



Experimental Question:

- What factors limit how large a cell can grow?

Procedure

1. Go to your lab tables and put on goggles.
2. Cut 3 cubes from potatoes, one in each size: 1.5 cm³, 1.0 cm³, 0.5 cm³
3. Place the cubes in a small beaker.
4. Cover the cubes with KMnO₄ solution. Let them sit for _____ minutes.

Discussion

- What do the potato cubes represent?
- What does the KMnO₄ solution represent?
- What do you expect to see when we look at the cubes?

Surface Area to Volume

- Cell surface area is important in taking in nutrients
- Surface area increases as the square of cell diameter
- But... entire cell volume needs to be fed
- And, cell volume increases as the cube of cell diameter

Relationship Between Surface Area and Volume



Side length	Surface area	Volume	Surface area/volume ratio
1 mm	6 mm ²	1 mm ³	6:1
2 mm	24 mm ²	8 mm ³	3:1
4 mm	96 mm ²	64 mm ³	3:2

Surface Area to Volume

Cell Radius (R)	5 μm	50 μm
Surface Area (4πr ²)	314 μm ²	31,400 μm ²
Volume (4/3πr ³)	524 μm ³	524,000 μm ³
Surface Area to Volume Ratio	0.6	0.06

Why are Cells Small?

- Cells must exchange gases & other molecules with environment...
- Nutrients in, Wastes out
- As height, length, width increase, so does the amount of stuff the cell contains
- As size increases, the rate of diffusion exchange slows down....

Surface Area to Volume

Cell Radius (R)	5 μm	50 μm
Surface Area (4πr ²)	314 μm ²	31,400 μm ²
Volume (4/3πr ³)	524 μm ³	524,000 μm ³
Surface Area to Volume Ratio	0.6	0.06