Foodborne Illness Diagnostic Chart

(Agents listed by first symptoms and onset)

Pathogen/Poison/ Toxin	Symptom onset	Symptoms (by frequency)	Implicated foods or common vehicles	Habitat/Reservoir	Specimen source [A, B, C, D]	Minimum amount	Laboratory/Diagnostic tests	Storage & transport instruction[E]
Upper Gastrointestinal Symptoms (nausea, vomiting)								
Metallic salts & heavy metals e.g. copper, zinc, tin, cadmium	<1h	N, V, altered taste sensation	Lemonade, punch, wine, gelatin dessert containing fruit, beer, carbonated drinks	Metallic containers	Blood,[1] urine,[1] vomitus,[1] food [2]	1ml blood in purple top test tube	Metal levels [A]	Call environmental epidemiologist at (512) 458-7269
Nitrites	1-2h	N, V, cyanosis, HA, dizziness, dyspnea, trembling, weakness, fainting	Spinach & other row crops kept moist at room temperature	Nitrification of fields where plants are grown prior to harvest	Food [2]		Nitrite level [A]	Call environmental epidemiologist at (512) 458-7269
Staphylococcus aureus heat stable enterotoxin	0.5-8h mean 2-4h	N, V, D, P, prostration	Meat, seafood, pasta, or salads & sandwich spreads made with eggs or mayonnaise	Nose, throat, skin, food stored at >40 °F	Stool,[1,2] food,[2] wound,[1,2] vomitus,[1,2] throat swab[1,2]	100g food (4oz)[2]	Culture,[1,2] (PFGE if pre-approved by TDH),[2] toxin assay,[2] colony count[1,2]	Ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen;** fully saturate swab for stool, wound, and throat specimen; place in Cary-Blair medium
Bacillus cereus heat stable emetic toxin	1-5h usual 2-4h	N, V	Starchy food, rice, salads, custards, cereals, pudding, soups	Soil, dust, spices, food stored at >40 °F; spore survives heat	Food [2]	100g food (4oz)[2]	Colony count,[2] identification [2]	Ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Amanita phalloides mushroom heat stable toxin	6-24h	N, V, D, thirst, pupil dilatation, collapse, coma	Food containing mushrooms	*Amanita* mushrooms (May-June)	Food[2]		Mushroom species identification	Call IDEAS epidemiologist (512) 458-7676
Streptococcus pyogenes	12-72h	Sore throat, F, N, V, runny nose, rash	Milk, deviled eggs or salads & sandwich spreads made with eggs or mayonnaise	Nose, throat, skin	Food,[2] stool,[1] throat swab,[1] wound swab[1]	100g food (4oz) [2]	Culture,[1,2] identification[1,2]	Ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen;** fully saturate swab for stool, wound, and throat specimen; place in Stuarts or Aimes medium
Lower Gastrointestinal Symptoms (diarrhea, abdominal cramps/pains)								
Vibrio cholerae O1, O139, & *Vibrio* non-O1	hrs-5d usual 2-3d	Watery diarrhea or (rice water stools) C, N, V	Food & water contaminated with feces or vomitus, raw or improperly cooked seafood	Shellfish, copepods, or other zooplankton in brackish waters or estuaries	Stool,[2] rectal swab,[2] food,[2] shellfish,[2] serum [1]	100g food,[2] 150g shellfish,[2] 15 unshucked oysters[2]	Culture,[2] identification,[2] typing,[2] toxin testing,[2] paired sera for *Vibrio* antibodies[3]	Ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen;** stool or fully saturated rectal swab transported in Cary-Blair medium
