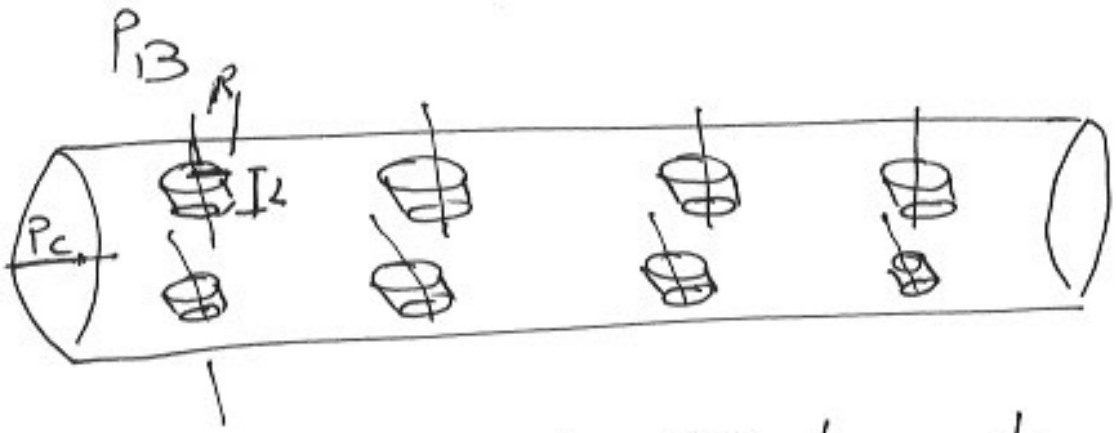


GFR = Glomerular filtration rate = $\frac{n \pi R^4 \Delta P}{8 \mu L}$

$R = 100 - 200\ \mathring{A}$

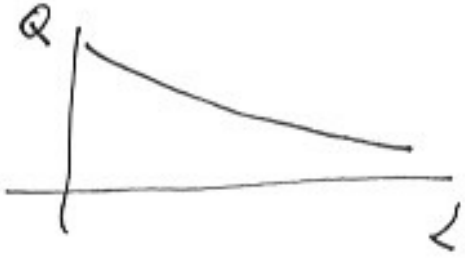
$L = 40 - 600\ \mathring{A}$

$\Delta P = 60 - 80$ mmHg

$\mu = 4$ CPoise.

$Q_{Renale} = 1200 \frac{ml}{min}$

GFR = 125 $\frac{ml}{min}$



$\frac{dQ}{dx} = K\frac{S}{l} P_{UF}$ $\quad = GFR$

P_{UF} = pressione di ultrafiltrazione

$P_{UF} = (P_C - P_B) - (\pi_C - \pi_B)$ $\quad \pi_B \approx 0$

$P_{UF} = \Delta p - \pi_C$

$\pi_C = a_1 C + a_2 C^2$

$\frac{dQ}{dx} = \frac{KS}{l}\left[\Delta p - a_1 C - a_2 C^2\right]$

$C = \frac{\dot{m}}{Q} = \frac{kg}{s} \cdot \frac{s}{ml} = \frac{kg}{ml}$ $\quad Q = \frac{\dot{m}}{C}$

$\frac{dQ}{dx} = \frac{d}{dx}\left(\frac{\dot{m}}{C}\right) = \dot{m}\frac{d}{dx}\left(\frac{1}{C}\right) = -\frac{\dot{m}}{C^2}\frac{dC}{dx}$

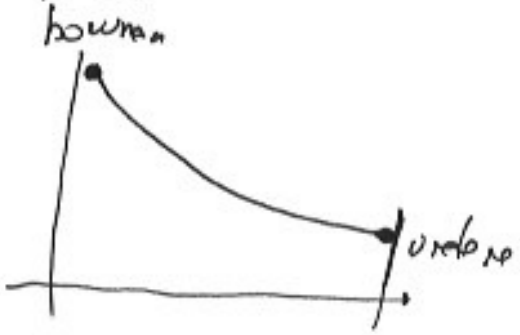
$-\frac{\dot{m}}{C^2}\frac{dC}{dx} = -\frac{KS}{l}\left[\Delta p - a_1 C - a_2 C^2\right]$

