

**Anchorage dependence**

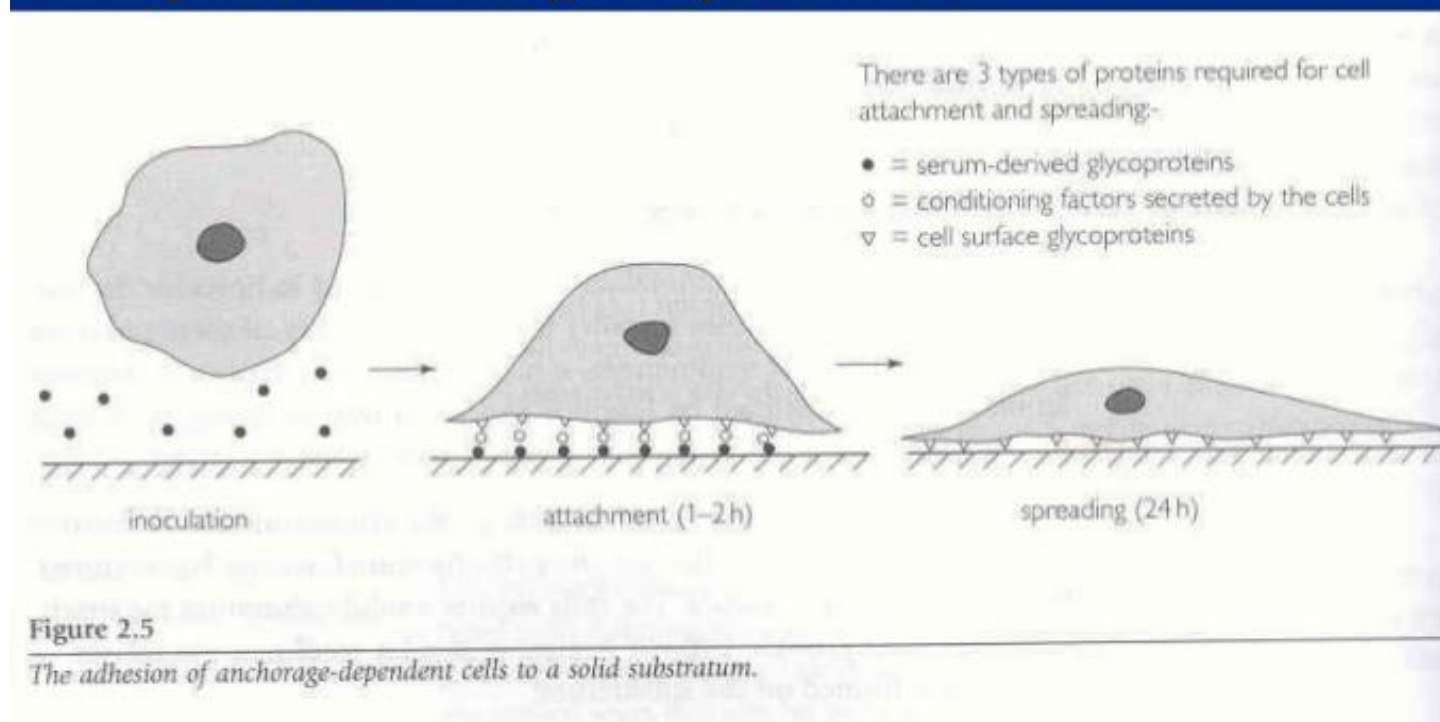
**وابستگی به تکیه گاه**

## Anchorage Dependence

وابستگی به تکیه گاه، نیاز سلول ها به یک بستر جامد جهت رشد می باشد

- Cells need to attach to solid substratum before growth occurs
- Combination of **electrostatic** attraction and **van der Waal's forces**
- Divalent **cations** ( $\text{Ca}^{2+}$ ) and **basic proteins** form layer between cells and substratum
- Mediated by a range of **nonspecific proteins** which form a layer on the substratum prior to cell attachment

## Example of Anchorage Dependence



### Serum-derived glycoprotein: fibronectin

- fibronectin is important in cell-substratum adhesion of anchorage-dependent cells.
- fibronectin enhances the survival of primary fibroblasts and endothelial cells in culture by suppressing p53-regulated apoptosis
- fibronectin plays an important role in stimulating many mitotic processes (such as the mitogen-activated protein kinase pathway) and has been shown to stimulate cell cycle progression in nontransformed cell lines

## ECM proteins:

**A number of proteins are important to ensure the attachment of anchorage dependent cells to their substratum. The attachment proteins (ECM proteins) are present in serum and can also be secreted by the cells. Some adherent cells do not bind directly onto plastic and require ECM proteins for efficient plating and growth.**

### **Serum-derived glycoprotein: Fibronectin**

is a high-molecular weight multimeric glycoprotein found on the surface membrane of cells.

It contains the RGD (Arginine-Glycine-Aspartate) cell attachment sequence.

**Plasma fibronectin** has been isolated from blood plasma and plays a role in **blood clotting**, **wound healing**, and **phagocytosis**.

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### **Laminin**

is another ECM protein and is similar in structure to fibronectin, but more predominant in **differentiated tissues**, and is one of the major components of the **basal lamina**. It also plays an important role in the regulation of **neuronal migration**, being a potent promoter of cell outgrowth in cultures, especially **neural cell lines**.

In conjunction with a polylysine peptide, laminin has been shown to provide **guidance for neuron attachment and axon outgrowth under serum-free conditions**.

### **Pronectin**

is a recombinant peptide designed to replace fibronectin in serum-free media formulations.

It contains the same repeats of the RGD (Arginine-Glycine-Aspartate) cell attachment sequence.

## Anchorage Dependence

- Substratum may be negatively or positively charged
- Alkali treatment (25mM NaOH + 0.1 M EDTA) for borosilicate glass to induce a negative charge.



- Sulfuric acid treatment (sulfonation) or high-voltage electrical treatment (corona-oxidation) for polystyrene plastic to induce a negative charge

# Anchorage Dependence

To induce a positive charge on the substratum:

- DEAE dextran
- Polylysine
- Polyarginine
- Polyhistidine
- Polyornithine
- Polyacrylamide