Targeting Podoplanin to Combat Cancer

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Technology description

Background

Lectin is a protein that selectively binds to carbohydrates and can be isolated from plant, viruses, invertebrate or vertebrate organisms. Lectin has been known to agglutinate cancer cells and exhibit anti-proliferative effects. However, the mechanism by which lectins induce anti-cancer properties involves receptors that have not yet been identified. The transmembrane receptor podoplanin (PDPN) is a glycoprotein receptor that augments tumor cell migration. The extracellular domain of PDPN is O-glycosylated with sialic acid, thereby enabling sialic acid to act as a vehicle to target other compounds to the PDPN receptor. Previous evidence has demonstrated that PDPN can be targeted by a lectin derived from the Maackia fauriei plant (MAA). Rowan researchers have demonstrated that MAA fused to sialic acid can be a potentially anti-proliferative agent in solid tumor cancer cells. In metastatic melanoma cell lines, 308 nM of MAA suppresses melanoma cell migration by over 99%, while inhibiting cell viability by about 20% within the same time period. In Src-transformed cells, which express aggressive tumorigenic behavior, 385 nM, 770 nM, and 1540 nM of MAA inhibit cell migration by over 25%, 50%, and 75%, respectively. In addition to inhibiting cell migration, MAA also inhibited the growth of Src transformed cells in a dose-dependent fashion. Taken together, these results indicate that administration of MAA binding to sialic acid inhibits transformed cell growth and migration, prior to inhibiting cell viability. The researchers also determined that oral administration of 25 mg/kg of MAA once a week inhibited subcutaneous growth of melanoma cells in mice by approximately 50%. Moreover, no adverse effects on mouse health or physiology were observed in vivo.

Market

The global cancer therapeutics market grew at a Compound Annual Growth Rate (CAGR) of 6.5% to reach $100 billion in 2014, with the United States leading the world with about 40% of overall spending. The market shows no signs of curtailing, as earlier diagnosis, longer treatment duration, and increased effectiveness of drug therapies all contribute to rising spending on cancer medicines. Annual global growth in the oncology drug market is expected to be 7.5 – 10.5 percent through 2020, reaching $150 billion. The most frequent cancer indications for new drug entities in late-stage clinical development are non-small cell lung cancer and breast, prostate, ovarian and colorectal cancers.

Advantages

The proposed technology can be isolated relatively cheaply from many naturally occurring species in large abundance
The proposed therapy is naturally occurring inside mammalian species and therefore would not be expected to generate adverse effects
The proposed therapy could potentially be applied to a broad range of metastatic solid tumor cancers
The proposed therapy is resistant to gastrointestinal proteolysis and can be taken via oral administration

Institution

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