



Brucellosis

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Key facts

To better understand public health terms included in this Disease Tool (e.g. What is a case definition? or What is an infectious agent?), consult our page on Key concepts in epidemiology.

Importance

Brucellosis is a highly contagious zoonotic disease caused by Gram-negative bacteria of the genus *Brucella*. It affects various species of animals and can be transmitted to humans primarily through direct or indirect contact with infected animals or their products. The disease is endemic in many parts of the world and represents a significant public health and economic burden in regions with underdeveloped livestock management and veterinary care. The most significant species responsible for human infection are:

- *Brucella melitensis*: The most virulent and common species causing brucellosis in humans, primarily associated with sheep and goats.
- *Brucella abortus*: Primarily affects cattle but can also cause zoonotic infection.
- *Brucella suis*: Primarily affects pigs and can cause severe, chronic human infections.
- *Brucella canis*: Infects dogs and rarely causes zoonotic disease but can lead to chronic infections in humans when it does

The World Organisation for Animal Health (WOAH) categorises brucellosis as a notifiable disease, due to its zoonotic potential and significant economic impact on livestock production.

Case definition

A **case definition** is a set of uniform criteria used to define a disease for public health surveillance. It enables public health officials to classify and count cases consistently.

*The following are standard case definitions to allow national health authorities to interpret data in an international context. However, during an outbreak case definitions may be adapted to the local context and the Red Cross Red Crescent should use those agreed/established by national health authorities. NB: Consider that during community-based surveillance, **volunteers** should use broad (simplified) case definitions (referred to as community case definitions) to recognize most or all possible cases, provide relevant risk communication and appropriate actions and encourage them to seek care. Other actors such as **healthcare workers or investigators** studying the cause of a disease, on the other hand, can use more specific case definitions that may require laboratory confirmation.*

As with zoonotic diseases, the control of brucellosis among humans is highly dependent on the control systems in the veterinary sector. The following include case definitions for human surveillance and exclude case definitions for veterinary surveillance. For more information on veterinary surveillance or clinical presentations, please visit [WOAH's](#) page on brucellosis.

Clinical description: It is characterised by 2 clinical forms

- Acute Phase
 - Fever, often fluctuating (undulant fever)
 - Sweating, particularly at night
 - Fatigue and general weakness
 - Muscle and joint pain
 - Headaches
- Chronic Phase
 - Persistent or recurrent fevers
 - Arthritis and joint pain
 - Swelling of the testicles and scrotum area
 - Neurological symptoms such as depression, fatigue, and headaches

Suspected case: A case that is compatible with the clinical description and has an epidemiological link to confirmed or suspected animal cases or contaminated animal products.

Probable case: A suspected case that has symptoms compatible with disease and is positive in the Rose Bengal test, but negative in blood culture and showing low titres in the confirmatory tests.

Confirmed case: A suspected case that is laboratory-confirmed

Source of information: ([FAQ](#))

Alert / epidemic threshold

An **alert threshold** is the pre-defined number of alerts that suggest the beginning of a possible disease outbreak and therefore warrant immediate notification.

Epidemic thresholds are the minimum number of cases indicating the beginning of a particular disease's outbreak.

Determined based on local contexts and is influenced by; seasonal trends and yearly incidence rates.

Risk factors

- People who work with animals (farmers, veterinarians, livestock breeders) or animal products such as wool, hides or hair (butchers, weavers).
- People who eat raw or undercooked meat from infected animals.
- Hunters who hunt wild animals in forests
- People living in known brucellosis endemic areas and/or with lack of infection, prevention and control measures during and after a known outbreak are at higher risk.

Attack rate (AR)

The **attack rate** is the risk of getting a disease during a specific time period (such as during an outbreak).

Attack rates will vary from one outbreak to another. In case of an outbreak, consult the latest information provided by health authorities.

- Generally low and depends on the type of exposure.

Groups at increased risk of severe illness (most vulnerable)

- Older people.
- People with weakened immune systems.
- Immunosuppressed persons such as those receiving chemotherapy, transplant recipients or HIV carriers.
- People with chronic diseases such as renal disease, cancer, chronic lung or liver disease and diabetes.

