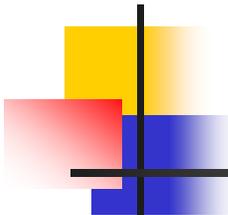


# **Surveillance of animal brucellosis**

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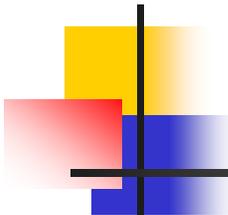
**Assoc.Prof.Dr. Theera Rukkwamsuk**  
**Department of large Animal and Wildlife Clinical Science**  
**Faculty of Veterinary Medicine**  
**Kasetsart University**



# Review of the epidemiology of brucellosis

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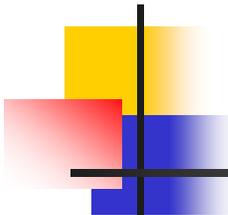
- **Brucellosis is a zoonotic disease occurring in humans and various species of domesticated and feral (wild) animals. The three species of *Brucella* of major concern here are *B. abortus*, *B. suis*, *B. melitensis***



# **Review of the epidemiology of brucellosis**

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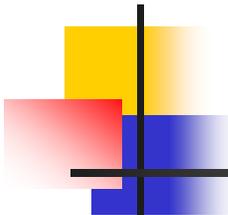
- **All are not host-specific, and may transmit to other animal species under appropriate condition.**
- **Initial infection in the reservoir species is often followed by abortion and subsequent delayed or permanent infertility.**



# **Review of the epidemiology of brucellosis**

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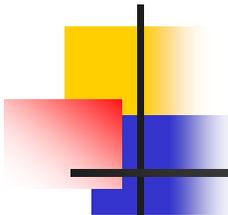
- **Infection is usually chronic in animals, and treatment is rarely undertaken.**
- **Infected animals shed the organisms in uterine discharges following abortion and subsequent parturition, and also in the colostrum and milk**



# Review of the epidemiology of brucellosis

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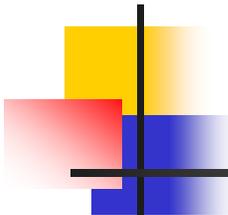
- **Brucellosis is a herd or flock problem.**
- **It is spread within the herd primarily by ingestion of contaminated material.**
- **Venereal infections can also occur, but this is mainly seen with *B. suis* infections.**
- **Spread between herds usually occurs by the introduction of asymptomatic chronically-infected animals.**



# **Review of the epidemiology of brucellosis**

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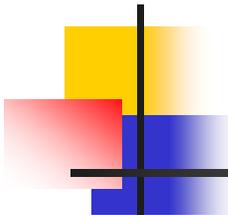
- **Human infections are characterized by a variable incubation period (from several days up to several months), and clinical signs and symptoms of continued, intermittent or irregular fever of variable duration, with headaches, weakness, profuse sweating, chills, depression and weight loss.**



# **Review of the epidemiology of brucellosis**

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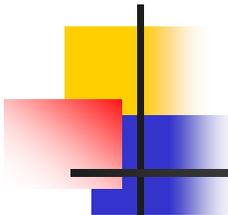
- **Diagnosis of clinical brucellosis in humans and animals is initially made by use of appropriate serological or other immunological tests, and confirmed by bacteriological isolation and identification of the agent.**



# **Review of the epidemiology of brucellosis**

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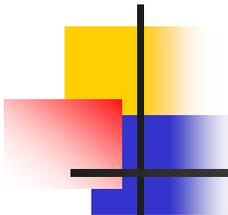
- **Transmission of infection to humans occurs through breaks in the skin, following direct contact with tissues, blood, urine, vaginal discharges, aborted fetuses or placentas.**
- **Food-borne infection occurs following ingestion of raw milk and other dairy products, but rarely from eating raw meat from infected animals.**



# **Review of the epidemiology of brucellosis**

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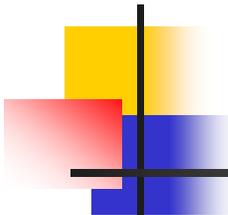
- **Occupational airborne infection in laboratories and abattoirs has also been documented.**
- **Accidental inoculation of live vaccines can also occur, resulting in human infections.**
- **There are also case reports of venereal and congenital infection in humans.**



# Review of the epidemiology of brucellosis

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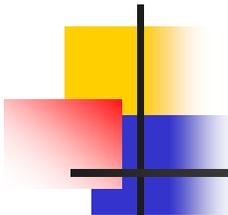
- **The disease occurs worldwide, except in those countries where bovine brucellosis (*B. abortus*) has been eradicated.**
- **Australia, Canada, Cyprus, Denmark, Finland, the Netherlands, New Zealand, Norway, Sweden and the United Kingdom.**