Vibrio parahaemolyticus	4-30h usual 12-24h	D, C, HA,V, F, wound infections, sepsis	Raw and undercooked seafood	Salt water shellfish; food stored at >40 °F	Stool,[2] shellfish [2]	150g food,[2] 15 unshucked oysters[2]	Culture,[2] identification [2]	Stool transported in Cary-Blair medium; ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Bacillus cereus heat labile diarrheal toxin	6-24h	D, C, and sometimes N, V	Starchy food, rice, salads, custards, cereals, pudding, soups	Soil, dust, spices, food stored at >40 °F; spore survives heat	Food,[2] stool [2]	100g food (4oz)[2]	Culture,[2] identification,[2] colony count[2]	Ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Clostridium perfringens heat stable spore	6-24h usual 10-12h	C, D	Meat & poultry dishes, sauces, gravies	Dust, soil, human, and animal GI tracts, food stored at >40 °F; prefers low oxygen	Stool,[2] food [2]	100g food (4oz)[2]	Culture,[2] identification,[2] colony count[2]	Ship food [2] and stool overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Salmonella all serotypes	6-72h usual 12-36h	D, C, F, N, V, HA	High protein foods: meat, poultry, fish, eggs	Human & animal intestinal tracts; food stored at >40 °F	Stool,[2] food,[2] blood[2]	100g food (4oz)[2]	Culture,[2] serotyping ,[2] identification,[2] PFGE [2]	Stool in Cary-Blair medium; ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Enteric viruses: Norwalk-like	10-50h usual 1-2d	F, N, V, P, D, HA	Shellfish, salads, clams, oysters, food handled by infected person	Humans	Fresh stool [2]	1-10g stool in sterile plastic container	Electron Microscopy (testing for outbreak investigations only)	**Obtain approval** for testing at virology (512) 458-7318. Collect specimen in sterile plastic container within 48h after symptom onset; keep cold at 2-8 °C (35-46 °F); **ship to lab immediately**
Escherichia coli (non-O157)	12-72h	D, C, N	Meats, cheeses, fecally contaminated food	Human & animal (cattle) feces; can grow at refrigeration temperatures	Stool,[2] food [2]	100g food (4oz)[2]	Culture,[2] identification,[2] toxin detection,[2] PFGE [2]	Stool in Cary-Blair medium; ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Shigella species	1-7d usual 1-3d	D, C, F, N, V	Moist mixed foods, salads, milk, beans, food handled by infected person	Humans	Stool,[2] food,[2] blood[1]	100g food (4oz)[2]	Culture,[1,2] PFGE,[2] identification,[2] grouping [2]	Stool in Cary-Blair medium; ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Yersinia enterocolitica or *Y. pseudotuberculosis*	3-7d usual 4-6d	D, F, P, N, V, mimics appendicitis	Pork, milk, tofu, poultry, beef	Pigs, cattle, poultry; grows at 35-40 °F; sensitive to heat at 122 °F	Stool,[2] blood,[1,2] tissue [1,2]	100g food (4oz)[2]	Culture,[1,2] identification[1,2]	Saturate swab with stool and place in Cary-Blair or CIN culture medium; ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Cyclospora species	1-11d median 7d	D, C, fatigue, N, weight loss; can be shed in stool for more than 28d	Fecally contaminated water, food, and raw produce	Humans	Stool[1,2]	Use O & P kit	Acid fast stain exam,[2] O & P exam [1,2]	Stool transported in PVA & formalin (O & P kit); stool specimens accepted only from public health officials
Campylobacter jejuni	1-10d usual 3-5d	D, C, N, F, HA, malaise, bloody D	Meat, poultry, milk, mushrooms; food stored at >86 °F	Foods of animal origin	Stool,[1,2] food,[2] rectal swab [1,2]	100g food (4oz) [2]	Culture,[1,2] identification [1,2]	Stool in Cary-Blair medium; ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Cryptosporidium parvum	1-12d mean 7d	D, C, N, F, fatigue, HA, V	Any food handled by infected person, fecally contaminated water	Humans, cattle, other domestic animals	Stool[1,2]	Use O & P kit	Acid fast stain exam,[1,2] O & P exam [1,2]	Stool transported in PVA & formalin (O & P kit); stool specimens accepted only from public health officials
Escherichia coli O157:H7	3-8d	Bloody D and C, hemolytic uremic syndrome	Meat, cheeses, unpasteurized milk, cider, juices, manure fertilized fruits & vegetables	Human & animal (cattle) feces; can grow at refrigeration temperatures	Stool,[2] food[2]	100g food (4oz) [2]	Culture,[2] identification,[2] toxin detection,[2] PFGE [2]	Stool in Cary-Blair medium; ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen**
