



# Human Case of *Brucella abortus* RB51 Associated with Raw Milk Consumption— New Jersey, 2017



## Case summary

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**47 year old New Jersey resident**

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**Onset of symptoms on 9/15**

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**9/18: Patient seen in ED for neck pain and headache; treated and discharged; blood cultures drawn**

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**9/21: Hospital notified patient of positive blood cultures (unidentified bacteria)**

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**9/23: Patient admitted to hospital in response of notification of blood culture result; patient still had headache, fever (Tmax 102.3), chills; placed on new antibiotics.**

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**9/30: Discharged from hospital; antibiotics to be continued at home**

## Case summary: diagnostics

### Isolate confirmation:

- **9/28:** Presumptive positive for *Brucella* spp. at commercial laboratory (located in MN); forwarded to MNDOH
- **10/13:** Presumptive positive for *Brucella abortus* RB51
- **10/23:** Culture confirmed positive for *Brucella abortus* RB51 at CDC
- **Other findings:** resistance to rifampin; PFGE showed isolate was 10 SNPs different than agent in Texas outbreak earlier in 2017
- **Exposed New Jersey laboratory workers began a 3 week course of doxycycline and TMP/SMX post-exposure prophylaxis**

# Brucellosis (1)

- Systemic disease from *Brucella* species (facultative, intracellular, gram-negative coccobacilli); acute or insidious onset
  - Continued, intermittent, or irregular fever of variable duration; headache; weakness; chills
  - Can persist for days to years
- Human infections most often associated with *B. melitensis*\*, *B. suis*\*, *B. abortus*\*

\*designated as select agents, i.e., potential to be developed as bioterrorism agents due to ability to undergo aerosolization

## Brucellosis (2)

- **Transmission to humans:**
  - eating undercooked meat or raw dairy products
  - direct contact with infected animals (e.g., hunting)
  - inhalation
  - exposure through skin wounds and mucous membranes
  - person-to-person rare
- **High-risk regions:** Mediterranean Basin, South and Central America, Eastern Europe, Asia, Africa, Middle East
- **Rare in U.S. largely due to cattle vaccination practices; U.S. cases usually imported or result from accidental laboratory exposures**

Source: <https://www.cdc.gov/brucellosis/clinicians/brucella-species.html>

# Clinical presentation in humans

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**Incubation period: usually 2-4 weeks after exposure (range: 5 days to several months)**

## **Initial symptoms:**

- **Fever**
- **Sweats**
- **Malaise**
- **Anorexia**
- **Headache**
- **Muscle/joint pain**
- **Fatigue**

## **Persisting symptoms:**

- **Recurrent fevers**
- **Arthritis**
- **Swelling of testicle and scrotum area**
- **Swelling of heart (endocarditis)**
- **Neurological symptoms**
- **Chronic fatigue**
- **Depression**
- **Swelling of liver and/or spleen**

# *Brucella abortus* RB51

***Brucella abortus* is causative agent for brucellosis in cattle**

***Brucella abortus* RB51 is a vaccine strain**

- **Conditionally approved for use in cattle in 1996**
- **Safe for cattle over 3 months of age**
- **Should not cause clinical signs of disease in cattle**
- **Usually clears from the blood stream within 3 days but in rare cases, vaccinated cows can shed RB51 in their milk**

**Human exposure to RB51**

- **Accidental contact with RB51 vaccine can cause infection in humans**
- **Ingestion of raw (unpasteurized) milk or raw milk products from vaccinated cows**
- **Inhalation of organism in laboratory setting**

