Registration form

WATER TREATMENT PRIMER 3 $100.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL $50.00

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You will have 90 days from this date in order to complete this course

List number of hours worked on assignment must match State Requirement. _____

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Please circle/check which certification you are applying the course CEU's.
Water Treatment ___ Water Distribution ___ Other _____

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AFFIDAVIT OF EXAM COMPLETION
I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

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WT Primer 3 Answer Key

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Please circle, underline, bold or X only one correct answer

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Please e-mail or fax this survey along with your final exam

WATER TREATMENT PRIMER 3 CEU TRAINING COURSE

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WT Primer 3 CEU Training Course Assignment

You will have 90 days from the start of this assignment to have successfully completed and submit this assignment back to TLC.

If you need course assistance, please call us at (928) 468-0665. You can find online assistance for this course on the in the Search function on Adobe Acrobat PDF to help find the answers. There are no intentional trick questions.

Water Disinfection

1. In the event of a significant intrusion of pathogens resulting, for example, from a broken water main, the level of the average "chlorine residual" will be insufficient to disinfect contaminated water. In such cases, it is the monitoring of the sudden drop in the _____ that provides the critical indication to water system operators that there is a source of contamination in the system.

A. Elemental chlorine
B. Disinfection
C. Chlorine residual
D. Chlorine disinfectant(s) (s) means plural or singular usage
E. Chlorine-based process
F. None of the above

The Benefits of Chlorine
Potent Germicide

2. _____ can reduce the level of many disease-causing microorganisms in drinking water to almost immeasurable levels.

A. Elemental chlorine
B. Disinfection methods
C. Chlorine residual
D. Chlorine disinfectant(s) (s) means plural or singular usage
E. Chlorine-based process
F. None of the above

3. Chlorine is added to drinking water to destroy pathogenic (disease-causing) organisms. It can be applied in several forms: elemental chlorine (chlorine gas), sodium hypochlorite solution (bleach) and _____.

A. Disinfection agents
B. Chlorine disinfectants
C. Chlorine-based process
D. Numerous alternative disinfection
E. Dry calcium hypochlorite
F. None of the above

4. One pound of _____ provides approximately as much free available chlorine as one gallon of sodium hypochlorite (12.5% solution) or approximately 1.5 pounds of calcium hypochlorite (65% strength).

A. Elemental chlorine
B. Disinfection
C. Chlorine residual
D. Chlorine disinfectant(s) (s) means plural or singular usage
E. Chlorine-based process
F. None of the above

5. While _____can effectively disinfect drinking water, each has distinct advantages and limitations for particular applications.

A. Any of these forms of chlorine
B. Chlorine disinfectants
C. Chlorine-based process
D. Numerous alternative disinfection methods
E. Dry calcium hypochlorite
F. None of the above

6. Almost all water systems that disinfect their water use some type of chlorine-based process, either alone or_____.

A. Disinfection
B. Chlorine disinfectants
C. Chlorine-based process
D. Numerous alternative disinfection methods
E. In combination with other disinfectants
F. None of the above

Taste and Odor Control

7. _____ reduce many disagreeable tastes and odors. Chlorine oxidizes many naturally occurring substances such as foul-smelling algae secretions, sulfides and odors from decaying vegetation.

A. Elemental chlorine
B. Disinfection methods
C. Chlorine residual
D. Chlorine disinfectant(s) (s) means plural or singular usage
E. Chlorine-based process
F. None of the above

Biological Growth Control

8. _____ eliminate slime bacteria, molds and algae that commonly grow in water supply reservoirs, on the walls of water mains and in storage tanks.

A. Disinfection
B. Chlorine disinfectants
C. Chlorine-based process
D. Numerous alternative disinfection methods
E. Dry calcium hypochlorite
F. None of the above

Chemical Control

9. Chlorine disinfectants destroy hydrogen sulfide (which has a rotten egg odor) and remove ammonia and other nitrogenous compounds that have unpleasant tastes and hinder _____. They also help to remove iron and manganese from raw water.

A. Elemental chlorine
B. Disinfection
C. Chlorine residual
D. Chlorine disinfectant(s) (s) means plural or singular usage
E. Chlorine-based process
F. None of the above

Understanding Disinfection

Water Disinfection

10. _____is usually the final stage in the water treatment process in order to limit the effects of organic material, suspended solids and other contaminants.

A. Disinfection
B. Chlorine disinfectant
C. Chlorine-based process
D. Numerous alternative disinfection methods
E. Dry calcium hypochlorite
F. None of the above

11. Like the disinfection of wastewater, the primary methods used for the disinfection of water in very small (25-500 people) and small (501-3,300 people) treatment systems are ozone, ultraviolet irradiation (UV) and _____.

A. Elemental chlorine
B. Disinfection
C. Chlorine residual
D. Chlorine disinfectant(s) (s) means plural or singular usage
E. Chlorine
F. None of the above

12. There are numerous alternative disinfection processes that have been less widely used in small and very small water treatment systems, including_____, potassium permanganate, chloramines and peroxone (ozone/hydrogen peroxide).

A. Disinfection
B. Chlorine disinfectants
C. Chlorine-based process
D. Chlorine dioxide
E. Dry calcium hypochlorite
F. None of the above

13. Surface waters have been the focal point of _____ since their inception, as groundwaters (like wells) have been historically considered to be free of microbiological contamination. Current data indicates this to not be true.

A. Elemental chlorine
B. Disinfection
C. Chlorine residual
D. Chlorine disinfectant(s) (s) means plural or singular usage
E. Chlorine-based process
F. None of the above

Chlorine Dioxide

14. Chlorine dioxide is a chemical compound with_____. This yellowish-green gas crystallizes as bright orange crystals at -59 °C. As one of several oxides of chlorine, it is a potent and useful oxidizing agent used in water treatment and in bleaching.

A. The formula ClO_2
B. Hypochlorite(s)
C. Available chlorine
D. One of several oxides of chlorine
E. A monohaloacetic acid
F. None of the above

15. The molecule ClO2 has an odd number of valence electrons and it is therefore a paramagnetic radical. Its electronic structure has long baffled chemists because_____.

A. The same residuals
B. A hydrogen atom
C. The molecule ClO2
D. None of the possible Lewis structures are very satisfactory
E. The only liquid hypochlorite disinfectant
F. None of the above

16. _____ is a highly endothermic compound that can decompose extremely violently when separated from diluting substances. As a result, preparation methods that involve producing solutions of it without going through a gas phase stage are often preferred. Arranging handling in a safe manner is essential.