Giardia lamblia	3-25d median 7-10d	D, mucoid fatty stools, gas, C, fatigue, N; shed for months in stool	Food handled by infected person; fecally contaminated water	Humans and other animals	Stool[1,2]	Use O & P kit	Trichrome stain exam [1,2]	Stool transported in PVA & formalin (O & P kit); stool specimens accepted only from public health officials
Entamoeba histolytica	1-8w usual 2-4w	Mucoid or bloody D, F, chills, C	Food handled by infected person; fecally contaminated water	Humans	Fresh stool [2]	Use O & P kit	Culture,[1,2] identification, [1,2] stool trichrome stain exam [1,2]	Stool collected and placed in PVA & formalin (O & P kit) **within 2-5 hours of sampling**
Taenia saginata & *T. solium*	3-6m	Nervousness, insomnia, P, anorexia, weight loss	Raw or undercooked beef (*T. saginata*) or pork (*T. solium*) products; food contaminated with tapeworm eggs	Intermediate host cattle (*T. saginata*) or pigs (*T. solium*); human definitive host	Stool[1,2]	Use O & P kit	Identification of parasite segments in stool [1,2]	Stool transported in PVA & formalin (O & P kit); stool specimens accepted only from public health officials
Neurological and/or Gastrointestinal (visual disturbances, vertigo, tingling, paralysis)								
Shellfish toxin	0.5-3h usual <1h	Paresthesias, reversal of hot-cold sensation, muscle aches, D, V	Shellfish, mollusks	Shellfish, mollusks	Shellfish,[2,C] urine,[1] blood[1]	150g shellfish,[2,C] 15 unshucked shellfish[2,C]	Toxin assay [C]	Refrigerate food [2,C] specimen at 2-8 °C (35-46 °F) or freeze
Muscaria-type mushrooms	0.25-2h usual <1h	Salivation, perspiration, pupil dilatation, wheezing	Foods containing mushrooms	Mushrooms (May-June)	Mushrooms		Mushroom species identification	Call IDEAS epidemiologist at (512) 458-7676
Organophosphate (pesticide)	<1h	N, V, C, D, HA, nervousness, blurred vision, chest pain, cyanosis, confusion, twitching, convulsions	Contaminated foods	Plants sprayed with pesticides or kept in same area with pesticides	Food,[2] whole blood[1]		Chemical analysis,[2] red cell cholinesterase activity [1]	Call environmental epidemiologist at (512) 458-7269
Ciguatera toxin	1-48h usual 1-6h	Tingling, numbness, dry mouth, pupil dilatation, blurred vision, paralysis	Large predatory reef fish: barracuda, snapper, amberjack, grouper	Large predatory reef fish	Fish,[2] mollusks[2]			Call IDEAS epidemiologist at (512) 458-7676
Clostridium botulinum neurotoxins	2h-6d usual 12-36h	Blurred vision, muscle weakness, cranial nerve palsies, descending paralysis, mental status changes, respiratory distress, possible death. In infants ìfloppy baby syndromeî	Home-canned foods, alkaline foods, lightly cured refrigerated foods, smoked fish. In infants: honey, molasses, and syrups	Soil, plants, marine sediments, and fish	Food,[2,4] stool,[2,4] vomitus,[2,4] gastric aspirate,[2,4] serum [1,2,4]	100g food,[2,4] 10ml blood,[2,4] or 5ml serum[2,4]	Culture,[2] toxin assay,[2] toxin typing [2]	Collect representative food specimen, keep at 2-8 °C (35-46 °F); ship food [2] overnight on wet ice; **do not freeze specimen.** Hold all other suspect canned foods until testing is completed, then dispose of properly. **Call both** IDEAS epidemiologist at (512) 458-7676 AND lab at (512) 458-7318.
Organic mercury, lead, arsenic	>72h	Numbness, leg weakness, spastic paralysis, impaired vision, blindness, coma	Crab, shellfish, fish, marine invertebrates	Crab, shellfish, fish, marine invertebrates	Urine		Chemical analysis	Call environmental epidemiologist at (512) 458-7269
