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## Studies of strontium biokinetics in humans

### Part 2: Uptake of strontium from aqueous solutions and labelled foodstuffs

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The wrong version of Appendix was published. The correct Appendix appears here.

#### Appendix

Derivation of the  $f_1$  equation:

$$f_1 = \frac{z_{86po}}{z_{84iv}} \cdot \frac{m_{84iv}}{m_{86po}}$$

$$\frac{z_{86po}}{z_{84iv}} = \frac{\left(\frac{z_{84}}{z_{88}}\right) \cdot (h_{86} \cdot k_{88} - k_{86}) + \left(\frac{z_{86}}{z_{88}}\right) \cdot (1 - h_{84} \cdot k_{88}) + h_{84} \cdot k_{86} - h_{86}}{\left(\frac{z_{84}}{z_{88}}\right) \cdot (1 - h_{86} \cdot l_{88}) + \left(\frac{z_{86}}{z_{88}}\right) \cdot (h_{84} \cdot l_{88} - l_{84}) + h_{86} \cdot l_{84} - h_{84}}$$

where  $\frac{z_{84}}{z_{88}}$ ,  $\frac{z_{86}}{z_{88}}$  are the ratios of strontium isotopes in blood and urine, measured by TI-MS

$h_{84}$ ,  $h_{86}$ : ratios of isotopes  $^{84}\text{Sr}$ , and  $^{86}\text{Sr}$  in relation to natural  $^{88}\text{Sr}$

$k_{86}$ ,  $k_{88}$ : ratios of isotopes  $^{86}\text{Sr}$ , and  $^{88}\text{Sr}$  in relation to  $^{84}\text{Sr}$  in the intravenous tracer

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$l_{84}$ ,  $l_{88}$ : ratios of isotopes  $^{84}\text{Sr}$ , and  $^{88}\text{Sr}$  in relation to  $^{86}\text{Sr}$  in the oral tracer

$m_{84}$ ,  $m_{86}$ : amounts of the isotopes  $^{84}\text{Sr}$  and  $^{86}\text{Sr}$  as administered tracers, multiplied with the enrichment factor (enrichment of  $^{84}\text{Sr}$ : 76.4%, of  $^{86}\text{Sr}$ : 95.70%, see Table 2) iv=intravenous, po=per oral.

For calculation of factors  $h_{84,86}$ ,  $k_{86,88}$ ,  $l_{84,88}$ : take the corresponding data given in Table 2 (e.g.:  $h_{84}$ =ratio of 0.56 to 82.58).

Considering the composition of the measured values at masses  $z_{84}$ ,  $z_{86}$  and  $z_{88}$ :

$$z_{84} = z_{84nat} + z_{84iv} + z_{84po} \quad (1)$$

$$z_{86} = z_{86nat} + z_{86iv} + z_{86po} \quad (2)$$

$$z_{88} = z_{88nat} + z_{88iv} + z_{88po} \quad (3)$$

It is:

$$z_{84nat} = h_{84} \cdot z_{88nat} \quad (4)$$

$$h_{84} = \frac{z_{84nat}}{z_{88nat}} \quad (4a)$$

$$z_{86nat} = h_{86} \cdot z_{88nat} \quad (5)$$

$$h_{86} = \frac{z_{86nat}}{z_{88nat}} \quad (5a)$$

$$z_{86iv} = k_{86} \cdot z_{84iv} \quad (6)$$

$$k_{86} = \frac{z_{86iv}}{z_{84iv}} \quad (6a)$$

$$z_{88iv} = k_{88} \cdot z_{84iv} \quad (7)$$

$$k_{88} = \frac{z_{88iv}}{z_{84iv}}$$

$$z_{84po} = l_{84} \cdot z_{86po}$$

$$l_{84} = \frac{z_{84po}}{z_{86po}}$$

$$z_{88po} = l_{88} \cdot z_{86po}$$

$$l_{88} = \frac{z_{88po}}{z_{86po}}$$

The ratio of  $\frac{z_{84}}{z_{88}}$  is set equal to ratio of Eq. (1) to Eq. (3)

(7a) and the ratio of  $\frac{z_{86}}{z_{88}}$  is set equal to ratio of Eq. (2) to Eq.(3) (11)

(8) Solve Eq. (10) for  $z_{88nat}$  (12)

(8a) and solve Eq. (11) for  $z_{88nat}$  (taking into account Eqs. 4 – 9a). (13)

(9a) Finally, set Eq. (12) equal to Eq. (13), and solve for  $\frac{z_{86po}}{z_{84iv}}$ .

(10)