

Biomaterials - Tissue Interactions

Homework #2

1. Cell Adhesion

- a. A scientist has developed a method for depositing laminin on the surface of tissue culture dishes. She expects to make a fortune by selling these dishes as improved adhesion surfaces for *in vitro* studies of all types of cell. What is your opinion?
- b. Is it possible that cell culture dishes could be developed with specific coatings for the culturing of certain cells? Explain.
- c. How is it that most types of cells in culture will adhere to plastic dishes manufactured with no protein coating?

2. Role of Integrins in Wound Healing

If dermis were injected with an agent that blocked the integrins of the constituent fibroblasts how would the unit cell processes associated with healing of a wound be affected?

3. Treatment to Prevent Osteoporosis

Osteoporosis is a disease associated with an imbalance in the bone remodeling process, with a net loss of bone due to resorption (*i.e.*, degradation). An investigator plans to treat the disease by injecting a solution containing molecules with the R-G-D sequence. How could such a treatment be expected to work, if it does? What are the potential problems with such a treatment?

4. Adhesion protein for a porous coating for orthopaedic implants

You have been hired by a firm to assist in the development of permanent metal mesh porous coatings to be applied to joint replacement prostheses to facilitate the fixation of the implant to bone (Fig. 1). Your boss has suggested that you might consider applying an adhesion protein to the surface of the porous material to facilitate the migration of the cells, which will form the blood vessels and bone, on the surface of the implant. She would prefer that only one adhesion protein be used. Will this be possible? Explain.

Fig. 1 Acetabular cup prosthesis with a metal mesh backing into which bone is to grow.

Photo of mesh acetabular cup removed due to copyright restrictions.

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