



# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

Feed the Future Innovation Lab for Livestock Systems

## Guide for training of pastoralists (women) in Borana Zone, Oromia Region, Ethiopia on good milk production, handling and processing practices and prevention of the transmission of milk-borne zoonotic diseases



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### **Credits and Disclaimer**

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This manual is made possible by the generous support of the American people through the United States Agency for International Development (USAID) and its Feed the Future Innovation Lab for Livestock Systems managed by the University of Florida and the International Livestock Research Institute. The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government.

The authors of this guide declare that it was prepared by consulting various dairy hygiene training manuals and textbooks but major modifications were made to suit to the targeted trainees (pastoral livestock production system where there access to standard facilities is very low). Maximum care was taken on the correctness of the contents of the guide but recommendations should not be taken as authoritative and any possible damage as a result of the use of the guide is not the responsibility of the authors.

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## About this training guide

This training manual was prepared in the framework of a research project titled “Improving handling practices and microbiological safety of milk and milk products in Borana pastoral communities, Ethiopia”. The project is funded by USAID through the Feed the Future Innovation Lab for Livestock Systems of the University of Florida and implemented with partnership of various institutions (the College of Veterinary Medicine and Agriculture of Addis Ababa University, International Livestock Research Institute, University of Tennessee, Agriculture Research Service of the United States of Department of Agriculture, and Yabello Pastoral and Dryland Agriculture).

The purpose of the guide is to give structured approach in the training of pastoral women in proper hygienic practices when handling milk and milk products. Given that the target groups in the training are pastoral women without formal education, the technicality of the veterinary medical terminologies were kept minimal when preparing the guide. However, it was not possible to have word by word translation for all of the terminologies and concepts of animal or human diseases (specifically related to zoonotic diseases). It is known that good milk production practices can involve advanced techniques and procedures which demand capital and technical knowledge to implement. Given that the pastoralists do have very limited access to such advanced dairy technologies, it was pragmatic enough to only focus on practices which can be improved in the local context. Therefore, some of the standard dairy hygiene recommendations intentionally not included in the training guides. It is known that the guide was prepared for specific project in Borana pastoral areas but can be modified and used for other settings as well.

We recommend that the trainer (s) should review the content of the guide before the actual training and well acquainted with the whole contents.

The training will involve participatory approach in which full participation of the trainees will be ensured through questions and answers between the different sessions.

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## **Objective of the training**

The objective of the training is to improve the knowledge, attitude and practices (KAP) of women with regard to milk handling, processing and consumption, and the potentially associated health risks, with a focus on microbial hazards. The focus on training is good milk production, handling and processing practices and prevention practices for the transmission of milk-borne zoonotic diseases. A training of 3 days will be conducted in four villages (effective 20 hours of lecture and practical demonstration).

## **Training contents (modules)**

The guide is divided into five parts or modules

Module 1: Food hygiene and food-related health problems

Module 2: Importance of milk and factors affecting contamination of milk or milk products

Module 3: Udder health problems and management

Module 4: How to produce clean and safe milk

Module 5: Milk-borne zoonotic diseases (brucellosis and tuberculosis)

### Training schedule (suggested)

Day	Time	Topics	Remarks
<b>Day 1</b>	8:30 AM-12:30 PM	Introduction and pre-training assessment of KAP (questionnaire)	Will be carried out by 3-4 individuals selected from district pastoral development office
	12:30-2:00 PM	Lunch	
	2:00 -4:50 PM	Module 1&2	
<b>Day 2</b>	8:30 AM-12:30 PM	Module 3	
	12:30-2:00 PM	Lunch	
	2:00 -4:50 PM	Module 4 (field visit for practical demonstration)	
<b>Day 3</b>	8:30 AM-12:30 PM	Module 5	
	12:30-2:00 PM	Lunch	
	2:00 -4:50 PM	Post-training assessment of KAP (questionnaire)	

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## Module I: Food hygiene and food-related health problems

### 1.1.Objective and goal of the module

This part will briefly introduce the importance of food hygiene in relation to human health. Discussions will be held with the pastoralists regarding their perceptions about the hygiene and safety of foods they are producing or consuming. The goal of the module is to help the trainees to understand the biological causes of food spoilage and related health risks towards improving food related malpractices leading to food contamination. . Understanding the biological mechanisms of the foodborne illness can be difficult for pastoralists which are often without formal education. Therefore, the module will be designed to effectively communicate to the pastoralists about the role of microorganisms (germs) in causing food spoilage (especially milk spoilage) and their relation to the health of consumers. The module will apply in general to foods, to then go more on the specifics of milk hygiene.