# Diagnosics for RB51

**No serologic assay  
available to detect  
Brucella abortus RB51**

**Diagnosis by culture  
or PCR only**

# Epidemiologic investigation

NIDJH BRUCELLOSIS INVESTIGATION WORKSHEET		CORSS #: _____	
<b>DEMOGRAPHICS</b>			
Race <input type="checkbox"/> White <input type="checkbox"/> Black <input type="checkbox"/> Asian <input type="checkbox"/> Pacific Islander/Native Hawaiian <input type="checkbox"/> Other _____	American Indian or Alaskan Native <input type="checkbox"/>	Ethnicity <input type="checkbox"/> Hispanic <input type="checkbox"/> Non-Hispanic	Country of Birth _____
Pregnancy status <input type="checkbox"/> Pregnant <input type="checkbox"/> Not Pregnant <input type="checkbox"/> N/A	Occupation <input type="checkbox"/> Animal research <input type="checkbox"/> Wildlife <input type="checkbox"/> Veterinarian/Vet Tech <input type="checkbox"/> Medical research <input type="checkbox"/> Rancher <input type="checkbox"/> Other _____	<input type="checkbox"/> Dairy <input type="checkbox"/> Laboratory <input type="checkbox"/> Slaughterhouse <input type="checkbox"/> Tannery/handling <input type="checkbox"/> Other _____	<input type="checkbox"/> Lives with person of above occupation
<b>CLINICAL INFORMATION AND TREATMENT</b>			
Disease Presentation <input type="checkbox"/> Acute (< 8 weeks) <input type="checkbox"/> Unknown		<input type="checkbox"/> Subacute (8 weeks - < 1 year) <input type="checkbox"/> Chronic (> 1 year+)	
Onset Date (dd/mm/yy) _____		Resolution Date (dd/mm/yy) _____	
List all signs and symptoms with onset/resolution dates:			
Fever, Max Temp: _____	Response <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	Onset Date (dd/mm/yy) _____	Resolution Date (dd/mm/yy) _____
Night sweats	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Arthralgia	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Headache	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Fatigue	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Anorexia	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Myalgia	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Weight loss	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Endocarditis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Otitis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Epididymitis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Hepatomegaly	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Splenomegaly	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Arthritis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Meningitis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Spondylitis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Other: _____	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk.	_____	_____
Was patient hospitalized because of this illness? <input type="checkbox"/> Yes, specify location and date(s) Hospital name: _____ Admission: _____/_____/_____ Discharge: _____/_____/_____ <input type="checkbox"/> No <input type="checkbox"/> Unknown		Did the patient die because of this illness? <input type="checkbox"/> Yes, specify date _____/_____/_____ <input type="checkbox"/> No <input type="checkbox"/> Unknown	
<b>Treatment</b>			
<input type="checkbox"/> Doxycycline	_____mg/day x _____ days	_____/_____/_____ to _____/_____/_____	
<input type="checkbox"/> Streptomycin	_____mg/day x _____ days	_____/_____/_____ to _____/_____/_____	
<input type="checkbox"/> Rifampin	_____mg/day x _____ days	_____/_____/_____ to _____/_____/_____	
<input type="checkbox"/> Other: _____	_____mg/day x _____ days	_____/_____/_____ to _____/_____/_____	
Not treated			

RISK FACTORS (SIX MONTH HISTORY FROM ILLNESS ONSET)														
Did the patient travel outside of the state? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown														
If yes, where? Dates of travel: _____ to _____														
Did the patient have contact with animals? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown														
Who owns the animal(s)?														
Type of contact	Cattle	Pig	Goat	Sheep	Dog	Deer	Beaver	Elk	Other _____	Case	Private	Wild	Commercial	Unk.
Birth/animal products	<input type="checkbox"/>													
Slaughtering/abner	<input type="checkbox"/>													
Hunting	<input type="checkbox"/>													
Other: _____	<input type="checkbox"/>													
Consume unpasteurized dairy or undercooked meat? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown														
In what country was the product acquired?														
Type of food product	Cattle	Pig	Goat	Sheep	Dog	Deer	Beaver	Elk	Other _____	U.S.	Other _____	Other _____		
Milk	<input type="checkbox"/>													
Yogurt	<input type="checkbox"/>													
French/soft cheese	<input type="checkbox"/>													
Undercooked meat	<input type="checkbox"/>													
Other: _____	<input type="checkbox"/>													
Have a link to a confirmed case? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown														
Who? <input type="checkbox"/> Household <input type="checkbox"/> Neighbor <input type="checkbox"/> Coworker <input type="checkbox"/> Other _____														
Know of similar illness in case? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown														
Have an exposure to Brucella? <input type="checkbox"/> Clinical specimen <input type="checkbox"/> Isolate <input type="checkbox"/> Vaccine <input type="checkbox"/> Unknown														
Where did the exposure occur? _____														
<b>LABORATORY DATA</b>														
Was a Brucella agglutination test conducted? <input type="checkbox"/> Yes Result: _____ Acute titer: _____ Convalescent titer: _____ Positive cut off: _____ <input type="checkbox"/> No <input type="checkbox"/> Unknown														
If not, was the recommendation for a Brucella agglutination test provided? <input type="checkbox"/> Yes <input type="checkbox"/> No														
Other tests conducted: _____														
Additional case notes: _____														

