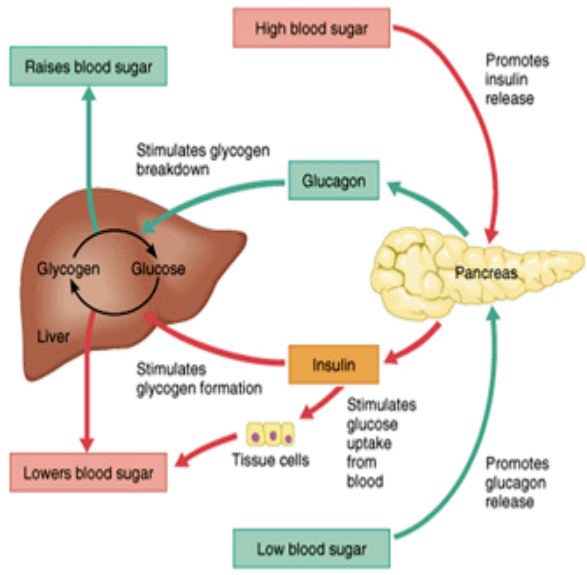
Form	BA - 1, Science, Biology with ESS, SY 24-25
Identifier	F-6DDWOB_C48474

Item	I-SCI-F-S000008 - BA1 - Q1
Identifier	I-SCI-F-S000008
Standards	SCI.9-12.HS-LS1-2

Regulation of Blood Glucose Levels in Humans

Time (minutes)	Glucose Level (mg/dL)
0	90
30	150
60	120
90	80
120	100



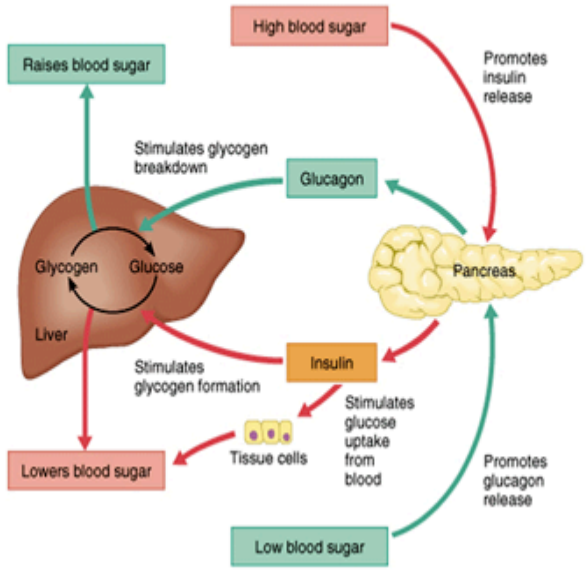
Based on the data table, describe the trend in blood glucose levels over the 2-hour period.

- A Blood glucose levels increase steadily
- B Blood glucose levels decrease steadily
- C Blood glucose levels may fluctuate based on interacting systems that provide specific functions within multicellular organisms
- D Blood glucose levels peak at 60 minutes then decline steadily

Item	I-SCI-F-S000009-BA1-Q2
Identifier	I-SCI-F-S000009
Standards	SCI.9-12.HS-LS1-2

Regulation of Blood Glucose Levels in Humans

Time (minutes)	Glucose Level (mg/dL)
0	90
30	150
60	120
90	80
120	100



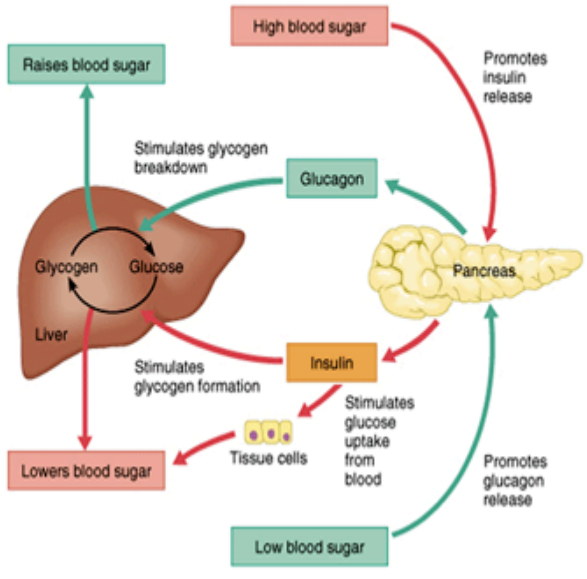
How does the body typically respond to high blood glucose levels? Provide an example of a specific organ involved in this regulation.

- A The body releases insulin, which promotes glucose uptake by the liver.
- B The body releases glucagon, which stimulates glucose release by the pancreas.
- C The body releases adrenaline, which increases glucose breakdown in muscles.
- D The body releases cortisol, which inhibits glucose absorption in the intestines.

Item	I-SCI-F-S000010-BA1-Q3
Identifier	I-SCI-F-S000010
Standards	SCI.9-12.HS-LS1-2