$\frac{dC}{dx} = \frac{KS}{l\dot{m}}\left[\Delta p - a_1 C - a_2 C^2\right] C^2$

$C_{glucosio\ (sangue)}$

$C_{glucosio\ (urine)}$

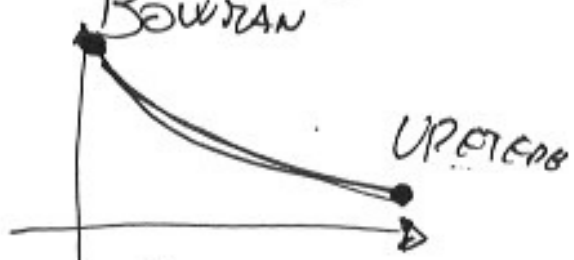
$$\frac{dc}{dx} = -\frac{KS}{\angle \dot{m}} \left[\Delta p - a_1 C_{\ast} O_2 C^2\right] C^2$$



$C_{glucosio\,(urine)}$

$C_{glucosio\,(sangue)}$

$C_{blood} - C_{urina} = \Delta C \Rightarrow$ membrana basale



Urea = $\Delta c = \emptyset$

Proteine = $\Delta c = C_{blood}$

Sali Na^+ = Δc =

Curina = $\emptyset$

$PH = Sangue = PH_{ULTRAFILTRATO}$

urina — sangue

$PH\ ACIDO \longrightarrow PH\ basico \rightarrow$ Produzione di $CO_2 \rightarrow$ Tessuti oss. NECROSI

$PH\ BASICO \longrightarrow PH\ acido \rightarrow$ EMOLISI $\rightarrow$

PROSSIMALE	MEDIALE	DISTALE	COLLETTORE

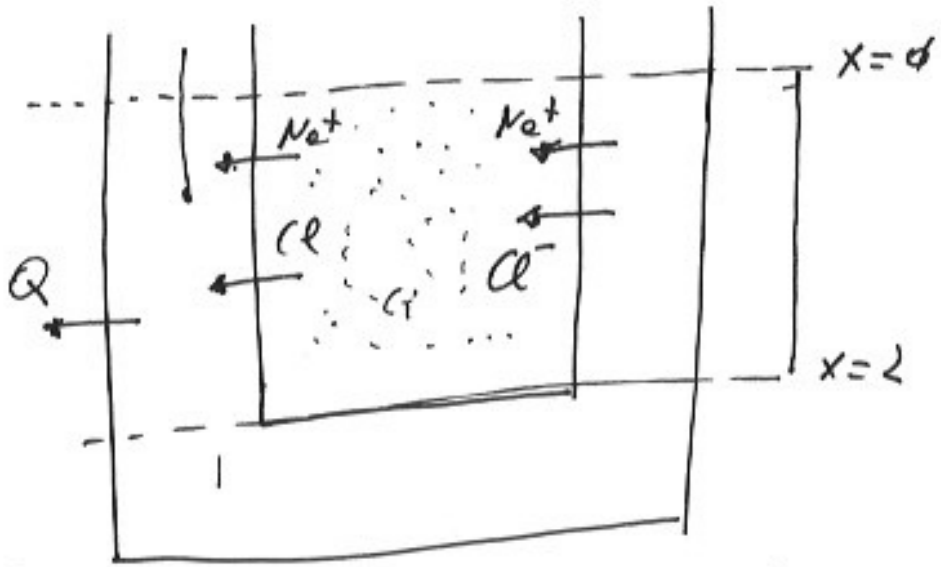
$$\frac{d(Q_{wj}\, C_{ij})}{dx_j} = -2\pi R_j n J_{ij}$$