A. Chlorine dioxide
B. Hypochlorite(s)
C. Available chlorine
D. The oxide of chlorine
E. A monohaloacetic acid
F. None of the above

Haloacetic Acids

17. Haloacetic acids are _____in which a halogen atom takes the place of a hydrogen atom in acetic acid.

A. The same residuals
B. Carboxylic acids
C. The molecule ClO2
D. The electronegative halogens
E. The only liquid hypochlorite disinfectant
F. None of the above

18. Thus, in a monohaloacetic acid, a single halogen would replace_____. For example, chloroacetic acid would have the structural formula CH_2ClCO_2H. In the same manner, in dichloroacetic acid two chlorine atoms would take the place of two hydrogen atoms ($CHCl_2CO_2H$).

A. Chlorine dioxide
B. Hypochlorite(s)
C. Available chlorine
D. A hydrogen atom
E. A monohaloacetic acid
F. None of the above

19. The inductive effect caused by the electronegative halogens often result in the higher acidity of these compounds by stabilizing_____.

A. The same residuals
B. A hydrogen atom
C. The molecule ClO2
D. The electronegative halogens
E. The negative charge of the conjugate base
F. None of the above

Contaminants in Drinking Water

20. Haloacetic acids (HAAs) are a common undesirable by-product of drinking water chlorination. Exposure to such _____ in drinking water has been associated with a number of health outcomes by epidemiological studies, although the putative agent in such studies has not been identified.

A. Chlorine dioxide
B. Hypochlorite(s)
C. Available chlorine
D. Disinfection by-products
E. A monohaloacetic acid
F. None of the above

Hypochlorites

21. Hypochlorites are calcium or sodium salts of hypochlorous acid and are supplied either dry or in liquid form (as, for instance, in commercial bleach). The same residuals are obtained as with_____ , but the effect on the pH of the treated water is different.

A. The same residuals
B. A hydrogen atom
C. The molecule ClO2
D. Gas chlorine
E. The only liquid hypochlorite disinfectant
F. None of the above

22. _____contain an excess of alkali and tend to raise the pH of the water. Calcium hypochlorite tablets are the predominant form in use in the United States for swimming pools.

A. Chlorine dioxide
B. Hypochlorite(s)
C. Hypochlorite compounds
D. As one of several oxides of chlorine
E. A monohaloacetic acid
F. None of the above

23. _____is the only liquid hypochlorite disinfectant in current use. There are several grades and proprietary forms available.

A. The same residuals
B. A hydrogen atom
C. The molecule ClO2
D. Sodium hypochlorite
E. The only liquid hypochlorite disinfectant
F. None of the above

24. _____, hypochlorite compounds have oxidizing powers equal to gas chlorine and can be employed for the same purposes in water treatment.

A. All sodium-hypochlorite solutions
B. Hypochlorite(s)
C. Available chlorine
D. Sodium hypochlorite
E. Pound-for-pound of available chlorine
F. None of the above

25. _____requires a larger initial investment for feed equipment than what is needed for hypochlorite compounds.

A. Bromate
B. Trihalomethanes or (THM)
C. Chlorite
D. Gas chlorination
E. Chlorine and other chemical disinfectants
F. None of the above

26. Calcium hypochlorite materials used in the water industry are chemically different from those materials variously marketed for many years as bleaching powder, chloride of lime, or chlorinated lime. Materials now in common use are _____ containing about 70 percent available chlorine and marketed under several trade names.

A. All sodium-hypochlorite solution(s)
B. Hypochlorite(s)
C. Available chlorine
D. Sodium hypochlorite
E. High-test calcium hypochlorites
F. None of the above

27. High-test calcium hypochlorites are _____that give off a strong chlorine odor. Granular powdered or tablet forms are commercially available and all are readily soluble in water.

A. The same residuals
B. White corrosive solids
C. The molecule ClO2
D. The electronegative halogens
E. The only liquid hypochlorite disinfectant
F. None of the above

28. Sodium hypochlorite is sold only as a liquid and is normally referred to as_____. It is generally available in concentrations of 5 to 15 percent available chlorine. These solutions are clear, light yellow, strongly alkaline, and corrosive in addition to having a strong chlorine smell.

A. Liquid bleach
B. Hypochlorite(s)
C. Available chlorine
D. Sodium hypochlorite
E. A monohaloacetic acid
F. None of the above

29. _____, though highly active, are relatively stable throughout production, packaging, distribution, and storage.

A. The same residuals
B. A hydrogen atom
C. High-test hypochlorites
D. The electronegative halogens
E. The only liquid hypochlorite disinfectant
F. None of the above

30. Storage at 86° F. for a year may reduce the _____ by about 10 percent. Storing at lower temperatures reduces the loss.

A. All sodium-hypochlorite solutions
B. Hypochlorite(s)
C. Available chlorine
D. Sodium hypochlorite
E. A monohaloacetic acid
F. None of the above

31. _____ are unstable to some degree and deteriorate more rapidly than the dry compounds.

A. The same residuals
B. A hydrogen atom
C. Different disinfectants
D. All sodium-hypochlorite solutions
E. The liquid hypochlorite disinfectants
F. None of the above

Disinfection Byproducts

32. _____ are formed when disinfectants used in water treatment plants react with bromide and/or natural organic matter (i.e., decaying vegetation) present in the source water.

A. Bromate
B. Trihalomethanes or (THM)
C. Chlorite
D. Disinfection byproducts
E. Chlorine and other chemical disinfectants
F. None of the above

33. _____ produce different types or amounts of disinfection byproducts.

A. Bromate
B. Trihalomethanes or (THM)
C. Different disinfectants
D. Disinfection byproducts
E. Chlorine and other chemical disinfectants
F. None of the above

34. Disinfection byproducts for which regulations have been established have been identified in drinking water, including_____.

A. Bromate
B. Trihalomethanes or (THM)
C. Chlorite
D. Trihalomethanes, haloacetic acids, bromate, and chlorite
E. Chlorine and other chemical disinfectants
F. None of the above

Trihalomethanes (THM)

35. Trihalomethanes (THM) are a group of four chemicals that are formed along with other disinfection byproducts when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. The trihalomethanes are_____, bromodichloromethane, dibromochloromethane, and bromoform.

A. Bromate
B. Chloroform
C. Chlorite
D. Disinfection byproducts
E. Chlorine and other chemical disinfectants
F. None of the above

36. Bromate is a chemical that is formed when _____used to disinfect drinking water reacts with naturally occurring bromide found in source water. EPA has established the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate bromate at annual average of 10 parts per billion in drinking water.

