Module 7 Assignment

585.751.81 Immunoengineering

1. Here are some examples of recent start-ups tackling challenges related to infectious diseases, and pick one and research further: (15 points)

* Karius
* Moderna
* Day Zero Diagnostics
* VIR Biotechnology
* IDbyDNA
* Vaxess
* You may also choose a start-up not found on this list that you find interesting

As you research, answer briefly (1-2 sentences for each):

1. What does their technology do and what disease is targeted?
2. What problem does their technology solve?
3. What stage of development are they at?
4. A new diagnostic test is being developed for tuberculosis. Tests with characterized patient samples have been performed on the new test. Values below correspond to the number of samples in the test positive for tuberculosis. (10 points)

* Calculate the sensitivity and specificity of the test for each group and also for all groups combined.
* Also, comment on the utility of this test based on these criteria.

HIV– groups (n = 222)

TB+ = 50/54

Latent TB = 8/62

Nontuberculosis mycobacteria = 6/64

Healthy controls = 0/42

HIV+ groups (n = 180)

Pulmonary TB+ = 70/80

Extrapulmonary TB+ = 36/42

TB- = 6/58

1. Compare and contrast *Large scale screening* to *Mechanistic* *insight* approaches to discover new therapeutic targets. Please focus on the advantages and disadvantages of each approach. (15 points)
2. Compare and contrast the four major different types of biologic therapeutic approaches. In your analysis answer: (20 points)

* When would you want to use each approach for infectious disease?
* What is one of the major advantages and disadvantages to each approach?
* What design criteria are shared between approaches in creating a therapy?

1. Design a biomaterial therapeutic to treat one of the following infectious diseases:

* Tuberculosis (Bacteria)
* Malaria (Parasite)
* HIV (Virus)

In your consideration of your design, please list specifically how the therapeutic was designed with design constraints such as:

1. Manufacturing/Cost
2. Safety
3. Specificity
4. Potency
5. Biomaterial properties – e.g. stiffness, degradability, size, shape, etc.