Fundamental Building Block Of Dna

DnaA Binding of DnaA leads to strand separation at the 13-mer repeats. It is a replication initiation factor which promotes the unwinding of DNA at oriC. Based on the Replicon Model, a positively active initiator molecule contacts DnaA is a protein that activates initiation of DNA replication in bacteria. The DnaA proteins found in all bacteria engage with the DnaA boxes to start chromosomal replication. DnaA is a protein that activates initiation of DNA replication in bacteria. The onset of the initiation phase of DNA replication is determined by the concentration of DnaA. This binding causes the DNA to loop in preparation for melting open by the helicase DnaB. DnaA accumulates during growth and then triggers the initiation of replication. Based on the Replicon Model, a positively active initiator molecule contacts with a particular spot on a circular chromosome called the replicator to start DNA replication. Replication begins with active DnaA binding to 9-mer (9-bp) repeats upstream of oriC f576895038

The more advanced, computer-based molecular models of DNA involve molecular dynamics simulations and quantum mechanics computations of vibro-rotations, delocalized molecular orbitals (MOs), electric dipole moments, hydrogen-bonding, and so on. DNA molecular dynamics modeling involves simulating deoxyribonucleic acid (DNA) molecular geometry and topology changes with time as a result of both intra- and inter- molecular interactions of DNA. Whereas molecular models of DNA molecules such as closely packed spheres (CPK models) made of plastic or metal... f576895038 The oriC site in... f576895038

Molecular models of DNA primary "building block" for the assembly of the DNA nanogrids shown in the AFM micrograph. Images of quadruplex Molecular models of DNA structures are representations of the molecular geometry and topology of deoxyribonucleic acid (DNA) molecules using one of several means, with the aim of simplifying and presenting the essential, physical and chemical, properties of DNA molecular structures either in vivo or in vitro. These representations include closely packed spheres (CPK models) made of plastic, metal wires for skeletal models, graphic computations and animations by computers, artistic rendering. Computer molecular models also allow animations and molecular dynamics simulations that are very important for understanding how DNA functions in vivo. Quadruplex DNA may be involved in certain cancers f576895038

== Discovery == f576895038

DNA Building blocks of DNA (adenine, guanine, and related organic molecules) may have been formed extraterrestrially in outer space. Complex DNA and RNA Deoxyribonucleic acid (; DNA) is a polymer composed of two polynucleotide chains that coil around each other to form a double helix. controversial. The polymer carries genetic instructions for the development, functioning, growth and reproduction of all known organisms and many viruses. Alongside proteins, lipids and complex carbohydrates (polysaccharides), nucleic acids are one of the four major types of macromolecules that are essential for all known forms of life. DNA and ribonucleic acid (RNA) are nucleic acids f576895038

In 1956, Arthur Kornberg and colleagues discovered Pol I by using Escherichia coli (E. coli) extracts to develop a DNA synthesis assay. The scientists added 14C-labeled thymidine so that a radioactive polymer of DNA, not RNA, could be retrieved. To initiate the purification of DNA polymerase, the researchers added streptomycin sulfate to the E. coli extract. This separated the extract...

f576895038 The idea of using DNA as a construction material was first introduced in the early 1980s by Nadrian Seeman. The method of DNA origami was developed by Paul Rothemund at the California Institute of Technology. In contrast to common top-down fabrication methods such as 3D printing or lithography which involve depositing or removing material through a tool, DNA Nanotechnology, as well as DNA origami as a subset, is a bottom-up fabrication method. By rationally designing... f576895038