A. Bromate
B. Trihalomethanes or (THM)
C. Chlorite
D. Ozone
E. Chlorine and other chemical disinfectants
F. None of the above

Chlorite

37. Chlorite is a byproduct formed when chlorine dioxide is used to disinfect water. EPA has published the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate _____ at a monthly average level of 1 part per million in drinking water.

A. Bromate
B. Trihalomethanes or (THM)
C. Chlorite
D. Disinfection byproducts
E. Chlorine and other chemical disinfectants
F. None of the above

Chloroform

38. Chloroform, typically the most prevalent _____measured in chlorinated water, is probably the most thoroughly studied disinfection byproduct. Toxicological studies have shown that high levels of chloroform can cause cancer in laboratory animals.

A. Bromate
B. Trihalomethanes or (THM)
C. Chlorite THM
D. Disinfection byproducts
E. Chlorine and other chemical disinfectants
F. None of the above

Understanding Disinfection Byproducts (DBPS)

39. Chlorine and other _____ have been widely used by public water systems (along with filtration) to protect the public from microbial pathogens in drinking water.

A. Bromate
B. Trihalomethanes or (THM)
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chemical disinfectants
F. None of the above

40. DBPs are formed when certain disinfectants react with _____(organic and inorganic materials) in source waters. In most cases, natural organic matter (NOM) is an important factor that affects the levels of DBPs that form (NOM is usually measured as TOC).

A. DBP precursors
B. Trihalomethanes or (THM)
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

41. _____ in drinking water can vary significantly from one point in a distribution system to another, as many continue to form in the distribution system. DBP levels are generally higher in surface water systems because surface water usually contains higher DBP precursor levels and requires stronger disinfection.

A. The levels of DBPs
B. Trihalomethanes or (THM)
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

Total Trihalomethanes

42. _____ are chemical compounds in which three of the four hydrogen atoms of methane (CH4) are replaced by halogen atoms.

A. The levels of DBPs
B. Trihalomethanes or (THM)
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

43. Many trihalomethanes find uses in industry as solvents or refrigerants. _____ are also environmental pollutants, and many are considered carcinogenic.

A. Bromate
B. Trihalomethanes or (THM)
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

44. Trihalomethanes with all the same halogen atoms are called_____ .

A. Bromate
B. Haloforms
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

45. Trihalomethanes are formed as a by-product predominantly when chlorine is used to disinfect water for drinking. They represent one group of chemicals generally referred to as disinfection by-products. They result from the reaction of chlorine and/or _____with organic matter present in the water being treated.

A. Bromate
B. Bromine
C. Bromoform
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

46. The _____produced have been associated through epidemiological studies with some adverse health effects. Many governments set limits on the amount permissible in drinking water.

A. Bromate
B. Trihalomethanes or (THMs)
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

47. However, trihalomethanes are _____—the vast majority of which are not monitored—and it has not yet been clearly demonstrated which of these are the most plausible candidate for causation of these health effects.

A. Bromate
B. Trihalomethanes or (THM)
C. Organic matter present
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

48. In the United States, the EPA limits the total concentration of the four chief constituents (chloroform, _____, bromodichloromethane, and dibromochloromethane), referred to as total trihalomethanes (TTHM), to 80 parts per billion in treated water.

A. Bromate
B. Bromine
C. Bromoform
D. Disinfection byproducts or DBPs
E. Chlorine and other chemical disinfectants
F. None of the above

THM Treatment

49. THM levels tend to increase with pH, temperature, time, and the level of "precursors" present. Precursors are _____which reacts with chlorine to form THM's.

A. Organic material
B. Trihalomethanes or (THM)
C. Bromoform
D. Disinfection byproducts or DBPs
E. Precursors
F. None of the above

50. One way to decrease _____is to eliminate or reduce chlorination before the filters and to reduce precursors.

A. Organic material
B. Trihalomethanes or (THM'S)
C. Bromoform
D. Disinfection byproducts or DBPs
E. Precursors
F. None of the above

51. _____ present before filtration, so we want to reduce or eliminate the time chlorine is in contact with this water.

A. Organic material
B. Trihalomethanes or (THM)
C. Bromoform
D. Disinfection byproducts or DBPs
E. There are more precursors
F. None of the above

52. If some oxidation before _____ is required, an alternative disinfectant like potassium permanganate or peroxide could be considered. Note that this may not be an option if prechlorination is necessary to achieve required CT values.

A. Reducing CT values
B. Trihalomethanes or (THM) removal
C. Enhanced coagulation
D. Disinfection byproducts or DBPs reduction
E. Filtration
F. None of the above

53. The EPA has indicated that the best available technology for THM control at treatment plants is removal of precursors through "_____".

A. Reducing CT values
B. Trihalomethanes or (THM) removal
C. Enhanced coagulation
D. Disinfection byproducts or DBPs reduction
E. Filtration
F. None of the above

54. _____refers to the process of optimizing the filtration process to maximize removal of precursors. Removal is improved by decreasing pH (to levels as low as 4 or 5), increasing the feed rate of coagulants, and possibly using ferric coagulants instead of alum.

A. Reducing CT values
B. Trihalomethanes or (THM) removal
C. Enhanced coagulation
D. Disinfection byproducts or DBPs reduction
E. Filtration
F. None of the above

Chlorine Section
Chlorine (DDBP)

55. Most of our drinking water supplies are free of the micro-organisms — viruses, bacteria, and protozoa — that cause serious and life-threatening diseases, such as cholera and typhoid fever. This is largely due to the introduction of water treatment, particularly_____, at the turn of the century.

A. Disinfection methods
B. Chlorine disinfectant(s)
C. Chlorination
D. Numerous alternative disinfection methods
E. Dry calcium hypochlorite
F. None of the above

56. Living cells react with _____and reduce its concentration while they die. Their organic matter and other substances that are present convert to chlorinated derivatives, some of which are effective killing agents.

A. All sodium-hypochlorite solution(s)
B. Hypochlorite(s)
C. Available chlorine
D. Sodium hypochlorite
E. Chlorine
F. None of the above

57. Chlorine present as Cl, HOCl, and OCl^- is called free available chlorine and that which is bound but still effective is combined chlorine. A particularly important group of compounds with _____.

A. Disinfection methods
B. Chlorine disinfectant(s)
C. Chlorination
D. Numerous alternative disinfection methods
E. Dry calcium hypochlorite
F. None of the above

58. One especially important feature of _____is the ease of overdosing to create a residual concentration. There is a constant danger that safe water leaving the treatment plant may become contaminated later.