Infectious agent

Infectious agents are bacteria, viruses, fungi, prions and parasites. A disease caused by an infectious agent or its toxic products is defined as an infectious disease.

Brucellosis is a zoonotic disease. The most significant species responsible for human infection are:

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associated with sheep and goats.

- *Brucella abortus*: Primarily affects cattle but can also cause zoonotic infection.
- *Brucella suis*: Primarily affects pigs and can cause severe, chronic human infections.

Brucella canis: Infects dogs and rarely causes zoonotic disease but can lead to chronic infections in humans when it does.

Reservoir / host

A **reservoir of infection** is a living organism or material in or on which an infectious agent lives and/or usually multiplies. Reservoirs include humans, animals and the environment.

A **susceptible host** is a person at risk of being infected. The level of susceptibility depends on age, sex, ethnicity and genetic factors, specific immunity also depends on other factors that affect an individual's ability to resist infection or to limit its ability to cause infection.

A **zoonotic disease** or **zoonosis** is an infectious disease that has jumped from a non-human animal to humans.

The final hosts for *Brucella* spp. are cattle, goats, sheep, pigs, camels, and humans. Wild animals such as (deer, bison, elk, wild boars, and some rodents) are also known to carry the disease as reservoir hosts.

How disease is spread (modes of transmission)

Categorisation of **modes of transmission** varies from one agency to another. In addition, some infectious agents can be transmitted by more than one mode. A list of modes of transmission can be found in the key concepts to serve as guidance to better understand the diseases included in this website.

People get infected with brucellosis when infected with the causative organisms. This can happen via:

- 1. Direct and Indirect Animal Contact:** Individuals working on livestock farms, slaughterhouses, veterinary clinics, or meat processing plants are at increased risk. This includes direct contact with animal blood, placenta, urine, or other tissues during birthing, slaughter, or veterinary procedures. Also, contaminated animal waste can serve as a source of transmission through skin abrasions or mucosal exposure.
- 2. Ingestion:** *Brucella* spp. can persist in raw milk, cheese, and other dairy products, especially in areas where pasteurisation standards are not enforced.
- 3. Aerosolization:** Laboratory personnel handling *Brucella* cultures without adequate biosafety measures are at risk of aerosol transmission. Animal handlers and abattoir workers may also inhale aerosolized bacteria during slaughter or animal birthing processes.
- 4. Vertical Transmission:** Rare cases of mother-to-child transmission have been documented, either during childbirth or breastfeeding.

Incubation period

This time from when infection occurs to the onset of symptoms is called the **incubation period**. It is a range of days and it can be different for each disease.

It is usually 2–4 weeks (but can range from 5 days–6 months)

Period of infectiousness

Period of infectiousness is the time interval during which an infected person can transmit the infection to other susceptible persons.

Human-to-human transmission is very rare and it has been recorded that women have passed the disease to their children during birth or through their breast milk.

Clinical signs and symptoms

- The **acute phase** of brucellosis typically occurs 2-4 weeks after infection and it is characterised by:
 - Fever, often fluctuating (undulant fever)
 - Sweating, particularly at night
 - Fatigue and general weakness
 - Muscle and joint pain
 - Headaches
- Brucellosis can progress to the **chronic phase** if left untreated, and it can persist for months or even years. This phase is marked by:
 - Persistent or recurrent fevers
 - Arthritis and joint pain
 - Swelling of the testicles and scrotum area
 - Neurological symptoms such as depression, fatigue, and headaches

Other diseases with similar clinical signs and symptoms

Typhoid fever, Q fever, Tuberculosis, Malaria, Lyme disease, Dengue fever, Leptospirosis

Diagnosis

- Isolation of *Brucella* spp. from clinical specimens (note that repeated attempts may be necessary); or
- *Brucella* agglutination titre, e.g. standard tube agglutination tests: SAT³160 in one or more specimens obtained after onset of symptoms; or
- ELISA (IgA, IgG, IgM), 2-Mercaptoethanol test, Complement fixation test, Combs, fluorescent antibody test.
- In small laboratories or clinics, a Rose Bengal screening test may be used. Positive results should always be confirmed by the tests listed above.