Triorthocresyl phosphate	>72h	Gastroenteritis, leg pain, high stepping gait, foot and wrist drop	Cooking oil substitute, contaminated flour, fluid ginger extract, parsley extract (apiol)	Lubricating oil, certain plastic containers, hydraulic fluid	Oil specimen,[2] food [2]		Chemical analysis	Call environmental epidemiologist at (512) 458-7269
Listeria monocytogenes	varies 3-70d median 3w	Flu-like illness (F, chills, muscle aches, N, and/or D), meningitis, neonatal sepsis, cerebritis	Milk, meats, soft cheeses, manure fertilized vegetables	Soil, plants, water, food stored at 30-40 °F	Food,[2] stool,[2] blood,[1] CSF,[1] tissue biopsy[1]	100g food,[2] 5g stool, 0.5ml serum, 10ml CSF	Culture,[1,2] identification,[1,2] PFGE [2]	Unpreserved stool in Cary-Blair; isolates shipped on nonglucose slants such as trypticase soy or heart infusion agar; all specimens kept at 2-8 °C (35-46 °F)
Taenia solium Cysticerci(us)	>2m	HA, N, V, seizures	Exposure to human stool or food contaminated with tapeworm eggs	Humans	Blood,[3] CSF[1,3]	10ml blood or 5ml serum	MRI or CT detection of cysticerci (cysts) in the brain,[1] serological assay [1,2,3]	Red top test tube for serum [3]
Allergic (facial flushing, itching)								
Scombroid histamine	<1-3h usual <1h	HA, N, V, P, flushing, itching, peppery taste	Tuna, mackerel, skipjack, bonito, mahi mahi, blue fish	Partially decomposed fish	Fish [2]		Identification of decomposed fish	Call IDEAS epidemiologist at (512) 458-7676
Monosodium L-glutamate (food additive)	<1h	Mouth numbness, tingling, N, HA in all when dose >1.5g (less in sensitive people)	Foods prepared with this ingredient	Not applicable	Food[2]		Chemical analysis	Call IDEAS epidemiologist at (512) 458-7676
Generalized Infection (fever, chills, malaise, prostration, aches, swollen lymph nodes)								
Salmonella typhi	3d-3m usual 1-3w	Malaise, HA, F, N, V, P, rose spots	Meat, poultry, egg products	Human intestinal tracts; food stored at >40 °F	Stool,[2] food,[2] blood[1]	100g food (4oz)[2]	Culture,[1] serotyping [2]	Collect a stool specimen from the case-patient and ship to the laboratory in buffered glycerol saline solution or Cary-Blair transport medium
Brucella species	5-60d usual 1-2m	F, myalgia, malaise, HA, arthralgia	Raw milk, products from sheep, cows, goats	Cattle, swine, sheep, goats, deer, kennel dogs, coyotes	Stool,[1] food,[2] blood,[1] gastric washing[1]	2ml serum, 100g food (4oz)[2]	Culture,[1] identification,[1] single and paired SAT [1,2]	Ship food [2] overnight on wet ice at 2-8 °C (35-46 °F); **do not freeze specimen;** collect blood specimen in red top test tube
Toxoplasma gondii	10-23d	F, HA, myalgia, rash	Contaminated foods	Cats, rats, birds, feces, dirt	Blood,[1,2] tissue biopsy[1,2]	2ml serum, 100g food (4oz)[2]	Single serum EIA (IgM),[1] paired sera IFA (IgG),[1,4] giemsa stain of tissue[1]	Collect blood specimen in red top test tube [4]
Hepatitis A	15-50d mean 30d	F, N, C, anorexia, later dark urine, jaundice	Oysters, clams, food handled by infected person	Transmitted by fecal/oral route, person to person, shed in human stool	Serum [1,2,4] **unhemolyzed and not lipemic**	2ml serum[4]	Total IgG,[1,2,4] single serum IgM anti-HAV [1,2,4]	**Obtain approval first,[4]** specimens only accepted during outbreaks. Collect blood specimen in red top test tube, ship at 2-8 °C (35-46 °F)[4]
Pathogen/Poison/ Toxin	**Symptom onset**	**Symptoms (by frequency)**	**Implicated foods or common vehicles**	**Habitat/Reservoir**	**Specimen source[A, B, C, D]**	**Minimum amount**	**Laboratory/Diagnostic tests**	**Storage & transport instructions[E]**

