

## Hypotheses Generation Toolkit

A hypothesis for a foodborne outbreak investigation is a reasonable and testable suspicion of a particular vehicle or exposure as the source of an outbreak. It is based on specific facts and circumstances from an initial investigation.

A hypothesis should be:

- Developed by an investigation team during the earliest stages of the investigation
- Modifiable, reasonable and testable.
- Refined as information is received

***Without the right hypothesis, you will not get the right answer***

Review the [basics of hypothesis generation for foodborne illness](#) outbreaks on CDC's website and CIFOR's [Guidelines for Foodborne Disease Outbreak Response](#).

**Use as specific a case definition as possible to reduce background noise**

**Use these three assessments to develop a hypothesis:**

### 1. Food-pathogen pairs

Review previous outbreaks, known reservoirs, routes of transmission, and risk factors.

Use CDC's [NORS Dashboard](#), a web-based tool for searching reports of outbreaks of foodborne, waterborne, and enteric diseases spread by person-to-person contact, environmental contamination, animal contact, and other means.

For detailed information on *Salmonella* serotypes, review the *Salmonella* Exposure Tables, which lists past outbreaks associated with serotypes, and the [Atlas of Salmonella in the United States, 1968-2011](#), which summarizes surveillance data in detail.

Other helpful resources for background on the pathogens that cause foodborne illness:

- [FDA - Classification of Illness Attributed to Foods](#)
- [FDA - Bad Bug Book](#)

*Tip: Don't rule out high-risk exposures that are easy to forget just because a low proportion of cases report the exposure! Examples include sprouts, raw milk, ground beef, leafy greens, and others.*

### 2. Descriptive data

Descriptive epidemiology of cases, including person, place, and time characteristics, can point to potential food sources. When generating a hypothesis, review:

**Case demographics.** Enter information about your outbreak in the [Outbreak Source Prediction Tool](#) to see the probabilities of potential food sources compared to historical outbreak data.

**Epidemic curve.** What is the pattern of your epidemic curve? Cases spread over a limited time period suggest a perishable food, whereas a longer time period suggests a shelf-stable or frozen food item.

**Geographic distribution.** Diffuse outbreaks are more likely caused by a widely distributed commercial food product, whereas local or clustered illnesses are more likely caused by a local or regionally distributed food.

### 3. Case exposure assessment

Effective interviewing is crucial to a foodborne outbreak investigation. Interviewers should be trained in the use of standardized interview forms and techniques and can be done by one or multiple interviewers.

Review the following [hypothesis generating questionnaires](#):

- [National Hypothesis Generating](#) Questionnaire
- [Oregon](#) Shotgun Questionnaire
- [Minnesota](#) Questionnaire

Review the CO CoE's [Interviewer Toolkit](#).

Additional methods to obtain case exposure information might be necessary, including shopper card information ([MN Key Points for Obtaining Food Transaction Records](#)). Use the [OR Binomial Probability Worksheet](#) to determine if a given exposure is significantly associated with cases.

***Remember: a hypothesis is not a final answer. Use additional methods, including epidemiological studies or traceback investigations, to determine the source of your outbreak.***