Targeting Polymers that Enable Delivery of Radionuclide Drugs Directly to Bone Tumors

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Technology description

Delivery Vehicle Protects Healthy Bone While Enabling Diagnostics or Enhancing Pain Relief

These polymers deliver therapeutic or diagnostic radionuclides directly to bone tumors with low risk of unpleasant side effects. Available therapies, such as Quadramet, used to relieve pain associated with bone metastases, have limited value because they target the entire skeleton -- tumors as well as healthy bone. This can lead to damage of healthy cells and side effects, including skin changes, fatigue, nausea, vomiting, and bone marrow toxicity. Each year, nearly 1,500 patients die from bone cancer and more than 3,000 new cases are diagnosed. Bone metastases, cancers that have spread to the bone from another location, are much more common than bone cancer. Skeletal metastases occur in many patients with different kinds of malignant tumors, especially in the advanced stages of breast, prostate, and lung cancer. Radiation therapy to treat these cancers is often costly, time-consuming, and can result in negative side effects. University of Florida researchers have developed a polymeric material that specifically targets tumors without impacting healthy bone. Not only do the polymers deliver a variety of specific drugs, they also have proven therapeutic value and may serve as a delivery system for therapeutics targeting other bone-related conditions.

Technology

These new polymers have a desired hydrodynamic radius that allows them to deliver radionuclides to tumor cells selectively over healthy cells. By using reversible addition fragmentation chain transfer (RAFT) polymerization, scientists can control the molecular weight and molecular weight distribution. These polymers are designed to be large for optimization in targeting a variety of solid tumors via the enhanced permeability and retention effect. These polymers are able to deliver diagnostic or therapeutic radionuclides specifically to osteosarcomas while significantly reducing the toxicity of such treatments to healthy bone. Like other phosphorous-containing polymers, these materials, when produced by less-expensive, conventional radical polymerization, have potential as flame retardants, corrosion-inhibiting agents, metal chelators, and water treatment agents.

Application area

Polymers for specific targeting of tumors

Advantages

Targets tumors, enabling more effective doses of available therapeutic radionuclides to relieve patient pain
Bypasses healthy bone, limiting side effects
Contains water-soluble polymeric materials, targeting solid tumors via permeability and retention (EPR) effect
Enables control over molecular weight and molecular weight distribution, opening up new possibilities in treating bone cancer

Institution

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