

Disease Detectives - Division C

Time: 50 Minutes

Name: _____

Date: _____



Directions:

This test is divided into four sections:

- 1) Basic Disease Multiple Choice Questions
- 2) Basic Epidemiology Vocab
- 3) Application of Epidemiology in Real Life Situations - Part I
- 4) Application of Epidemiology in Real Life Situations - Part II

You must answer the provided questions within 50 minutes. Each competitor is permitted one reference sheet and one scientific calculator (NO GRAPHING CALCULATORS ALLOWED!)

Show all work for mathematical statistical problems or else points will be deducted.

Score (for captains to fill out only): _____/148 points

Basic Disease Multiple Choice Questions (3 pts each)

1. Noroviruses are the most common cause of _____.
 - a. Salmonella
 - b. Botulism
 - c. Intestinal Cryptosporidiosis
 - d. Gastroenteritis
2. What are symptoms of cyclosporiasis?
 - a. Diarrhea
 - b. Constipation
 - c. Fever
 - d. Muscle Weakness
3. What is the onset time of shigella after ingestion?
 - a. 3-4 days
 - b. 6-48 hours
 - c. 2-8 days
 - d. 4-7 days
4. What illness is characterized by the consumption of raw/undercooked poultry?
 - a. Botulism
 - b. Salmonella
 - c. Malaria
 - d. Perfringens food poisoning
5. Which foodborne disease causes ulcers which require surgical removal?
 - a. *V. Vulnificus* infection
 - b. Campylobacteriosis
 - c. Herpes Simplex
 - d. Botulism
6. Which diseases are caused by the consumption of undercooked seafood? (Select all that apply)
 - a. Hepatitis A.
 - b. *V. Parahaemolyticus* infection.
 - c. *V. vulnificus* infection.
 - d. *B. cereus* food poisoning

7. Listeriosis can lead to _____. (Select all that apply)
- a. Bacteremia
 - b. Meningitis
 - c. Flu-like illness
 - d. Muscle ache
8. Retroviruses are unique in that they show _____.
- a. DNA mutations
 - b. Reverse Transcription
 - c. Characteristics of ancient viruses
 - d. Ability to reverse viral activity
9. The nucleic acids of a virus are surrounded by a _____.
- a. A cell wall.
 - b. Plasma membrane.
 - c. Protein coat.
 - d. Viral micro-membrane.
10. There are around _____ cases of foodborne illness annually.
- a. 48 million.
 - b. 300 million.
 - c. 26 million.
 - d. 850,000
11. Each year, foodborne illnesses result in _____ hospitalizations and _____ deaths.
- a. 100,000 ; 14,000
 - b. 500,000 ; 36,000
 - c. 128,000 ; 3,000
 - d. 30,000 ; 12,000
12. Zika is spread by _____.
- a. *Aedes. Aegypti*
 - b. *Aedes. Ziketus*
 - c. *Aedes. Zepti*
 - d. *albopictus*

13. Meningitis is a(n) _____ disease. (Select all that apply)
- a. Viral
 - b. Fungal
 - c. Bacterial
 - d. Parasitic
14. Microcephaly can be diagnosed through _____.
- a. Amniocentesis
 - b. Ultrasound.
 - c. PKU
 - d. Pulse oximetry test.
15. What are potential causes of microcephaly? (Select all that apply)
- a. Rubella.
 - b. Toxoplasmosis.
 - c. Cytomegalovirus.
 - d. Malnutrition.

Basic Epidemiology Vocab (Match Vocab to Definition)

(2 point each)

Question #	Answer (Letter)	Definition	Word Bank
16		Deals with controlling and preventing health problems	a. Herd Immunity
17		Resistance developed in response to an antigen.	b. Incubation Period
18		Infections occurring over multiple continents	c. Antibody
19		Branching chart that indicates evolutionary lineage of organisms	d. Epitope
20		Protein that can mess up structure of other proteins	e. Forest Plot
21		Resistance to an infectious agent of an entire group or community as a result of a substantial proportion of population being immune	f. Fomite
22		Aggregation of cases within an area in a specified time period	g. Applied epidemiology
23		Environment in which infectious agent lives	h. Descriptive epidemiology
24		Ability of an agent to cause disease.	i. Field epidemiology
25		Region where antibody binds to virus.	j. Nosocomial Infection
26		Graph that displays point estimates and confidence intervals of individual studies included in a meta-analysis as a series of parallel lines	k. Cluster
27		Time from exposure to a causal agent onset of symptoms of a disease	l. Epidemiological Triad

28		Time interval from exposure to an infectious agent to onset of symptoms of infectious disease	m. Active Immunity
29		Without apparent symptoms.	n. Prion
30		Y- shaped molecule.	o. Pandemic
31		Study similar to a survey.	p. Reservoir
32		A form of applied epidemiology	q. Syndrome
33		Ability of agent to cause disease after infection; can be expressed as a number	r. Virulence
34		Organizing and summarizing data regarding infected people	s. Subclinical
35		Agent, host, environment	t. Cross-sectional
36		Illness acquired within a hospital.	u. Pathogenicity
37		Systematic difference in collection of data.	v. Phylogenetic tree.
38		Inanimate object that acts as vehicle for transmission	w. Latency period.
39		Combination of symptoms characteristic of a disease or health condition	x. Information bias.
40		Branching chart representing logical pathway of clinical or public health decision	y. Decision tree

Application of Epidemiology in Real Life Situations - Part I

(36 points)

Scenario

Nalnuj is an epidemiologist who is given a case regarding the famous “Cougar Shopping Market” in central New Jersey. In the month of February, some customers reported having severe cases of diarrhea, abdominal cramps, and vomiting. Nalnuj decides to call customers with and without the disease in order to conduct descriptive and statistical analysis on the situation. After calling 100 customers who visited Cougar Shopping Market in February, Nalnuj discovered that 43 customers exhibited symptoms of severe food poisoning while 57 customers demonstrated no symptoms whatsoever. Out of those 43 customers with food poisoning, 36 of them reported purchasing baked cream pastries from the market and 6 of them reported purchasing fresh produce. However, 4 of the 57 healthy customers purchased baked cream pastries as well, and 52 of them purchased fresh produce.

