FOCUS: BLOOD CELL MALIGNANCIES

Continuing Education Questions

WINTER 2002

To receive 3.0 contact hours of intermediate level P.A.C.E.® credit for Focus: Blood Cell Malignancies, insert your answers in the appropriate spots on the immediately following page; then complete and mail the form as directed. Refer to the first page of each article for the learning objectives for that article.

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 you fill in matches the number of the question you are answering.

LEARNING OBJECTIVES
1. Compare and contrast the functional characteristics of oncogenes and tumor suppressor genes.
2. Summarize the four broad functional categories of oncogenes.
3. Define and explain the role of cyclins and Cdk's in regulating cell cycle progression.
4. Describe the 'cell-cycle checkpoints'.
5. Explain how loss of Rb protein can contribute to oncogenesis.
6. Summarize the roles of caspases, the Bcl-2 family of proteins, and IAPs (inhibitors of apoptosis) in the regulation of apoptosis.
7. Correlate overexpression of Bcl-2 and Bcl-X, or loss of function of p16 or p27, with oncogenesis.
8. Describe the role of telomerase in tumorigenesis.
9. Compare and contrast the principles of FAB and WHO classifications for myeloid neoplasms.
10. Categorize presentations into the WHO nomenclature.
11. Justify the percentage of blasts necessary for a diagnosis of acute leukemia in the WHO system.
12. Explain the four parameters on which the WHO classification is based.
13. Describe multi-lineage dysplasia and give examples of peripheral blood and bone marrow characteristics.
14. Summarize the four categories of acute myeloid leukemia in the WHO system.
15. Associate recurrent genetic abnormalities with specific leukemic presentations.

16. Associate therapy related leukemia and myelodysplastic syndromes with chemotherapeutic agents.
17. Describe the entities included in AML, not otherwise categorized.
18. Summarize the five categories of myelodysplastic syndromes included in the WHO classification.
19. Rationalize the creation of the category of MPD/MDS and discuss the disorders included in that category.
20. Compare and contrast the FAB and WHO classifications for lymphoid neoplasms.
21. Explain the four parameters on which the REAL and WHO classifications of lymphoid neoplasms are based.
22. State the three major categories of lymphoid neoplasms in the WHO system.
23. Differentiate between leukemia and lymphoma.
24. Correlate favorable and unfavorable cytogenetic abnormalities with cases of ALL.
25. Compare pre-B and pre-T leukemia with Burkitt leukemia/lymphoma as regards characteristic cells, incidence, immunophenotype, cytogenetic aberrations, and prognosis.

MALIGNANCY: AN EVOLVING DEFINITION OF A CANCER CELL

1. Genes which function to preserve a normal pattern of growth are called:
   a. tumor suppressor genes
   b. oncogenes
   c. caspases
   d. telomeres

2. An oncogene which binds DNA and controls expression of cellular genes required for proliferation or cell death belongs to which group of proteins?
   a. signal transducer molecules
   b. growth factor
   c. transcription factors
   d. growth factor receptors

3. The regulatory subunit of the kinase complex responsible for regulation of cell cycle progression is:
   a. cyclin dependent kinase (Cdk).
   b. p53.
   c. cyclin.
   d. Rb.
4. All of the following statements concerning the function of the Rb protein are true EXCEPT:
   a. In its hypophosphorylated state, Rb has antiproliferative effects.
   b. In its hyperphosphorylated state, Rb binds transcription factors (E2F proteins), rendering them inactive.
   c. Active cyclin D/Cdk4/Cdk6 phosphorylates Rb.
   d. Rb functions as a tumor suppressor gene.

5. Over-expression of cyclin D would have what effect on cellular proliferation?
   a. It would inhibit cell cycle progression.
   b. It would activate Rb protein function.
   c. It would contribute to excess proliferation.
   d. It would have no effect on cellular proliferation.

6. All of the following statements concerning caspases are true EXCEPT:
   a. Caspases are cysteine proteases that, when activated, orchestrate apoptosis.
   b. Caspases are indiscriminate proteases, which extensively degrade most intracellular proteins.
   c. Activation of apoptosis involves first activation of “initiator” caspases, which in turn activate (downstream) ‘executioner’ caspases.
   d. Caspase activity is modulated or inhibited by IAPs.

7. The role of Bcl-2 in cellular homeostasis is to:
   a. protect cells against cell death (apoptosis).
   b. activate apoptosis and initiate cell death.
   c. activate cell proliferation.
   d. activate telomerase.

8. Most tumor cells are thought to have:
   a. complete loss of telomeres.
   b. reduced telomerase.
   c. reactivation of telomerase activity.
   d. the same level of telomerase/telomeres as their benign counterparts.

9. The WHO classification for hematopoietic neoplasms is based on which of the following:
   a. morphology, immunophenotyping, cytochemistry
   b. morphology, cytochemistry, organ involvement
   c. immunophenotyping, cytogenetics, morphology, and clinical features
   d. cytogenetics, immunophenotyping, and prognosis

10. The percentage of blasts in blood and bone marrow required for a diagnosis of acute leukemia according to the WHO classification is:
    a. 20.
    b. 30.
    c. 50.
    d. 90.