- Local health department conducted patient interview to identify risk factors for brucellosis

- Patient consumed 4.5% raw cow milk from Udder Milk, home delivery company that has illegally sold unpasteurized milk in New Jersey
- Consumed small quantities (e.g., uses in coffee); other family members are primary consumers
- Patient completed antibiotic treatment; family completed post-exposure prophylaxis and have remained asymptomatic to date

# Laboratory exposures

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Brucellosis is most commonly reported laboratory-associated bacterial infection

- lack of experience working with the organism
- work performed on *Brucella* isolate on an open bench, not under BSL-3 conditions
- Inadequate PPE
- **unknown or unidentified samples that arrive for analysis**

Certain characteristics of bacterium, such as its low infectious dose and ease of aerosolization also contribute to risk of infection by organism in laboratory setting



# Assessing laboratory exposure risk

## RISK LEVEL = HIGH

Persons at Risk	Exposure Activities
Person performing activity and any person within a 5 ft. radius	Work with a <i>Brucella</i> isolate Sniffed or opened culture plate Mouth pipetted specimen material Worked in Class II biosafety cabinet or on open bench without using BSL-3 precautions
All persons present in laboratory room	Occurrence of widespread aerosol generating procedures*

## RISK LEVEL = LOW

Persons at Risk	Exposure Activities
All person present in laboratory room at distance greater than 5 ft. from activity	Present in the lab at the time of manipulation of <i>Brucella</i> isolate on an open bench, but who do not have high risk exposures

**17 high risk exposures were identified  
in New Jersey**

# Post-exposure prophylaxis (PEP) and monitoring

## BRUCELLA SPP. (NON-RB51)

Risk Level	PEP Recommendations	Follow up/ Monitoring
High Risk	<ul style="list-style-type: none"> <li>Doxycycline 100mg twice daily and <b>rifampin</b> 600mg once daily for 3 weeks</li> </ul>	<ul style="list-style-type: none"> <li><b>Sequential serologic testing at 0, 6, 12, 18 and 24 weeks post exposure</b></li> <li>Symptom watch (e.g. weekly) and daily self fever check for 24 weeks</li> </ul>
Low Risk	<ul style="list-style-type: none"> <li>Discuss with HCP</li> <li>May consider PEP if immunocompromised or pregnant</li> </ul>	<ul style="list-style-type: none"> <li><b>Sequential serologic testing at 0, 6, 12, 18 and 24 weeks post exposure</b></li> <li>Symptom watch (e.g. weekly) and daily self fever check for 24 weeks</li> </ul>

## BRUCELLA ABORTUS RB51

Risk Level	PEP Recommendations	Follow up/ Monitoring
High Risk	<ul style="list-style-type: none"> <li>Doxycycline and <b>trimethoprim and sulfamethoxazole (Bactrim)</b> for 3 weeks</li> </ul>	<ul style="list-style-type: none"> <li>Symptom watch (e.g. weekly) and daily self fever check for 24 weeks</li> </ul>
Low Risk	<ul style="list-style-type: none"> <li>Discuss with HCP</li> <li>May consider if immunocompromised or pregnant</li> </ul>	<ul style="list-style-type: none"> <li>Symptom watch (e.g. weekly) and daily self fever check for 24 weeks</li> </ul>