# Review of the epidemiology of brucellosis

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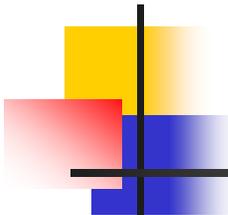
- **The mediterranean countries of Europe, northern and eastern Africa, Near East countries, India, Central Asia, Mexico and Central and South America are especially affected.**
- **There are no reliable reports that *B. melitensis* has been eradicated from small ruminants.**



# Review of the epidemiology of brucellosis

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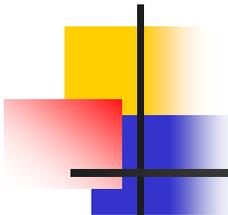
- **The sources of infection for humans and the species of *Brucella spp.* found vary according to geographical region.**
- **It is usually either an occupational or a food-borne infection.**
- **Both sporadic cases and epidemics occur in human, but often the disease is either unrecognized, or, if diagnosed, not reported to the public authorities.**



# **Review of the epidemiology of brucellosis**

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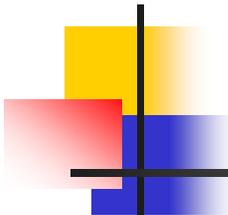
- **Methods of prevention include health education to reduce occupational and food-borne risks, including pasteurization of all dairy products.**
- **Ultimate prevention of human infection remains elimination of the infection among animals.**



# Review of the epidemiology of brucellosis

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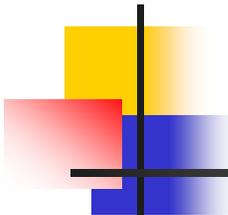
- **A combination of vaccination of all breeding animals to reduce the risks of abortion and raise herd immunity, followed by elimination of infected animals or herds by segregation and slaughter.**



# Critical issues in designing a brucellosis surveillance system

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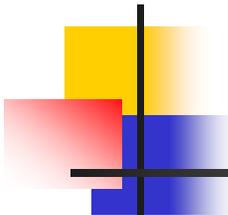
- **Epidemiological surveillance is the ongoing and systematic collection, analysis and interpretation of health-related data.**
- **The process involves describing and monitoring health events in populations of humans or animals, or, in the case of a zoonosis such as brucellosis, both.**



# Critical issues in designing a brucellosis surveillance system

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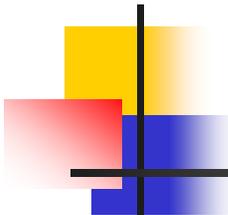
- **Typical questions to which a surveillance system might be asked to provide answers include**
  - **How extensive is the infection, and when and where is it occurring?**
  - **Which species of *Brucella* are involved?**
  - **Which animal species are involved?**
  - **Is the prevalence and incidence (human or animal) decreasing, increasing, or static?**



# Critical issues in designing a brucellosis surveillance system

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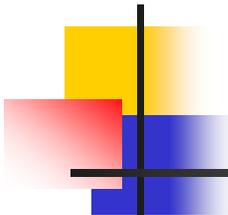
- **When epidemics occur, what is the source, and how is the agent being transmitted?**
- **What strategies should be adopted to control, prevent and ultimately eradicate the infection?**
- **What are the knowledge, attitudes and practices of the populations affected?**
- **What laboratory or field research needs to be undertaken?**



# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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- 1. Identify indicators of human and animal health events – surveillance should always be outcome-oriented, and thus focused on events associated with the disease under surveillance. These include specific epidemiological indices such as the total number of cases, incidence and prevalence rates, and severity as measured by days hospitalized and economic impacts**

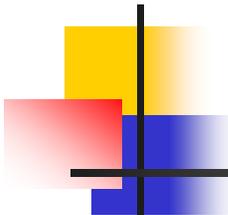


# Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system

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## 2. **Establish clearly defined objectives**

- **Determination of the incidence and prevalence of infected humans, animals and herds or groups of animals, villages, states, regions, etc.**
- **Detection of epidemics and sporadic or endemic cases**
- **Identification of vehicles and routes of transmission to humans, whether food-borne, airborne, through animal contact or between flocks or herds of animals.**
- **Monitoring of short- and long- term trends by location and over time**

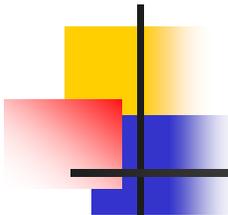


# Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system

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## 3. Develop specific case definitions

- For human disease, a specific set of symptoms and signs, together with laboratory tests, are needed to describe possible, probable or confirmed cases.
- With animals, isolation of *Brucella* species is used, with or without serological evidence.
- Whether system is chosen, it should be both comprehensive and mutually exclusive. For animals, this may be positive, negative or uncertain.

