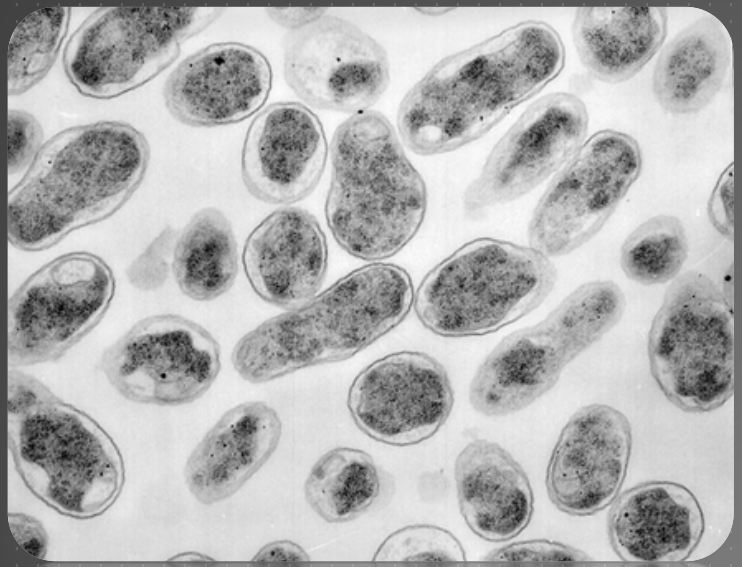
BRUCELLOSIS OVERVIEW



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RECENT EPIDEMIOLOGY REPORT

The owner reported heifers congregated around and licked a newborn elk calf in May 2011.

OVERVIEW

- Organism
- Epidemiology
- Transmission
- Disease in Humans
- Disease in Animals
- Diagnosis
- Prevention and Control

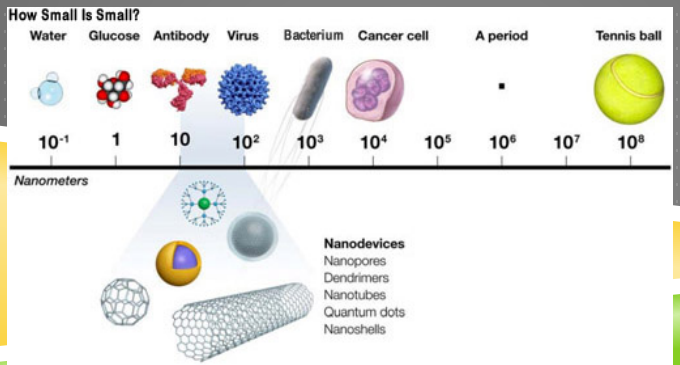
VIRUSES VS. BACTERIA

Viruses

- Size
  - Tiny
- Treatment
  - Antivirals
- Vaccines
  - Available
  - Usually very effective
- Immunity
  - Often lifetime

Bacteria

- Size
  - Small
- Treatment
  - Antibiotics
- Vaccines
  - Sometimes
  - Multiple doses
  - Efficacy varies
- Immunity
  - Temporary



THE MANY NAMES OF BRUCELLOSIS

Human Disease

- Malta Fever
- Undulant Fever
- Mediterranean Fever
- Rock Fever of Gibraltar
- Gastric Fever

Animal Disease

- Bang's Disease
- Enzootic Abortion
- Epizootic Abortion
- Slinking of Calves
- Ram Epididymitis
- Contagious Abortion

DISTRIBUTION

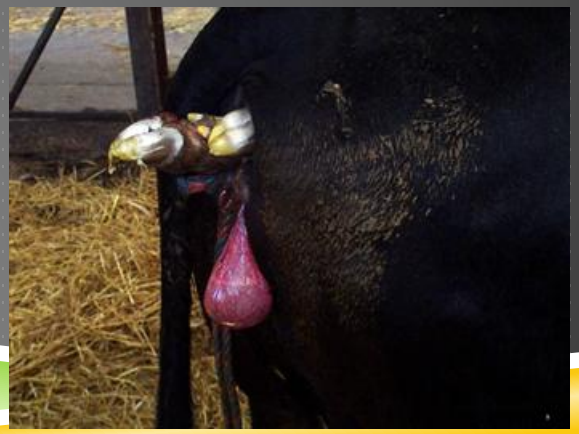
- Significant health problem in Mediterranean region, western Asia, parts of Africa and Latin America
- Human disease rare in the U.S.
  - U.S. incidence ~ 100-150 cases/yr
  - Unpasteurized soft Mexican cheese
- Six species including ones specific to dogs, sheep, pigs.