Vaccine or treatment

Please refer to the appropriate local or international guidelines for clinical management. All clinical management including the administration of a treatment or vaccine should be conducted by a health professional.

- Brucellosis can be prevented and treated with antibiotics.
- There is no approved vaccine for brucellosis in humans.

Immunity

There are two types of immunity:

- **Active immunity** results when exposure to an agent triggers the immune system to produce antibodies to that disease.
- **Passive immunity** is provided when a person is given antibodies to a disease rather than producing them through his or her own immune system.

Brucellosis infection results in long-term immunity.

Which interventions are most effective for prevention and control?

The following is a list of activities considered for Red Cross Red Crescent volunteers to take part in. It is not an exhaustive list of all prevention and control activities for the specific disease.

- Communicate risks about the disease or epidemic, not only to share information on prevention and

mitigation measures, but also to encourage informed decision-making, positive behaviour change and maintenance of trust in the Red Cross Red Crescent response. This includes the identification of rumours and misinformation around disease—frequent during health emergencies—to manage them appropriately. Volunteers should use the most context-appropriate communication techniques (ranging from social media to face-to-face interactions).

- Community education and engagement activities to encourage the adoption of protective behaviours including:
 - Since brucellosis is a disease primarily of animals, control in livestock is the best way to control outbreaks. Control in livestock includes the correct disposal of carcasses (preferably through incineration), and treatment and/or vaccination of animals as appropriate.
 - Quarantine of herds where brucellosis has occurred (limiting contact between sick and non-exposed animals; preventing sick animals from reaching the market).
 - Safe slaughtering practices, including improved supervision of slaughter and meat inspection.
- Social mobilization to support animal vaccination (ring vaccination) in endemic areas, where possible. This includes extensive Information, Education and Communication (IEC) activities on the benefits of the vaccines, vaccination schedules and where/when to get the vaccines for livestock.
- The population should be well informed about the nature of the disease to avoid further transmission and community stigmatization, and to encourage positive health seeking behaviours (early presentation at treatment centres). e include:
 - Frequent handwashing in communities.
 - Quarantine or close follow-up of close contacts.
 - Use of personal protective equipment by animal healthcare workers while caring for infected animals.
 - Contact tracing and follow-up of animals detected at abattoirs and slaughterhouses.

Epidemic characteristics and RCRC indicators and targets

The first table below includes data that should be gathered from health authorities and relevant non-governmental actors to understand the progress and characteristics of the epidemic in the specific country and area of intervention. The second table includes a list of suggested indicators that can be used for monitoring and evaluating Red Cross Red Crescent activities; wording of indicators may be adapted to specific contexts. Target values for a specific indicator can vary widely from one context to another and therefore managers should define them based on the specific population, area of intervention and programmatic capacity. Exceptionally, some indicators in this website may include target values when these are globally agreed as a standard; e.g. 80 per cent of individuals who slept under an insecticide-treated net (ITN) the previous night—the normative World Health Organization benchmark for universal coverage with ITNs.

Epidemic characteristics and progression

Suspected cases per week (disaggregate by age, sex)

Epidemic characteristics and progression
Confirmed cases per week (disaggregate by age, sex)
Case fatality rate