Regulation of Blood Glucose Levels in Humans

Time (minutes)	Glucose Level (mg/dL)
0	90
30	150
60	120
90	80
120	100



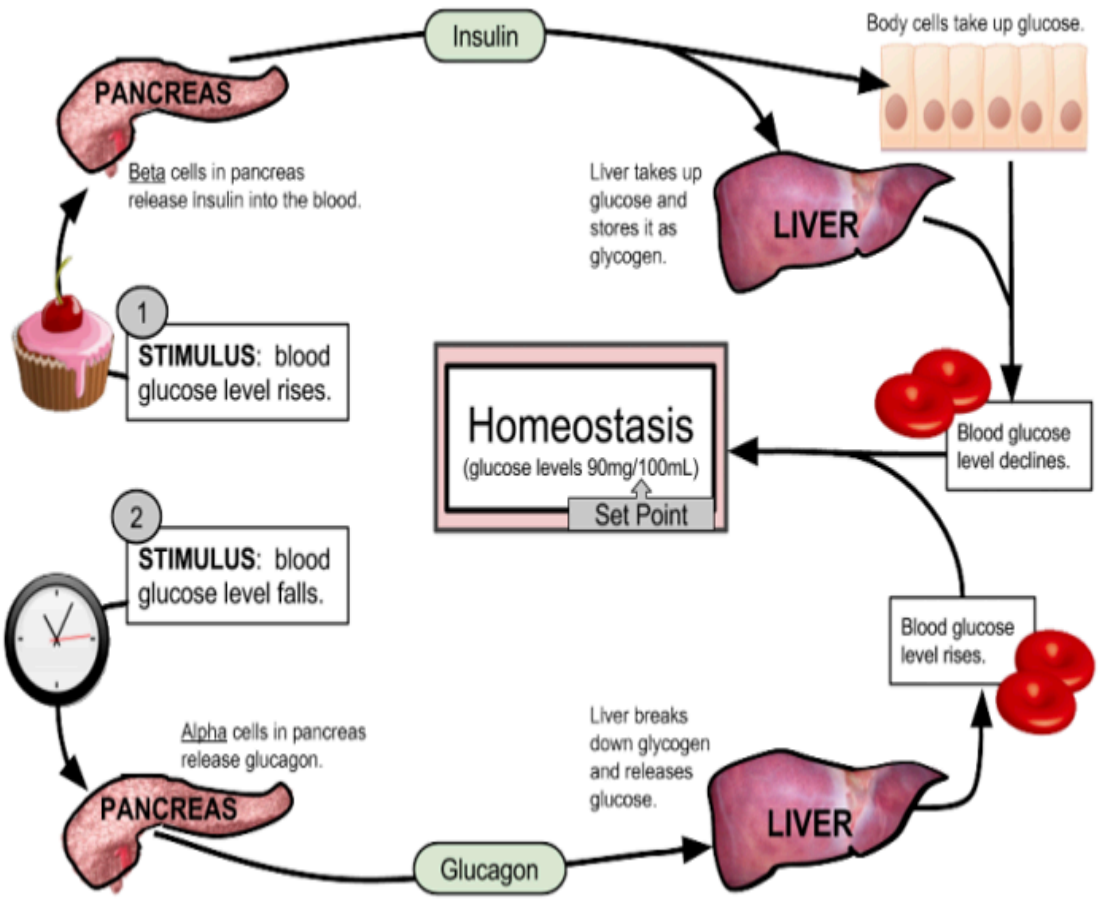
Explain the role of feedback mechanisms in maintaining homeostasis of blood glucose levels in the human body.

- A. Feedback mechanisms ensure constant blood glucose levels by inhibiting insulin release.
- B. Feedback mechanisms maintain blood glucose levels by promoting glucagon secretion.
- C. Feedback mechanisms adjust insulin and glucagon release based on blood glucose levels.
- D. Feedback mechanisms rely solely on insulin to regulate blood glucose levels.

Item	I-SCI-F-S000011-BA1-Q4
Identifier	I-SCI-F-S000011
Standards	SCI.9-12.HS-LS1-3

The Role of Insulin in Blood Glucose Regulation

A crucial aspect of maintaining homeostasis in the human body is the regulation of blood glucose levels, primarily controlled by the hormone insulin. When an individual consumes a meal rich in carbohydrates, the levels of glucose in the bloodstream increase. In response to this spike in blood sugar, the pancreas secretes insulin, signaling cells to uptake glucose from the blood for energy production or storage. This process prevents blood glucose levels from rising to dangerous levels, thereby maintaining homeostasis.



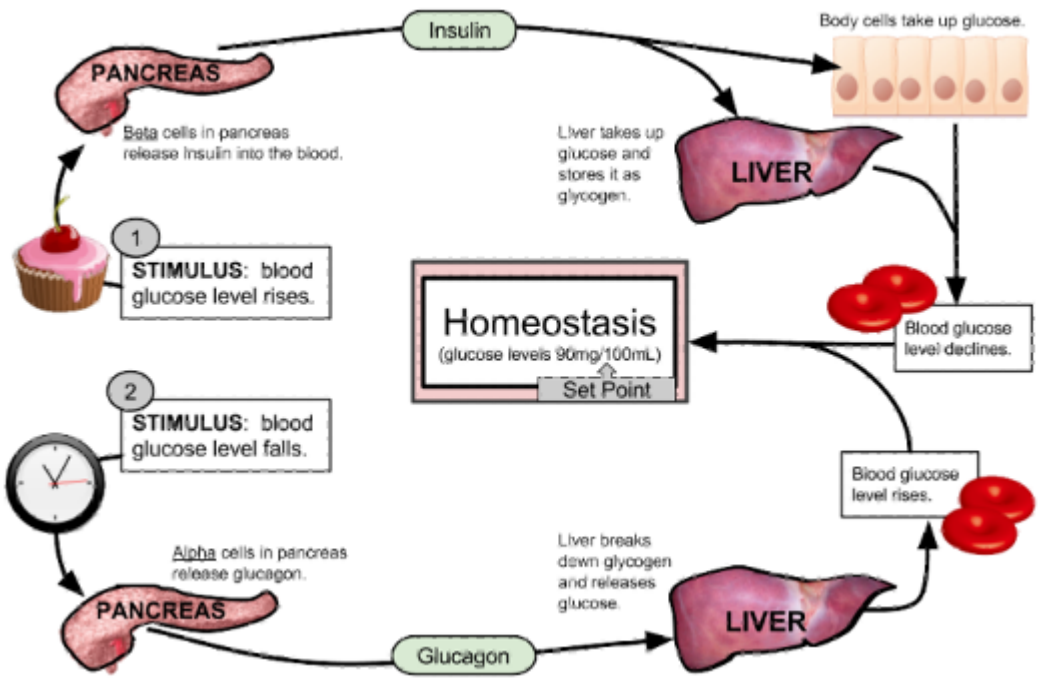
How does the body's feedback mechanism involving insulin help in maintaining homeostasis with regards to blood glucose levels?

