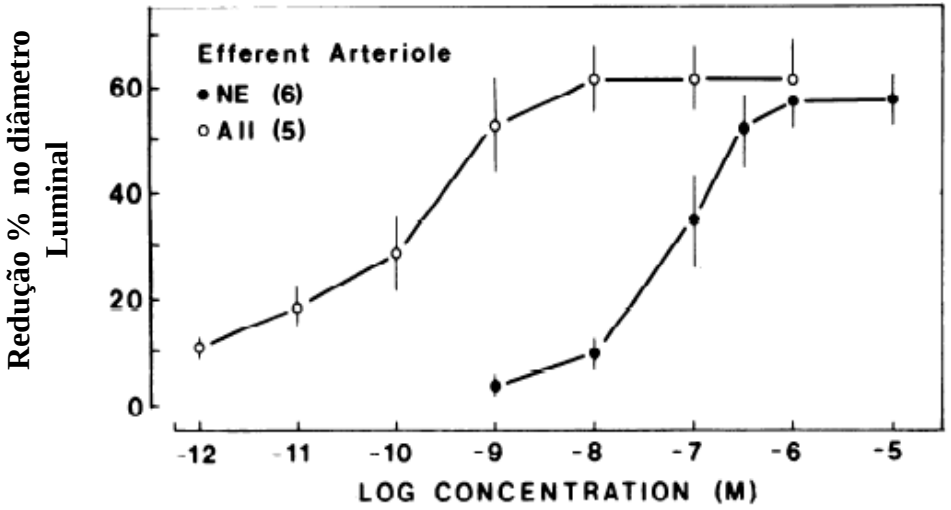
↓Lavagem da ureia do interstício medular

↓[Ureia]
↓[Na^+] no interstício medular

↑Gradiente para reabsorção passiva de NaCl no ramo fino ascendente da alça de Henle

↑Reabsorção de Na^+ na alça de Henle





Edwards Am. J. Physiol. 244: F526, 1983.