BME 695 Engineering Nanomedical Systems
September 27, 2011

Lecture 9: Challenges of proper drug dosing with nanodelivery systems

9.1 Overview of drug dosing problem
- 9.1.1 Problems of scaling up doses from animal systems
- 9.1.2 Basing dosing on size, area, weight of recipient
- 9.1.3 Vast differences between adults in terms of genetics, metabolism
- 9.1.4 Dosing in children – children are NOT smaller adults!
- 9.1.5 Pharmacokinetics – drug distribution, metabolism, excretion, breakdown
- 9.1.6 Conventional dosing assumes drug goes everywhere in the body
- 9.1.7 Targeted therapies – a model for future nanomedical systems?

9.2 From the animal dosing to human clinical trials
- 9.2.1 Importance of picking an appropriate animal model system
- 9.2.2 Does drug dosing really scale?
- 9.2.3 The human guinea pig in clinical trials and beyond

9.3 Traditional drug dosing methods
- 9.3.1 Attempts to scale up on basis of area
- 9.3.2 Attempts to scale up on weight/volume
- 9.3.3 Attempts to use control engineering principles

9.4 Genetic responses to drug dosing
- 9.4.1 All humans are not genomically equivalent!
- 9.4.2 Predicting on basis of family tree responses
- 9.4.3 SNPs, chips, and beyond…predicting individual drug response
- 9.4.4 After the $???? individual genome scan… more closely tailored individual therapies

9.5 Dosing in the era of directed therapies – a future model for nanomedical systems?
- 9.5.1 How directed therapies change the dosing equation
- 9.5.2 Current generation directed antibody therapies dosing
- 9.5.3 Some typical side effects of directed therapies
- 9.5.4 Nanomedical systems are the next generation of directed therapies

9.6 Most directed therapies are nonlinear processes!
- 9.6.1 Meaning of nonlinear processes
- 9.6.2 Some examples of how a few directed therapies work
- 9.6.3 Side effects of “directed therapies”

9.7 Other ways of controlling dose locally
- 9.7.1 Magnetic field release of drugs
- 9.7.2 Light-triggered release of drugs

References

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