11. The WHO uses the term acute leukemia with multi-lineage dysplasia to describe a condition in which there is at least ___% dysplasia in ____ or more cell lines.
    a. 10/one
    b. 20/three
    c. 50/two
    d. 90/three

12. The following are seen in a bone marrow from a patient with severe anemia: bi-nucleated erythroid precursors, uneven cytoplasmic staining in myeloid precursors, and large mononuclear megakaryocytes. This bone marrow would be interpreted as:
    a. normal.
    b. uni-lineage dysplasia.
    c. bi-lineage dysplasia.
    d. tri-lineage dysplasia.

13. A patient presents with 90% blasts of uncertain origin and 25% eosinophils. Cytogenetic testing demonstrates an inv(16)(p13q22) abnormality. Placement into the WHO nomenclature would be in the category:
    a. acute myeloid leukemias with recurrent cytogenetic translocations.
    b. precursor T-cell leukemia/lymphoma.
    c. chronic idiopathic myelofibrosis.
    d. extranodal marginal B-cell lymphoma.

14. The FAB classification of AML-M5 would now be described as:
    a. AML with recurrent cytogenetic translocations.
    b. AML with multi-lineage dysplasia.
    c. AML and myelodysplasia, therapy related.
    d. AML not otherwise categorized.

15. Therapy related acute myeloid leukemia is more likely following treatment with:
    a. all-trans retinoic acid (ATRA).
    b. topoisomerase II inhibitors.
    c. antimetabolites.
    d. tumor antibiotics.
16. The disease, refractory anemia with excess blasts in transformation is now classified as:
   a. 5q- syndrome.
   b. myelodysplastic syndrome, unclassifiable.
   c. AML evolving from MDS.
   d. atypical chronic myelogenous leukemia (aCML).

17. The FAB M0 through M7 leukemias, with the exception of FAB M3, are classified by WHO in which category?
   a. AML, therapy related
   b. Acute leukemia/myelodysplasia transformation
   c. AML, not otherwise categorized
   d. AML with multi-lineage dysplasia

18. A 20-year-old male presents with an elevated WBC, 50% blasts, 20% promyelocytes, 20% myelocytes, and 10% polymorphonuclear cells. Auer rods are present in some cells. Which of the following genetic abnormalities might you expect to see?
   a. t(8;21)(q22;q22); AML1/ETO
   b. t(15;17)(q22;q12); PML/RARα
   c. inv(16)(p13;q22); CBFβ/MYH11
   d. t(9;22)(q34;q11.2); BCR/ABL

19. Chronic myelomonocytic leukemia fits the criteria for which WHO classification?
   a. 5q- syndrome
   b. Myelodysplastic syndrome, unclassifiable
   c. MPD/MDS
   d. Atypical CML

20. The WHO uses the term refractory cytopenia with multilineage dysplasia to describe a condition in which there is bi- or pancytopenia and at least ___% dysplasia in _____ or more cell lines.
   a. five/one
   b. ten/two
   c. 20/three
   d. 50/two

THE NEW WHO NOMENCLATURE: LYMPHOID NEOPLASMS

21. Which of the following systems did the WHO use as a starting point for their classification of lymphoid neoplasms?
   a. FAB
   b. Lukes and Collins
   c. Rai
   d. REAL

22. The parameters used in classifying leukemias/lymphomas in both the REAL and WHO classifications include:
   a. cytochemistry, morphology, and cytogenetics.
   b. morphology, immunophenotyping, and genetic features.
   c. clinical outcomes and morphology.
   d. morphology only.

23. How is FAB L3 leukemia classified by WHO?
   a. Precursor T-ALL
   b. Precursor B-ALL
   c. Burkitt leukemia/lymphoma
   d. Hodgkin lymphoma

24. When a malignant process is confined to a mass without evidence of blood or bone marrow involvement, how is it classified by WHO?
   a. Lymphoma
   b. Acute leukemia
   c. Neoplasm of undetermined significance
   d. Peripheral neoplasm

25. A five-year-old female patient presents with bone pain and a WBC of 5.5 x 10^9/L, hemoglobin of 8.0 g/dL, and platelet count of 20 x 10^9/L. On her differential there are 90% blast cells with very little cytoplasm and very indistinct nucleoli. Which of the following cytogenetic results would project the best prognosis?
   a. t(9;22)(q34;q11.2)
   b. t(12;21)(p13;q22)
   c. hypodiploidy
   d. t(4;11)(q21;q23)

26. On a peripheral blood smear, 50% of the cells are medium sized with deeply basophilic cytoplasm. The majority of the cells have multiple cytoplasmic vacuoles and prominent nucleoli. The immunophenotype of this leukemia is most likely positive for:
   a. CD7, CD3, and TdT.
   b. SmIg, CD19, and CD22.
   c. HLA-Dr, CD34, and CD3.
   d. CD10, SmIg, and CD2.
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Answers

Circle correct answer (questions are on previous two pages).

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