41) What type of epidemiological study is this and why? (2 points)

42) Create a contingency table for this situation between group who did not purchase baked cream pastries and group who did purchase baked cream pastries. (2 points)

43) Perform the statistical test regarding pastries corresponding with the study type in question 41. (4 points)

44) Is it probable that baked cream pastries caused the disease? Provide descriptive reasoning. (3 points)

45) Verify or refute your answer to 44 with a chi-square test. Refer to chart under this question for critical values . Use a p-value of 0.05 for comparison. Write your null hypothesis down. (6 points)

DEGREES OF FREEDOM	PROBABILITY										
	0.95	0.90	0.80	0.70	0.50	0.30	0.20	0.10	0.05	0.01	0.001
1	0.004	0.02	0.06	0.15	0.46	1.07	1.64	2.71	3.84	6.64	10.83
2	0.10	0.21	0.45	0.71	1.39	2.41	3.22	4.60	5.99	9.21	13.82
3	0.35	0.58	1.01	1.42	2.37	3.66	4.64	6.25	7.82	11.34	16.27
4	0.71	1.06	1.65	2.20	3.36	4.88	5.99	7.78	9.49	13.28	18.47
5	1.14	1.61	2.34	3.00	4.35	6.06	7.29	9.24	11.07	15.09	20.52
6	1.63	2.20	3.07	3.83	5.35	7.23	8.56	10.64	12.59	16.81	22.46
7	2.17	2.83	3.82	4.67	6.35	8.38	9.80	12.02	14.07	18.48	24.32
8	2.73	3.49	4.59	5.53	7.34	9.52	11.03	13.36	15.51	20.09	26.12
9	3.32	4.17	5.38	6.39	8.34	10.66	12.24	14.68	16.92	21.67	27.88
10	3.94	4.86	6.18	7.27	9.34	11.78	13.44	15.99	18.31	23.21	29.59

Nonsignificant

Significant

Source: R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, 6th ed., Table IV, Oliver & Boyd, Ltd., Edinburgh, 1963, by permission of the authors and publishers.

46) Create a contingency table for this situation between the group who did purchase fresh produce vs the group that did not. (2 points)

47) Perform the statistical test regarding fresh produce corresponding with the study type in question (4 points)

48) Is it probable that fresh produce caused the disease? Provide reasoning based on your answer to question (3 points)

49) Verify or refute your answer to 44 with a chi-square test. Refer to chart under question 45 for critical values . Use a p-value of 0.05 for comparison. Write your null hypothesis down. (10 points)

50) Based on your previous answers, what disease is likely present within Cougar Shopping Market? What organism causes the said disease? (4 points)

51) What type of infection is this based on your answer to question 50? (2 points)

Application of Epidemiology in Real Life Situations - Part II (11 pts)

Scenario

Taken from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5621a1.htm>

In November 2006, public health officials at CDC and state health departments detected a substantial increase in the reported incidence of isolates of *Salmonella* serotype Tennessee. In a multistate case-control study conducted during February 5--13, 2007, illness was strongly associated with consumption of either of two brands (Peter Pan or Great Value) of peanut butter produced at the same plant. Based on these findings, the plant ceased production and recalled both products on February 14, 2007. The outbreak strain of *Salmonella* Tennessee subsequently was isolated from several opened and unopened jars of Peter Pan and Great Value peanut butter and from two environmental samples obtained from the plant. New case reports decreased substantially after the product recall (Figure 1). As of May 22, 2007, a total of 628 persons infected with an outbreak strain of *Salmonella* serotype Tennessee had been reported from 47 states since August 1, 2006 (Figure 2). Local and state public health officials in multiple states, with assistance from CDC and the Food and Drug Administration (FDA), are continuing to investigate this outbreak caused by peanut butter, a new food source for salmonellosis in the United States. All remaining jars of Peter Pan or Great Value peanut butter with a product code beginning with 2111 should be discarded.

In February 2007, a case-control study with 65 patients and 124 controls was conducted to identify the food item associated with illness. For the study, a case was defined as infection with the outbreak strain of *Salmonella* Tennessee in a person aged >18 years with a history of diarrhea.

Epidemiologic data suggesting Peter Pan brands of peanut butter as the possible source of the outbreak were provided to FDA officials on February 13, 2007. The following day, FDA issued a health alert to consumers indicating that they should not eat Peter Pan or Great Value peanut butter with a product code beginning with 2111, both of which were manufactured in a single facility in Georgia operated by ConAgra Foods. ConAgra Foods voluntarily recalled the products, destroyed existing products in their possession, and temporarily halted production pending further investigation.

52. What would be an ideal control for the case-control study described in this situation?

53. How might salmonellae be introduced into the peanut butter in the first place?

54. What is a serotype?

55. What are three steps you can take to prevent salmonella?

56. Is salmonella a communicable disease?