- A Insulin inhibits glucose uptake by cells, preventing blood sugar spikes.
- B Insulin promotes the release of glucose from the liver, increasing blood sugar levels.
- C Insulin stimulates cells to uptake glucose from the blood, reducing blood sugar levels.
- D Insulin triggers the breakdown of glycogen into glucose, stabilizing blood sugar levels.

Item	I-SCI-F-S000012-BA1-Q5
Identifier	I-SCI-F-S000012
Standards	SCI.9-12.HS-LS1-3

The Role of Insulin in Blood Glucose Regulation

A crucial aspect of maintaining homeostasis in the human body is the regulation of blood glucose levels, primarily controlled by the hormone insulin. When an individual consumes a meal rich in carbohydrates, the levels of glucose in the bloodstream increase. In response to this spike in blood sugar, the pancreas secretes insulin, signaling cells to uptake glucose from the blood for energy production or storage. This process prevents blood glucose levels from rising to dangerous levels, thereby maintaining homeostasis.



Describe what happens in the body when there is a deficiency in insulin production, and how it impacts blood glucose regulation.

A Blood glucose levels decrease due to increased glucose uptake by cells.

B Blood glucose levels increase due to decreased glucose uptake by cells.

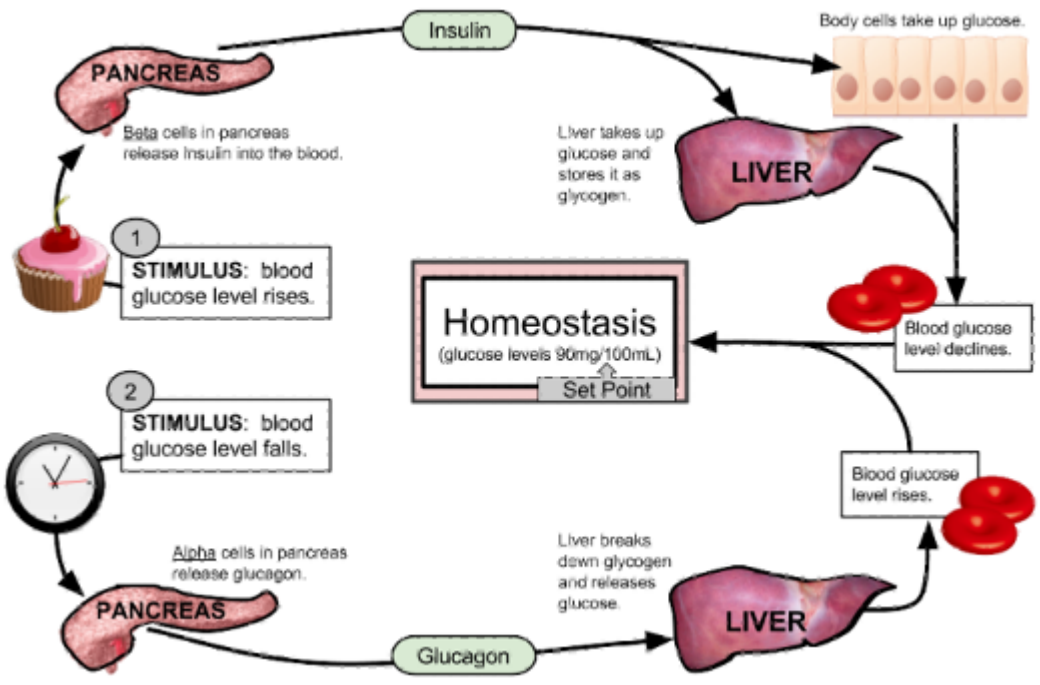
C Blood glucose levels decrease due to increased glycogen breakdown in the liver.

D Blood glucose levels increase due to decreased glycogen breakdown in the liver.

Item	I-SCI-F-S000016-BA1-Q6
Identifier	I-SCI-F-S000016
Standards	SCI.9-12.HS-LS1-3

The Role of Insulin in Blood Glucose Regulation

A crucial aspect of maintaining homeostasis in the human body is the regulation of blood glucose levels, primarily controlled by the hormone insulin. When an individual consumes a meal rich in carbohydrates, the levels of glucose in the bloodstream increase. In response to this spike in blood sugar, the pancreas secretes insulin, signaling cells to uptake glucose from the blood for energy production or storage. This process prevents blood glucose levels from rising to dangerous levels, thereby maintaining homeostasis.