### 1.2.Possible required materials for training

- Flipchart
- Marker
- Sticker card
- Bacterial culture from lab (flashcard)

### 1.3.Approach

Interactive lecture based with full participation of the trainees in the form of questions and answers, experience sharing and picture demonstrations.

The training will be provided in Afaan Oromoo language by a trainer fluent in the language and in addition assisted by a person speaking Borana dialect of Afan Oromo. The assistant from the area will participate in all trainings and help address any potential language misunderstandings between the trainer and the participants.

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## 1.4.Contents (guide for the trainer, statements are suggested)

### About importance of food

We start from something every one of us are very familiar with it.

What is food?

Food is any substance which humans eat and drink (for the purpose of enjoyment, building body, keeping health, getting energy and the likes).

Food is good and it is one of the basic necessities for human survival.

Food has many functions including necessity for human survival, social and psychological satisfaction.

**Questions for the audiences:** Tell us food consumed in Borana. Which types of food consumed and in what forms?

**[For the trainer]:** Take about 10 minutes to jot down and discuss common locally available food types listed by the pastoralists. The discussion should be noted on flipchart or potentially audio or video recorded. The discussion should focus on the source, ingredients and preparations.

If food of animal origin such as meat, poultry, milk and egg and their products are not listed, probe the trainees [e.g., Asking what about meat and milk?]

### Food hygiene and safety

We have stated that food is good in various aspects. But consumption of improperly produced and handled food can harm the health of consumers.

Food should be of high quality and safety:

- **Nutritious:** refers containing substances useful for human body in adequate quantity
- **Clean:** refers to free of any visible dirt
- **Psychological acceptability** refers to pleasing look to our sense organs (smell, taste, touch, sight).



- **Safety of food** refers to food free from anything which can harm health of consumer.

[Points of emphasis for the trainer]:

*“Clean and psychologically pleasing appearance of food do not give guarantee for its safety”*

### How to keep food safe (free of harmful things)?

Ensuring food safety requires due attention during harvest, transport, processing, storage and finally during food preparation and storage of processed food by consumers.

What are the things which make food unsafe?

- Germs (microorganisms)
- Chemicals (poisons)
- Physical (non-edible substance such as hairs, nails, glass etc)

**Germs** (microorganisms) are very small living things which cannot be seen with the naked eye.

There are three different types of microorganisms: the good, the bad and the dangerous.

1. The good germs (e.g. those responsible for making yoghurt and bread)
2. The bad germs (e.g. cause food spoilage) but do not usually make people sick. They cause food to cause bad smell, taste and look.
3. Dangerous germs make people sick and can even kill. As noted before, the smell, taste and appearance of food are not good indicators of whether the food will make you sick  
[Show below flash card of E.coli grown on selective media).

Germs are everywhere, but are mostly found in:

- Feces of animals;
- Soil and water;
- People (bowel, mouth, nose, intestines, hands, **fingernails** and skin).



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**What are the symptoms of diseases we get from eating spoiled food containing dangerous germs?**

Range of illnesses can be associated with consuming contaminated food (which can be caused by germs, poisons or presence of physical or unwanted materials).

The most common symptoms may include:

- Stomach pains
- Vomit
- Diarrhea
- Increased body temperature

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*Diseases we get from spoiled food can cause  
severe health problems in*



- Germs are the major causes of foodborne illness.
- People can get foodborne illnesses and recover without serious consequences.
- But some of the effects can be serious leading to long lasting disability (kidney failure, inflammation of joints, brain damage etc) and even death.
- Health disorders results in poor appetite reducing dietary intake affecting nutritional status
- Causes mal-absorption and reduced utilization of micronutrients due to diarrhea and vomiting

All foods are not equally harboring microorganisms.