Species	Biovar / Serovar	Natural Host	Human Pathogen
B. abortus	1-6, 9	cattle	yes
B.melitensis	1-3	goats, sheep	yes
B. suis	1, 3	swine	yes
	2	hares	yes
	4	reindeer, caribou	yes
	5	rodents	yes
B. canis	none	dogs, other canids	yes
B. ovis	none	sheep	no
B. neotomae	none	Desert wood rat	no
B. maris (?)		marine mammals	?

TRANSMISSION / EPIDEMIOLOGY

TRANSMISSION POTENTIAL

- Birthing and abortion tissues highly infectious
  - Can contain up to 10,000,000,000 bacteria/ml
- Infectious dose (aerosol): 10-100 organisms
- Brucella viable in fetal remains for 81 days



TRANSMISSION

- Mucous membranes or broken skin contacting infected tissues
  - Blood, urine, vaginal discharges, aborted fetuses, placentas
- Ingestion
  - Raw milk & unpasteurized dairy products
  - Rarely through undercooked meat
- Injection
  - Vaccine

PERSONS AT RISK

- Consumers of:
  - unpasteurized milk, cheese, and other dairy products
  - infected meat not thoroughly cooked
- Hunters
- Veterinarians
- Ranchers
- Dairymen

DISEASE IN HUMANS

BRUCELLOSIS - DISEASE IN HUMANS

- Incubation variable: 5 d - 5 mo (2 - 4 wks)
- Frequently asymptomatic acute infection
  - Mild acute illness may go unrecognized
- Clinical presentations: (variable and non-specific)
  - Fever: Nonspecific fever, undulant, periodic
  - Non-specific symptoms: muscle aches, chills, fatigue
  - Arthritis, meningitis, endocarditis, osteomyelitis
  - Endocarditis #1 cause mortality
  - Relapse (5% treated cases) and chronic disease

HUMAN DISEASE

- 20-60% of cases
  - Osteoarticular complications
    - Arthritis, spondylitis, osteomyelitis
- Hepatomegaly may occur
- Gastrointestinal complications
- 2-20% of cases
  - Genitourinary involvement
    - Orchitis and epididymitis most common

ANIMALS AND BRUCELLOSIS

CLINICAL SIGNS: WILDLIFE

- Elk
  - Abortions, no retained placenta
- Moose
  - Debilitated, death
- Predators not clinical, but may be vectors
  - Coyotes, crows, vultures, bears
    - Aid in disease spread by carrying infected tissues away from abortion site

CLINICAL SIGNS: CATTLE & BISON

- Mild to moderate disease
- Third trimester abortions with *B. abortus*
- Retained placenta
  - Once expelled will have a leathery appearance
- Endometritis
- Birth of dead or weak calves
  - Respiratory distress and lung infections
- Reduced herd reproductive capacity

DIAGNOSIS

SEROLOGY (BLOOD TESTS)

- Cattle
  - Approved battery of serologic tests
  - RAP / CARD, FP, CF
  - 99% sensitive and specific on cattle if run in series

ELK

- BAPA / FPA recently recommended for approval for elk (cervids)
- Sensitivity (false negatives)
  - FPA (98.4), BAPA (85.9) Card (83.9), SPT (81.3), Rivanol (89.9), CF (1.0)
- Specificity (false positives)
  - FPA (99.1), BAPA (98.6), CARD (99.3), SPT(96.8), Rivanol (98.6), CF (98)
- Western Blot
  - Subjective interpretation of agarose gel
  - NOT validated, or approved
  - Sensitivity 33% (based on 6 samples)