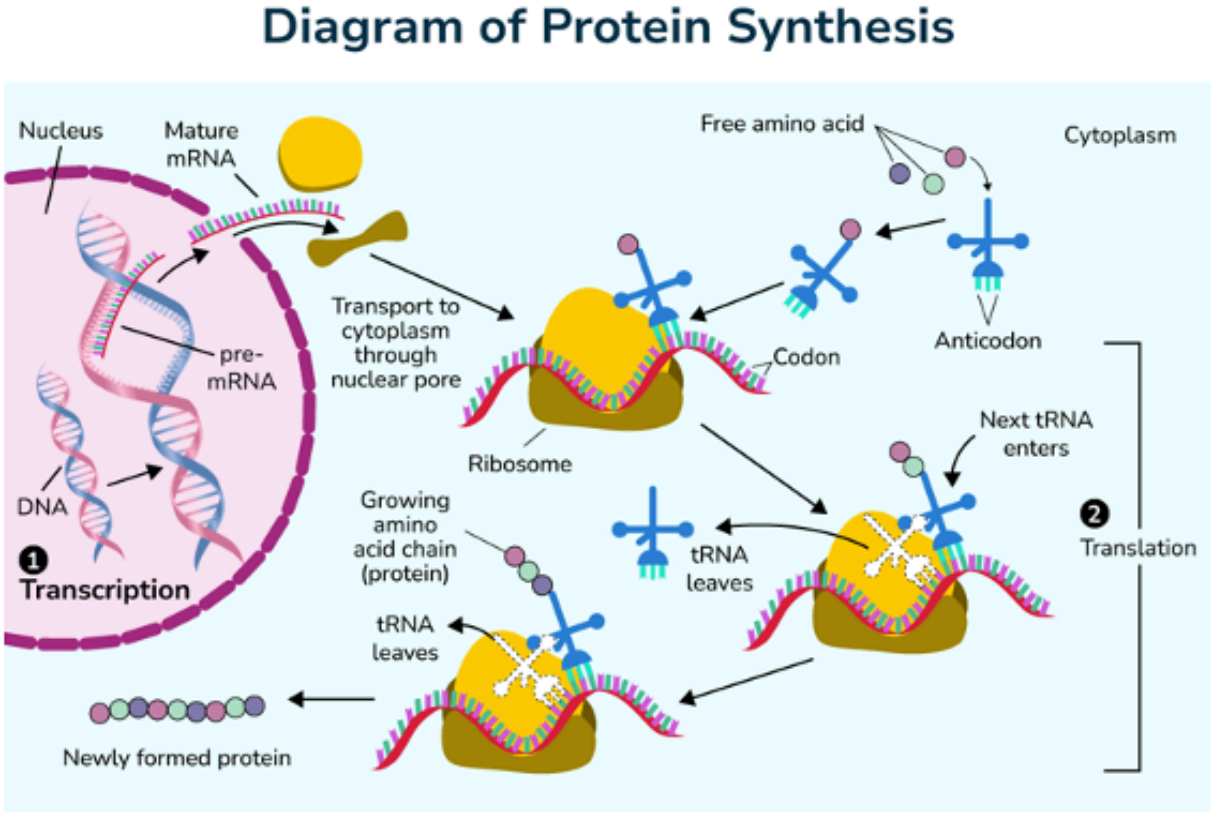
In what specific organ is insulin produced in the body, and how does it contribute to the regulation of blood glucose levels?

- A Insulin is produced in the liver, regulating glucose release into the bloodstream.
- B Insulin is produced in the kidneys, controlling glucose filtration.
- C Insulin is produced in the adrenal glands, influencing glucose metabolism.
- D Insulin is produced in the pancreas, promoting glucose uptake by cells.

Item	I-SCI-F-S000022-BA1-Q7
Identifier	I-SCI-F-S000022
Standards	SCI.9-12.HS-LS1-1

Impact of DNA Structure on Protein Function in Human Cells

Recent research has uncovered a fascinating connection between the structure of DNA and the functions carried out by proteins within human cells. The human genome, composed of DNA, contains the instructions for producing proteins. DNA is made up of nucleotide sequences that encode specific amino acids. These amino acid sequences are transcribed into messenger RNA (mRNA) and translated into proteins through a process involving ribosomes and transfer RNA (tRNA). The unique sequence of nucleotides in DNA determines the specific amino acid sequence in a protein, which in turn influences the protein's shape and function. Proteins are vital for various cellular processes, such as enzymatic reactions, structural support, and signaling within and between cells. Through the intricate system of specialized cells, proteins play a crucial role in the orchestration of essential functions that sustain life in human beings.



Which statement best explains how the sequence of nucleotides in DNA determines the structure of a protein?

A The sequence of nucleotides determines the number of proteins that are produced.

B The sequence of nucleotides directly codes for specific amino acids that fold into a protein.

C The sequence of nucleotides influences the speed at which proteins are synthesized.

D The sequence of nucleotides has no direct effect on protein structure but affects cell division rates.

Item	I-SCI-F-S000023-BA1-Q8
Identifier	I-SCI-F-S000023
Standards	SCI.9-12.HS-LS1-1

