-The Statistical Mechanics Approach to Cell Adhesion on Matrix-

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The ability of cells to recognize and adhere specifically to the insoluble extracellular matrix (ECM) proteins is critical for physiological process such as their proliferation and migration. The cell-substrate adhesion is mainly mediated by the multiple ligand-receptor (integrin) binding.

If we know the cell-substrate contact area, the density of integrin, and the density of ligand on ECM protein, it might be feasible to describe the energy of ligand-integrin binding and the free energy of cell adhesion. Also, since the binding force between cell and the matrix (typically 100 pN/cell to 1000 pN/cell) is the quantity that can be experimentally measured in the laboratory, it would be beneficial to derive the expression of the binding force in terms of free energy and other parameters.

Furthermore, the relationship between the cell-matrix binding force and the number of individual integrin-ligand bindings still have not been revealed. Thus with the statistical mechanics approach, I would like to derive the relationship between two parameters as well.

Since there are still many factors that might make this approach less feasible such as the mobility of individual integrin along the membrane, it would be still valuable for us to predict and describe the cell behaviors upon its attachment on the matrix.