A. All sodium-hypochlorite solution(s)
B. Hypochlorite(s)
C. Available chlorine
D. Sodium hypochlorite
E. Disinfection using chlorine
F. None of the above

59. There may be breaks in water mains, loss of pressure that permits an inward leak, or plumbing errors. _____ provides some degree of protection right to the water faucet.

A. With free available chlorine
B. Free available chlorine
C. Available chlorine
D. This residual concentration of chlorine
E. No chlorine residual
F. None of the above

60. _____, a typical residual is from 0.1 to 0.5 ppm. Because chlorinated organic compounds are less effective, a typical residual is 2 ppm for combined chlorine.

A. With free available chlorine
B. Free available chlorine
C. Available chlorine
D. This residual concentration of chlorine
E. No chlorine residual
F. None of the above

61. _____over the amount that reacts with the organic matter present. However, reaction kinetics complicates interpretation of chlorination data. The correct excess is obtained in a method called Break Point Chlorination.

A. Residual chlorine
B. Free available chlorine
C. Available chlorine
D. Sodium hypochlorite
E. There will be no chlorine residual unless there is an excess
F. None of the above

Chlorine by-products

62. Chlorination by-products are the chemicals formed when _____used to kill disease-causing micro-organisms reacts with naturally occurring organic matter (i.e., decay products of vegetation) in the water. The most common chlorination by-products found in U.S. drinking water supplies are the trihalomethanes (THMs).

A. All sodium-hypochlorite solution(s)
B. Hypochlorite(s)
C. Available chlorine
D. Sodium hypochlorite
E. The chlorine
F. None of the above

The principal trihalomethanes are:

63. The amount of THMs formed in drinking water can be influenced by a number of factors, including the season and the source of the water. For example, _____are generally lower in winter than in summer, because concentrations of natural organic matter are lower and less chlorine is required to disinfect at colder temperatures.

A. Organic material
B. THM concentrations
C. Bromoform
D. Disinfection byproducts or DBPs
E. Precursors
F. None of the above

64. THM levels are also low when wells or large lakes are used as the drinking water source, because organic matter concentrations are generally low in these sources. The opposite — high organic matter concentrations and_____— is true when rivers or other surface waters are used as the source of the drinking water.

A. Organic material
B. High THM levels
C. Bromoform
D. Disinfection byproducts or DBPs
E. Precursors
F. None of the above

Health Effects

65. Laboratory animals exposed to _____have shown increased incidences of cancer. Also, several studies of cancer incidence in human populations have reported associations between long-term exposure to high levels of chlorination by-products and an increased risk of certain types of cancer.

A. Organic material
B. Trihalomethanes or (THM)
C. Bromoform
D. Disinfection byproducts or DBPs
E. Very high levels of THMs
F. None of the above

Bacteria Section
Shigella dysenteriae

66. Shigella dysenteriae is a species of the rod-shaped bacterial genus Shigella. _____ can cause shigellosis (bacillary dysentery).

A. Shigella
B. Salmonella
C. Fecal coliform bacteria
D. Shigella dysenteriae
E. Disease-carrying organisms
F. None of the above

67. _____are Gram-negative, non-spore-forming, facultatively anaerobic, non-motile bacteria.

A. Shigellae
B. Salmonella
C. Fecal coliform bacteria
D. Shigella dysenteriae
E. Disease-carrying organisms
F. None of the above

68. S. dysenteriae, spread by contaminated water and food, causes the most severe dysentery because of its potent and deadly Shiga toxin, but other species may also be_____.

A. Shigellae
B. Salmonella
C. Fecal coliform bacteria
D. Dysentery agents
E. Disease-carrying organisms
F. None of the above

69. _____is typically via ingestion (fecal–oral contamination); depending on age and condition of the host as few as ten bacterial cells can be enough to cause an infection.

A. Shigellae
B. Shigella infection
C. Fecal coliform bacteria
D. Shigella dysenteriae
E. Disease-carrying organisms
F. None of the above

70. _____ causes dysentery that result in the destruction of the epithelial cells of the intestinal mucosa in the cecum and rectum.

A. Shigella
B. Salmonella
C. Fecal coliform bacteria
D. Shigella dysenteriae
E. Disease-carrying organisms
F. None of the above

71. Some strains produce enterotoxin and_____, similar to the verotoxin of E. coli O157:H7. Both Shiga toxin and verotoxin are associated with causing hemolytic uremic syndrome.

A. Shigellae
B. Shiga toxin
C. Fecal coliform bacteria
D. Shigella dysenteriae
E. Disease-carrying organisms
F. None of the above

Salmonella

72. _____ is a Gram-negative bacterium. It is found in many turtles and other reptiles. In clinical laboratories, it is usually isolated on MacConkey agar, XLD agar, XLT agar, DCA agar, or Önöz agar.

A. Shigellae
B. Salmonella
C. Fecal coliform bacteria
D. Shigella dysenteriae
E. Disease-carrying organisms
F. None of the above

Escherichia Coli Section
Fecal Coliform Bacteria

73. _____ are microscopic organisms that live in the intestines of warm-blooded animals. They also live in the waste material, or feces, excreted from the intestinal tract.

A. New sources of bacteria
B. Indicator(s)
C. Pathogens
D. Actual pathogens
E. Fecal coliform bacteria
F. None of the above

74. When fecal coliform bacteria are present in high numbers in a water sample, it means that the water has received _____from one source or another.

A. Enterococcus bacteria
B. Fecal matter
C. Fecal coliform bacteria
D. Bacteria
E. Disease-carrying organisms
F. None of the above

75. Although not necessarily agents of disease, _____ may indicate the presence of disease-carrying organisms, which live in the same environment as the fecal coliform bacteria.

A. New sources of bacteria
B. Indicator(s)
C. Pathogens
D. Actual pathogens
E. Fecal coliform bacteria
F. None of the above

Reasons for Natural Variation

76. Unlike the other conventional water quality parameters, _____ are living organisms.

A. Enterococcus bacteria
B. Indicators
C. Fecal coliform bacteria
D. Bacteria
E. Disease-carrying organisms
F. None of the above

77. Because bacterial concentrations are dependent on specific conditions for growth, and these conditions change quickly, _____ counts are not easy to predict. For example, although winter rains may wash more fecal matter from urban areas into a stream, cool water temperatures may cause a major die-off.

A. Enterococcus bacteria
B. Indicators
C. Fecal coliform bacteria
D. Bacteria
E. Disease-carrying organisms
F. None of the above

Expected Impact of Pollution

78. The primary sources of _____ to fresh water are wastewater treatment plant discharges, failing septic systems, and animal waste.

