Continuing Education Questions

FALL 2005

To receive 3.5 contact hours of advanced level P.A.C.E.® credit for the **Focus: Gene-based Diagnostics I** questions, insert your answers in the appropriate spots on the immediately following page; then complete and mail the form as directed.

NOTE: There may be more answer spaces on the answer sheet than needed. If so, leave them blank. Make sure the number of the answer space being filled matches the number of the question being answered.

LEARNING OBJECTIVES

1. Describe the classification of gene-based amplification methods.
2. State the principles of gene-based amplification methods.
3. Discuss the advantages and disadvantages of gene-based diagnostics.
4. Define future prospectives of gene-based diagnostics.
5. Describe the uses of molecular-based assays in addressing issues related to HIV infection.
6. List three specific molecular methods commonly used to quantify HIV viral load and describe how they differ in principle.
7. Describe molecular methods that can be used to determine viral resistance to anti-retroviral drugs.
8. Define thrombophilia and explain the difference between acquired and inherited forms.
9. Define the terms multigenic and multifactorial.
10. Identify the three most common inherited protein deficiencies associated with venous thrombosis.
11. List three common genetic single nucleotide polymorphisms (SNPs) tested in the diagnosis of inherited thrombosis.
12. Describe the mechanism by which the factor V Leiden mutation affects hemostasis.
13. Describe the effect of the MTHFR C677T mutation on homocysteine metabolism.
14. Explain the purpose of polymerase chain reaction (PCR).
15. Compare and contrast laboratory methods used to identify single nucleotide polymorphisms.

FROM SINGLE CELL GENE-BASED DIAGNOSTICS TO DIAGNOSTIC GENOMICS: CURRENT APPLICATIONS AND FUTURE PERSPECTIVES

1. Select the gene-based amplification method.
   a. Target-based
   b. Probe-based
   c. Signal-based
   d. All of the above

2. Which technique does **NOT** use a probe-based amplification method?
   a. Real-time PCR
   b. Qβ-replicase
   c. LCR
   d. SDA

3. Which one of the following statements is **NOT** true?
   a. Strand displacement assay (SDA) resembles a DNA repair process.
   b. PCR mimics jellyfish DNA synthesis.
   c. NASBA resembles retroviral replication.
   d. Qβ-replicase assay imitates bacteriophage replication.

4. Which one of the following statements about the conventional PCR is **NOT** correct?
   a. Conventional PCR amplifies DNA in an exponential way.
   b. A small variation in DNA templates could lead to a large variation of the amplified final products.
   c. Conventional PCR normally has a limited linear dynamic range of detection.
   d. Final quantity of the amplicons can be used to determine copy number of the DNA template.

5. Which of the following is a fluorescent label currently used as detection marker in molecular diagnostics?
   a. FAM (SYBR Green I)
   b. JOE (VIC)
   c. TAMRA (NED or Cy3)
   d. ROX (Texas Red)
   e. All of the above

6. Gene-based diagnostic methods have all of the following advantages over serological assays **EXCEPT**:
   a. high sensitivity and specificity.
   b. no need for specimen cultivation.
   c. low error rate.
   d. diagnosis of HIV infection in newborns.

7. Which one of the following assays potentially has the highest sensitivity?
   a. Real-time PCR
   b. LCM
   c. iPCR
   d. BCA

8. What is MALDI-TOF-MS used for?
   a. Protein isolation in proteomic assay
   b. Protein sequence identification
   c. Formation of protein tertiary structure
   d. DNA extraction

9. Which of the following statements closely describes the potential role of quantum dots in gene-based diagnostics? Qdots potentially have the highest:
   a. Amplification power
   b. Specificity power
   c. Detection power
   d. All of the above

10. Which of the following statements closely describes the nature of BCA?
    a. BCA is a target-based amplification assay
    b. BCA is a probe-based amplification assay
    c. BCA is a signal-based amplification assay
    d. None of the above

MOLECULAR-BASED LABORATORY TESTING AND MONITORING FOR HUMAN IMMUNODEFICIENCY VIRUS INFECTIONS

11. Which of the following is **NOT** an appropriate use of molecular HIV tests:
    a. Confirming HIV infection in persons who have positive antibody tests
    b. Detection of HIV infection during the serologic window period
    c. Monitoring viral load for prognostic purposes
    d. Monitoring the effectiveness of anti-retroviral therapy

12. How many days can a molecular method detect HIV infection earlier than antibody tests?
    a. 3 days
    b. 5 days
    c. 10 days
    d. 60 days

13. Which of the following molecular methods relies on signal amplification:
    a. RT-PCR
    b. bDNA
    c. NASBA
    d. PCR

14. HIV viral load peaks early during infection to levels of about:
    a. 500 copies/mL
    b. 10,000 copies/mL
    c. 1 million copies/mL
    d. 1 billion copies/mL

15. Most of the molecular assays for HIV have a lower range of detection of:
    a. 50 copies/mL.
    b. 1,000 copies/mL.
    c. 2,000 copies/mL.
    d. 5,000 copies/mL.

