KEY POINTS
for Successful Foodborne Outbreak Detection and Investigation

INVESTIGATING ESTABLISHMENT SUBCLUSTERS

Multi-state foodborne outbreaks due to commercially distributed foods are usually first recognized as *clusters* of cases with isolates that are highly related by whole genome sequencing. Interviews of cluster cases often detect groups of cases that identify exposure to the same individual points of service such as restaurants, catered events, or cafeterias. These groups of cases are termed *establishment subclusters* and represent an invaluable opportunity to solve the outbreak, because the investigation can be focused on the limited number of food items consumed by cases at the subcluster establishment(s). All available resources should be committed to rapidly and comprehensively investigate these subclusters because of the high chance for success, and to limit the need to obtain 7-day food histories from other cases. If resources are not available to conduct an investigation fully and rapidly, assistance should be sought from other agencies. The following key points are applicable to the majority of establishment subcluster investigations.

1. Identify potential establishment subclusters

- ➢ In their initial interview, all newly identified cluster cases should be asked to identify all dining locations eaten at during the exposure period.
- ➢ Cases often do not recall eating at some locations outside the home when asked open-ended questions on initial interview (e.g., "What restaurants did you eat at?").
- ➢ After the first few cases in a cluster are interviewed, it is often fruitful to re-interview cases about a list of all dining locations outside the home named by any of the cases.
- ➢ All newly identified cluster cases should be asked specifically about the list of dining locations named by previous cases.

2. Ascertain additional cases associated with subcluster locations

- ➢ Once a subcluster is identified, cases that were previously interviewed should be re-interviewed and asked specifically about the subcluster establishment.
- ➢ All newly identified cluster cases should be asked specifically about the subcluster establishment during their first interview.
- ➢ Cases should be asked to check credit/debit card statements to improve recall.
- ➢ It is very important to pinpoint the meal date to the extent feasible (if a receipt or credit card statement is not available, record how confident the case is about the meal date).
- ➢ Additional subcluster cases may be ascertained by contacting additional patrons of the subcluster establishment (e.g., via credit card receipts, on-line orders, or reservations).

3. Gather detailed food consumption data for subcluster cases

➢ Subcluster cases should be interviewed using the subcluster venue's menu, or a more defined menu if an event cohort with a limited, discrete menu is identified.
  o Make sure you are starting with the full menu
  o Ask cases about additions or subtractions to the menu item(s) they ordered.
➢ The establishment manager and/or chef should be interviewed to obtain ingredient lists for menu items; sometimes a call to corporate can get you recipe info.
➢ A frequency distribution of ingredients consumed by cases should be compiled; this is critical even if comparison group info cannot be obtained.
  o Include **every** ingredient consumed by at least one case.

4. Conduct an analytic study at the subclusters establishment

➢ An ingredient specific case-control study should be conducted. It is reasonable to do so with as few as 3 cases, as time is of the essence and in most situations more cases will be ascertained.
➢ Identify additional cases and enroll controls by:
  o Interviewing meal companions – this represents the lowest hanging fruit regarding obtaining controls
  o Interviewing patrons/attendees from implicated meal dates identified from credit card receipts, online orders, guest/reservation lists, or lists of workers or students (if a cafeteria).
➢ Sales data obtained from the establishment can often provide background ingredient consumption rates that can be compared to case consumption rates in a binomial model.
➢ Ascertaining additional cases (and increasing the number of controls) increases the likelihood of meaningful results and the confidence you can have in those results.
  o Make the clinical case definition specific for the pathogen of interest (e.g., for *Salmonella* use "fever and diarrhea" or "diarrhea duration >3 days"). This will minimize the likelihood that unrelated illness will dilute associations.
➢ **Every** plausible ingredient should be included in the study. Be systematic - don't focus solely on one or two ingredients that were commonly reported by cases. Some ingredients (e.g., spices, garnishes) may be used in multiple menu items and thus could be overlooked.

5. Trace back suspected vehicle(s)

➢ If there are multiple subclusters (i.e., multiple points of service), trace back ingredients implicated in analytic studies or those that were most frequently consumed by cases.
  o This is often worth pursuing even if there are few cases in a subcluster or if statistically significant results are not found.
➢ Do **not** exclude food ingredients from the investigation based on apparent differences in distributors used by the subcluster establishments, as commonalities in the source of food items might not occur until farther back in the distribution chain.
➢ Trace backs are not a substitute for thorough epidemiologic investigation (#s 3 and 4 above). Only when results of the two approaches are combined can you have the highest level of confidence in your data and maximize the likelihood of reaching the right conclusion.

Additional Resources:

Establishment Subcluster Investigation Questions and Answers

Establishment Subcluster Investigation Checklist

Ingredient Specific Analysis Guidance

Ingredient Specific Analysis CodeBuilder

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