Objective of this module:
To provide a basic understanding of the definition of biological monitoring, when it is used, and the elements of a biological monitoring program.

Assigned Reading:
Read the first five chapters of Biological Monitoring: A Practical Field Manual, pages 1-12.

Module #1 Test Questions

1. What is biological monitoring?
   a) the measurement of biological agents such as mold.
   b) the measurement of compounds in body fluids of the human body that are indicative of exposure to chemicals.
   c) the measurement of affected components of body fluids of the human body that are indicative of adverse health effect.
   d) both b and c.

2. Before development of a biological monitoring program, what is the first thing that should be done?
   a) determine the cost involved.
   b) define the role of biological monitoring in the overall health and safety program.
   c) collect specimens
   d) determine top management’s position.

3. What are three substances for which biological monitoring is required by federal OSHA in the United States?
   a) lead, mercury, and arsenic
   b) benzene, lead, and cadmium
   c) cadmium, lead, and toluene
   d) lead, benzene, and arsenic

4. What are some reasons that management may wish to limit the role of biological monitoring to a certain set of circumstances?
a) to ensure ethical issues are addressed  
b) to limit legal liabilities  
c) to use resources wisely  
d) all of the above

5. What is (are) a reason(s) to consult the union at an early point in the planning of a biological monitoring program?  
a) to keep the union happy  
b) to get information on the what sampling method to use  
c) for quality control information.  
d) to enlist adequate worker confidentiality protections and get worker support.

6. Biological monitoring is considered part of a…  
a) drug testing program  
b) respirator program  
c) industrial hygiene program  
d) medical monitoring program

7. Why is it important that hygienists have access to exposure monitoring results, including biological monitoring data?  
a) so that they can be communicated to personnel who are not monitored (with appropriate confidentiality)  
b) so that hygienists can define appropriate exposure controls  
c) so that the company medical doctor can view them  
d) both a and b

8. What are some situations in which air monitoring is inadequate to assess worker exposure?  
a) when the chemical agent is known to pass through the skin or is ingested  
b) when the chemical agent possesses a long biological half-life  
c) both a and b  
d) when no personal protective equipment is used and the chemical agent is adsorbed mainly through inhalation exposure.

9. Biological monitoring is justified when:  
a) no personal protective equipment is used  
b) the substance is adsorbed through inhalation exposure  
c) air monitoring results are not elevated and workers symptoms of overexposure are evident  
d) air monitoring results are not hazardous and there are no symptoms of overexposure.

10. Why should biological monitoring programs and results be treated with more care than other air monitoring programs?  
a) there is more paperwork involved  
b) results can be related to air exposures and the ventilation system  
c) results are less meaningful to worker health and procedures are less invasive
d) results are more meaningful to worker health and the procedures are more invasive

11. What are some reasons to be more cautious about biological monitoring programs and results than air monitoring programs and results?
   a) biological monitoring results can be more variable, are more personal, and sampling and analytical procedures are more complicated
   b) biological monitoring results are always precise
   c) biological samples are stored at -70°C and can be easily spilled
   d) biological monitoring programs often require notification of results to participants

12. What are the industrial hygienist’s duties in a biological monitoring program?
   a) to primarily interpret the results of the medical tests
   b) to adjust the gas chromatograph when analyzing blood samples
   c) to provide legal guidance to the team
   d) to define the objectives and sampling strategy and to recommend control and prevention measures.

13. What are some disciplines that should be involved in the program development of a biological monitoring program?
   a) industrial hygienist, high management advisor, chemist, and secretary
   b) industrial hygienist, accountant, and occupational physician
   c) industrial hygienist, botanist, podiatrist, chemist, and toxicologists
   d) industrial hygienist, analytical chemist, and occupational physician

14. Before sampling is conducted what should be evaluated to determine if biological monitoring is scientifically justified?
   a) exposure conditions are appropriate for the biological monitoring index
   b) the adequacy of the current exposure assessments
   c) the efficacy of the current personal protective equipment
   d) all of the above

15. What is a good reason to carry out a request for biological monitoring from a union or worker group?
   a) to reinforce the existing exposure assessment
   b) to be responsive to union requests
   c) the results are easier to acquire than air monitoring
   d) both a and c

16. For determining a sampling strategy, what is an example of a group of workers whose exposure monitoring results may be highly variable?
   a) welders who work only on stainless steel
   b) maintenance workers who have different job tasks
   c) workers performing the same function on an assembly line
   d) office workers
17. Identify which item is not needed to understand the exposure scenario and plan the biological monitoring program?
   a) each employees’ height and weight
   b) information on other exposure compounds, if relevant
   c) PPE use and efficacy
   d) number of workers and length of work shift

18. What information is not included in the ACGIH BEI documentation?
   a) a review of the adsorption and toxicokinetics
   b) a description of appropriate respirator to use
   c) information on compounds that can confound results
   d) justification, parameters or application, and analytical methods

19. Which is not a crucial question to determine if biological monitoring is necessary after all relevant information is gathered?
   a) Is the index appropriate for the exposure scenario?
   b) Are the sample collection and analytical method feasible and cost effective?
   c) Can potential confounding exposures or medical conditions or treatments be controlled or determined?
   d) How many workers are potentially exposed to this substance?

20. Which is not an element in a written biological monitoring program?
   a) process summary
   b) collection schedule
   c) QC
   d) blood samples

21. In the United States, is worker participation in a biological monitoring program voluntary?
   a) not usually
   b) yes, unless the employer requires participation as a condition of employment
   c) yes
   d) no, it is always mandatory

22. Which work group will require sampling over the longest period?
   a) the work group with the most shifts
   b) the largest workgroup
   c) the group with the largest exposure variability
   d) the group with the smallest exposure variability

23. When is the risk of contamination of an index compound reduced?
   a) when sampling for lead or cadmium
   b) when the marker is a metabolite
   c) when storing at -70°C
   d) when shipping on dry ice
24. What is not a likely question on a questionnaire for participants in a biological monitoring program?
   a) What tasks did you perform today?
   b) Did you wear earplugs today?
   c) What PPE was worn when you performed each task?
   d) Can you make any observations about your exposures today?

25. Creatinine corrections are used for which sampling media?
   a) blood
   b) saliva
   c) breath
   d) urine
Module #1 Test - Answers.

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