- Out of food items available for human consumption, food from obtained from animals (e.g. meat and milk) provide ideal conditions for germs to grow and can cause high health problems.
- The good the news about foodborne illnesses, they are preventable following good production, handling and consumption practices:
  - by keeping clean the food and environment
  - thoroughly cooking food and immediately consuming

## Module 2: Importance of milk and factors affecting contamination of milk or milk products

[Note of the trainer: Similar material and approach for module 1]

### 2.1. Why milk and its nutritional importance

[Ask the pastoralists for reflections on the importance of milk in human nutrition. Ask volunteer to say proverb or short traditional music about livestock or dairy animal or milk]

- ✓ Milk is 'perfect' food when produced and consumed under good practices.
- ✓ Milk is a valuable source of important nutrients required for human body.
- ✓ In pastoral communities, milk makes a substantial part of the diet of the people.
- ✓ Milk especially good for infants and growing children [Show flash card, picture of pastoral child drinking milk]



But milk is highly perishable food if not produced and handled in good condition.

Milk can easily be contaminated and it is an efficient vehicle in transmitting variety of agents causing diseases in humans.

The hygiene of milk or milk products is affected by different factors related to animal, person milking the animals, milk containers and the environment the animals are housed or milked.

Milk can contain dangerous germs which can affect the health of consumers.

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[For trainer: Ask the following question the participants and get feedback from them. Jot down the reflections. After the reflections, discuss further based on the following text].

## **2.2. How can germs potentially contaminate milk and dangerous for consumers? Or how can germs enter into milk?**

After above discussion, give explanation on the following conditions (cases).

The conditions of contamination of milk can be classified into the following categories.

### **Case 1: Before milk is removed from the udder**

a) When an animal is infected with pathogens and the pathogens secreted into milk. This occurs when animals are affected by germs which cause diseases such tuberculosis, brucellosis and salmonellosis. Dear participants, there will be separate session to discuss diseases of such types (i.e. those transmitted from animals to humans).

b) Milk can be contaminated when the animal is suffering from mastitis: (1) subclinical mastitis: no symptoms, but detected by special diagnostic technique or (2) clinical mastitis: shows visible signs). Separation discussion will be followed in the next sessions about udder health problems.

### **Case 2: Contamination after milking**

This is the most common means of contamination. The sources of the contaminants can be feces, soils, skin surface of animals or hands of humans, improperly cleaned milk containers, use of contaminated water for cleaning and insects.

[For trainer: Use flashcards or PowerPoint slides to show the following conditions in explaining the source of contamination]:

(1) flank/udder of cow heavily soiled with feces



(2) the container is put upside down directly on soil during smoking of the container



(3) Container highly covered with flies because it was kept uncovered after using it



(4) Hand of woman soiled with feces



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## Module 3: Udder health problems and proper management

[Note for the trainer: Follow same format as module 1)

### 3.1. Why udder health?

We have discussed about the important of milk in the diet of people. Healthy udder produces healthy milk intended for human consumption and also for the newborn of the animal itself. There are various udder health problems which can include external injuries to internal infections.

The position of udder relative to the other body parts of animals makes it open to physical problems (e.g. injuries in the form of laceration from thorns, wires).

Skin diseases of the udder include germ infections, mange and wounds

The control and management of diseases such as mastitis is the responsibilities of the livestock keepers.

So, you as pastoralists keeping livestock need a good knowledge about udder health of your animals.

Having detail understanding and knowledge about udder health can help you to get the best possible benefits from the dairy animals you are keeping or the milk you produce.

### 3.2. Udder and teat health problems

There are different udder health problems which we will discuss now.

#### 3.2.1. Udder tick infestation and consequences

[For trainer: Pastoralists have good knowledge about tick infestation and the biology of ticks.

Before starting the module, ask few questions about ticks and the infestation to get information in advance. This can save time and also focus on only areas where misunderstanding is there].

- What do you know about ticks?
- In which season ticks are common?
- What are the effects of tick infestation on the health of animals?
- What do you think the effect of tick infestation on udder health?

[The trainer or assistant trainer should jot down the responses of the trainees and give explanation if some of the descriptions given by them deviates from the existing scientific knowledge. After the interactive discussion, share the following information with the participants].



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Ticks are external parasites which have negative impacts on the health and productivity of the animals.