h=hour d=day w=week m=month C=abdominal cramps D=diarrhea F=fever GI=gastrointestinal HA=headache N=nausea P=abdominal pain V=vomiting
CSF=cerebrospinal fluid EIA=enzyme immunoassay IFA=indirect fluorescent antibody test PFGE=pulse-field gel electrophoresis SAT=serum agglutination test ^{0}C=degrees Centigrade ^{0}F= degrees Farenheit
IDEAS=Infectious Disease Epidemiology and Surveillance Division TDH=Texas Department of Health CDC=Centers for Disease Control and Prevention

[1] Initial diagnostic test done at local hospital, clinic, commercial, or nearest health department laboratory.

[2] Call the Texas Department of Health (TDH) Laboratory at (512) 458-7598 for submission, collection, and handling instructions (<3d old food; ship food **overnight** on wet ice at 2-8 °C (35-46 °F); do not freeze specimen; food only accepted from public health officials); call (512) 458-7661 to obtain shipping containers for pure cultures.

[3] Reference test forwarded by TDH to federal laboratory.

[4] Call TDH IDEAS at (512) 458-7676 for testing authorization **PRIOR** to sampling and submission.

[A] Initial (diagnostic) specimens should be routed to the local hospital laboratory and remaining or reference specimens to the Texas Department of Health (TDH) laboratory. TDH forwards certain specimens for testing to federal laboratories and results may not be available for weeks or months.

[B] Food specimens for bacteriological analysis: collect a minimum of 100g (4 oz) and a maximum of 450g (1 lb) for each specimen, store and ship in a sterile Whirl Pak bag or sterile plastic container at 0-4 °C (32-39^{0} F). Frozen foods should remain frozen. Send specimens to laboratory as soon as the specific food is suspected as a vehicle of transmission. Shellfish specimens need to be refrigerated at 0-4 °C (32-39 ^{0}F) and tested within 24h after collection. Alert the laboratory of need to test food specimen and ask for further shipping instructions. Approximate conversions for food measures: 100g=4 ounces; 5ml=one teaspoon; 2ml=20-30 drops

[C] Oyster specimens for brevetoxin assay need to be maintained in 100ml of 0.18N HCl per 150-200g (5-7 oz) of shucked oyster meat. Specimens can be refrigerated or frozen during shipping.

[D] Stool specimen analyses require prior approval at (512) 458-7318; shipping containers can be obtained by calling (512) 458-7661; specimens for bacteriological culturing are collected in a Cary Blair CultureSwab Transport System (in some cases an unpreserved fresh specimen is needed); stool specimens for intestinal parasites require division of the specimen into two portions: one portion is placed into a vial of formaldehyde, the other in a vial of polyvinyl alcohol (O & P kit); the fully saturated rectal swab may be shipped without a preservative, in a glycerol saline solution, or inoculated into a specific transport medium depending on the test. Samples may be refrigerated.

[E] General guidelines: (1) clinical human and animal specimens must be transported in a triple container; (2) the specimen container should hold no more than 50ml of specimen; therefore multiple containers may be necessary; (3) the secondary container must be a durable, screw-capped, leak-proof container and not a bag, and must have sufficient absorbent materials to absorb all the contents of the primary container in case of leakage; and (4) the outside or tertiary container must be a fiberboard cylinder with a screw-capped lid or similar material. The inner specimen container must be labeled with the patient's name and or specimen identification number (form ID) **exactly** the way it is written on the laboratory request form. The proper complete laboratory forms must be included outside the second container. The outermost container must be labeled with the name of the laboratory, its full address, and a return full name and address. **Pure isolates of microorganisms require a biohazard label on the outermost container.**