How to know which one is better?

1. ~~Experiment~~
2. Math Model

Experiment:

Doing Research on Particles/Cells etc will face lots of difficulties (Can only done **Qualitatively** (only detect if it’s successful, rather statistically)), since:

Every experiment can vary by conditions:

* 1. Environment: concentrations, injection time, temperatures
  2. Nature of Cells: Type, Size, fluorescence strength, cell movements
  3. Design: Method of Injection, Detection, etc

Therefore, Dosimetry (Measurement) can vary a lot, with data uncertain

Thus, Need Math Equations to solve, For **Quantitative** analysis (increases how much etc)

Math Solving: Combine these two together for **Experiment Use in Vitro** (In solution, Lab Environment)

1. Association Model: Biological Interaction with Cells-Particles
2. Dosimetric Model: Particle Movements in Vitro (out of body, in solution, lab-related)

* : function of Dosimetry parts, {on cells: Logo

  Description automatically generated; not on cells: 0}
* ： Function of Association parts (cell related)

Table

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1. SC: surface coverage of cells (How many cells) Pos
2. r: rate of association (particle into cells rate) Pos
3. u: Concentration of Particles Pos
4. P\_capactiy: Cell’s **inside** capacity for particles Pos
5. P\_assoc: num of particles **inside** cells Neg
6. S\_capacity: Cell’s **Surface** capacity for particles Pos

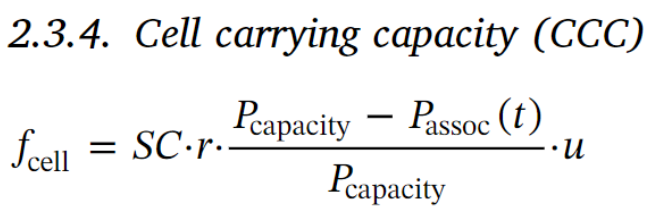
Visualise:

Incubate Cells(1,2) => Put Particles into fluid(3) => Particles move onto cells’ surfaces(6) => Particles move from surfaces into Cells(4, 5)

Performance Measure:

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Best Model:  --------Indicates S\_capacity is not important (threshold may be P\_ instead, association speed rather than surface capacity)

Determine Association rate **r** :

Bigger, larger cell may have high **association(brighter, settling faster),** but may not have high **Association rate r** .(Easy to identify but may not be efficient)

Targeting Behavior is shown, but still phagocytic cell can still associate many particles

A further experiment given different conditions leads to same association rate r, (meaning r is more cell-oriented and independent of experiment elements)

Conclusion:

* Found rate of association r, this parameter stands for characteristics of cells (independent of environment). Enable us to do quantitative analysis by using it (control variables of environmental elements)
* Math Modelling: model association rate considering environmental elements as well

Questions:

Why does this report mention **phagocytic** a lot?

**Diffusion Formula:**

Text

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**Sedimentation Velocity:**

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**Surface Area:**

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**LIVER Absorption**

**Factors affecting number of Particles entering Hepatocyte**

Particles enter human body(blood vein) -> [impede by Kupffer Cells] or [through vein window] –> into space between hepatocytes and vein -> enter hepatocytes -> exit hepatocytes -> Enter Bile Duct

Factors need to consider:

1. Particles (use **Concentration Function** that we have already solved?):
   1. Size
   2. Type
   3. Concentration
2. Vein
   1. Blood Speed (Heart Rate)
   2. Fenestrae size (windows on central vein): impact more on larger particles. Source: <https://www.nature.com/articles/gt200860#:~:text=In%20the%20current%20study%2C%20we,is%20107%C2%B11.5%20nm>.
   3. Kupffer Cells: Roadblocks, (impact more on **larger** particles), Negative Correlation

F\_kupffer = Remaining Capacity/Particle\_Size

**F\_vein = C\_fenestrae \* F\_kupffer**

1. Space In Between:

**F\_****space = F\_fluid = -D\*delta\_u + s\*u**

1. Hepatocytes (can we just use **F\_cell** directly? With discharge rate added):
   1. Absorption rate: Positive Correlation
   2. Discharge rate: Positive Correlation
   3. Capacity: Positive Correlation
   4. Quantity: Positive Correlation

**F\_hepatocytes = F\_cell of CCC model**

1. Bile Duct:
   1. Concentration
   2. Circulation speed

**F\_bileduct = Speed \* (1/Concentration)**

**In total:**

u = concentration of particles inside Hepatocytes

d(u)/d(t) = F\_kupffer \* C\_fenestrae \* F\_vein \* F\_space \* F\_hepatocytes \* F\_bileduct