## Symptom monitoring

**For both high and low risk exposures, monitor for symptom development**

**For 6 months: active temperature monitoring**

**For 6 months: passive symptom monitoring**

# Public notification



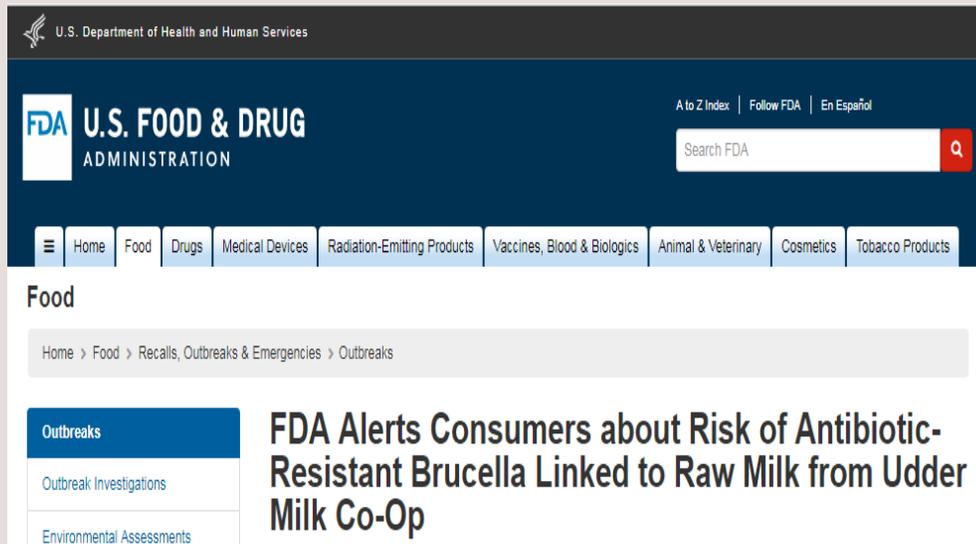
The screenshot shows the CDC Newsroom website. At the top left is the CDC logo and the text "Centers for Disease Control and Prevention" with the tagline "CDC 24/7. Saving Lives. Protecting People™". A search bar is located at the top right. Below the header is a green bar with "CDC Newsroom" and a "CDC A-Z INDEX" dropdown. A sidebar on the left contains links for "Newsroom Home", "Press Materials", "CDC Newsroom Releases", and "Archived Releases". The main content area features a breadcrumb trail: "CDC > Newsroom Home > Press Materials > CDC Newsroom Releases". The headline reads "People in Four States May Be Drinking Contaminated Raw Milk". Below the headline are social media icons for Facebook, Twitter, and a plus sign. A sub-headline states "CDC and partners urge families at risk to see their doctor for antibiotics".



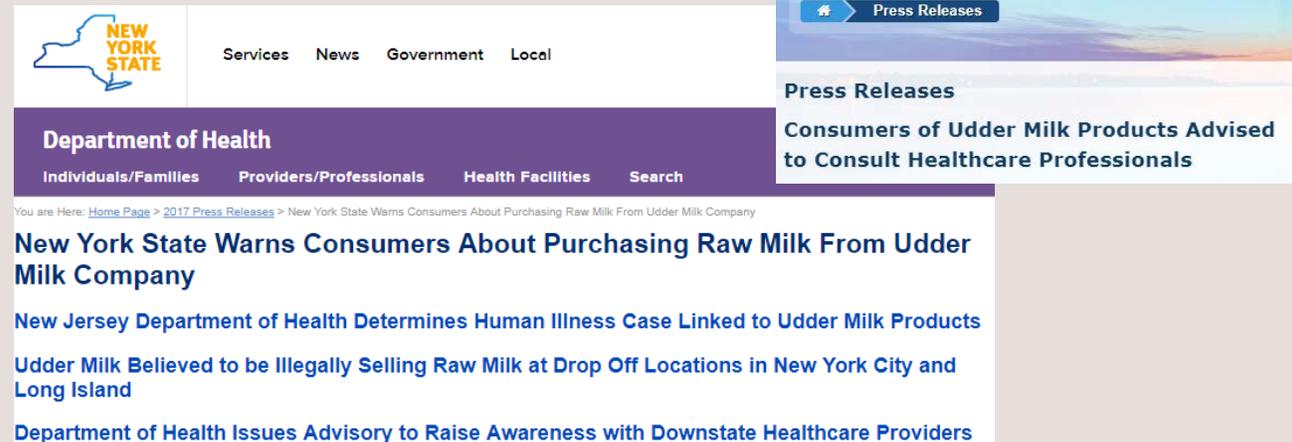
The screenshot shows the NJ Health Department website. At the top is the "STATE OF NEW JERSEY DEPARTMENT OF HEALTH" logo. To the right, it lists "Governor Chris Christie · Lt. Governor Kim Guadagno" and provides links for "NJ Home", "Services A to Z", "Departments/Agencies", and "FAQs". A search bar is present with "All of NJ" and "All File Types" dropdowns, and a "submit" button. Below the header is the "NJ Health" logo and a navigation menu with categories: "About Us", "Your Health", "Healthcare Facilities & Services", "Public Health", and "Health IT, Facts & Findings". A blue banner reads "Improving Health Through Leadership and Innovation". Below this is a "News" section with a year-based navigation menu (Home, 2017, 2016, 2015, 2014, 2013, 2012). A breadcrumb trail shows "Home > 2017 > DOH Issues Cease-and-Desist Orders to Company that Illegally Sold Raw Milk in NJ".