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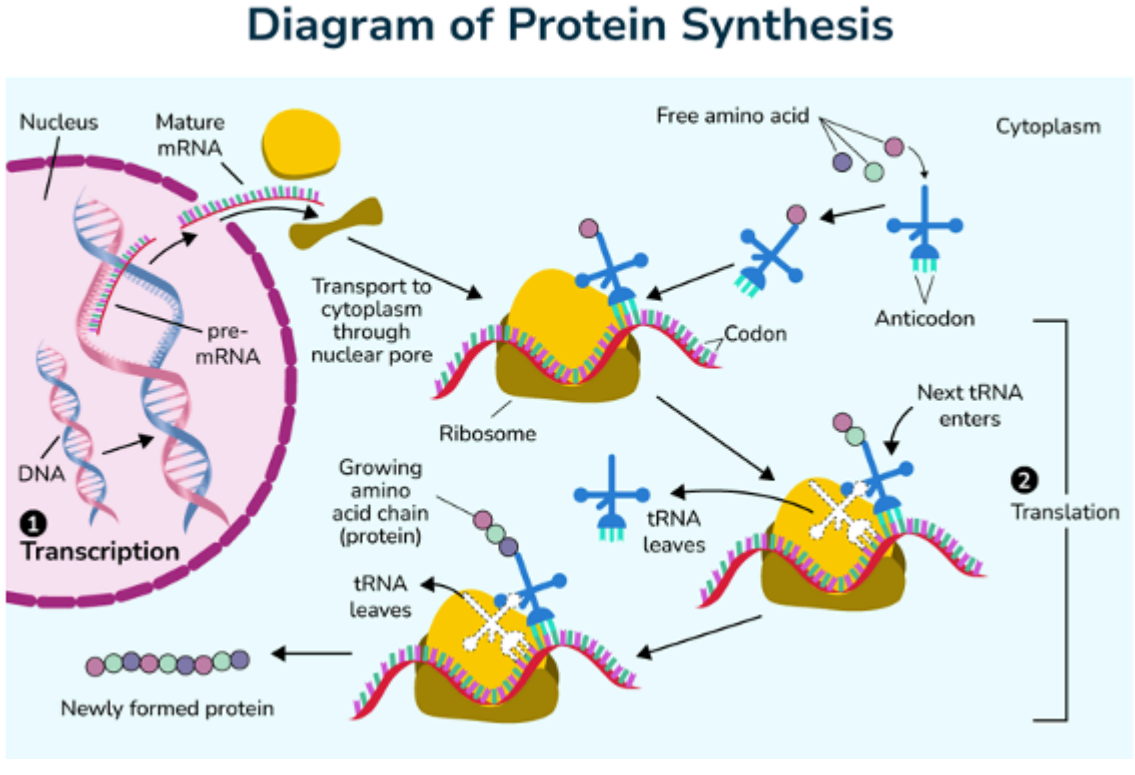

Describe the process by which genetic information encoded in DNA is eventually converted to proteins that carry out essential functions in specialized human cells.

A DNA undergoes replication to produce mRNA, which is then translated into proteins.

B DNA is directly converted into proteins without intermediate steps.

C DNA is transcribed into tRNA, which directs protein synthesis.

D DNA is transcribed into mRNA, which carries the genetic code to ribosomes for protein synthesis.

Item	I-SCI-F-S000025-SB-Q9
Identifier	I-SCI-F-S000025
Standards	SCI.9-12.HS-LS1-1

Impact of DNA Structure on Protein Function in Human Cells

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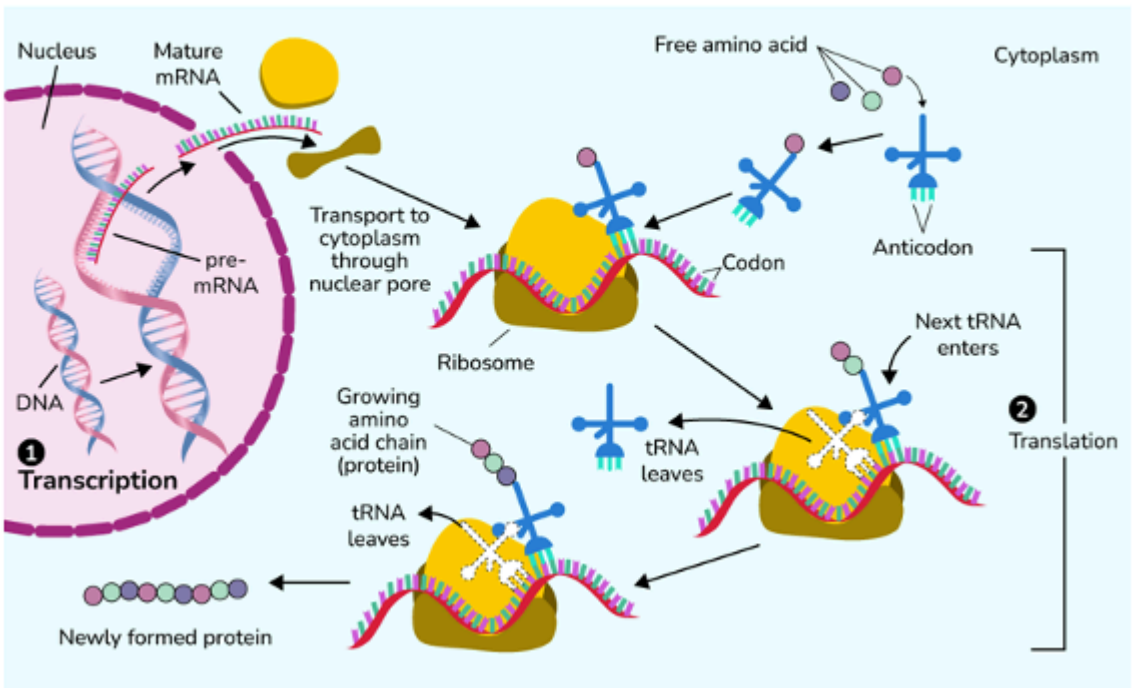


Why is it important for proteins within human cells to have specific shapes and functions dictated by the sequence of nucleotides in DNA?

A Proteins with specific shapes perform specialized cellular tasks efficiently.

B Protein functions are independent of DNA sequence.

C Specific protein shapes ensure proper DNA replication.

D Protein shape is determined by environmental factors, not DNA sequence.

