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Control of Gene Expression

BIO 100 Principles of Biology

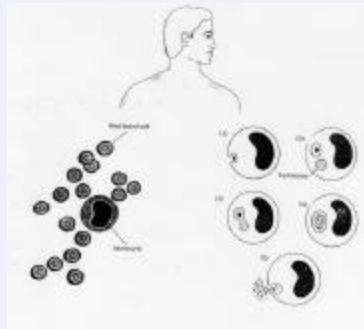
Cedarville University

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? The Puzzling Problem ?

HOW CAN CELLS
FROM THE SAME ZYGOTE
BE SO DIFFERENT IN
STRUCTURE AND
FUNCTION?
Or....



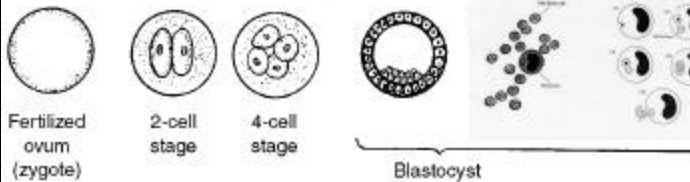
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? The Puzzling Problem ?

IF ALL CELLS ARE FROM THE ZYGOTE
HOW CAN THEY APPEAR SO DIFFERENT ?

This pattern is evident
even in the early embryo...

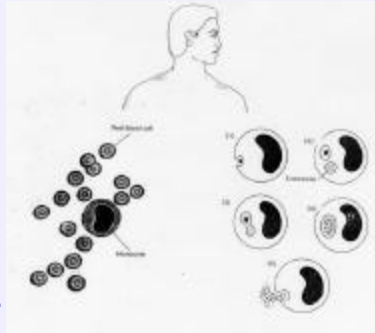


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> Answer <

CELLS FROM THE
ZYGOTE HAVE THE
SAME GENES, BUT
DIFFERENT GENES
ARE EXPRESSED AS
CELLS DIFFERENTIATE.



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Two Separate Questions

1. How are genes expressed?

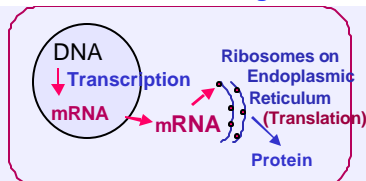
2. How is gene expression controlled?

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DNA to RNA

1. DNA stays in the nucleus -- "master copy"
2. mRNA (messenger RNA) a complementary copy, moves to ribosomes to direct protein synthesis
3. TRANSCRIPTION = RNA synthesis in nucleus from a segment of DNA



Slide 10

Two Separate Questions

1. How are genes expressed?

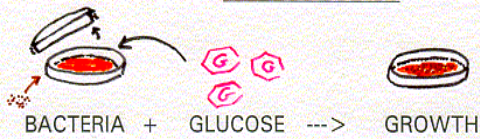
2. How is gene expression controlled?

Slide 11

How Is Gene Expression Controlled? "The Operon Theory"

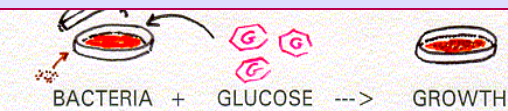
CONTROL OF GENE EXPRESSION by Jacob and Monod

Experiment #1: CERTAIN BACTERIA GROW WELL IN CULTURE WITH GLUCOSE SUGAR AS ENERGY SOURCE



Slide 12

How Is Gene Expression Controlled? "The Operon Theory"



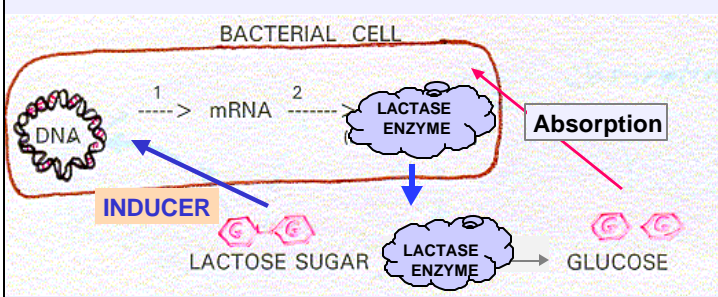
Experiment #2: WHEN LACTOSE SUGAR IS SUBSTITUTED FOR GLUCOSE, BACTERIA SYNTHESIZE LACTASE ENZYME



Interpretation: LACTOSE IS AN ENVIRONMENTAL "STIMULUS" OR **INDUCER** TO CAUSE SYNTHESIS OF LACTASE ENZYME (a Protein)

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How Is Gene Expression Controlled? "The Operon Theory"



QUESTION:
What controls the production of lactase enzyme?

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How Is Gene Expression Controlled? "The Operon Theory"

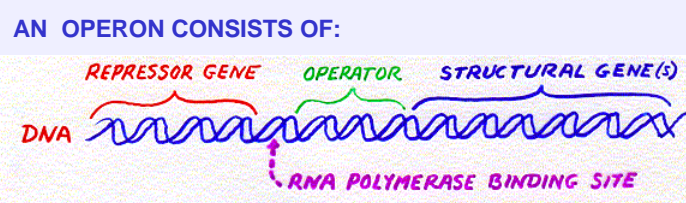


Figure 17-4

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How Is Gene Expression Controlled? "The Operon Theory"

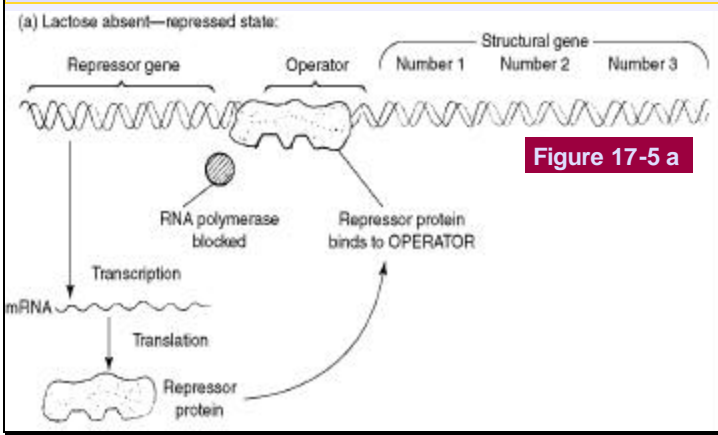


Figure 17-5 a

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How Is Gene Expression Controlled? "The Operon Theory"

Figure 17-5 b