Indicators for Red Cross Red Crescent activities
<p>Number of volunteers trained on a specific topic (e.g. Epidemic Control for Volunteers (ECV); Community-based surveillance (CBS); WASH training; CBHFA training, etc.)</p> <p>Numerator: Number of volunteers trained Source of information: Training attendance sheets</p>
<p>Suspect cases detected by volunteers who were encouraged to seek healthcare and who arrived at a health facility</p> <p>Numerator: Brucellosis suspect cases detected by volunteers in a determined period preceding this survey (e.g. two weeks) for whom advice or treatment was sought from a health facility</p> <p>Denominator: Total number of people and animals who are brucellosis suspect cases in the same period preceding the survey Source of information: Survey</p>
<p>Percentage of people recognizing at least one transmission route and at least one measure for preventing it</p> <p>Numerator: Total number of people who recognized at least one transmission route and at least one measure for preventing it during the survey</p> <p>Denominator: Total number of people surveyed Source of information: Survey</p>
<p>Percentage of people who know the cause, symptoms, treatment or preventive measures</p> <p>Numerator: Number of people who cite the cause, symptoms, treatment or preventive measures</p> <p>Denominator: Number of people surveyed</p>

See also:

- For Community Engagement and Accountability (CEA) indicators for activities accompanying ECV actions, please refer to: IFRC *CEA toolkit (Tool 7.1: Template CEA logframe, activities and indicators)*. Available at: <https://www.ifrc.org/document/cea-toolkit>
- For community-based surveillance guidance please see: IFRC, Norwegian Red Cross, Croix-Rouge de

Belgique (2022), *Community Based Surveillance Resources*. Available at: www.cbsrc.org/resources.

Impact on other sectors

Sector	Link to the disease
WASH	The main WASH activities concern environmental and animal hygiene before, during and after exposure to potentially infected livestock.
Food security	<i>Brucella</i> spp. can be transmitted by contaminated food. Safe slaughtering practices, including improved supervision of slaughter and meat inspection is an effective prevention measure.
Nutrition	Poor nutrition increases the risk of the spread of brucellosis as unlikely sources of food would be explored by affected individuals.
Shelter and settlements (including household items)	Housing facilities located close to infected livestock can be exposed to brucellosis through environmental contamination and it may spread to humans.
Psychosocial support and Mental health	Brucellosis can have several negative impacts on psychological, social and emotional aspects of a person's life. Psychological reactions may include fear of social stigma, anxiety and worry about the outcome, social withdrawal, among others.

Sector	Link to the disease
Sex and Gender	<p>In the context of brucellosis, gender roles significantly shape patterns of exposure and access to prevention and care. Women and men are exposed differently based on their social roles, occupations, and access to information and services. In many regions, women are more likely to be involved in small-scale livestock care, home-based dairy processing, and the handling of raw milk and animal by-products, increasing their risk of exposure. Men, on the other hand, are more often engaged in livestock trading, slaughtering, and field-level veterinary work, which involves contact with infected tissues and fluids and places them at high risk. Gender norms may discourage both women and men from seeking timely care for brucellosis symptoms, which are often vague and flu-like.</p> <p>Brucellosis during pregnancy can lead to serious complications such as miscarriage or preterm birth, making pregnant women a particularly vulnerable group.</p>
Education	<p>Through appropriate capacity-building, young people can be effective advocates for the adoption of preventive measures during an epidemic and are those best placed to mobilise and motivate their peers.</p>
Livelihoods	<p>Livelihoods based on livestock breeding or work with animal products can be significantly affected during brucellosis outbreaks (quarantine of herds, slaughtering of livestock). This can lead to a loss of income due to the diversion of resources to seek medical treatment when sick and possible loss of livestock.</p>

Resources :

- Centers for Disease Control and Prevention (CDC); [About Brucellosis](#) (2024)
- Food and Agriculture Organization of the United Nations (FAO); [Food and Surveillance of human brucellosis](#) (n.d.)
- Health Protection Surveillance Centre; [Brucellosis \(*Brucella* species\)](#) (2019)
- World Health Organization (WHO); [Brucellosis](#) (2020)
- World Health Organization (WHO); [Brucellosis in humans and animals](#) (2006)
- World Organisation for Animal Health (WOAH); [Brucellosis](#). (n.d.)
- World Organisation for Animal Health (WOAH); [Brucellosis](#) (2022)
- <https://www.mayoclinic.org/diseases-conditions/brucellosis/symptoms-causes/syc-20351738>
- <https://pubmed.ncbi.nlm.nih.gov/28196298/>