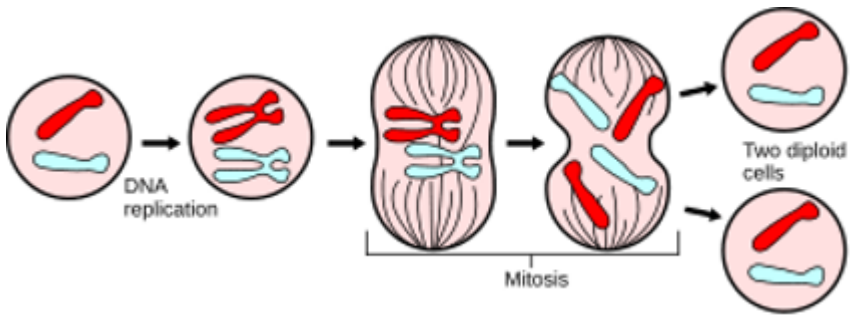
Item	I-SCI-F-S000027-BA1-Q10
Identifier	I-SCI-F-S000027
Standards	SCI.9-12.HS-LS1-4

Role of Mitosis and Differentiation in Producing and Maintaining Complex Organisms

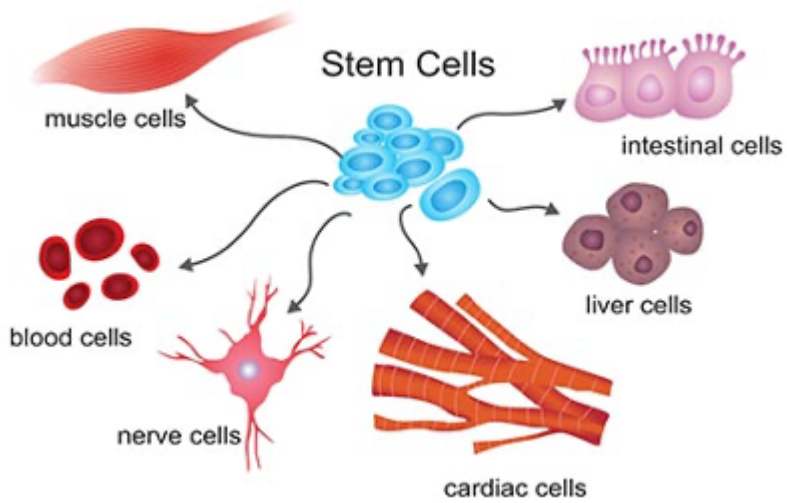
A new study conducted at a university investigated the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. In the research, scientists focused on the development of a specific organism, the *Drosophila melanogaster*fruit fly, known for its rapid life cycle and well-understood genetics.

Drosophila melanogaster – The Common Fruit Fly

By closely observing the process of mitosis, where a single cell divides to create two identical daughter cells, researchers identified how this fundamental biological process contributes to growth and repair within the organism. Through multiple rounds of mitosis, the fruit fly embryo develops from a single fertilized egg into a complex multicellular organism.



Moreover, the study delved into the critical concept of differentiation, where cells become specialized to perform specific functions within the organism. This process is essential for the creation of various tissues and organs in complex organisms. By regulating gene expression, cells undergo differentiation to become distinct cell types such as muscle cells, nerve cells, or epithelial cells.



The findings from this research provide valuable insights into the intricate interplay between mitosis and differentiation, showing how these processes work together to generate and maintain the complexity of organisms like the *Drosophila melanogaster* fruit fly.

How does the process of mitosis contribute to the growth and development of a complex organism like the *Drosophila melanogaster* fruit fly?

A Mitosis creates genetic variations necessary for adaptation.

B Mitosis leads to the formation of specialized cell types.

C Mitosis generates identical daughter cells, promoting tissue growth and repair.

D Mitosis triggers programmed cell death, regulating organism size.

Item	I-SCI-F-S000030-BA1-Q11
Identifier	I-SCI-F-S000030
Standards	SCI.9-12.HS-LS1-4

Phenomenon: Role of Mitosis and Differentiation in Producing and Maintaining Complex Organisms

A new study conducted at a university investigated the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. In the research, scientists focused on the development of a specific organism, the *Drosophila melanogaster*fruit fly, known for its rapid life cycle and well-understood genetics.

Drosophila melanogaster – The Common Fruit Fly

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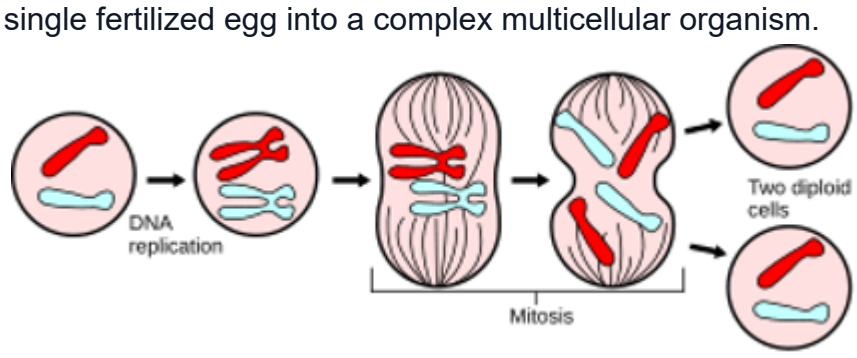

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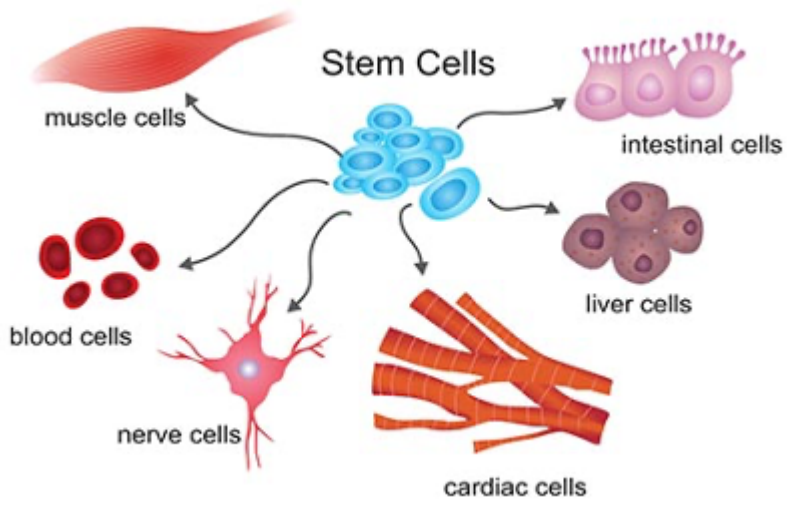

The findings from this research provide valuable insights into the intricate interplay between mitosis and differentiation, showing how these processes work together to generate and maintain the complexity of organisms like the *Drosophila melanogaster* fruit fly.