This block shows the content of a press release from the NJ Department of Health. It includes the address "PO Box 360, Trenton, NJ 08625-0360" and the text "For Release:". The main headline is "DOH Issues Cease-and-Desist Orders to Company that Illegally Sold Raw Milk in NJ". Below the headline is a sub-headline: "North Jersey woman became ill with rare bacterial infection, people should know health risks".



The screenshot shows the FDA website. At the top is the "U.S. Department of Health and Human Services" logo. Below it is the "FDA U.S. FOOD & DRUG ADMINISTRATION" logo. A search bar is located at the top right with the text "Search FDA". Below the header is a navigation menu with categories: "Home", "Food", "Drugs", "Medical Devices", "Radiation-Emitting Products", "Vaccines, Blood & Biologics", "Animal & Veterinary", "Cosmetics", and "Tobacco Products". Below the menu is a "Food" section with a breadcrumb trail: "Home > Food > Recalls, Outbreaks & Emergencies > Outbreaks". A sidebar on the left contains links for "Outbreaks", "Outbreak Investigations", and "Environmental Assessments". The main content area features a headline: "FDA Alerts Consumers about Risk of Antibiotic-Resistant Brucella Linked to Raw Milk from Udder Milk Co-Op".



The screenshot shows the NY State Department of Health website. At the top is the "NEW YORK STATE" logo. Below it is a navigation menu with categories: "Services", "News", "Government", and "Local". Below the menu is a purple banner with the text "Department of Health" and sub-categories: "Individuals/Families", "Providers/Professionals", "Health Facilities", and "Search". A breadcrumb trail shows "You are Here: Home Page > 2017 Press Releases > New York State Warns Consumers About Purchasing Raw Milk From Udder Milk Company". The main content area features a headline: "New York State Warns Consumers About Purchasing Raw Milk From Udder Milk Company". Below the headline are several sub-headlines: "New Jersey Department of Health Determines Human Illness Case Linked to Udder Milk Products", "Udder Milk Believed to be Illegally Selling Raw Milk at Drop Off Locations in New York City and Long Island", and "Department of Health Issues Advisory to Raise Awareness with Downstate Healthcare Providers".



The screenshot shows the RI.gov website. At the top is the "RI.gov" logo. Below it is a search bar with the text "Search RI Government". Below the search bar is a "Press Releases" button. Below the button is a "Press Releases" section with a headline: "Consumers of Udder Milk Products Advised to Consult Healthcare Professionals".

# Surveillance

- To date, two additional families that consumed raw milk from Udder Milk started PEP, symptom monitoring.
- To date, no additional cases identified

# Investigation of Raw Milk Distribution

- Udder Milk – “Co-op on wheels”
  - Distributes raw milk to multiple states
    - Raw milk is illegal to be sold across state lines
    - Sale or distribution of raw milk is illegal in NJ
- Members-only
  - Need to be approved before you can order
  - Provides drop offs in public locations and home delivery
- Where is the milk coming from?
  - No physical address on website (only a cell phone number and e-mail address)
- Actions:
  - NJDOH issued a Cease and Desist order to Udder Milk **on 11/10**
  - After the issuance of the Cease and Desist, Udder Milk moved their regular pick-up sites to unannounced members addresses and seem be delivering direct to the customer’s home



