Nucleic acid major function

What is the function of the nucleic acids. What is the main function of the nucleic acid. Which of the following is a major function of nucleic acid.

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Molecular biology of cells 4, 960–970 (2003) (link to article) Pierce, B. A. Genetics: A Conceptual Approach, 2nd ed. (New York, Freeman, 2000) Serganov, A. & Patel, D. J. Ribozymes, riboswitches and beyond: Regulation of gene expression without protein. Genetics 8, 776-790 (2007) doi:10.1038/nrg2172 (link to article) Steitz, J.A. RNA Machines of the mammal nucleus. Abstract research, Howard Hughes Medical Institute. www.hhmi.org/research/investigators/steitzja.html (2008) Wightman, B., et al. Posttrascritional regulation of the heterochronic gene lin-14 mediates the formation of temporal patterns in C. elegans. Cell DNA 75, 855–862 (1993) is the instruction set for our cells. Our DNA determines who and what we are. Describe the basic structure of nucleic acids Compare and contrast the structure of DNA and RNA nucleic acids Nucleic acids are the most important macromolecules for the continuity of life. They carry the genetic model of a cell and carry instructions for the functioning of the cell. The two main types of nucleic acids are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). DNA is the genetic material found in all living organisms, ranging from monocellular bacteria to multicellular mammals. It is located in the nucleus of eukaryotes and organelles, chloroplasts and mitochondria. In prokaryotes, DNA is not enclosed in a membranous envelope. The entire genetic content of a cell is known as its genome, and the study of the genome is genomic. In eukaryotic cells but not in prokaryotes, DNA forms a complex with iston protein to form chromatin, the substance of eukaryotic chromosomes. A chromosome may contain tens of thousands of genes. Many genes contain information to produce protein products; other genes codify for RNA products. DNA controls all cell activity by transforming "on" or "off" genes. The other type of acidRNA, is mainly involved involved protein synthesis. DNA molecules never leave the nucleus, but instead use an intermediary to communicate with the rest of the cell. This intermediate is the messenger RNA (mRNA). Other types of RNA, such as rRNA, tRNA and microRNA, are involved in protein synthesis and its regulation. DNA and RNA are monomers known as nucleotides. Nucleotides combine to form a polynucleotide, DNA or RNA. Each nucleotide consists of three components: a nitrogenous base, a pentosium sugar (five-carbon) and a phosphate group (Figure 1). Each nitrogen base in a nucleotide is attached to a sugar molecule, which is attached to one or more phosphate groups. Figure 1. A nucleotide consists of three components: a nitrogenous base, a pentosium sugar and one or more phosphate groups. The carbon residues in pentosium are numbered from 1â2 to 5â2 (the former distinguishes these residues from those in the base, which are numbered without using a primary notation). The base is attached to the 1â2 position of ribose, and the phosphate is attached to the 5â2 position. When a polynucleotide is formed, the 5â2 phosphate of the incoming nucleotide attaches to the 3â2 hydroxyl group at the end of the growing chain. Two types of pentosium are found in nucleotides, deoxyribose (found in DNA) and ribose (based in RNA). Deoxyribose is similar in structure to ribose, but has an H instead of an OH at the 2â2 position. The bases can be divided into two categories: purines and pyrimids. Purines have a double ring structure, and pyrimids have a single ring. Nitrogen bases, important components of nucleotides, are organic molecules and are so called because they contain carbon and nitrogen. They are bases because they contain an amino group that has the potential to bind an extra hydrogen, and thus, reduces the concentration of hydrogen ions in its environment, making it more essential. Each nucleotide in DNA contains one of four possible nitrogen bases: adenine (A), guanine (G), cytosine (C), and thymine (T). Nucleotide RNAs also contain one of four possible bases: adenine, guanine, cytosine and uracil (U) rather than thymine. Adenine and guanine are classified as purine. The primary structure of a purine is two carbon-nitrogen rings. Cytosine, thymine and uracil are classified as pyrimides having a single carbon-nitrogen ring as their primary structure (Figure 1). Each of these basic carbon-nitrogen rings has several functional groups attached to it. In molecular biology, nitrogen bases are simply known by their symbols A, T, G, C and U. DNA contains A, T, G and C while RNA contains A, U, G and C. The pentosium sugar in DNA is deoxyribous, and in RNA, sugar is ribose (Figure 1). The difference between sugars is the presence of the hydroxyl group on the second carbon of ribose and hydrogen on the second carbon of deoxyribose. The carbon atoms of the of sugar are numbered as 1â € ², 1â € ², 3′, 4′ and 5′ (1′ is read as "a first"). The phosphate residue is attached to the 5′ carbon hydroxyl group of a sugar and the 3′ carbon hydroxyl group of the next nucleotide sugar, which forms a 5′-3′ phosphorous link. The connection of phosphodiester is not formed by a simple dehydration reaction such as other connections connecting monomers in macromolecules: its formation involves the removal of two phosphate groups. A polynucleotide can have thousands of such phosphodiester connections. DNA Double Structure Figure 2. DNA is a double antiparallele propeller. The phosphate spine (curvy lines) is on the outside, and the bases are on the inside. Each base interacts with a base from the opposing wire. (credited: Jerome Walker/Dennis Myts) DNA has a double helix structure (Figure 2). Sugar and phosphate lie outside the helix, forming the backbone of DNA. The nitrogen bases are stacked inside, like the steps of a staircase, in pairs; couples are linked to each other by hydrogen bonds. Each base pair in the double helix is separated from the next base pair of 0.34 nm. The two wires of the elix run in opposite directions, which means that the 5′ carbon end of a wire will face the 3′ carbon end of its matching filament. (This is indicated as a paragliding orientation