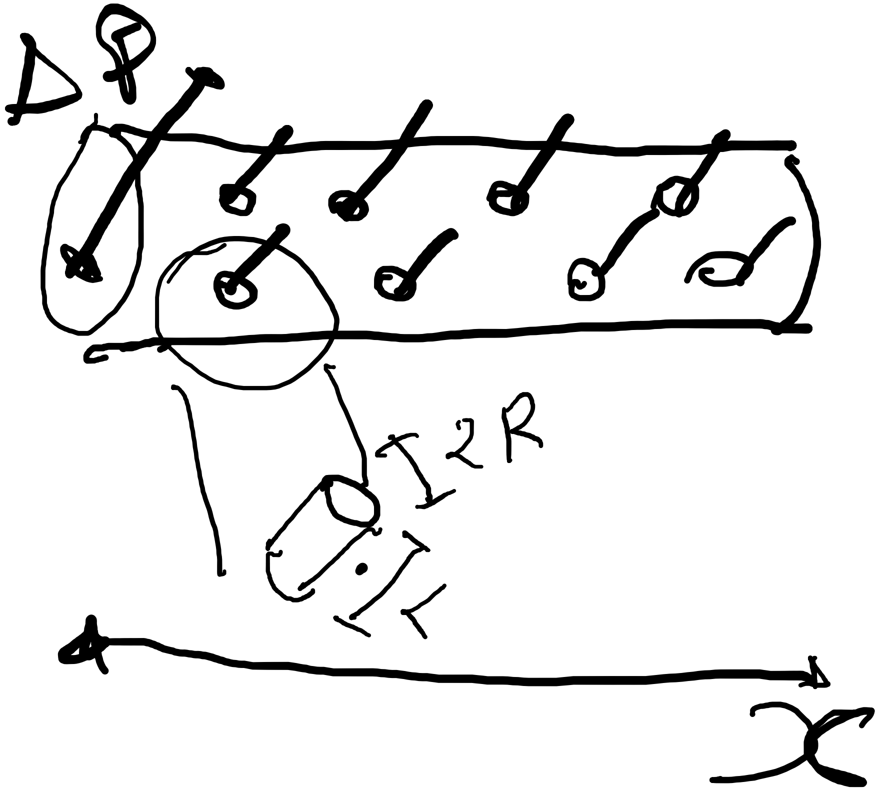


$$Q = \frac{n \pi R^4 \Delta P}{8 \mu l} = GFR = 125\ \text{ml/mn}$$

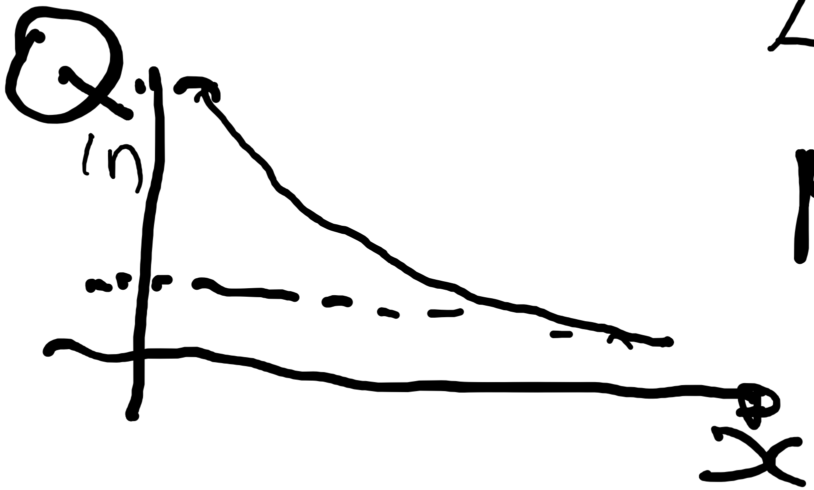
$R = 100 - 200\ A^\circ$

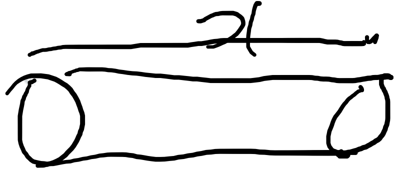
$l = 40 - 600\ A^\circ$

$\Delta P = 60 - 80$ mmHg.