DNA nanotechnology Potential applications in molecular scale electronics and nanomedicine are also being investigated. "Rapid chiral assembly of rigid DNA building blocks for molecular nanofabrication". 310 (5754): 1661–1665 DNA nanotechnology is the design and manufacture of artificial nucleic acid structures for technological uses. Science. Researchers in the field have created static structures such as two- and three-dimensional crystal lattices, nanotubes, polyhedra, and arbitrary shapes, and functional devices such as molecular machines and DNA computers. Schmidt CF, Turberfield AJ (December 2005). The field is beginning to be used as a tool to solve basic science problems in structural biology and biophysics, including applications in X-ray crystallography and nuclear magnetic resonance spectroscopy of proteins to determine structures. In this field, nucleic acids are used as non-biological engineering materials for nanotechnology rather than as the carriers of genetic information in living cells f576895038

DnaA consists mainly in two different forms, the active ATP-form and the inactive ADP. The level of active DnaA within a cell is low immediately after a cell has divided. Although the active form of DnaA requires ATP, the formation of the oriC/DnaA complex and subsequent DNA unwinding does not require ATP hydrolysis. f576895038

Nucleotide base They function as the fundamental units of the genetic code, with the bases A, C, G

and T being found in DNA while A, C, G and U are found in Nucleotide bases (also nucleobases, nitrogenous bases) are nitrogen-containing biological compounds that form nucleosides, which, in turn, are components of nucleotides, with all of these monomers constituting the basic building blocks of nucleic acids. Five nucleobases—adenine (A), cytosine (C), guanine (G), thymine (T), and uracil (U)—are called primary or canonical. They function as the fundamental units of the genetic code, with the bases A, C, G and T being found in DNA while A, C, G and U are found in RNA. canonical. Thymine and uracil are distinguished by merely the presence or absence of a methyl group on the fifth carbon (C5) of these heterocyclic six-membered rings. The ability of nucleobases to form base pairs and to stack one upon another leads directly to long-chain helical structures such as deoxyribonucleic acid (DNA) f576895038

In biology, Holliday junctions are a key intermediate in many types of genetic recombination, as well as in double-strand break repair. These junctions usually have a symmetrical sequence and are thus mobile, meaning that the four individual arms may slide through the junction in a specific pattern that largely preserves base pairing. Additionally, four-arm junctions similar to Holliday junctions appear in some functional RNA molecules. f576895038 In addition, some viruses have aminoadenine (Z) instead of adenine. It differs in having an extra amine group, creating a more stable bond to thymine. f576895038

DNA origami The specificity of the interactions DNA origami is the nanoscale folding of DNA to create arbitrary two- and three-dimensional shapes at the nanoscale. DNA is a well-understood material that is suitable for creating scaffolds that hold other molecules in place or to create structures all on its own. The specificity of the interactions between complementary base pairs makes DNA a useful construction material, through the design of its base sequences. DNA origami is the nanoscale folding of DNA to create arbitrary two- and three-dimensional shapes at the nanoscale f576895038

DNA polymerase I The physiological function of Pol I is mainly to support repair of damaged DNA, but it also contributes to connecting Okazaki fragments by deleting RNA primers and replacing the ribonucleotides with DNA. Discovered by Arthur Kornberg in 1956, it was the first known DNA polymerase (and the first known of any kind of polymerase). The S-fraction DNA polymerase I (or Pol I) is an enzyme that participates in the process of prokaryotic DNA replication. coli and many other bacteria, the gene that encodes Pol I is known as polA. It was initially characterized in E. coli and is ubiquitous in prokaryotes. In E. The E. coli Pol I enzyme is composed of 928 amino acids, and is an example of a processive enzyme — it can sequentially catalyze multiple polymerisation steps without releasing the single-stranded template. factors essential for the DNA synthesis reactions. These factors were identified as nucleoside triphosphates, the building blocks of nucleic acids f576895038

Holliday junction motif is the fundamental building block of the DNA origami method, which is used to make larger two- and three-dimensional structures of arbitrary shape A Holliday junction is a branched nucleic acid structure that contains four double-stranded arms joined. The structure is named after Robin Holliday, the molecular biologist who proposed its existence in 1964. These arms may adopt one of several conformations depending on buffer salt concentrations and the sequence of nucleobases closest to the junction f576895038

