Synthetic Restriction Enzymes Reagents For Rapid DNA Cleavage & Analysis

Published date: Feb. 1, 2012

Technology description

Summary

We have developed a family of reagents that complex with DNA, fluoresce strongly, and rapidly cleave DNA upon irradiation with long wavelength UV light. Derivatives can be attached to DNA sequence-specific proteins, nucleotides and carbohydrates, thus having the potential for creating synthetic restriction enzymes.
The less photochemically reactive but strongly fluorescing analogs are useful in DNA sequencing and analysis work. The more photochemically reactive analogs can be used for the cleavage of DNA at specific sites as determined by the attached sequence recognition units. In addition to their use as DNA complexing and cleaving reagents, members of this versatile class should be useful as drugs for the treatment of various DNA-related diseases: e.g., in the targeting of cancers arising from the activation of oncogenes, or in the treatment of virus and retrovirus disorders such as Rous Sarcoma or AIDS.

Advantages

Analogs can be prepared easily, often in only one or two steps. Many synthetic variations are possible, including chiral analogs designed to fit into the grooves of DNA. Even the chiral analogs require only about five steps - a significant improvement over existing DNA cleaving agents, which either have to be isolated from natural sources or require involved syntheses.
They bind strongly to DNA even without the attachment of water solubilizing units.
Their intense fluorescence should greatly aid in analytical work.
A few seconds of irradiation are sufficient to achieve DNA cleavage with the more photo- chemically reactive analogs.
Reaction conditions can be adjusted to achieve site-specific cleavage.
The cleavage process can also be amplified to achieve massive DNA destruction, as required for the treatment of cancer.
These compounds are not associated with heavy metals, and therefore should be less toxic than cisplatin and related anticancer drugs.

Institution

University of Cincinnati