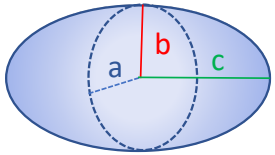
How volumes of diffrenet 3D shapes translate to their cross sectional area

– a (simplified) calculation excercise

spheroid



$$CA_{spheroid} = \pi bc$$

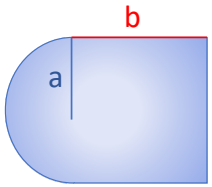
$$V_{spheroid} = \frac{4}{3}\pi abc$$

$let's\ consider\ a\ spheroid\ where\ b = a\ \ and\ \ c = 1.5a$

$$CA_{spheroid} = 1.5\pi a^2$$

$$V_{spheroid} = 2\ \pi a^3$$

bullet*



$$CA_{bullet} = \frac{1}{2}\pi a^2 + b^2$$

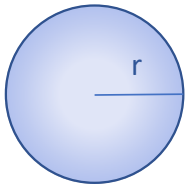
$$V_{bullet} = \frac{1}{2}\cdot\frac{4}{3}\pi a^3 + \pi a^2 b$$

$let's\ consider\ an\ example\ where\ b = 2a$

$$CA_{bullet} = \frac{1}{2}\pi a^2 + 4a^2$$

$$V_{bullet} = \frac{8}{3}\pi a^3$$

sphere



$$CA_{sphere} = \pi r^2$$

$$V_{sphere} = \frac{4}{3}\pi r^3$$

*for simplicity I consider bullet as a sum of ½ sphere and a cyllinder

Let's consider an example:

For constant V = 1200 µm^3

$CA_{spheroid}$ = 156.28 µm^2

CA_{bullet} = 152.51 µm^2

CA_{sphere} = 136.52 µm^2

Constant volume :

$CA_{spheroid} > CA_{bullet} > CA_{sphere}$

For constant CA = 150 µm^3

V_{sphere} = 1382.0 µm^2

V_{bullet} = 1170.5 µm^2

$V_{spheroid}$ = 1128.4 µm^2

Constant area:

$V_{sphere} > V_{bullet} > V_{spheroid}$