$$\frac{d(Q_{w(j)}\, C_{i(j)})}{dx_{(j)}} = -2\pi R_{(j)} n \cdot J_{i(j)}$$

$$J_w = K_w Q_w \times$$

$$J_{Na} = K_{Na} [C_{Nai} - C_{Nao}]$$

$$J_{Na} = K_{Na} C_{Nai} \; !$$



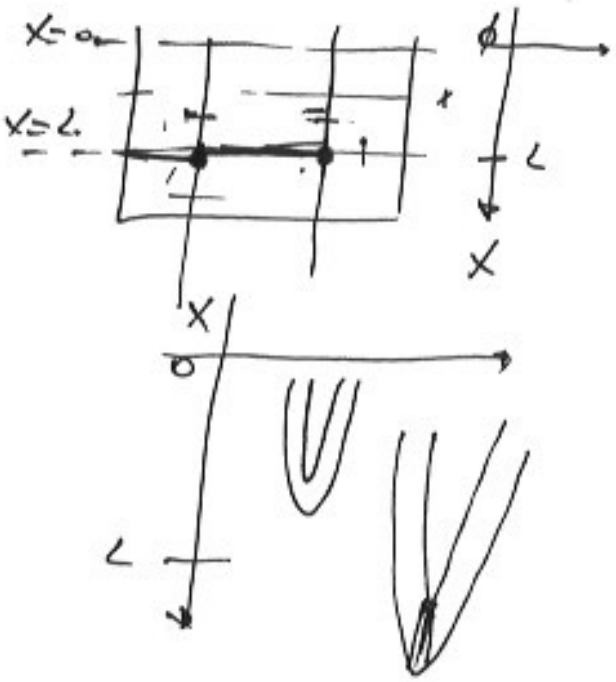
$L = 1\ cm$

$$\begin{cases} -\dfrac{d(QC_d)}{dx} = K_d(C_d - C_i) \quad (1) \\ Q_a \dfrac{dC_a}{dx} = K_a C_a \quad \text{osmotico} \quad (2) \\ -\dfrac{dQ}{dx} = K_0(C_i - C_d) \quad (3) \\ K_0 C_a = -K_d(C_d - C_i) \quad (4) \end{cases}$$

C_d = concentrazione Sodio nel tratto discendente

C_a = concentrazione Sodio nel tratto ascendente

C_i = concentrazione Sodio nell'interstizio



$$Q_a \frac{dC_a}{dx} = K_a C_a$$

$$\frac{dC_a}{C_a} = \frac{K_a}{Q_a} dx$$

$$\int_{C_{a(0)}}^{C_{a(x)}} \frac{dC_a}{C_a} = \int_0^x \frac{K_a}{Q_a} dx$$

$$\int_{C_{a(0)}}^{C_{a(x)}} \frac{dC_a}{C_a} = \int_0^x \frac{K_a}{Q_a} dx$$

$$\ln \frac{C_{a(x)}}{C_{a(0)}} = \frac{K_a}{Q_a} x \qquad \frac{C_{a(x)}}{C_{a(0)}} = e^{\frac{K_a}{Q_a} x}$$

$$C_a(x) = C_{a(0)} e^{\frac{K_a}{Q_a} x}$$

$$-\frac{dQ}{dx} = K_o (C_i - \epsilon_d)$$

$$K_a \epsilon_a = -K_d (C_d - C_i) = K_d (C_i - C_d)$$

$$(C_i - C_d) = \frac{K_a C_a}{K_d}$$

$$-\frac{dQ}{dx} = \frac{K_o K_a}{K_d} C_a$$

$$-\int_{Q(0)}^{Q(x)} dQ = \frac{K_o K_a}{K_d} \int_0^x C_a \, dx$$

$$-Q(x) + Q(0) = \frac{K_o K_a}{K_d} C_a(0) \cdot \frac{Q_a}{K_a} e^{\frac{K_a}{Q_a} x} \Big|_0^x$$

$$-Q(x) + Q(0) = \frac{K_o K_a}{K_d} C_a(0) \frac{Q_a}{K_a} \left[e^{\frac{K_a}{Q_a} x} - 1 \right]$$

$$\boxed{Q(x) = Q(0) - \frac{K_o}{K_d} C_a(0) Q_a \left[e^{\frac{K_a}{Q_a} x} - 1 \right]}$$

$$-Q(x) + Q(0) = \frac{K_o K_a}{K_d} \int_0^x C_a(0) e^{\frac{K_a}{Q_a} x} \, dx.$$