# Why raw milk?

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## Myths--

**“Raw milk is healthier and more nutritious than pasteurized milk.”**

**“Drinking raw milk may not be safe, but no harm will come from eating products made from raw milk.”**

**“Milk is safe as long as it’s labeled ‘organic’.”**

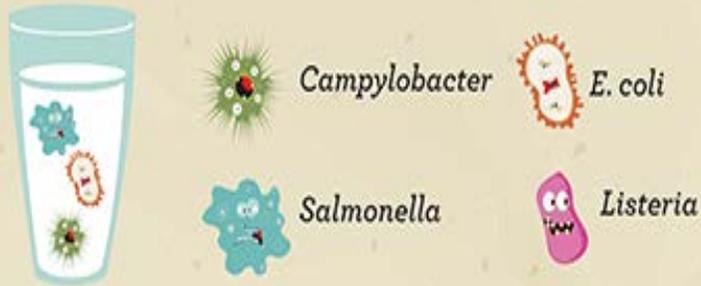
**“Raw milk and products made from raw milk are safe if they come from healthy cows.”**

**“If animals are raised in sanitary conditions on humane farms, their milk is safe.”**



# Raw milk-associated outbreaks

Some germs linked to raw milk outbreaks



Summer 2017: RB51 outbreak associated with raw milk bar in Texas (NJ case not linked to TX)

CDC analysis, 1993-2006 data

- Raw milk more likely to be linked to outbreaks than pasteurized
- Outbreaks associated with raw milk tended to cause more severe disease
- Younger people affected more in outbreaks linked with raw milk than in outbreaks linked to pasteurized milk
- States that allowed sales of raw milk had more outbreaks linked to drinking raw milk

Source: <https://www.cdc.gov/media/releases/2017/p0915-raw-milk-brucella.html>;  
[https://wwwnc.cdc.gov/eid/article/18/3/11-1370\\_article](https://wwwnc.cdc.gov/eid/article/18/3/11-1370_article)

## WHAT CAN YOU DO TO LOWER YOUR RISK OF GETTING SICK?



Choose **pasteurized** milk and dairy products.  
Buy and eat products that say "pasteurized" on the label. If in doubt, don't buy it!



Refrigerate dairy products at 40°F or below.



Throw away any expired product.

**BE WISE. ONLY DRINK MILK THAT'S PASTEURIZED!**

## HOLY COW!

### RAW MILK OUTBREAKS ARE ON THE RISE IN THE U.S.



**150x** ↗

The risk of an outbreak caused by raw milk is at least 150 times higher than the risk of an outbreak caused by pasteurized milk.



**4x** ↗

The average number of outbreaks linked to raw milk was 4 times higher from 2007-2012 compared to 1993-2006.



**81**

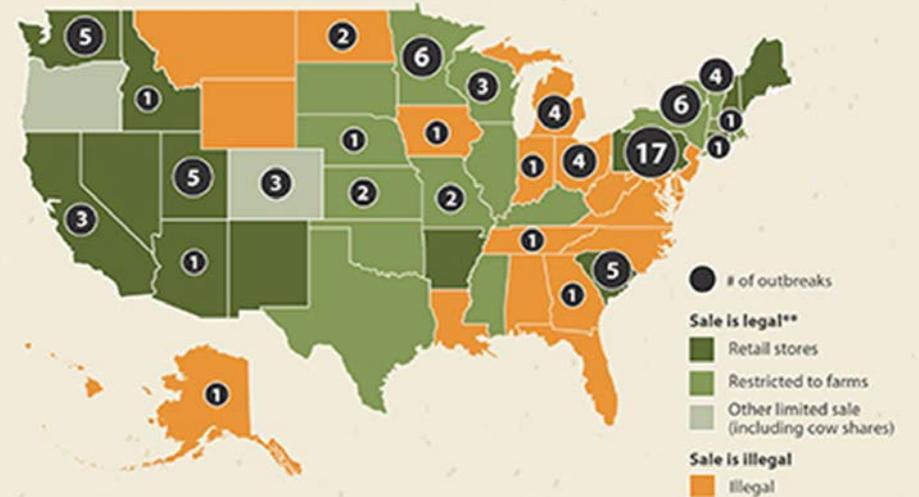
In all, 81 outbreaks in 26 states were linked to raw milk from 2007-2012

# The future...

INFORM THE PUBLIC OF THE RISK OF RAW MILK CONSUMPTION

PREVENT THE ILLEGAL SALE OF RAW MILK

## Legal Status of the Sale of Raw Milk and Outbreaks\* Linked to Raw Milk, by State, 2007-2012



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