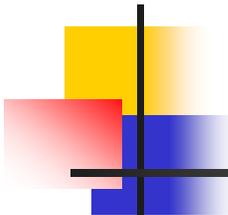


# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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- 4. Identify existing data sources, or develop new data collection systems, including a flow chart. Questions to be answered!**

**4.1 Will brucellosis be a notifiable (by law or regulation) infection for physicians, veterinarians, laboratories, etc? Or will it be voluntary?**



# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

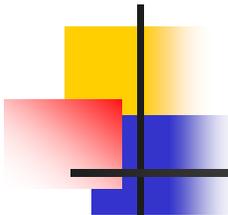
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**4.2 Will the system be complete census based, sample (random or non-random) based, or sentinel based?**

**4.3 Identify both passive and active surveillance component.**

**4.4 Can the populations at risk be identified and enumerated, and how accessible are they?**

**4.5 Will data collection be for a specific time, or open-ended?**



# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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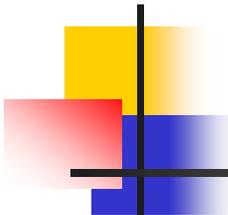
**4.6 What samples and data will be collected, by whom, and where?**

**4.7 Who will provide the data and how reliable is this source?**

**4.8 How will the information be transferred and stored?**

**4.9 How will laboratory results be linked to the human and animal databases?**

**4.10 Who will carry out quality control checks?**



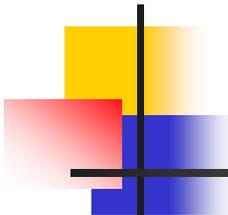
# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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**4.11 Who will analyse the data, how, and how often?**

**4.12 What format should the summarized reports take, and with what frequency will they be disseminated?**

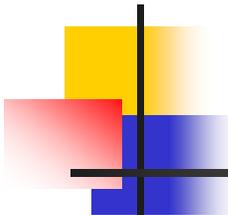
**4.13 To whom will the reports be distributed?**



## **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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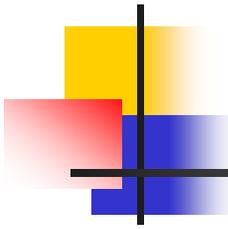
- 5. Pilot test the methods in the field – there will always be unforeseen problems, especially in any new system, so a pilot test is always required.**



## **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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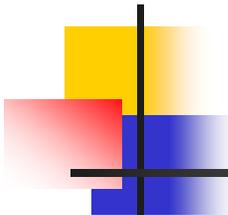
- 6. Define role of the laboratory in brucellosis surveillance – identify current and future resources for both regional and central laboratories, including training, equipment, reagents and supplies. All tests should be documented by Standard Operating Procedures, including quality control program.**



# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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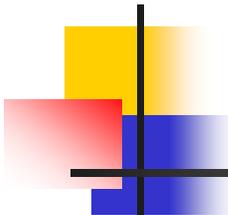
- 7. Control validity of the system – whether paper- or computer-based, error can always occur.**
- 8. Analyses and interpret surveillance data – exploratory data analysis involves using techniques to make the overall dataset more understandable.**



## **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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- 9. Develop dissemination methods – new surveillance information, conclusion and recommendations soon become redundant unless distributed promptly to those with a need to know. Therefore a regular reporting system should be developed, whether it be a simple newsletter, posted, faxed or sent electronically to the district level, or a more complex set of analyses for decision makers.**



# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

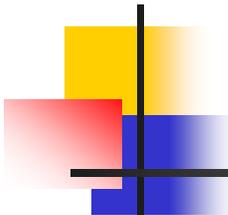
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## **10. Evaluate brucellosis surveillance systems**

**10.1 describe the health events under surveillance in terms of number of cases, incidence and prevalence**

**10.2 describe the system to be evaluate, including the objectives, and case definitions of health events under surveillance**

**10.3 indicate the usefulness of the system by describing actions taken by decision-makers and others**

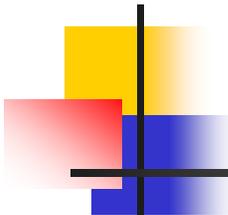


# **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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## **10.4 Evaluate the overall system for each of the following attributes:**

- **Symplicity**
- **Flexibility**
- **Acceptibility**
- **Sensitivity**
- **Predictive value**
- **Positive results**
- **Representativeness and**
- **timeliness**

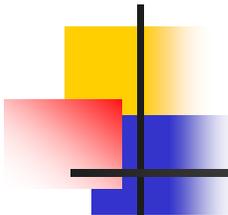


## **Ten basic steps in designing and operating a coordinated human and animal brucellosis surveillance system**

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**10.5 Describe the resources used to operate the system, and if possible, estimate the direct costs.**

