Biomaterials - Tissue Interactions

Homework #6

1a. Three companies have developed competing polymers that they say can result in bonding (chemical bonding) of fibrous tissue to the surface as a result of adhesion of fibronectin (Fn). In support of their claims they provide the following data (Fig. 1.1). Which polymer would you choose to use? Explain.
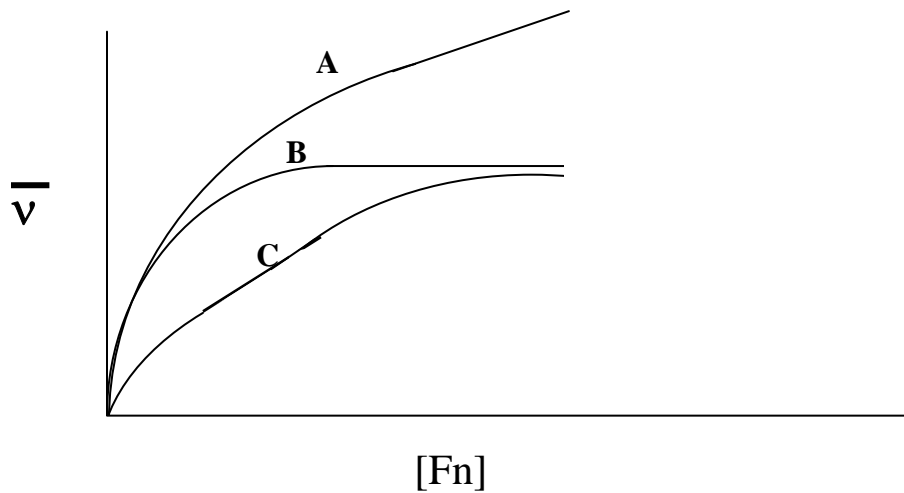

Fig. 1.1

1b. A fourth company has also been investigating the adsorption and desorption of fibronectin on a specific polymer ("D"). It has generated the following data (Figs. 1.2 and 1.3) but cannot explain its behavior. The desorption curve was produced after a residence time of 10 hours. Help this company explain its findings.
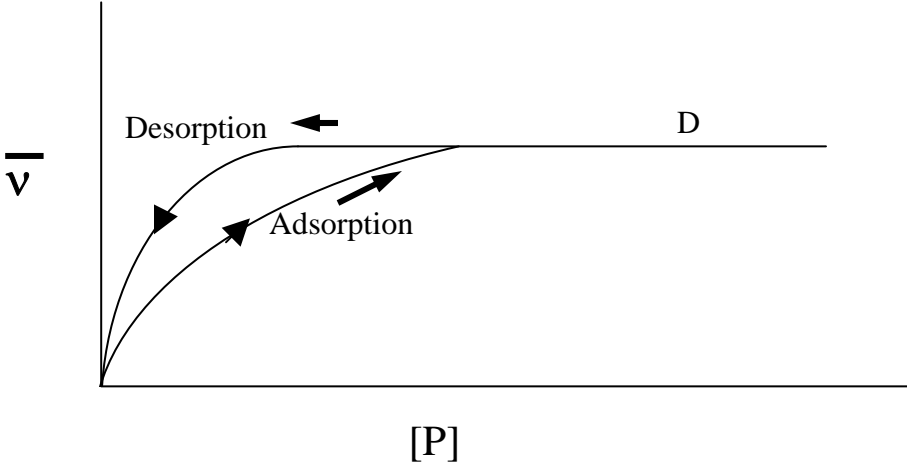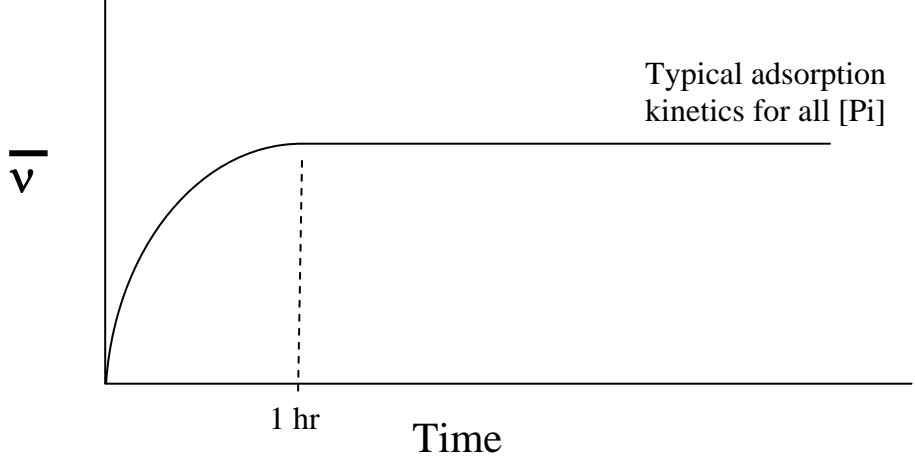