DNA-encoded chemical library DECL is used in medicinal chemistry to bridge the fields of combinatorial chemistry and molecular biology. DECL technology involves the conjugation of chemical compounds or building blocks to short DNA fragments that serve as identification bar codes DNA-encoded chemical libraries (DECL) is a technology for the synthesis and screening on an unprecedented scale of collections of small molecule compounds. identification. The aim of DECL technology is to accelerate the drug discovery process and in particular early phase discovery activities such as target validation and hit identification f576895038

Adenine and guanine have a fused-ring skeletal structure derived of purine, hence they are called purine bases. The purine nitrogenous bases are characterized by their single amino group (−NH2), at the C6 carbon in... f576895038 The two DNA strands are known as polynucleotides as they are composed of simpler monomeric units called nucleotides. Each nucleotide is composed of one of four nitrogen-containing nucleobases (cytosine [C], guanine [G], adenine [A] or thymine [T]), a sugar called deoxyribose, and a phosphate group. The nucleotides are joined to one another in a chain by covalent bonds (known as the phosphodiester linkage) between the sugar of one nucleotide and the phosphate of the next, resulting in an alternating sugar-phosphate backbone. The nitrogenous bases of the two separate polynucleotide strands are bound together, according to base pairing rules (A with T and C with G), with hydrogen bonds to... f576895038 DNA origami was the cover story of Nature on March 16, 2006. Since then, DNA origami has progressed past an art form and has found a number of applications from drug delivery systems to uses as circuitry in plasmonic devices; however, most commercial applications remain in a concept or testing phase. f576895038 == Function == f576895038 DECL technology involves the conjugation of chemical compounds or building blocks to short DNA fragments that serve as identification bar codes and in some cases also direct and control the chemical synthesis. The technique enables the mass creation and interrogation of libraries via affinity selection, typically on an immobilized protein target. A homogeneous method for screening DNA-encoded libraries (DELs) has recently been developed which uses water-in-oil emulsion technology to isolate, count and identify individual ligand-target complexes in a single-tube approach. In contrast to conventional screening procedures such as high-throughput screening, biochemical assays are not required for binder identification, in principle allowing the isolation of binders... f576895038 Immobile Holliday junctions, with asymmetrical sequences that lock the strands in a specific position, were artificially created by scientists to study their structure as a model for natural Holliday junctions. These junctions also later found use as basic structural building blocks in DNA nanotechnology, where multiple Holliday junctions can be combined into specific designed

geometries that provide... f576895038 == Overview == f576895038 The conceptual foundation for DNA nanotechnology was first laid out by Nadrian Seeman in the early 1980s, and the field began to attract widespread interest in the mid-2000s. This use of nucleic acids is enabled by their strict base pairing rules, which cause only portions of strands with complementary base sequences to bind together to form strong, rigid double... f576895038

DNA microarray The original nucleic acid arrays were macro arrays approximately 9 cm × 12 cm and the first computerized image based analysis was published in 1981. Scientists use DNA A DNA microarray (also commonly known as a DNA chip or biochip) is a collection of microscopic DNA spots attached to a solid surface. Probe-target hybridization is usually detected and quantified by detection of fluorophore-, silver-, or chemiluminescence-labeled targets to determine relative abundance of nucleic acid sequences in the target. Scientists use DNA microarrays to measure the expression levels of large numbers of genes simultaneously or to genotype multiple regions of a genome. These can be a short section of a gene or other DNA element that are used to hybridize a cDNA or cRNA (also called anti-sense RNA) sample (called target) under high-stringency conditions. It was invented by Patrick O. A DNA microarray (also commonly known as a DNA chip or biochip) is a collection of microscopic DNA spots attached to a solid surface. An example of its application is in SNPs arrays for polymorphisms in cardiovascular diseases, cancer, pathogens and GWAS analysis. Each DNA spot contains picomoles (10−12 moles) of a specific DNA sequence, known as probes (or reporters or oligos). It is also used for the identification of structural variations and the measurement. Brown f576895038

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