A. Enterococcus bacteria
B. Indicators
C. Fecal coliform bacteria
D. Bacteria
E. Disease-carrying organisms
F. None of the above

79. _____do not necessarily decrease as a watershed develops from rural to urban. Instead, urbanization usually generates new sources of bacteria.

A. New sources of bacteria
B. Indicator(s)
C. Pathogens
D. Bacteria levels
E. Fecal coliform bacteria
F. None of the above

80. Farm animal manure and septic systems are replaced by domestic pets and leaking sanitary sewers. In fact, stormwater runoff in urbanized areas has been found to be_____.

A. Enterococcus bacteria
B. Indicators
C. Fecal coliform bacteria
D. Surprisingly high in fecal coliform bacteria concentrations
E. Disease-carrying organisms
F. None of the above

81. The presence of old, disintegrating storm and sanitary sewers, misplaced sewer pipes, and good breeding conditions are common explanations for_____.

A. New sources of bacteria
B. Indicator(s)
C. The high levels measured
D. Actual pathogens
E. Fecal coliform bacteria
F. None of the above

Indicator Connection Varies

82. _____are the "indicator" organisms generally measured to assess microbiological quality of water. However, these aren't generally what get people sick. Other bacteria, viruses, and parasites are what we are actually worried about.

A. Enterococcus bacteria
B. Bacteria
C. Fecal coliform bacteria
D. General coliforms, E. Coli, and Enterococcus bacteria
E. Disease-carrying organisms
F. None of the above

83. Because it is so much more expensive and tedious to do so, actual pathogens are virtually never tested for. Over the course of a professional lifetime pouring over indicator tests, in a context where all standards are based on _____, water workers tend to forget that the indicators are not the things we actually care about.

A. New sources of bacteria
B. Indicator(s)
C. Pathogens
D. Actual pathogens
E. Fecal coliform bacteria
F. None of the above

What are these indicators?

84. _____indicate that the water has come in contact with plant or animal life. General coliforms are universally present, including in pristine spring water. They are of little concern at low levels, except to indicate the effectiveness of disinfection.

A. Enterococcus bacteria
B. Indicators
C. Fecal coliform bacteria
D. Bacteria
E. General coliforms
F. None of the above

85. At very high levels they indicate there is what amounts to a lot of compost in the water, which could easily include _____ (Ten thousand general coliform bacteria will get you a beach closure, compared to two or four hundred fecal coliforms, or fifty enterococcus).

A. New sources of bacteria
B. Indicator(s)
C. Pathogens
D. Actual pathogens
E. Fecal coliform bacteria
F. None of the above

86. Fecal coliforms, particularly _____, indicate that there are mammal or bird feces in the water.

A. Pathogen(s)
B. E. coli
C. E. coli O157:H7
D. Fecal contamination of water
E. Organism
F. None of the above

87. Enterococcus bacteria also indicate that there are feces from warm blooded animals in the water. Enterococcus are a type of_____.

A. Feces
B. Actual pathogens
C. Escherichia coli
D. Escherichia coli O157:H7
E. Fecal streptococci
F. None of the above

88. They are another valuable indicator for determining the amount of _____. According to studies conducted by the EPA, enterococci have a greater correlation with swimming-associated gastrointestinal illness in both marine and fresh waters than other bacterial indicator organisms, and are less likely to "die off" in saltwater.

A. Fecal streptococci
B. E. coli
C. E. coli O157:H7
D. Fecal contamination of water
E. Organism
F. None of the above

89. The more closely related the animal, the more likely pathogens excreted with their feces can infect us. _____are the biggest concern, because anything which infects one human could infect another. There isn't currently a quantitative method for measuring specifically human fecal bacteria (expensive genetic studies can give a presence/absence result).

A. Human feces
B. Actual pathogens
C. Escherichia coli
D. Escherichia coli O157:H7
E. Fecal streptococci
F. None of the above

90. Ingesting _____via contaminated water supply is a classic means for infections to spread rapidly. The more pathogens an individual carries, the more hazardous their feces.

A. Pathogen(s)
B. E. coli
C. E. coli O157:H7
D. Fecal contamination of water
E. Organism
F. None of the above

91. Ingesting feces from someone who is not carrying any _____may gross you out, but it can't infect you. (You thought you had it bad at work, this person has it bad and has to like it LOL.)

A. Feces
B. Actual pathogens
C. Escherichia coli
D. Pathogens
E. Fecal streptococci
F. None of the above

92. Infection rates are around 5% in the US, and approach 100% in areas with _____and contaminated water supplies. Keep in the back of your mind that **the ratio of indicators to actual pathogens is not fixed**. It will always be different, sometimes very different.

A. Feces
B. Actual pathogens
C. Escherichia coli
D. Poor hygiene
E. Fecal streptococci
F. None of the above

93. Whenever you are trying to form a mental map of reality based on water tests, you should include in the application of your water intuition an adjustment factor for your best guess of the ratio between indicators and _____.

A. Feces
B. Actual pathogens
C. Escherichia coli
D. Escherichia coli O157:H7
E. Fecal streptococci
F. None of the above

E. coli O157:H7

94. E. coli O157:H7 (bacterium) found in _____. Symptoms vary with type caused gastroenteritis.

A. Human feces
B. Actual pathogens
C. Escherichia coli
D. Fecal contamination of water
E. Fecal streptococci
F. None of the above

95. Escherichia coli O157:H7 is an emerging cause of foodborne illness. An estimated 73,000 cases of infection and 61 deaths occur in the United States each year. Infection often leads to bloody diarrhea, and occasionally to kidney failure. Most illnesses have been associated with eating _____ . (I do not make this stuff up, LOL)

A. Human feces
B. Actual pathogens
C. Escherichia coli
D. Fecal contamination of water
E. Fecal streptococci
F. None of the above

96. Person-to-person contact in families and child care centers is also an important mode of transmission. Infection can also occur after _____and after swimming in or drinking sewage-contaminated water.

A. Drinking raw milk
B. Actual pathogens
C. Eating Escherichia coli
D. Fecal contamination of water
E. Eating fecal streptococci
F. None of the above

97. Consumers can prevent _____ infection by thoroughly cooking ground beef, avoiding unpasteurized milk, and washing hands carefully. Because the organism lives in the intestines of healthy cattle, preventive measures on cattle farms and during meat processing are being investigated.

A. Pathogen(s)
B. E. coli
C. E. coli O157:H7
D. Fecal contamination of water
E. Fecal streptococci
F. None of the above

What is Escherichia coli O157:H7?