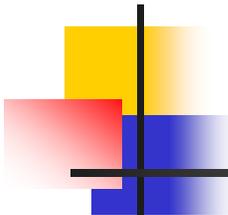
**10.6 List conclusions and recommendations. State whether the system is meeting its objectives, and assess the need to continue or modify the surveillance system or both.**



# Surveillance of ovine and caprine brucellosis

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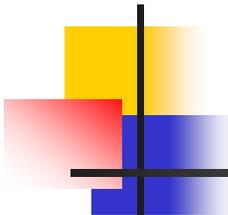
- ***Brucella melitensis* is the main causative agent of caprine and ovine brucellosis.**
- **Clinically, the disease is characterized by one or more of the following signs: abortion, retained placenta, orchitis, epididymitis and, rarely, arthritis.**



# Surveillance of ovine and caprine brucellosis

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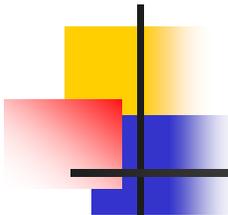
- **Identification of the agent**
  - **Presumptive evidence of *Brucella* is provided by the demonstration, by modified acid-fast staining of organisms, of *Brucella* morphology in abortion material or vaginal discharge, especially if supported by serological tests.**



# Surveillance of ovine and caprine brucellosis

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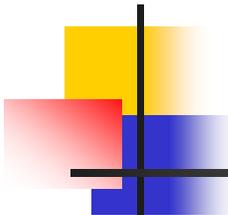
- **Serological and allergic skin tests – the Rose Bengal plate agglutination, complement fixation and indirect ELISA tests are usually recommended for screening flocks and individual animals. The complement fixation test is the only test prescribed for confirmation and international trade, but other tests, such as the immunodiffusion and competitive ELISA, are useful for confirmation purposes.**



# Surveillance of ovine and caprine brucellosis

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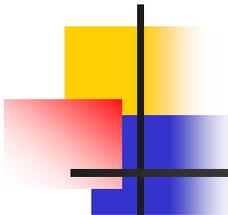
- **The serum agglutination test (SAT) is not considered reliable for use in small ruminants.**
- **For pooled samples, there are no useful tests equivalent to the milk ring test in cattle.**
- **The brucellin allergic skin test can be used as a screening or complementary test in unvaccinated flocks, provided that a lipopolysaccharide-free and standardized antigen preparation is used.**



# Surveillance of ovine and caprine brucellosis

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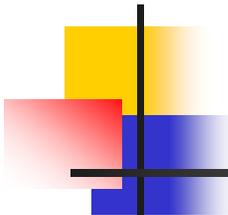
- **Results must then be interpreted in relation to the clinical signs, history, and the results of serological or culture examination.**



# Surveillance of ovine and caprine brucellosis

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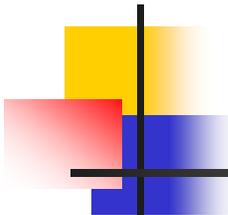
- **Requirements for vaccines and diagnostic biologicals**
  - ***B. melitensis* strain *Rev. 1* live vaccine is recommended to immunize sheep and goats at risk of infection from *Brucella*.**



# Surveillance of ovine and caprine brucellosis

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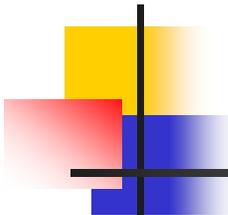
- **High or unknown prevalence phase with no control programs**
- **Mass vaccination phase**
- **Test and removal, segregation or slaughter phase**
- **Freedom phase**
- **Maintenance of officially free status**
- **Suspension and recovery of officially free status**



# Freedom phase

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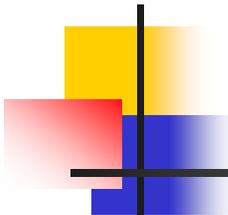
- **The occurrence or suspected occurrence of caprine and ovine brucellosis has been compulsorily notifiable for at least five years**
- **All flocks of sheep and goats in the country or part of the territory of the country are under official veterinary control**



# Freedom phase

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- **99.8% of these flocks are qualified as officially free from caprine and ovine brucellosis**
- **No case of brucellosis in sheep or goats has been reported for at least 5 years, and no sheep or goats have been vaccinated against the disease for at least 3 years**



# **Suspension and recovery of officially free status**

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- **All infected and in-contact animals have been eliminated from the flock as soon as the result of the diagnostic test was known**
- **All remaining sheep and goats in the flock over six months of age on the day of sampling have been subjected to a diagnostic test for caprine and ovine brucellosis, with negative results, on two occasions, at an interval of not less than three months**