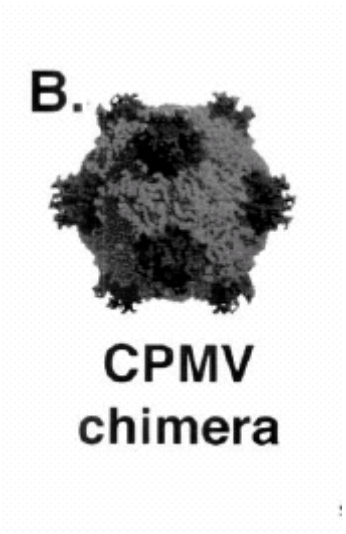
Virus-Based Nanoparticles: Novel Biomolecular Sensors for Targeting Cancer

Marianne Manchester, Scripps Research Institute

Biomolecular Systems Research Program



Space filling model of a chickpea mosaic virus chimera expressing an antibody epitope from a human rhinovirus

Description

Engineer icosahedral virus particles as transport vector.

Attach tumor antigen-targeting molecules to surface-peptides, antibodies and tumor specific T-cell receptors.

Image targeting and destruction of tumors in-vivo with mouse models

Innovative Claims/NASA Significance

Virus-based nanoparticles (VBNPs) are especially useful because of the ease of production compared to animal viruses or other biomaterials, with low expense and simple culture conditions. Identification of accessible surface residues on VBNP surfaces facilitates simple chemical attachment of a variety of molecules on the particle surface. The platform generation and ligand attachment can be performed in a modular format by generating generic VBNP platforms that can allow for attachment of a variety of tumor-targeting motifs. Finally, our knowledge of the VBNP capsid structures allows rational design of the tumor-ligand orientation and stoichiometry in order to maximize tumor recognition.

Plans

Year 1

1. Label VBNP with gadolinium and iron for in-vivo imaging for oral dose
2. Establish mouse cancer xenograft model

Year 2

1. Image other dose routes
2. Time sequence MRI imaging
3. MRI imaging of tumor localization

Year 3

1. Measure tumor destruction in mice with labeled VPNP