

What does a microarray measure?

Gene Activity

What does gene activity mean?

Transcription and Translation of genes on DNA into mRNA and protein. If a gene is expressed a protein is made.

Why did we use the P, R, B, and N tubes yesterday?

These were used to compare the color.

Do all living organisms have the same DNA?

No

Do all body cells within a living organism have the same DNA?

Yes

Wednesday March 25th

Objective: Students will analyze results from their microarray to determine which genes are important in causing cancer.

Agenda:

Warm Up

Finish Lab papers

Class Discussion of gene expression labs

Homework: Big Test Tomorrow (OPEN NOTES) where you will be evaluated on your labs.

-Gene Expression Lab

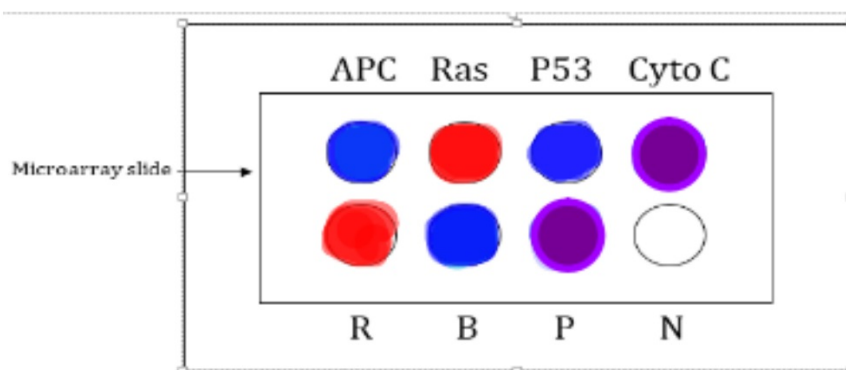
-Microarray Background Information

-Microarray Paper Lab

-Microarray Simulation

(paper clip
these papers
together)

Get out your microarray simulation paper

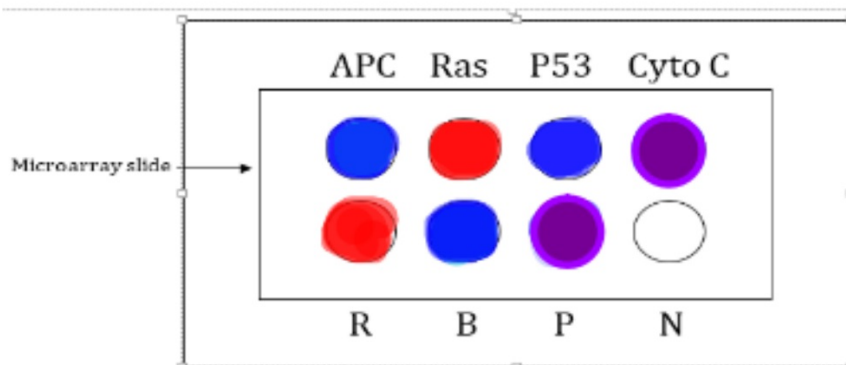


- Fill in the chart.
- Make sure you have colored in the larger image of the results.
- Answer the analysis questions

(10 min)

Data: Color of 4 Different Genes on a Microarray Slide

Microarray Well (Circle)	Color	Gene Expressed? (On or Off)	Cell Type: Normal, Cancerous or Both
1 - APC			
2 - Ras			
3 - P53			
4 - Cytochrome c			
R - (+)			
B - (+)			
P - (+)			
N - (-)			



3. From the four genes studied in this lab, which genes would you expect to be turned on in a cancer cell? Genes turned off in a cancer cell?

Cancer cell	
Genes turned on:	Genes turned off:

4. From the four genes studied in this lab, which genes would you expect to be turned on in a healthy cell? Genes turned off in a healthy cell?

Normal (Non-Cancerous) cell	
Genes turned on:	Genes turned off:

5. Are there any genes turned on in both the normal and the cancerous cells? If so, identify the gene and **explain** if this is an expected result.

6. Are there any genes turned off in both the normal and the cancerous cells? If so, identify the gene and **explain** if this is an expected result.

7. Use the following vocabulary to explain the purpose of a microarray and what it measures.

Word Bank: DNA, mRNA, protein, gene and expressed, microarray

(refer to the first two questions from your warm up today)

Get out your Microarray Paper Simulation

Turn to the analysis questions

Name: _____ Period: _____

Microarray Paper Simulation

1. In this lab, we will study gene expression (making mRNA) in skin cancer cells as compared to those in normal, healthy skin cells. Complimentary DNA or cDNA is made from the mRNA of cancer cells and will be labeled red, and the cDNA made from the mRNA from normal cells will be labeled blue. If neither cell is expressing a gene which means it's not making mRNA for that gene, then the spot shows black. What three colors are seen in most microarrays used in scientific research? What type of cells are you studying?

2. If the cDNAs made from the cancer cells' mRNA are labeled red, and the cDNAs made from the normal cells' mRNA are labeled blue, for each of the situations below, describe what color you expect the gene spot to be on a microarray; red, blue, or purple.

GENE DESCRIPTION	COLOR OF SPOT
A gene was expressed (making mRNA) more in cancer cells than in normal cells.	
A gene was expressed the same in both cells.	
A gene wasn't expressed at all in either cell.	
A gene was expressed (making mRNA) more in normal cells than in cancer cells.	

Analysis of Results:

1. Which gene(s) were expressed (transcribed) in the skin cancer cells? How do you know?

2. Which gene(s) were not expressed in the skin cancer cells? How do you know?

3. Which gene was not expressed in either skin cell type?

4. Why do think that gene was not expressed? (Hint: Think about the type of cell you are using in the microarray)

5. Why do you think that genes 3 and 5 are expressed in both skin cell types, as well as all cells in the body?

6. Choose at least one gene you think may play a role in causing cancer in cells. Explain why you chose that gene and not other genes based upon the microarray results. (**on-level**)
Choose two or more genes you think may play a role in causing cancer in cells. Explain why you chose those genes and not other genes based upon the microarray results. (**honors**)

Finish the analysis questions

Microarray Paper Simulation

Microarray Results

Gene 1: P53



Gene 2: BDNF



Gene 3: Cyto C



Gene 4: APC



Gene 5: ST3GAL5



Gene 6: RAS



Microarray Paper Simulation

Analysis of Results:

1. Which gene(s) were expressed (transcribed) in the skin cancer cells? How do you know?
2. Which gene(s) were not expressed in the skin cancer cells? How do you know?
3. Which gene was not expressed in either skin cell type?
4. Why do think that gene was not expressed? (Hint: Think about the type of cell you are using in the microarray)

Answer the questions

Microarray Paper Simulation

Analysis of Results:

5. Why do you think that genes 3 and 5 are expressed in both skin cell types, as well as all cells in the body?

6. Choose at least one gene you think may play a role in causing cancer in cells. Explain why you chose that gene and not other genes based upon the microarray results. (on-level)

If you missed the lab from Thursday/Friday on Cell Differentiation and Gene Expression- Finish those questions

Class Discussion Questions

- How would gene expression be different in a muscle cell than in a digestive lining cell?
- How would gene expression be similar in those cells?
- How does gene expression change in a muscle cell over time?

Why aren't all genes expressed in every cell?

What causes gene expression to change within a cell?

How does a microarray allow a scientist to learn about which genes might be causing cancer?

- Gene Expression Lab
- Microarray Background Information
- Microarray Paper Lab
- Microarray Simulation

Paper clip these papers together so you are ready for your test tomorrow