There are different types of ticks and some ticks can have long mouth which can damage skin. Ticks have preference for different body parts of the animal and udder is one of the body parts preferred by ticks [Show flashcard of tick infested udder].

Skin damage due to ticks can result in wound formation and subsequently pus can be formed.

### **3.2.2. Mastitis**

Mastitis is inflammation (soreness) of udder tissues.

Mastitis represents the commonest udder health problems of dairy animals.

The udder can be inflamed when the gland is affected by germs or injured physically (e.g. thorny plant or tick infestation which facilitates bacterial entry) or exposed to chemical irritants.

The most common cause of mastitis in dairy animals is germs.

#### *Factors which may increase the chance of animals to get mastitis (predisposing factors)*

- As age increase chance of getting mastitis increases
- State of lactation- more likely mastitis occurs at early and late lactation
- High yielding animals are most commonly affected by mastitis and care should be taken for these animals
- Poor milking hygiene increases the occurrence of mastitis (contagious pathogens can be transmitted from infected to health one)
- Teat sores and trauma to the udder will predispose animals to mastitis
- Poor hygiene of the environment where the animals are sleeping or resting

Mastitis in dairy animals can be classified into two major categories: clinical (the one with symptoms) and

#### *Symptoms of mastitis*

According to the presence or degree of the symptoms, mastitis can be roughly divided into different forms.

##### **1. Mastitis without symptoms (Sub-clinical mastitis)**

- No visible signs (the cow, the milk and the udder are apparently normal)

1. Only identified by indirect examination of milk [For trainer: Demonstrate CMT by using already known milk from mastitic animal].

## 2. Mastitis with symptoms (Clinical mastitis or visible mastitis)

[For trainer: Ask the trainees open question on what symptoms an animal exhibits when suffering from clinical mastitis. Jot down the lists of the symptoms and discuss further on the unnamed symptoms. Give emphasis in differentiating mastitis and physiological changes, e.g. edema (accumulation of fluid in udder tissue) in the late pregnancy and early lactation. At the end of this session, the trainees should get clear understanding of the differences between inflammation of udder and physiological (normal) changes]

In case of clinical (visible) mastitis, various symptoms are evident related to changes in milk, udder and the general body of the animal. One or more of the following symptoms can be observed depending on the severity of mastitis.

- Mild signs include clots in the milk and may have slight swelling of infected quarter.
- Changes in milk secretion which can vary from wateriness with a few clots
- There is swelling, heat, pain and abnormal secretion of the gland
- Slight to moderate systemic disturbances such as fever and depression
- Milk consists of either a precipitate of yellow sediment or blood clots with or without flakes of a white or yellowish color
- Severe systemic disturbances such as fever, marked depression, rapid weak pulse, sunken eyes, weakness, and complete loss of appetite, dehydration and death may occur.

### *How to know animals have mastitis?*

- For mastitis which is not apparent (subclinical mastitis), we have to depend on laboratory tests. For example, there is a test called California Mastitis Test (CMT) which detects inflammatory response and indirectly shows presence of mastitis [
- When the condition is clinically apparent, careful observation of clinical signs are useful (touching of the udder for its consistency, temperature and size are important). The udder becomes hard and painful to touch, hot and increased size when animals are suffering from mastitis

- Another useful means to detect visible mastitis is examination of milk for change in color, composition, odor and the presence of flakes or clots.

### *How to treat mastitis?*

*[For trainer: Explain that treatment should be done through advice from animal health professional and it is not good to give many antibiotics], put the emphasis of the discussion on prevention methods (see below)]*

- Treatment is recommended when clinical mastitis occurs
- Systemic application of antibiotics especially for severe mastitis is recommended
- Intra-mammary infusion of combination of drugs can be used (intramammary infusion, seek professional assistance)

### *Control and prevention of mastitis*

- Improving the hygiene of the place where animals are kept overnight (e.g. frequent removal of manure)
- Follow proper milking techniques (e.g. don't use stripping, instead use squeezing).  
[Demonstrate flashcard showing stripping and squeezing]





- Control of tick infestation (Use manual removal or acaricides to control tick infestation based on strict advice from animal health professionals)
- Cuts and injuries on udder or teat should be treated immediately using topic antiseptics locally available (e.g. **GV**)
- Animals suffering of mastitis should be milked completely to facilitate healing and also prevent potential blockage of teat canal if not milked.
- To prevent transmission of pathogens from animals suffering from mastitis to healthy once, animals suspected of having mastitis should be milked at last (i.e. after milking healthy animals)
- Milk from mastitic animal can contain dangerous germs and also small quantity of drugs (residues). Therefore, milk from animals suffering from mastitis should not be consumed especially if the animal is receiving drug treatment (even after boiling, it should not be used for human consumption).