$\mu = 4$ Cpoise

$Q_{in} = 1200$ ml/mn





$$\frac{dQ}{dx} = -K\frac{S}{L}P_{UF}$$

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

π = pressione osmotica colloide

$$\pi_B \simeq 0$$

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

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

C riferito al volume di sangue

$$C = \frac{\dot{m}}{Q} \rightarrow Q = \frac{\dot{m}}{C}$$

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

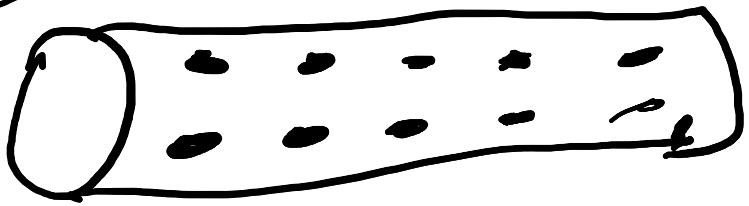
$$\frac{dQ}{dx} = -\frac{KS}{2} P_{UF} = -\frac{KS}{2}\left[\Delta p - \pi_C\right] = -\frac{KS}{2}\left[\Delta p - a_1 C - a_2 C^2\right]$$

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

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

$$C = C_i(\text{sangue}) - C_i(\text{urina})$$

S = somma della superficie dei pori = porosità



angiografia. radiopaco al condotto vasc

L

$$K = \frac{\Delta C}{\Delta t}$$

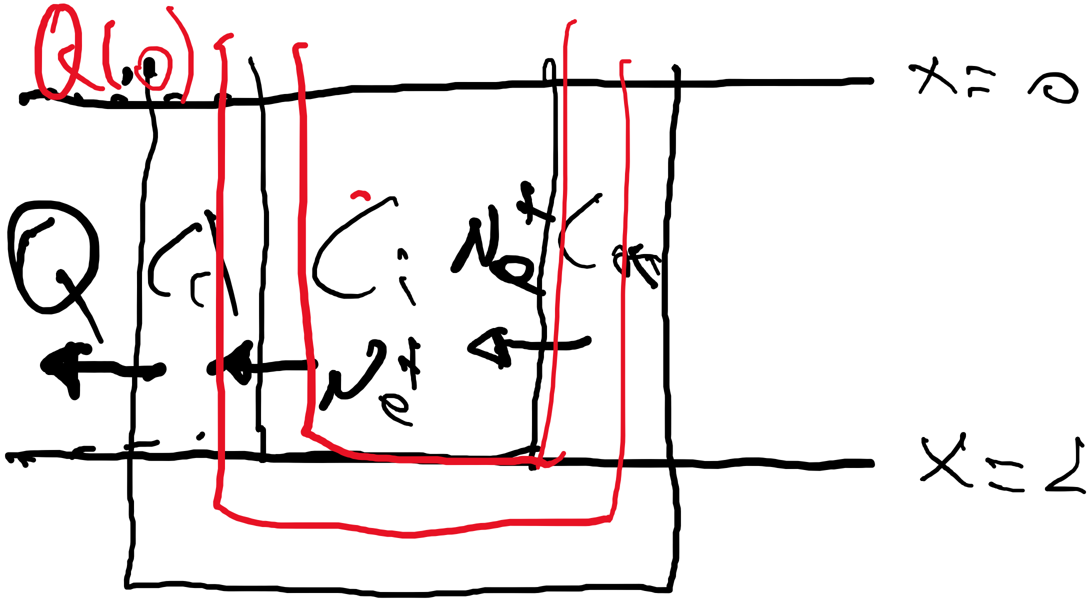
| PROSS. | HENLE | DISTALE | COLLETTORE |

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

$$J_w = K_w Q_w x$$

$$J_{Na} = K_{Na}[C_{Na_i} - C_{Na_o}]$$ → per Cl ansa

$$\overline{J_{Na}} = \overline{K_{Na}} C_{Na_i}$$



$L = 1$ cm

C_i : concentrazione interstiziale

C_a : conc. nel tratto ascendente

C_d = conc. nel tratto discendente

$$-\frac{d(QC_d)}{dx} = K_d(C_d - C_i) \quad (1)$$

$$Q_a \frac{dC_a}{dx} = K_a C_a \quad (2)$$

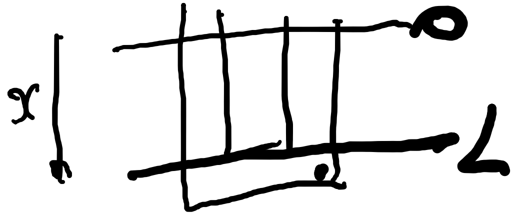
$$K_a C_a = -K_d(C_d - C_i) \quad (4)$$

$$-\frac{dQ}{dx} = K_a(C_i - C_d) \quad (3)$$

$$Q(0) = 125 \frac{ml}{min} = GFR.$$

eq. 2.

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



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

$$\ln C_a(x)\Big|_{C_a(0)}^{C_a(x)} = \frac{K_a}{Q_a}\,x \Rightarrow \ln\frac{C_a(x)}{C_a(0)} = \frac{K_a}{Q_a}\,x$$

$$\boxed{C_a(x) = C_a(0)\, e^{\frac{K_a}{Q_a}x}}$$

eq. 3 -

$$-\frac{dQ}{dx} = K_o(C_i - C_d) \qquad K_a C_a = -K_d(C_d - C_i) = K_d[C_i - C_d]$$