98. E. coli O157:H7 is one of hundreds of strains of the bacterium _____. Although most strains are harmless and live in the intestines of healthy humans and animals, this strain produces a powerful toxin and can cause severe illness.

A. Feces
B. Actual pathogens
C. Escherichia coli
D. Escherichia coli 007
E. Fecal streptococci
F. None of the above

99. _____ was first recognized as a cause of illness in 1982 during an outbreak of severe bloody diarrhea; the outbreak was traced to contaminated hamburgers. Since then, most infections have come from eating undercooked ground beef.

A. Feces
B. Actual pathogens
C. Escherichia coli
D. Escherichia coli O157:H7
E. Fecal streptococci
F. None of the above

100. The combination of letters and numbers in the name of the bacterium refers to the specific markers found on its surface and distinguishes it from other types of _____

A. Pathogen(s)
B. E. coli
C. E. coli O157:H7
D. Fecal streptococci
E. Organisms
F. None of the above

101. Currently, there are four recognized classes of enterovirulent E. coli (collectively referred to as the EEC group) that cause gastroenteritis in humans. Among these is_____.

A. A sample is positive for total coliform
B. The enterohemorrhagic (EHEC) strain designated E. coli O157:H7
C. That all bacterial contamination such as E. coli. is inactivated
D. E. coli comes from human and animal wastes
E. Causing human illness by several different mechanisms
F. None of the above

102. E. coli is a normal inhabitant of the intestines of all animals, including humans. When aerobic culture methods are used, E. coli is_____.

A. That cause gastroenteritis in humans
B. The dominant species found in feces
C. That cause severe damage to the lining of the intestine
D. May end up in drinking water
E. Can be treated using chlorine, ultra-violet light, or ozone
F. None of the above

103. Normally E. coli serves a useful function in the body by suppressing the growth of harmful bacterial species and_____.
A. By synthesizing appreciable amounts of vitamins
B. Although it may be regulated by state or local authorities
C. That all bacterial contamination such as E. coli. is inactivated
D. E. coli comes from human and animal wastes
E. Causing human illness by several different mechanisms
F. None of the above

104. A minority of E. coli strains are capable of causing human illness by _____.
A. Causing gastroenteritis in humans
B. Serving a useful function in the body
C. Causing severe damage to the lining of the intestine
D. Causing human illness by several different mechanisms
E. Chlorine, ultra-violet light, or ozone
F. None of the above

105. E. coli serotype O157:H7 is a rare variety of E. coli_____, potent toxins that cause severe damage to the lining of the intestine. These toxins [verotoxin (VT), shiga-like toxin] are closely related or identical to the toxin produced by Shigella dysenteriae.
A. A sample is positive for total coliform
B. Although it may be regulated by state or local authorities
C. That all bacterial contamination such as E. coli. is inactivated
D. That produces large quantities of one or more related
E. Causing human illness by several different mechanisms
F. None of the above

How does E. coli or other fecal coliforms get in the water?
106. E. coli_____. During rainfalls, snow melts, or other types of precipitation, E. coli may be washed into creeks, rivers, streams, lakes, or groundwater.
A. Comes from human and animal wastes
B. Serves a useful function in the body
C. Causing severe damage to the lining of the intestine
D. May end up in drinking water
E. Can be treated using chlorine, ultra-violet light, or ozone
F. None of the above

107. When these waters are used as sources of drinking water and the water is not treated or inadequately treated, E. coli_____.
A. A sample is positive for total coliform
B. Serves a useful function in the body
C. Is a tasty bacterial contamination
D. Comes from human and animal wastes
E. May end up in drinking water
F. None of the above

How is water treated to protect me from E. coli?
108. The water can be treated using chlorine, ultra-violet light, or ozone, all of which act to kill or inactivate E. coli. Systems using surface water sources are required to disinfect to ensure that all bacterial contamination such as E. coli. is inactivated. Systems using ground water sources are not required to_____.
A. Disinfect, although many of them do
B. Serve disinfection
C. Provide chlorination
D. Inform the public of DBPs, although many of them do
E. None of the above

How does the U.S. Environmental Protection Agency regulate E. coli?

109. According to EPA regulations, _____, and serves 25 people or more or has 15 or more service connections, is regulated as a public water system under the Safe Drinking Water Act.
A. A sample is positive for total coliform
B. Although it may be regulated by state or local authorities
C. That all bacterial contamination such as E. coli. is inactivated
D. If you cause E. coli coming from an operator
E. If you cause a human illness by several different mechanisms, like chlorination mutation
F. None of the above

110. _____as defined by EPA regulations, it is not regulated under the Safe Drinking Water Act, although it may be regulated by state or local authorities.
A. A sample is positive for total coliform
B. If a system is not a public water system
C. That all bacterial contamination such as E. coli. is inactivated
D. If you cause E. coli coming from an operator
E. If you cause a human illness by several different mechanisms, like chlorination mutation
F. None of the above

111. Under the Safe Drinking Water Act, the EPA requires public water systems to monitor for coliform bacteria. Systems analyze first for total coliform,_____.
A. A sample is positive for total coliform
B. Although it may be regulated by state or local authorities
C. That all bacterial contamination such as E. coli. is inactivated
D. Because this test is faster to produce results
E. Causing human illness by several different mechanisms
F. None of the above

112. _____, the same sample must be analyzed for either fecal coliform or E. coli. Both are indicators of contamination with animal waste or human sewage.
A. That cause gastroenteritis in humans
B. Serves a useful function in the body
C. That cause severe damage to the lining of the intestine
D. Any time that a sample is positive for total coliform
E. If you cause a human illness by several different mechanisms, like chlorination mutation
F. None of the above

113. The largest public water systems (serving millions of people) must take at least 480 samples per month. Smaller systems must take at least five samples a month unless the state has conducted a sanitary survey – a survey in which a state inspector examines system components and ensures they will protect public health –_____.
A. A sample is positive for total coliform
B. Although it may be regulated by state or local authorities
C. That all bacterial contamination such as E. coli. is inactivated
D. At the system within the last five years
E. Preventing human illness by several different mechanisms
F. None of the above

114. Systems serving 25 to 1,000 people typically take one sample per month. Some states reduce this frequency to quarterly for ground water systems if a recent sanitary survey shows that the system is free of_____.

A. Pathogen(s) D. Fecal contamination of water
B. E. coli E. Sanitary defects
C. E. coli O157:H7 F. None of the above

115. Some types of systems can qualify for annual monitoring. Systems using surface water, rather than ground water, are required to take extra steps to protect against _____because surface water sources are more vulnerable to such contamination. At a minimum, all systems using surface waters must disinfect. Disinfection will kill E. coli O157:H7.

