Estrogen Receptor Mediated Inhibition of NF-kB as a Route to Treatment of Breast Cancer

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The American Cancer society projects 47,000 women will die as a result of breast cancer in 2009. Approximately, two-thirds of breast cancers result from overexpression of the estrogen receptor (ER), a nuclear hormone receptor which acts as a transcription factor for hundreds of genes. The traditional approach to breast cancer therapy uses selective estrogen receptor modulators (SERMs), such as tamoxifen, to antagonize the estrogen receptor. Unfortunately tamoxifen treatment leads to a recurrence of breast cancer. The immune system and the inflammatory response, which is known to exacerbate breast cancer, appear to be contributing to this recurrence. We have previously synthesized a lead compound which inhibits both tumor proliferation and the inflammatory response to breast cancer. Guided by a crystal structure, we are developing new classes of compounds containing the functional groups we have determined to be critical for this unique mode of estrogen receptor antagonism.

Mechanically-Induced Solvent Based Self-Healing

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Mechanical damage to bulk polymers typically begins as a microcrack which can lead to eventual failure of the material if there is no process to inhibit crack growth. In living systems, this damage initiates a healing response. Self-healing polymers are engineered with the unique ability to extend the lifetime of materials by preventing crack propagation using various chemical mechanisms triggered by crack formation. Common organic solvents have been used as inexpensive healing agents for self-repairing polymers. Liquid-filled microcapsules have been prepared with various core components in solvent and are embedded within a bulk polymer during processing. By compartmentalizing reactive fluids into a bulk material, *in situ* chemical reactions occur on demand. A crack propagating through the bulk material ruptures the embedded microcapsules, thus releasing solvent-based mixtures into the crack plane of the sample. Solvent-based self-healing reactions that occur within epoxy thermosets, thermoplastics, and bone cement materials will be presented in detail.