$$-\frac{d(QC_d)}{dx} = K_d(C_d - C_i)$$

$$K_a C_a = -K_d(C_d - C_i)$$

$$+d\frac{(QC_d)}{dx} = +K_a C_a$$

$$d(QC_d) = K_a C_a\, dx$$

$$\int_{Q(0)C_d(0)}^{a(x)C_d(x)} d(QC_d) = K_a \int_0^x C_a\, dx$$

$$Q(x)C_d(x) - Q(0)C_d(0) = K_a \int_0^x C_{a0}\, e^{\frac{K_a}{Q_a}} dx.$$

$$Q(x)\underline{C_d(x)} - Q(0)C_d(0) = \frac{K_a Q_a}{K_a} C_{a0}\left[e^{\frac{K_a}{Q_0}x} - 1\right]$$

$$C_d(x) = \frac{Q(0)C_d(0) + KQ_a C_{a0}\left[e^{\frac{K_a}{a_0}x} - 1\right]}{Q(x)}$$

$$\begin{cases} C_d(x) = \dfrac{Q(0)\,C_d(0) + Q_a C_{a0}\left[e^{\frac{K_a}{Q_a}x} - 1\right]}{Q(0) - \frac{K_0}{K_d} C_{a0} Q_a \left[e^{\frac{K_a}{Q_a}x} - 1\right]} \\ C_a(x) = C_a(0)\, e^{\frac{K_a}{Q_a}x} \\ Q(x) = Q(0) - \dfrac{K_0}{K_d} C_{a0} Q_a \left[e^{\frac{K_a}{Q_a}x} - 1\right] \end{cases}$$

$$K_a C_a = -K_d (C_d - C_i)$$

$C_i = \phi$ $\quad K_a C_a = -K_d C_d$ fisiologica

$C_i = \phi$. $C_a \gg C_d$. fisiologica.

$C_i = \phi$ $\quad C_a \ll C_d$. calcolosi - patologica.

$C_i \neq 0 \quad C_i = C_a = C_d$

patologica

$C_i \neq 0 \quad C_i << C_d \quad C_i << C_a$

sclerotizzazione renale

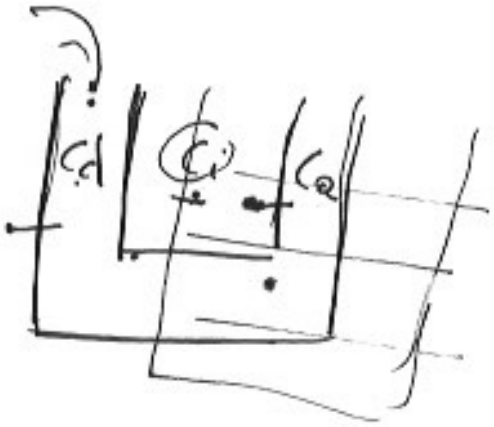
$C_i \neq 0 \quad C_i << C_d \quad C_i >> C_e$

fisiologica → dieta povera di sale

$C_i \neq 0 \quad C_i >> C_d \quad C_i >> C_a$

patologica

edema renale → ritenzione idrica



$C_i \neq 0 \quad C_i >> C_d \quad C_i << C_a$

fisiologica → dieta ricca in sale

Cloro

$$\begin{cases} -\dfrac{d(Qcd)}{dx} = K_d(c_d - c_i) \\ Q_a \dfrac{dc_a}{dx} = K_a(c_a - c_i) \\ -\dfrac{dQ}{dx} = k_o(c_i - c_d) \\ K_a(c_a - c_i) = -K_d(c_d - c_i) \end{cases}$$

c_a = Concentrazione Cloro nel tratto ascendente

c_d = concentrazione Cloro nel tratto discendente

c_i = concentrazione del Cloro nell'interstizio

$$c_i - c_d = c^*$$

$$\begin{cases} -\dfrac{d(Qcd)}{dx} = -K_d c^* & (1) \\ Q_a \dfrac{dc_a}{dx} = K_a(c_a - c_i) & (2) \\ -\dfrac{dQ}{dx} = K_o c^* & (3) \\ K_a(c_a - c_i) = +K_d c^* & (4) \end{cases}$$

