



# Invasive *Cronobacter* Infection

*Cronobacter* spp.

## **DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS**

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of listeriosis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at <http://localhealth.nj.gov/>.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to (609) 826-5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to (609) 392-2020 during all other days and hours.

# 1 THE DISEASE AND ITS EPIDEMIOLOGY

## A. Etiologic Agent and Background

*Cronobacter* infections are caused by bacteria in the species *Cronobacter* formerly classified as *Enterobacter sakazakii*. These are opportunistic Gram-negative, rod-shaped, bacteria known for its ability to survive in dry, low-moisture environments. Species *C. sakazakii* and *C. malonaticus* are recognized as causing invasive disease in infants. These bacteria are found naturally in the environment and can contaminate dry foods like powdered infant formula (PIF), herbal teas, and starches, as well as feeding items like breast pump equipment.

## B. Clinical Description

Although anyone can get a *Cronobacter* infection, newborns are at the highest risk of invasive illness and although rare, these infections can be life-threatening for newborns because of the risk of sepsis and meningitis. In infants less than 12 months of age, *Cronobacter* infections usually start with a fever, poor feeding, excessive crying, or very low energy. Some babies may also have seizures. An invasive infection can include meningitis, cerebral abscess, sepsis, necrotizing enterocolitis, or urinary tract infection. Infections in infants usually occur in the first days or weeks of life and infants younger than 2 months, born prematurely, or with weakened immune systems are more likely to get sick. Around 20% of infants with meningitis or bloodstream infections due to *Cronobacter* in the United States have died.

## C. Reservoirs

*Cronobacter* spp. are ubiquitous in the environment and infections in infants who are less than 12 months are often linked to PIF which can get contaminated in homes or in processing facilities that make the formula.

## D. Modes of Transmission

While *Cronobacter* spp. have been detected in food products, the environment, and contaminated PIF, some cases have been attributed to breast milk that was expressed using contaminated or inadequately cleaned breast pump equipment. Intrinsic contamination of PIF can occur at any stage of manufacturing at the factory before distribution of the product for retail. Extrinsic contamination can occur once the container is opened by the user at any stage through contaminated water, utensils, work surfaces, at the time of feeding, or because of inappropriate storage conditions.

## E. Incubation Period

The incubation period for *Cronobacter* infections is relatively unknown. Studies and investigations suggest an incubation period as short as a few hours to days, especially in neonates and infants.

**F. Period of Communicability or Infectious Period**

*Cronobacter* infection is not known to spread from person to person.

**G. Epidemiology**

The incidence of invasive *Cronobacter* infection among infants in the U.S. is estimated to be 0.49 cases/100,000 infants, or approximately 19-20 cases annually, although cases are likely underreported. There are no known reports of invasive *Cronobacter* infection among infants in New Jersey.

## 2 NJDOH CASE DEFINITION

**A. Clinical Criteria**

In the absence of a more likely alternative diagnosis, an acute illness in an infant characterized by an invasive infection, including but not limited to meningitis, cerebral abscess, sepsis, necrotizing enterocolitis, or urinary tract infection.

**B. Laboratory Criteria for Diagnosis**

**1. Confirmatory laboratory evidence:**

Isolation by culture of *Cronobacter* spp. in a clinical specimen from a normally sterile site (e.g., blood or cerebrospinal fluid)

**2. Supportive laboratory evidence:**

Isolation of *Cronobacter* spp. in a clinical specimen from a non-sterile site (e.g., stool or rectum, urine, skin, respiratory secretions, or broncho-alveolar lavage, etc.)

**C. Epidemiologic Linkage**

Epidemiologic risk factors within 7 days prior to illness onset in an infant:

- Consumption of powdered infant formula (PIF) implicated as the source of infection, OR
- Exposure to a non-PIF product, such as breast milk, implicated as the source of infection, OR
- Residing in a congregate setting (e.g., a neonatal intensive care unit [NICU]) with an active *Cronobacter* spp. outbreak.

**D. Case Classification**

**1. Confirmed**

- A case that meets clinical criteria and confirmatory laboratory evidence.

**2. Probable**

- A case that meets clinical criteria AND epidemiologic linkage criteria AND supportive laboratory evidence.

**3. Possible/Suspect**

- A case that meets clinical criteria AND supportive laboratory evidence, **OR**
- A case that meets clinical criteria AND epidemiologic linkage criteria.

**E. Criteria for Distinguishing a New Case from an Existing Case**

A new case should be enumerated when

- An infant was previously reported but not enumerated as a confirmed, probable, or suspect case, but now meets the criteria for a confirmed, probable, or suspect case, OR
- An infant most recently enumerated as a suspect case with supportive laboratory evidence with specimen collection date for that classification within 90 days prior but now meets the confirmed case classification, OR
- WGS results indicate that a new positive specimen and a prior positive specimen are genetically distinct.