**Concluding remarks:**

**[For trainer: Tell the trainees that “evil eye” does not cause mastitis and reach at consensus with thorough discussion on the causes of mastitis]**

## Module 4: How to produce clean and safe milk

### When milking animals:

- Isolate sick animals and milk them last
- Don't mix milk obtained from sick animals with normal
- Clean udder, teats and flank of the animal before milking
- Dispose the fore-milk
- Tie tails of troublesome animals when milking
- Properly restrain the animal by loosely tying on the hock with rope
- Don't allow calf to suckle when milking
- Don't use your saliva for lubrication
- Don't put your finger into the milk for lubrication
- Squeeze the teat instead of stripping [show picture of the two milking methods using flashcard]
- Wash hands with water and dry them well before starting milking of animals

### Milker

- The person milking animals should be healthy and clean (for example, should not suffer from cough, diarrhea and similar health ailments)
- Maintain short finger nails and hair cut (or cover hair)
- Avoid smoking or chewing tobacco during milking time.
- Milking should be carried quickly without interruptions

### Milking environment

- As much as possible, try to prepare and use dry and clean milking area for your animals
- Give small amount of roughage feed at the time of milking
- Avoid any source of bad smells around the milking area
- Livestock should not have access to the shed during the day

### Milking utensils

- It is good to use utensils preferably stainless steel for milking and milk storage
- If you are cleaning by washing, don't use perfumed soap or detergent

- 
- After washing, put upside down the containers with direct sun exposure
  - If you are smoking, don't put down on container on the floor [use flashcard]
  - Cover the container after smoking or washing until you use it for milking or milk storage

### **Milk storage and transport**

- Immediately transport milk to market places or keep milk at cool places until you transport
- If it is necessary to keep overnight, soak a sack or textile and cover the surface of container to reduce the temperature (for example, wrapping using sisal fiber) [use picture]

## Module 5: Milk-borne zoonotic diseases (tuberculosis and brucellosis)

[Note for the trainer: This part is going to be prepared in poster format]

There are many diseases which humans can get from animals. In science, we call these diseases zoonoses. Zoonoses are diseases which can be transmitted from animals to humans. In our training, we will consider two of diseases which can be transmitted from animals to humans.

The first disease which will discuss is called tuberculosis (specifically tuberculosis of cattle) and the second one is brucellosis. We will have separate description and discussion for the two diseases in subsequent sessions.

### **Bovine tuberculosis**

#### **What causes tuberculosis in humans and animals?**

Tuberculosis is an infectious disease of both animals and humans caused by germ called *Mycobacterium* (the germ is grouped under a group of small living organisms called bacteria). The germs which cause tuberculosis in animals and humans are very similar.

A germ scientifically called *Mycobacterium bovis* (“cattle type”) is the cause of cattle tuberculosis and the corresponding germ in human is called *Mycobacterium tuberculosis* (“human type”).

It is known that the “human type” is the most common cause of tuberculosis in humans.

The “cattle type” in addition to causing tuberculosis in various animals, it causes very similar disease in humans.

#### **How transmission occurs from animals to animals or from animals to humans?**

Cattle can spread this disease to other cattle in the following ways:

- through respiratory route when animals breath (especially when coughing droplets)
- when healthy animals, especially the young ones, consume infected or contaminated milk from diseased animal

- animals can also get tuberculosis before birth through the placenta
- it is possible that animals can get tuberculosis causing germs when their feed or water is contaminated with the germs

### **Transmission to humans**

- Consumption of raw milk or milk products
- Direct transmission to human through inhalation of air droplet from the animal is also another means. In this case, people working closely with animals such as herders and those sleeping close to animals (e.g. keeping of animals in house overnight) are prone to get tuberculosis from animals