Explain the significance of cellular differentiation in the context of creating specialized cell types within a multicellular organism.

A Cellular differentiation prevents cell division in multicellular organisms.

B Cellular differentiation allows for the production of genetically identical cells.

C Cellular differentiation ensures all cells have the same function.

D Cellular differentiation creates diverse cell types with specialized functions.

Item	I-SCI-F-S000032-BA1-Q12
Identifier	I-SCI-F-S000032
Standards	SCI.9-12.HS-LS1-4

Phenomenon: Role of Mitosis and Differentiation in Producing and Maintaining Complex Organisms

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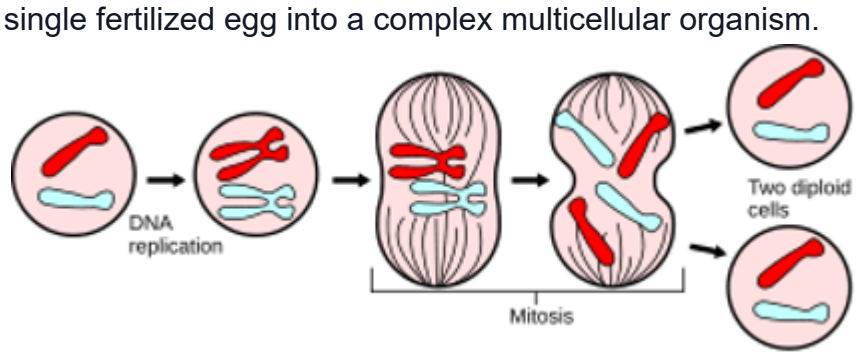
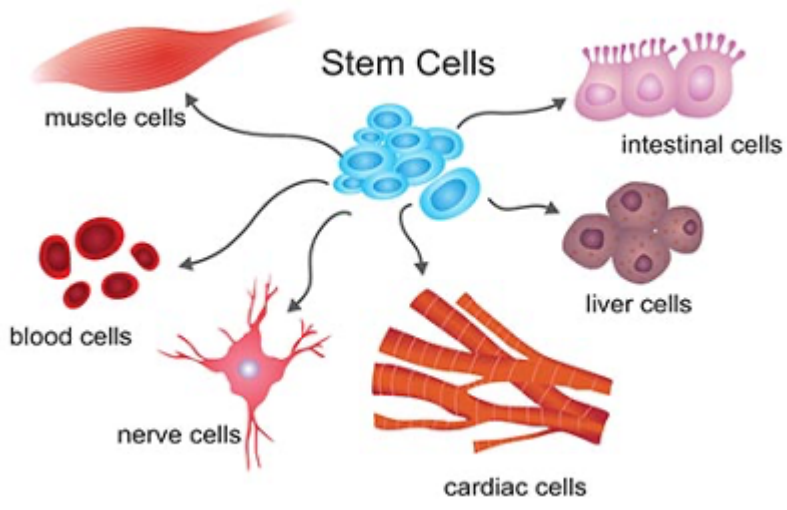


Moreover, the study delved into the critical concept of differentiation, where cells become specialized to perform specific functions within the organism. This process is essential for the creation of various tissues and organs in complex organisms. By regulating gene expression, cells undergo differentiation to become distinct cell types such as muscle cells, nerve cells, or epithelial cells.



The findings from this research provide valuable insights into the intricate interplay between mitosis and differentiation, showing how these processes work together to generate and maintain the complexity of organisms like the *Drosophila melanogaster* fruit fly.

How do mitosis and differentiation work together to maintain the complexity of organisms such as the *Drosophila melanogaster* fruit fly?

- A. Mitosis generates new cells, while differentiation assigns specific functions to those cells.
- B. Mitosis creates specialized cells, while differentiation regulates cell division.
- C. Mitosis produces identical cells, while differentiation ensures genetic diversity.
- D. Mitosis and differentiation are independent processes with no relation to organism complexity.

Item	I-SCI-F-S000035-BA1-Q13
Identifier	I-SCI-F-S000035
Standards	SCI.9-12.HS-LS3-1

Inheritance and Variation of Traits

If a certain trait is not expressed in the offspring, which question would best help clarify the genetic relationship involved?

A How do environmental factors suppress certain traits?

B What is the probability of the trait being expressed in future generations?

C Is the gene for this trait located on a dominant or recessive chromosome?

D What are the potential mutations that could cause this trait to be unexpressed?

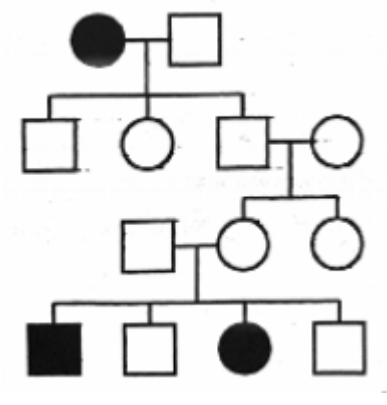
Item	I-SCI-F-S000037-BA1-Q14
Identifier	I-SCI-F-S000037
Standards	SCI.9-12.HS-LS3-1

Inheritance and Variation of Traits

Which question would best help clarify why some traits are more common in one gender than the other?

