

**Southwest Center for Microsystems Education (SCME)
University of New Mexico**

DNA Microarray Learning Module

This learning module contains seven units:

Knowledge Probe (pre-Quiz)
Primary Knowledge (Reading material)
DNA Hybridization Activity
DNA Microarray Terminology Activity
DNA Microarray Model Activity
DNA Microarray – An Ethical Dilemma?
Final Assessment

This learning module provides an overview of DNA microarrays – types of arrays, applications, interpretation, design, and fabrication. Activities provide the opportunity for students to gain a better understanding of these concepts as well as to discuss the ethical questions surrounding some of the applications and possibilities of these arrays.

Target audiences: High School, Community College, University

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Website: www.scme-nm.org

DNA Microarrays

Knowledge Probe (Pre-Quiz)

Participant Guide

Introduction

The DNA Microarray Learning Module provides an overview of DNA microarrays – types of arrays, applications, interpretation, design, and fabrication. Activities provide the opportunity for students to gain a better understanding of these concepts as well as to discuss the ethical questions surrounding some of the applications and possibilities of these arrays.

The purpose of this knowledge probe is to determine your current understanding of the applications, operations, interpretation, and fabrication of DNA microarrays. It is not a test. Answer each question to the best of your current knowledge.

1. Cytosine, Guanine, Adenine, and Thymine are the _____ of a DNA molecule.
 - a. Oligonucleotides
 - b. Nucleotides
 - c. Nitrogenous bases
 - d. Genomes
2. A cytosine, guanine, adenine or thymine with a sugar and a phosphate is called _____.
 - a. Oligonucleotide
 - b. Nucleotide
 - c. Polymorphism
 - d. Genome
3. Which of the following is NOT a valid base pair sequence?
 - a. A-T, T-A, C-G, A-T
 - b. T-A, C-G, C-T, T-A
 - c. T-A, T-A, G-C, A-T
 - d. C-G, G-C, C-G, A-T
4. A DNA microarray uses synthetic _____ as probes to capture target molecules from test and control samples.
 - a. Oligonucleotides
 - b. Nitrogenous bases
 - c. Polymorphisms
 - d. Genomes

5. DNA microarrays depend on which of the following processes to occur on the surface of the microarray in order to accurately analyze the DNA of the control and test samples?
 - a. Replication
 - b. Transcription
 - c. Reverse Transcription
 - d. Hybridization
6. Which of the following applications do NOT use DNA microarrays?
 - a. Genome studies of various species
 - b. Identification of specific genes for specific diseases
 - c. Study how genes react to specific drugs or drug dosages
 - d. Identification of specific viruses or bacteria
 - e. All of the above applications use DNA microarrays
7. Which of the following BEST explains the process that takes place on the surface of a DNA microarray?
 - a. Hybridization occurs between a synthetic oligo probe on the array and a complementary ssDNA from the control or test sample
 - b. Hybridization occurs between a ssDNA from the control sample and a complementary DNA from the test sample
 - c. DNA transcription divides a DNA molecule from the test sample into a ssDNA and RNA
 - d. A copy DNA is made from the test sample's RNA using reverse transcription
8. Which of the following BEST describes a GeneChip[®]? A grid or array consisting of thousands or millions of ...
 - a. genes from a specific organism strategically placed on a glass or silicon substrate using an inkjet printing process
 - b. synthetic oligos that were fabricated using an inkjet printing process
 - c. synthetic oligos that were fabricated using a photolithography process
 - d. ssDNA from a control and a test sample strategically placed on a silicon substrate using a photolithography process
9. The photolithography fabrication process of a DNA microarray using masks requires which of the following components?
 - a. Glass substrate, a set of masks, UV light, hundreds of oligonucleotide solutions
 - b. Silicon substrate, a set of masks, UV light, four nucleotide base solutions with blocking agent
 - c. Silicon substrate, a set of masks, UV light, hundreds of oligonucleotide solutions with blocking agent
 - d. Glass substrate, a set of masks, UV light, a blocking agent, four oligo solutions

10. Which of the following BEST describes the process steps of the photolithography process used for DNA microarray fabrication?
- Coat, align, expose, develop
 - Protect, deprotect, develop
 - Protect, deprotect, addition
 - Coat, deprotect, addition
11. In the photolithography process of a DNA microarray using masks, each mask identifies the placement location of which of the following components?
- A specific oligonucleotide
 - A specific DNA sequence
 - A specific DNA hybrid
 - A specific nucleotide base
12. What is the purpose of the UV light in the photolithography process of a DNA microarray?
- To remove the blocking agent from the top of the oligo chain
 - To add the blocking agent to the top of the oligo chain
 - To add a nucleotide base to the top of the oligo chain
 - To block a specific position from the placement of a nucleotide base
13. Which of the following prevents the addition of a nucleotide base to specific features during the addition step of photolithography fabrication?
- Mask
 - Blocking agent
 - UV light
 - Fluorescent tag
14. In the interpretation of a DNA microarray, what color would indicate the presence of cDNA from the control sample as well as the test sample?
- Yellow
 - Red
 - Green
 - Black
15. In the interpretation of a DNA microarray, what color would indicate the presence of cDNA from only the test sample?
- Yellow
 - Red
 - Green
 - Black

16. DNA microarrays are fabricated with “positive and negative control features”, features that verify the validity of the test. Which of the following would indicate an “invalid” test?
- a. Positive control feature with both control and test sample genes
 - b. Positive control feature with both control and test sample genes AND negative controls with no hybrids shown
 - c. Negative control feature with genes from neither the control or test sample
 - d. Negative control feature with a gene or genes from either the control or test sample

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