### **Symptoms in animals**

- In the early stages of tuberculosis, symptoms are not visible (that is an animal can live infected without showing any sign for long period of time). After extended time, when the infected animal starts to show symptoms, the visible signs depend on the extent and location of wound (lesion). Overall, chronically animal infected with tuberculosis can show the following symptoms:
  - Enlargement of superficial lymph nodes
  - Weakness
  - Irregular appetite
  - Difficulty in breathing
  - Emaciation (loss of body weight), chronic wasting even if the animal put under good nutrition and care
  - Fluctuating temperature
  - Dry cough (if lung involved)

### **Symptoms in humans**

Similar to cattle, tuberculosis in humans is chronic disease with the following symptoms.

- Fever
- Coughing
- Night sweat



- Loss of appetite
- Weight loss
- Abdominal pain
- Diarrhea
- Death if not treated

### *Diagnosis (how to know an animal has the disease)*

- Clinical diagnosis of tuberculosis in animals is usually possible only after the disease has reached an advanced stage
- The disease can be diagnosed when slaughtering. **[For trainer: Show typical pathological lesions of tuberculosis in cattle using flashcard]**
- Animal health professionals can test the animal by injecting special diagnostic solution (tuberculin) under skin and check whether an animal has been infected [For trainer: show a flashcard showing skin test]
- Diagnosis of tuberculosis in humans done by health professionals (please consult health extension agent of your village or the nearest health centre for more information about tuberculosis diagnosis, treatment and control in humans)

### **Treatment, control and prevention**

- Treating of animals suffering from tuberculosis using drugs is not recommended.
- There is no effective vaccination for tuberculosis in animals
- The only option is culling or systematically removing of infected animals (e.g. through slaughtering)
- Heat treatment of milk or milk products before consumption is a good option to control transmission of the germ from animal to humans through milk).
- Anyone who is showing above stated symptoms should consult health professional.
- The disease in humans can be treated by a complex combination of drugs over a long period.

## **Brucellosis [to be prepared in poster form)**

The second disease which we will discuss is called brucellosis. Brucellosis affects wide range of animal species and also humans. The germ which causes brucellosis is called Brucella. Brucella infection in animals is generally characterized by abortion related to the inflammation of the uterus and fetal membranes. In humans, brucellosis is characterized by varying symptoms from mild flu-like to severe illnesses. The disease affects commonly nervous, musculoskeletal and cardiovascular systems of human body.

We will discuss the symptoms of brucellosis separately for cows, bulls and small ruminants

Symptoms of brucellosis in cows:

- Increased temperature
- Late abortion
- After abortion, slimy pus-like, grey-whitish to reddish vaginal discharge
- Retention of fetal membrane
- Increased intercalving
- Permanent sterility

Brucellosis in bulls:

- Acute fever
- Swollen scrotum with pain (due to orchitis - inflammation)
- Decreased feed intake
- Hygromas (swelling of the carpal joint)
- Enlargement of lymph nodes around testicles

***Brucellosis in small ruminants:***

Brucellosis is characterized by orchitis and epididymitis as well as inflammation of the joints and bursae. Abortion may also occur in the female small ruminant.

- Infertility (both male and female)
- High mortality in lambs/kids
- Mastitis
- Reduced milk production

## **Symptoms of brucellosis in humans**

The following clinical signs may occur from week, months to years

- Loss of appetite
- Headaches
- Chills
- Night sweating
- Weight loss
- Joint pain
- Muscle pain
- Back pain
- Inflammation of testicle

### *How to know animals or humans are affected by brucellosis (Diagnosis)*

Brucellosis in animals or humans can be suspected from the clinical presentation but definitive diagnosis should be based on laboratory examinations. Therefore, humans suspected of contracting brucellosis should consult human health professionals and for animals veterinary professionals.

### *Treatment, control and prevention*

Treatment of brucellosis in domestic animals is not recommended.

Humans are treated with antibiotics (doxycycline with rifampicine).

To prevent yourself or your family from brucellosis, do the following:

- Don't touch
- As much as possible avoid consuming not boiled milk and milk derivatives, especially when obtained from abortion cases.
- When assisting animals during delivery, avoid direct contact with afterbirths and use protective (gloves) if handling is a must. Such precaution should be especially made when abortion cases are handled and managed.

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