A. Pathogen(s) D. Fecal contamination of water
B. E. coli E. Bacterial contamination
C. E. coli O157:H7 F. None of the above

What can I do to protect myself from E. coli O157:H7 in drinking water?

116. Approximately 89 percent of Americans are receiving water from_____ .

A. Treated seawater and may cause gastroenteritis in humans
B. Although it may be regulated by state or local authorities, it is okay for non-potable use
C. Removing all bacterial contamination such as E. coli. and all bacteria is inactivated
D. The system where the operator is e.coli free, at least on paper
E. Community water systems that meet all health-based standards
F. None of the above

Positive Tests

117. If you draw water from a private well, you can contact your state health department to obtain information on how to have your well tested for_____, and E. coli contamination.

A. Pathogen(s) D. Fecal contamination of water
B. E. coli E. Total coliforms
C. E. coli O157:H7 F. None of the above

118. If your well tests positive for _____, there are several steps that you should take: (1) begin boiling all water intended for consumption, (2) disinfect the well according to procedures recommended by your local health department, and (3) monitor your water quality to make certain that the problem does not recur.

A. Pathogen(s) D. Fecal contamination of water
B. E. coli E. Total coliforms
C. E. coli O157:H7 F. None of the above

119. If _____is a recurring problem, you should investigate the feasibility of drilling a new well or install a point-of-entry disinfection unit, which can use chlorine, ultraviolet light, or ozone.

A. Pathogen(s) D. Bacteria
B. E. coli E. The contamination
C. E. coli O157:H7 F. None of the above

How is E. coli O157:H7 spread?

120. _____in diarrheal stools of infected persons can be passed from one person to another if hygiene or hand washing habits are inadequate. This is particularly likely among toddlers who are not toilet trained.

A. Pathogen(s) D. Bacteria
B. E. coli E. The contamination
C. E. coli O157:H7 F. None of the above

121. Family members and playmates of these children are at high risk of becoming infected. Young children typically shed the organism in their feces for a week or two after their illness resolves. Older children rarely carry the_____.

A. Pathogen(s)
B. E. coli
C. E. coli O157:H7
D. Bacteria
E. Organism without symptoms
F. None of the above

Legionnaires' Disease Legionella Section

122. The first discovery of bacteria from _____ came in 1976 when an outbreak of pneumonia at an American Legion convention led to 29 deaths.

A. Legionella bacteria
B. Genus Legionella
C. Organism
D. Original American Legion outbreak
E. Pneumonia, and Pontiac fever, a milder illness
F. None of the above

123. _____, what would come to be known as Legionella pneumophila, was isolated and given its own genus.

A. Legionella bacteria
B. Genus Legionella
C. Bacteria
D. Original American Legion outbreak
E. The causative agent
F. None of the above

124. The organisms classified in this genus are _____that are considered intracellular parasites. The disease has two distinct forms: Legionnaires' disease, the more severe form of infection which includes pneumonia, and Pontiac fever, a milder illness.

A. Legionella bacteria
B. Genus Legionella
C. Bacteria
D. Original American Legion outbreak
E. Gram-negative bacteria
F. None of the above

What have been the water sources for Legionnaires' disease?

125. The major source is water distribution systems of large buildings, including hotels and hospitals. Cooling towers have long been thought to be a major source for _____, but new data suggest that this is an overemphasized mode of transmission. Other sources include mist machines, humidifiers, whirlpool spas, and hot springs.

A. Legionella
B. Genus Legionella
C. Bacteria
D. Original American Legion outbreak
E. Pneumonia, and Pontiac fever, a milder illness
F. None of the above

126. Air conditioners are not a source for_____. They were suspected to be the source in the original American Legion outbreak in a Philadelphia hotel, but new data now suggests that the water in the hotel was the actual culprit.

A. Legionella bacteria
B. Genus Legionella
C. Legionnaires' disease
D. Original American Legion outbreak
E. Pneumonia, and Pontiac fever, a milder illness
F. None of the above

127. _____is caused most commonly by the inhalation of small droplets of water or fine aerosol containing Legionella bacteria.

A. Legionella bacteria
B. Legionnaire’s disease
C. Bacteria
D. Original American Legion outbreak
E. Pneumonia, and Pontiac fever, a milder illness
F. None of the above

128. _____ are naturally found in environmental water sources such as rivers, lakes and ponds and may colonize man-made water systems that include air conditioning systems, humidifiers, cooling tower waters, hot water systems, spas and pools.

A. Legionella bacteria
B. Legionnaire's disease
C. Bacteria
D. Original American Legion outbreak
E. Pneumonia, and Pontiac fever, a milder illness
F. None of the above

How do people contract Legionella?

129. The most popular theory is that the organism is aerosolized in water and people inhale the droplets containing _____.

A. Legionella bacteria
B. Legionella
C. Bacteria
D. Original American Legion outbreak
E. Pneumonia, and Pontiac fever, a milder illness
F. None of the above

130. However, new evidence suggests that another way of contracting Legionella is more common. "Aspiration" is the most common way that bacteria enter into the lungs to cause _____.

A. Legionella bacteria
B. Genus Legionella
C. Legionnaire's disease
D. Original American Legion outbreak
E. Pneumonia
F. None of the above

131. _____means choking such that secretions in the mouth get past the choking reflexes and instead of going into the esophagus and stomach, mistakenly, enter the lung.

A. Aspiration
B. Common mode of transmission
C. Resulting in expensive settlements
D. Legionella testing of environmental samples
E. Not part of a routine maintenance program
F. None of the above

132. _____to prevent aspiration is defective in patients who smoke or have lung disease. Aspiration now appears to be the most common mode of transmission.

A. Aspiration
B. Common mode of transmission
C. Resulting in expensive settlements
D. The protective mechanisms
E. Not part of a routine maintenance program
F. None of the above

133. _____ may multiply to high numbers in cooling towers, evaporative condensers, air washers, humidifiers, hot water heaters, spas, fountains, and plumbing fixtures. Within one month, Legionella can multiply, in warm water-containing systems, from less than 10 per milliliter to over 1,000 per milliliter of water.

A. Legionella bacteria
B. Legionella
C. Bacteria
D. Original American Legion outbreak
E. Pneumonia, and Pontiac fever, a milder illness
F. None of the above

134. Once high numbers of Legionella have been found, _____for disinfecting water systems with chlorine and detergent is available. This procedure is not part of a routine maintenance program because equipment may become corroded.