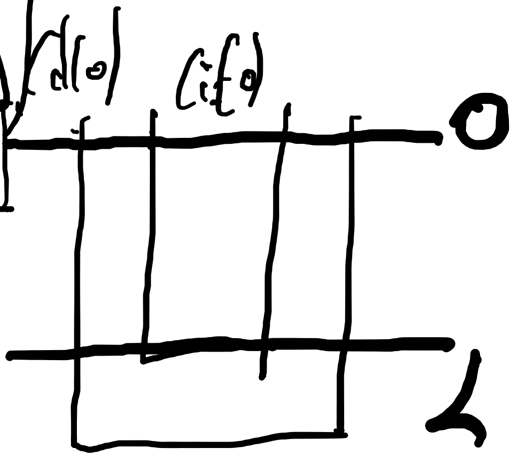
$$C_i - C_d = \frac{K_a C_a}{K_d}$$

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

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

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

$$\boxed{Q(x) = \underset{\text{GFR}}{\underset{\parallel}{Q(0)}} - \frac{K_e}{K_d} C_{a0} Q_a \left[e^{\frac{K_a}{Q_a} x} - 1 \right]}$$



$$K_e C_a = -K_d (C_d - C_i) \quad \forall x$$

$$K_e C_a(0) = -K_d \left[C_d(0) - C_i(0) \right] \quad x = \phi$$

$$C_a(0) = -\frac{K_d}{K_a} \left[C_d(0) - C_i(0) \right] \quad C_i(0) \simeq \phi$$

eq. 1

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

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

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

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

$$C_d(x) = \frac{Q(0)\,C_d(0) + Q_e\,C_{oo}\left[e^{\frac{K_o}{Q_e}x} - 1\right]}{Q(x)}$$

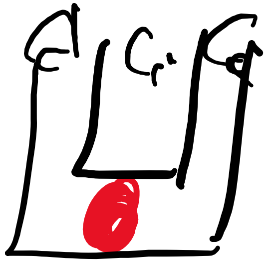
dove $Q(x) = Q(0) - \frac{K_o}{K_d} C_{oo}\, Q_e \left[e^{\frac{K_o}{Q_e}} - 1\right]$

$K_o\, C_o = -K_d\,(C_d - C_i)$

$C_i = \phi$ $\quad K_o C_o = -K_d C_d$ fisiologica formazione

$C_i = \phi$ $\quad C_o >> C_d$ fisiologica

$C_i = \phi$ $\quad C_o << C_d$ calcolosi - patologica



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

$C_i \neq 0$ $C_i \ll C_d$ $C_i \ll C_a$ patologica – sclerotizz.

$C_i \neq 0$ $C_i \ll C_d$ $C_i \gg e$ fisiologica – dieta ricca di sali

$C_i \neq 0$ $C_i \gg C_d$ $C_i \gg C_a$ patologica – edema rit. idrica

$C_i \neq 0$ $C_i \gg C_d$ $C_i \ll C_e$ fisiologica – dieta povera di sal.

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

Cloro

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

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

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

$$C_i - C_d = C^*$$

$$-\frac{d(QC_d)}{dx} = -K_d C^* \quad (1)$$

$$Q_e \frac{dC_e}{dx} = K_o(C_e - C_i) \quad (2)$$

$$-\frac{dQ}{dx} = K_o C^* \quad (3)$$

$$K_o(C_e - C_i) = K_d C^* \quad (4)$$

eq. 3.

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

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

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

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

Ea. 1

$$-\frac{d(Q\,Cd)}{dx} = -k\,d\,C^{*}$$

$$+\,d(Q\,Cd) = +K\,d\,C^{*}\,dx$$

$$+\int_{Q(x)\,Cd(x)}^{Q(0)\,Cd(0)} d(Q\,Cd) = +K\,d\,C^{*}\int_{0}^{x} dx$$

$$Q(x)\,Cd(x) - Q(0)\,Cd(0) = K\,d\,C^{*}\,x$$

$$Cd(x) = \left[Q(0)\,Cd(0) - K\,d\,C^{*}\,x\right] \Big/ \left[Q(0) - K_{o}\,C^{*}\,x\right]$$

Eq. 2.

$$Q_a \frac{dC_a}{dx} = K_a (C_a - C_i) \Rightarrow K_a(C_a - C_i) = K_d C^*$$

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

$$Q_a \, dC_a = K_d C^* dx$$

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

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

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

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

Se $C_i = \phi$ $\quad C^* = -C_d \quad K_e \cdot C_e = -K_d C_d$

Se $C_e \neq C_d$ condizione fisiologica formazione rene

$C_i = \phi \quad C_e >> C_d$ patologica edema renale

$C_i = \phi \quad C_e << C_d$ patologica sangue che si basifica

$C_i = \phi \quad C_e = C_d$ morte

$C_i \neq 0$	$C_a >> C_i$	$C_d >> C_i$	sclerosi nefr.	pat.
	$C_e >> C_i$	$C_d << C_i$	dialisi	pat
	$C_e << C_i$	$C_d >> C_i$	pH acido sangue	pat
	$C_e << C_i$	$C_d << C_i$	edema	