Fig. 1.2

Fig. 1.3

1c. The company with polymer "D" stated that these results show that with increasing time *in vivo* (*i.e.*, increasing residence time) the strength of tissue attachment should increase. Do you agree?

2. A company has performed experiments to determine the adsorption of a particular adhesion protein to its bone-bonding material, and has generated the graph in Fig. 2.1.

    a. The manufacturer has proposed the model in Fig. 2.2 (drawn close to scale) to explain the results. It notes that "o" and "x" are two non-interacting binding sites. Do you agree?

    b. The company notes that it has a new material with 10 times more binding sites than the material in Fig. 2.2. It claims that this should lead to better tissue bonding. Do you agree?

    c. Assuming that the model in Fig. 2.2 is correct, how would you recommend changing the relative number of "o" and "x" binding sites for the material to function more effectively if the conditions are those at region A in Fig. 2.1.
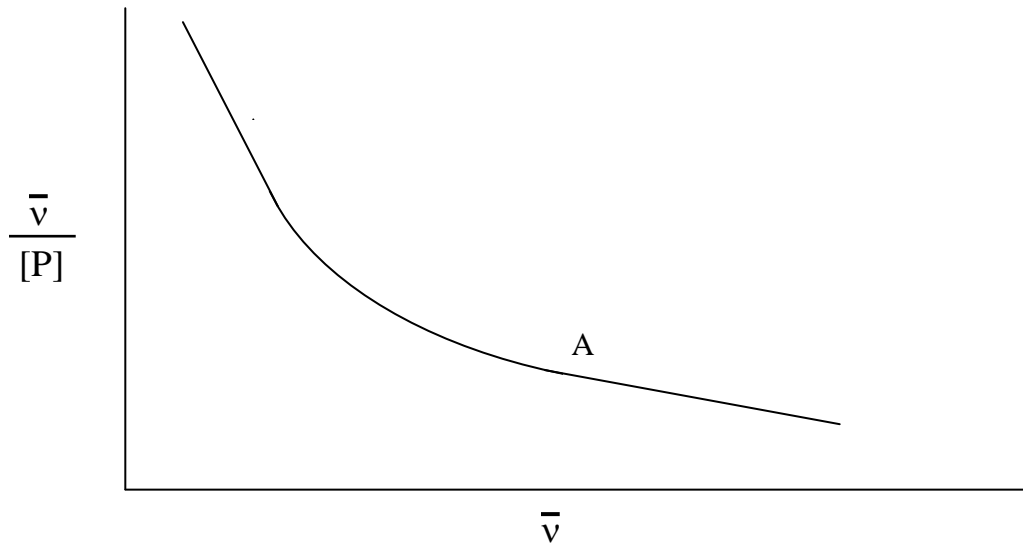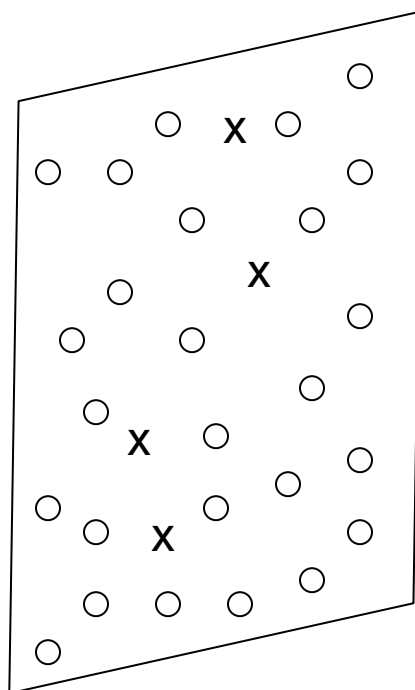
Fig. 2.1

Fig. 2.2

3

20.441J / 2.79J / 3.96J / HST.522J Biomaterials-Tissue Interactions
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