Folic acid has been frequently exploited for target therapies geared toward overexpressed folate receptors on malignant cells. The folic acid/folate-receptor high affinity interaction can be used to not only target but image cancer cells. Folate-linked nanoparticles represent a potential new drug carrier for tumor cell-selective therapeutics. Folate targeting, nanoparticles in therapeutics, and cancer cell imaging will be outlined in this literature report.

**ABSTRACT**

**BACKGROUND**

Cancer cells, unlike normal human cells, overexpress folate receptors. The receptors displayed on the surface of these cells have a high affinity for folic acid. Forty to fifty percent of all cancers can be targeted using folic acid. Ovarian and lung cancer cells have the highest level of receptors. These cells can have anywhere from 2000 to 4 million receptors on their surface. There are two major forms of folate receptors: folate receptor alpha (FR-α) and folate receptor beta (FR-β). FR-α primarily exist on cancer cells. FR-α binds folic acid on the surface of the cell and allows it to cross the cell membrane via receptor mediated endocytosis, RME. Endocytosis is the process by which cells internalize specific molecules. RME occurs by cell engulfment rather the actual penetration of the cells. The cell membrane RME allows cells to take up very specific macromolecules called ligands.

**NANOTECHNOLOGY IN CANCER THERAPEUTICS**

**Targeted Drug Delivery**

- **Passive Targeting**
  - Leaky vasculature
    - Exploits tumor tissue permeability.
  - Tumor microenvironment
    - Exploits tumor environment.
  - Local drug application
    - Direct application

- **Active Targeting**
  - Carbohydrate Directed Targeting
    - Direct lectin targeting
    - Reverse lectin targeting
  - Receptor and Antigen Directed Targeting
    - Folate

**GOLD NANOPARTICLE LIGAND FOR FR-α CELL BINDING**

AuNPs as drug delivery agents targeted to cancer cells

- AuNP is in the pro-drug form
- The two primary methods for tumor targeting: conjugation of AuNPs to PEG (passive approach)
- conjugation of AuNPs with specific antibodies which bind specifically to biomarkers expressed on the surface of tumor cells. (active approach)

**REFERENCES**


Jesse B. Wolinsky, Yolonda L. Colson, Mark W. Grinstaff; Local drug delivery strategies for cancer treatment: Gels, nanoparticles, polymeric films, rods, and wafers; Journal of Controlled Release; Volume 159, Issue 1, 10 April 2012, Pages 14–26

**GOLD NANOPARTICLES AND BIOMEDICAL IMAGING**

AuNPs as sensors for probing and imaging tumor cells

- Gold nanoparticles (AuNPs) are good candidates for imaging because of their ability to strongly absorb and scatter visible light.