(3)

$$-\frac{dQ}{dx} = K_0 C^*$$

$$-dQ = K_0 C^* dx.$$

$$-\int_{Q(0)}^{Q(x)} dQ = K_0 \int_0^x C^* dx \qquad C^* = \text{cost}$$

$$-Q(x) + Q(0) = K_0 C^* x$$

$$\boxed{Q(x) = Q(0) - K_0 C^* x.}$$

" 125 ml/m

$$-\frac{d(QC_d)}{dx} = -K_d C^*$$

$$+Q\frac{dC_d}{dx} + C_d\frac{dQ}{dx} = +K_d C^*$$

$$-\frac{dQ}{dx} = K_0 C^*$$

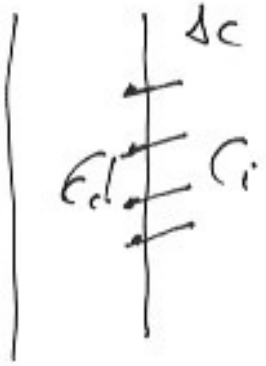
$$Q\frac{dC_d}{dx} + C_d(-K_0 C^*) = K_d C^*$$

$$Q\frac{dC_d}{dx} = K_d C^* + K_0 C^* C_d = C^*[K_d + K_0 C_d]$$

$$\frac{dC_d}{K_d + K_0 C_d} = \frac{C^*}{Q}\,dx = \frac{C^*}{Q(0) - K_0 C^* x}\,dx$$

$$\ln \frac{K_d + K_0 C_d(x)}{K_d + K_0 C_d(0)} = - \ln \left[\frac{Q(0)}{C^*} - K_0 x \right] \cdot \frac{C^*}{Q_0}$$

$$\ln \frac{K_d + K_0 C_d(x)}{K_d + K_0 C_d(0)} = - \ln \left[\frac{(Q(0) - K_0 x C^*)\, C^*}{C^* Q_0} \right]$$



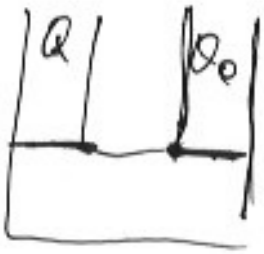
$$\ln \frac{K_d + K_0 C_d(x)}{K_d + K_0 C_d(0)} = \frac{C^* Q_0}{C^* [Q(0) - K_0 x C^*]}$$

$$K_d + K_0 C_d(x) = \frac{[K_d + K_0 C_d(0)]\,[C^* Q_0]}{C^* [Q(0) - K_0 x C^*]}$$

$$C_d(x) = \frac{1}{K_0} \frac{[K_d + K_0 C_d(0)]\,[C^* Q_0]}{C^* [Q(0) - K_0 x C^*]} - \frac{K_d}{K_0}$$

$$Q_a \frac{dC_a}{dx} = K_a (C_a - C_i)$$

$$K_a (C_a - C_i) = K_d C^*$$



$$Q_a \frac{dC_a}{dx} = K_d C^*$$

$$Q_a \, dC_a = K_d C^* dx \qquad Q_a = Q(L)$$

$$dC_a = \frac{K_d}{Q_a} C^* dx$$

$$\int_{C_a(0)}^{C_a(x)} dC_a = \frac{K_d C^*}{Q_a} \int_0^x dx.$$

$$C_a(x) - C_a(0) = \frac{K_d C^*}{Q_a} x$$

$$\boxed{C_a(x) = C_a(0) + \frac{Q_0}{K_d} C^* x}$$

Ca Ci C* Cloro

$C_i = \phi$ $C^* = -E_{Cl}$ Ca $C_i = \phi$

$K_a C_a = -K_d C_d$ $C_a \neq C_d$

$C_i = \phi$ $C_a >> C_d$ patologica edema renale

$C_i = \phi$ $C_a << C_d$ patologica sangue basificato

$C_i = \phi$ $C_a = C_d$ fisiologica

$C_i \neq \phi$ fisiologica $C_i \simeq 0$

$C_i \neq \phi$	patologica	dialisi