16. Which of the following methods does **NOT** rely on isothermal amplification?
    a. NASBA
    b. TMA
    c. RT-PCR
    d. bDNA

17. Which of the following is often used to determine mutations associated with anti-retroviral drugs?
    a. TMA
    b. NASBA
    c. bDNA
    d. Genotyping

18. DNA PCR is usually used to:
    a. detect HIV infection in newborns.
    b. detect viral resistance.
    c. detect DNA in serum samples.
    d. stage HIV infection.

19. In clinical laboratories, amplicons, generated from amplification methods, are usually detected by:
    a. colorimetric or chemiluminescent methods.
    b. gel electrophoresis.
    c. radioisotopes.
    d. Southern blotting.

20. Which of the following methods for determining gene mutations is the most expensive and has the longest turn around time for results?
    a. Genotyping
    b. Phenotyping
    c. Virtual genotyping

MOLECULAR DIAGNOSTICS OF INHERITED THROMBOSIS

21. Thrombophilia is defined as:
    a. a tendency towards bleeding.
    b. a shift in hemostasis towards an increased predisposition for thrombosis.
    c. an equal balance between the prothrombotic and antithrombotic components of hemostasis.
    d. a protein deficiency.

22. A multigenic disease is one that:
    a. has many different symptoms.
    b. is caused by both environmental and genetic factors.
    c. can be caused by genetic variations in more than one gene.
    d. creates new genetic changes in an individual.

23. Which type of thrombophilia is due to environmental factors such as hormone replacement therapy or surgery?
    a. Acquired
    b. Inherited
    c. Neither of the above
    d. Both of the above

24. The three most common inherited protein deficiencies associated with VTE are:
    a. factor VIII, factor IX, and factor VII.
    b. protein C, protein S, and fibrinogen.
    c. cystathionine-β-synthase, methylenetetrahydrofolate reductase, and methionine synthase.
    d. factor V, prothrombin, and factor XIII.

25. FVL, PT G20210A, and MTHFR C677T are:
    a. protein deficiencies associated with VTE.
    b. three SNPs commonly tested in inherited thrombophilia.
    c. methods used in molecular testing.
    d. acquired causes of thrombophilia.

26. The FVL polymorphism causes _____ because it alters a protein C cleavage site, not allowing factor Va to be inactivated.
    a. hyperhomocysteinemia
    b. activated protein C resistance
    c. acquired thrombophilia
    d. abnormal fibrinogen cross-linking

27. When the MTHFR C677T variant is present, enzyme activity is _____, causing an _____ in plasma homocysteine levels.
    a. increased; increase
    b. increased; decrease
    c. decreased; increase
    d. decreased; decrease

28. PCR is a molecular method used to:
    a. measure the amount of a protein.
    b. measure the function of a protein.
    c. link small pieces of DNA together into larger fragments.
    d. create many copies of a short fragment of DNA for further analysis.

29. Which one of the following molecular methods would be ideally suited to very large sample sizes where high throughput is needed?
    a. ASA
    b. Probe-based
    c. Luminex
    d. RFLP

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Answers
Circle correct answer (questions are on previous three pages).

1. a b c d e	9. a b c d e	17. a b c d e	25. a b c d e
2. a b c d e	10. a b c d e	18. a b c d e	26. a b c d e
3. a b c d e	11. a b c d e	19. a b c d e	27. a b c d e
4. a b c d e	12. a b c d e	20. a b c d e	28. a b c d e
5. a b c d e	13. a b c d e	21. a b c d e	29. a b c d e
6. a b c d e	14. a b c d e	22. a b c d e	30. a b c d e
7. a b c d e	15. a b c d e	23. a b c d e	31. a b c d e
8. a b c d e	16. a b c d e	24. a b c d e	32. a b c d e

Participant Information
Please circle the most appropriate answers.

1. Is this program used to meet your CE requirements for:
(a) state license (b) NCA (c) employment (d) other

2. Specialty: (a) biochemistry/urinalysis (b) microbiology (c) lab administration (d) hematology/hemostasis (e) education (f)immunology (g) immunohematology

3. Workplace: (a) hospital over 500 beds (b) hospital 200–499 beds (c) hospital 100–199 beds (d) hospital under 100 beds (e)private lab (f) community blood bank (g) group practice (h) private physician (i) clinic (j) other

4. Salary range: (a) under $10,000 (b) $10,000 to $20,000 (c) $20,000 to $30,000 (d) $30,000 to $40,000 (e) over $40,000

5. Did these articles achieve their stated objectives?
(a) yes (b) no

6. How much of these articles can you apply in practice?
(a) all (b) some (c) very little (d) none

7. Employment status: (a) full time (b) part time (c) student (d) not employed (e) retired

8. How long did it take you to complete both the reading and the quiz? _____minutes

9. What subjects would you like to see addressed in future Focus articles?

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