and is important for DNA replication and in many interactions of nucleic acid.) Only a few basic mating types are allowed. For example, a certain purine can only match with a certain pyrimidine. This means that A can match with T, and G can match with C, as shown in Figure 3. This is known as the basic complementary rule. In other words, DNA threads are complementary to each other. If the sequence of a wire is AATTGGCC, the complementary wire would have the TTAACCGG sequence. During DNA replication, each strand is copied, resulting in a double helix of the daughter's DNA containing a parent's DNA strand and a newly synthesized filament. Figure 3. In a double strand DNA molecule, the two strands run antiparallele to each other so that a wire runs 5′ to 3′ and the other 3′ to 5″. The phosphate spine is located outside, and the bases are in the center. Adenine forms hydrogen bonds (or basic pairs) with timina and guanino base pairs with cytosine. A mutation occurs, and cytosine is replaced with adenine. What impact do you think this has on the DNA structure? RNA Ribonucleic acid, or RNA, is mainly involved in the protein synthesis process under the direction of DNA. RNA is usually monostrate and is made of ribonucleotides that are connected by phosphodiester bonds. A ribonucleotide in the RNA chain contains ribose (patose sugar), one of the four nitrogen bases (A, U, G and C), and the phosphate group. There are four main types of RNA:Messenger (MRNA), RIBOSOMIC RNA (RRNA), Transfer RNA (TRNA), and microRNA (MIRNA). The first, MRNA, brings the message from DNA, DNA, check all cell tasks in a cell. If a cell requires a certain protein to be synthesized, the gene for this product is turned on and the messenger RNA is synthesized in the nucleus. The RNA base sequence is complementary to the DNA coding sequence from which it was copied. However, in RNA, base T is absent and U is present instead. If the DNA thread has an AATTGCGC sequence, the complementary RNA sequence is UUAACGCG. In the cytoplasm, mRNA interacts with ribosomes and other cellular machinery (Figure 4). Figure 4. A ribosome has two parts: a large subunit and a small subunit. The mRNA is located between the two subunits. A tRNA molecule recognizes a codon on the mRNA, binds them to it by complementary basic coupling, and adds the correct amino acid to the growing peptide chain. The mRNA is read in series of three bases known as cod. Each codone encodes for a single amino acid. This way, mRNA is read and protein product is made. Ribosomal RNA (rRNA) is an important constituent of ribosomes on which mRNA binds. rRNA ensures proper alignment of mRNA and ribosomes; ribosome rRNA also has an enzyme activity (peptidyl transfer) and catalyzes the formation of peptide bonds between two aligned amino acids. RNA transfer (tRNA) is one of the smallest of four types of RNA, usually 70–90 long nucleotides. Bring the correct amino acid to the protein synthesis site. It is the basic coupling between tRNA and mRNA that allows the correct amino acid to be inserted in the chain of polypeptide. micro RNAs are smaller RNA molecules and their role involves adjusting gene expression by interfering with the expression of some mRNA messages. DNA against RNA While DNA and RNA are similar, they have very distinct differences. Table 1 summarizes the characteristics of DNA and RNA. Table 1. Features of DNA and RNA DNA Function Carri genetic information Involved in protein synthesis Position Stays in the core Leaves the DNA structure core is double-stranded "ladder": backbone of sugar-phosphate, with basic rungs. Usually monolayer of sugar Deossiriboso Ribose Pirimidine Cytosine, timina Cytosine, uracil Purine Adenine, guanino Adenine, guanino Another difference mentions. There's only one type of DNA. DNA is the airtight information that is transmitted to each cell generation; Its wires can be "szipped" with a small amount of energy when DNA needs replication, and DNA is transcribed in RNA. There are mutliple RNA types: The Messenger RNA is a temporary molecule that carries the necessary information to make a protein from the nucleus (where DNA remains) to the cytoplasm, where rhbosomes are. Other types of RNA include ribosomal RNA (rRNA), transfer RNA (tRNA), small nuclear RNA (snRNA), and microRNA. Although RNA is single filamentate,most of the types of RNA show a vast intramolecular base that matches between between sequences, creating a predictable three-dimensional structure essential for their function. As you have learned, the flow of information in an organism takes place from DNA to RNA to proteins. DNA dictates the structure of the mRNA in a process known as transcription, and RNA dictates the structure of the protein in a process known as translation. This is known as the central dogma of life, which holds true for all organisms; However, exceptions to the rule occur in relation to viral infections. Nucleic acids are molecules made up of nucleotides that direct cell activity as a cell division and protein synthesis. Each nucleotide consists of a potent sugar, a nitrogen base and a phosphate group. There are two types of nucleic acids: DNA and RNA. DNA brings the cell's genetic project and is transmitted by parents to the prole (in the form of chromosomes). It has a double helical structure with the two threads running in opposite directions, connected by hydrogenic and complementary links to each other. RNA is rubbed and is made of a potent sugar (ribose), a nitrogen base and a phosphate group. RNA is involved in protein synthesis and its regulation. Messenger RNA (MRNA) is copied from DNA, is exported from the nucleus to cytoplasm and contains information for protein construction. Ribosomal RNA (RRNA) is a part of the protein synthesis site ribosmes, while the transfer of RNA (TRNA) brings amino acid to the protein synthesis site. Micranda regulates the use of mRNA for protein synthesis. Check your understanding Answer the question below to see how you understand the topics covered in the previous section well. This short quiz doesn't count for your class vote, and you can resume an unlimited number of times. Use this quiz to check your understanding and decide whether (1) further study the previous section or (2) go to the next section. section.