**F. Differences from CDC Case Definition**

There are no substantive differences between the NJDOH and CDC case definitions; “suspected” cases will be classified as “possible” in CDRSS.

## **3 LABORATORY TESTING**

Clinical and commercial laboratories are not required to submit clinical specimens to the NJDOH Public Health and Environmental Laboratories (PHEL). The Foodborne and Waterborne Disease Unit (FWD Unit) within the Communicable Disease Service (CDS) will approve and help coordinate clinical, product and environmental sample submission to PHEL for further testing at CDC if warranted.

## **4 PURPOSE OF SURVEILLANCE AND REPORTING REQUIREMENTS**

- To identify transmission sources of public health concern (e.g., commercially distributed food product) and to stop transmission.
- To provide education about reducing the risk of infection.

## 5 CASE INVESTIGATION

### A. Forms

It is the health officer's responsibility to investigate the case by interviewing the parents, guardians, caregivers and others who may be able to provide pertinent information about the case patient's illness. Some of the required information can be obtained from the patient's healthcare provider or the medical record. Much of the information on exposure and history must be obtained from the parent or guardian as it is not likely to be found in the medical record. The "Invasive *Cronobacter* Infection in Infants Case Report Form" is an investigation tool for LHDs to use when conducting interviews. All information gathered using this tool should be entered into CDRSS.

### B. Update CDRSS

Please refer to the disease prioritization guidance that provides LHDs with timeframes for public health response and enter critical details on all cases in CDRSS: demographics, signs/symptoms, clinical status, laboratory information, patient location, and sources of infections and risk factors. Invasive *Cronobacter* Infections are a Priority Level 3 disease and critical details should be entered into CDRSS within 2 weeks. If critical details cannot be obtained, local health departments (LHDs) should document the reason for the delay and the anticipated time when these details will be available.

### C. Other Reporting/Investigation Issues

Once LHD completes investigation and assigns a report status of "LHD CLOSED," the FWD Unit will review and approve the case by changing the report status to "DHSS APPROVED." At this time, the case will be submitted to CDC and locked for editing. If additional information is received after a case has been "DHSS APPROVED," you will need to contact the FWD Unit at NJDOH to reopen the case. This should be done only if relevant exposure information becomes available or if the additional information changes the case status of the report.

## 6 CONTROLLING FURTHER SPREAD

### A. Isolation and Quarantine Requirements (NJAC 8:57)

None

### B. Protection of Contacts of a Case

None

### C. Managing Special Situations

Cases that have been linked to multistate clusters or outbreaks may require additional follow-up from LHDs. Specific investigation details will be provided by the FWD Unit on a case-by-case basis.

## 7 OUTBREAK SITUATIONS

If the number of reported cases in a facility or jurisdiction is higher than usual, or if an outbreak is suspected, LHDs should investigate to determine the source of infection and mode of transmission. NJDOH staff will help determine a course of action to prevent further cases and perform surveillance for cases across jurisdictions that may be difficult to identify at a local level. Suspected outbreaks should be immediately reported to the LHD where the facility is located. A directory of LHDs with after-hours contact information is available at [www.localhealth.nj.gov](http://www.localhealth.nj.gov). LHDs should immediately notify NJDOH by telephone at (609) 826-5964 during business hours and (609) 392-2020 after business hours and on weekends and holidays.

## 8 PREVENTIVE MEASURES

### A. Environmental Measures

Implicated food items may be recalled by federal partners and recall notices will be shared by the NJDOH Public Health Food Protection Program (PHFPP) via NJ LINCS. If a commercial product is suspected, PHFPP will coordinate follow-up and provide technical assistance with traceback and environmental investigation (e.g., interpreting the New Jersey Food Code, conducting a hazard analysis and critical control point risk assessment, initiating enforcement actions, collecting food samples).

### B. Personal Preventive Measures/Education

- Very few cases of *Cronobacter* infections have been reported among exclusively breastfed infants; milk can be kept safe by [cleaning and sanitizing breast pumps](#)
- To prevent infections, it is important to keep hands and surfaces clean and [prepare and store formula](#) safely.

### References

1. [NJ Administrative Code](#)
2. [NJDOH Disease Reporting](#)
3. [NJDOH \*Cronobacter\* Infection Webpage](#)
4. [CDC \*Cronobacter\* Infection](#)
5. [CSTE Public Health Reporting and National Notification for Invasive \*Cronobacter\* Infection Among Infants](#)