- A What role do sex chromosomes play in the inheritance of certain traits?
- B How do lifestyle choices impact the expression of traits in different genders?
- C How does the number of chromosomes differ between males and females?
- D What environmental factors influence gender-specific traits?

Item	I-SCI-F-S000039-BA1-Q15
Identifier	I-SCI-F-S000039
Standards	SCI.9-12.HS-LS3-1



When studying a family tree, you notice that a trait skips a generation. Which question would best clarify the genetic explanation for the pattern seen above?

A How do epigenetic factors cause traits to skip generations?

B How do recessive alleles contribute to the skipping of traits in a family lineage?

C What is the relationship between gene linkage and the skipping of generations?

D How does genetic recombination during reproduction influence trait inheritance?

Item	I-SCI-F-S000040-BA1-Q16
Identifier	I-SCI-F-S000040
Standards	SCI.9-12.HS-LS3-2

The Impact of Ultraviolet (UV) Radiation on Skin Pigmentation in Fruit Flies
Ultraviolet (UV) radiation significantly impacts skin pigmentation in fruit flies (Drosophila melanogaster), triggering the production of melanin, a protective pigment that absorbs UV rays and reduces DNA damage. This melanization process enhances the flies' survival by preventing cellular harm from UV exposure. In addition to immediate pigmentary responses, UV radiation can also influence inheritable genetic variations in skin pigmentation. These genetic variations are subject to natural selection, where fruit flies with advantageous pigmentation traits are more likely to survive and reproduce. Consequently, these beneficial traits are passed on to subsequent generations, leading to a population with increased resistance to UV-induced damage over time.

Generation	UV Exposure	Skin Pigmentation of Offspring
P	None	Light
F_1	High	Dark
F_2	None	Light

Drosophila melanogaster – The Common Fruit Fly

Which of the following would be the **BEST** claim about how inheritable genetic variations in skin pigmentation might have occurred in the F2 generation?

- A. Genetic variations in skin pigmentation occurred randomly due to environmental factors.
- B. Genetic variations in skin pigmentation were solely influenced by UV radiation exposure.
- C. Genetic variations in skin pigmentation were inherited from both parental lines and further influenced by UV radiation.
- D. Genetic variations in skin pigmentation were primarily due to mutations during DNA replication.

Item	I-SCI-F-S000042-BA1-Q17
Identifier	I-SCI-F-S000042
Standards	SCI.9-12.HS-LS3-2

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Generation	UV Exposure	Skin Pigmentation of Offspring
P	None	Light
F_1	High	Dark
F_2	None	Light

Drosophila melanogaster – The Common Fruit Fly

What evidence from the reading supports the claim that environmental factors can cause inheritable genetic variations?

A Fruit flies with darker pigmentation are more likely to survive.

B UV radiation triggers immediate melanin production in fruit flies.

C Melanization enhances survival by absorbing UV rays.

D UV radiation can cause mutations that result in genetic variations in skin pigmentation.

Item	I-SCI-F-S000043-BA1-Q18
Identifier	I-SCI-F-S000043
Standards	SCI.9-12.HS-LS3-2

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Generation	UV Exposure	Skin Pigmentation of Offspring
P	None	Light
F_1	High	Dark
F_2	None	Light

Drosophila melanogaster – The Common Fruit Fly

A newly found population of fruit flies shows a wide range of genetic diversity. Which claim is best supported by evidence explaining how this diversity arose?

A Genetic diversity is solely the result of mutations caused by environmental factors.

B Genetic diversity is primarily due to random errors during DNA replication, with little contribution from other factors.

C Genetic diversity is the result of a combination of new genetic combinations during meiosis, errors in DNA replication, and environmental mutations.

D Genetic diversity occurs only through new genetic combinations during meiosis.

Item	I-SCI-F-S000045-BA1-Q19
Identifier	I-SCI-F-S000045
Standards	SCI.9-12.HS-LS3-3

Heredity: Inheritance and Variation of Traits

Kentucky Green Tiger Beetle

Kentucky Brown Tiger Beetle

In a population of Kentucky Tiger Beetles, 60% have green shells, and 40% have brown shells. If a new environmental factor favors brown shells, what statistical principle could be used to predict the shift in the population's trait distribution?

A The principle of natural selection and probability.

B The principle of independent assortment.

C The law of large numbers.

D The rule of multiplication in probability.

Item	I-SCI-F-S000049-SB1-Q20
Identifier	I-SCI-F-S000049
Standards	SCI.9-12.HS-LS3-3

A population of flowers shows a distribution where 25% have white petals, and 75% have purple petals. Which statistical concept would best explain the expected ratio of red to white flowers in the next generation?

- A. The probability of purple flowers in the next generation is guaranteed to remain 75% due to genetic stability.
- B. The probability of white and purple flowers can fluctuate based on genetic drift and environmental factors.
- C. The distribution will remain the same unless mutations occur, which are statistically rare.
- D. The ratio will shift to equal distribution due to natural selection favoring genetic diversity.

Item	I-SCI-F-S000053-BA1-Q21
Identifier	I-SCI-F-S000053
Standards	SCI.9-12.HS-LS3-3

Which statistical concept would you apply to determine the likelihood of an offspring inheriting a recessive trait when both parents are heterozygous for that trait?

A The probability distribution of random variables.

B The concept of independent probability events.

C The statistical mean of the population.

D The Punnett square method to calculate the likelihood.