A. A relatively simple procedure
B. Exercising 'reasonable care'
C. Resulting in expensive settlements
D. Legionella testing of environmental samples
E. Not part of a routine maintenance program
F. None of the above

135. Property owners have been sued for the spread of Legionella, resulting in expensive settlements. _____with a battery of DFA monoclonal antibodies for several serogroups and species of Legionella morphologically intact bacteria provides a means for exercising 'reasonable care' to deter potential litigation.

A. Regular monitoring
B. Exercising 'reasonable care'
C. Resulting in expensive settlements
D. Legionella testing of environmental samples
E. Not part of a routine maintenance program
F. None of the above

136. Currently, there are no United States government regulations concerning permissible numbers of legionella in water systems and there are no federal or state certification programs for laboratories that perform _____.

A. Aspiration
B. Exercising 'reasonable care'
C. Resulting in expensive settlements
D. Legionella testing of environmental samples
E. Not part of a routine maintenance program
F. None of the above

Viruses

137. Viruses are acellular microorganisms. They are made up of only genetic material and a protein coat. Viruses depend on the energy and metabolic machinery of_____.

A. The host cell to reproduce
B. Bacteria
C. Fecal coliforms
D. Organism
E. Infectious diseases
F. None of the above

138. A virus is an infectious agent found in virtually all life forms, including humans, animals, plants, fungi, and bacteria. _____ consist of genetic material—either deoxyribonucleic acid (DNA) or ribonucleic acid (RNA)—surrounded by a protective coating of protein, called a capsid, with or without an outer lipid envelope.

A. Virus(es)
B. Bacteria
C. Fecal coliforms
D. Organism
E. Cells
F. None of the above

139. _____are between 20 and 100 times smaller than bacteria and hence are too small to be seen by light microscopy.

A. Virus(es)
B. Bacteria
C. Fecal coliforms
D. Viruses are not considered free-living
E. Although many infectious diseases
F. None of the above

140. _____ are not considered free-living, since they cannot reproduce outside of a living cell; they have evolved to transmit their genetic information from one cell to another for the purpose of replication. Viruses often damage or kill the cells that they infect, causing disease in infected organisms.

A. Virus(es)
B. Bacteria
C. Fecal coliforms
D. Viruses are not considered free-living
E. Although many infectious diseases
F. None of the above

141. A few viruses stimulate cells to grow uncontrollably and produce cancers. Although many infectious diseases, such as the common cold, are caused by viruses, there are no cures for these_____.

A. Virus(es)
B. Illnesses
C. Fecal coliforms
D. Organisms
E. Infectious diseases
F. None of the above

Bacteriological Monitoring Review

142. 26 _____have been documented each year in the United States over the past 25 years (Kramer and others, 1996). The persistence of outbreaks over time indicates that more progress is needed to meet the “drinkable and swimmable” goals of Federal water-quality legislation.

A. Pathogen outbreaks
B. E. coli outbreaks
C. Fecal coliforms outbreaks
D. Waterborne-disease outbreaks
E. Total coliforms outbreaks
F. None of the above

143. Although significant improvements in drinking water and wastewater treatment have been achieved, _____ indicate that certain types and sources of waterborne pathogens (disease-causing organisms) are still a threat to human health in the United States (Craun, 1992).

A. Pathogen outbreaks
B. E. coli outbreaks
C. Fecal coliforms outbreaks
D. Waterborne-disease outbreaks
E. Total coliforms outbreaks
F. None of the above

144. In particular, waterborne disease outbreaks caused by Escherichia coli O157.:H7 were reported more frequently in 1995-96 than in previous years, and during that same period, _____ caused large outbreaks associated with recreational water quality (Levy and others, 1998).

A. Pathogen(s)
B. E. coli
C. Fecal coliforms
D. Cryptosporidium and Giardia
E. Total coliforms
F. None of the above

145. Microbiological examination of water is used to determine the sanitary quality of water and the public health risk from_____. Although microbiological monitoring of finished waters is well established, microbiological monitoring of source waters and recreational waters is considered by some to be fragmented, incomplete, or virtually nonexistent in many parts of the Nation (Rose and others, 1999).

A. Pathogen(s)
B. E. coli
C. Outbreak(s)
D. Escherichia coli O157.:H7
E. Waterborne disease
F. None of the above

146. Data to characterize the microbiological quality of source waters are usually collected for local purposes, most often to judge compliance with standards for protection of public health in swimmable or drinkable waters. For example, monitoring programs vary widely at the local level for recreational waters, and the result is the _____ across the United States (U.S. Environmental Protection Agency, 1999a).

A. Pathogen(s)
B. E. coli
C. Fecal coliforms
D. Escherichia coli O157.:H7
E. Total coliforms
F. None of the above

147. There is a need to identify human and animal factors associated with contamination of different source and recreational waters and to understand the processes that affect microbiological water quality. Concepts about the relation between the occurrence and distribution of _____and a range of environmental factors such as climate, hydrology, land use, and human and animal population densities need to be tested in areas that represent the national water-use patterns for public and domestic supply and for recreational uses.

A. Pathogen(s)
B. E. coli
C. Outbreak(s)
D. Escherichia coli O157.:H7
E. Organisms
F. None of the above

Understanding Bacteriological Monitoring
Understanding Bacteria Sampling

148. Waterborne bacterial pathogens in the United States include species in the genera Salmonella, Shigella, Vibrio, Campylobacter, Yersinia, and pathogenic strains of _____.

A. Infectious diseases
B. E. coli
C. Fecal coliforms
D. Escherichia coli O157.:H7
E. Total coliforms
F. None of the above

149. Because bacterial pathogens generally appear intermittently in low concentrations in the environment and because methods of culturing are difficult, _____are used to indicate the possible presence of pathogens.

A. Pathogen(s)
B. E. coli
C. Total Coliform
D. Fecal-indicator bacteria
E. Bac-T tests
F. None of the above

150. The most widely used bacterial indicators include total coliforms, fecal coliforms, E. coli, fecal streptococci, enterococci, and Clostridium perfringens (C. perfringens). _____should be applicable in all types of water; unable to reproduce in ambient waters; be harmless to man and other animals; lend itself to easy, quantitative testing procedures; be of warm-blooded animal origin; correlate with fecal contamination; and be present in waters in greater numbers than and survive as long as or longer than pathogens.

A. Pathogen(s)
B. E. coli
C. Total Coliform
D. Fecal-indicator bacteria
E. Bac-T tests
F. None of the above

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