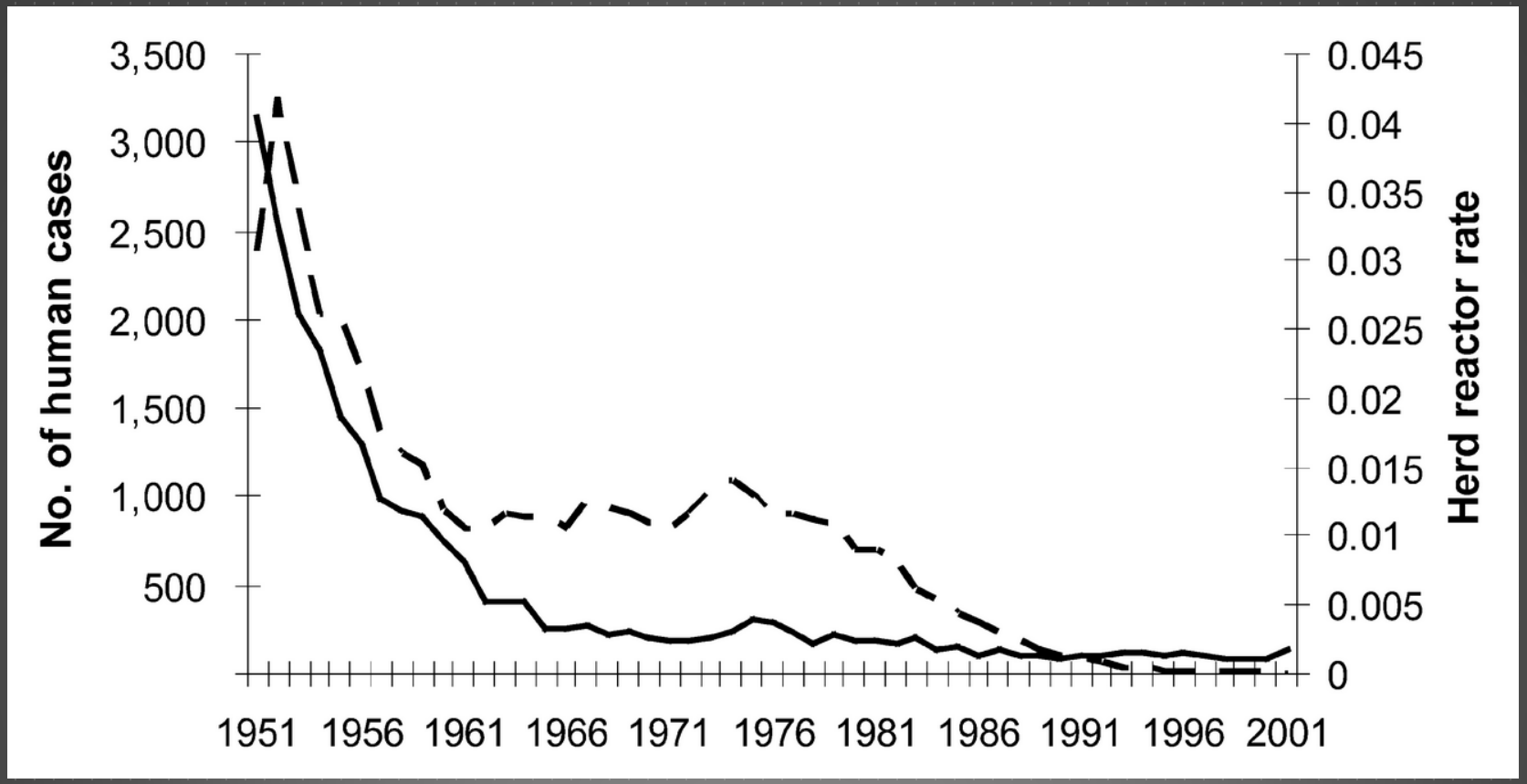
CONFIRMATORY TEST

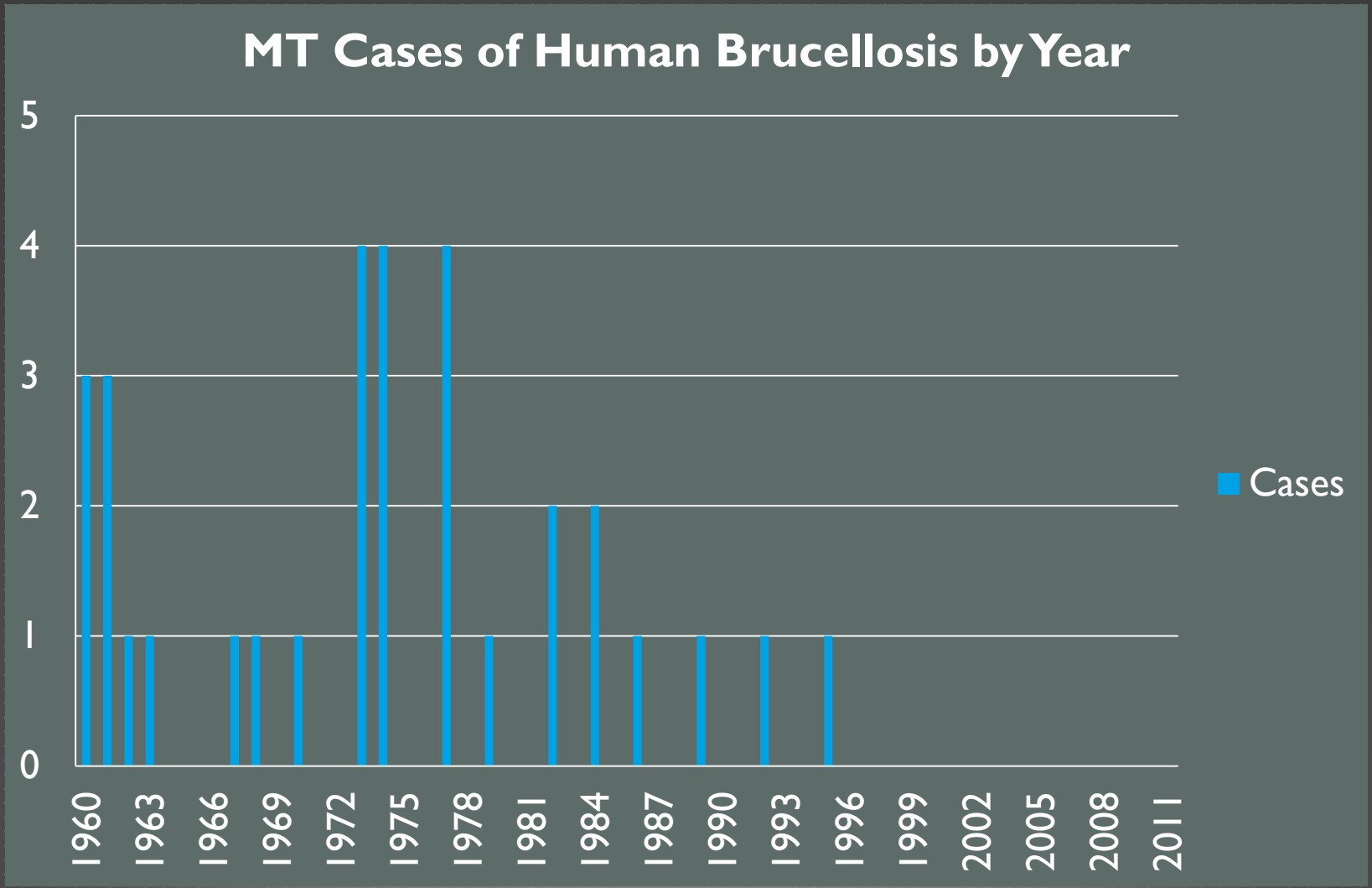
- Tissue culture
  - Not always positive even if animal infected

REGULATORY PROGRAM

U.S. ERADICATION PROGRAM

- U.S. Department of Agriculture
  - 1934: Cooperative State-Federal Brucellosis Eradication Program
    - Removal of diseased cattle due to drought
- 1951: APHIS became involved
- 1957: 124,000 positive herds
- Approach
  - Test, slaughter, trace back, investigate, and vaccinate


No. of human cases
3,500
3,000
2,500
2,000
1,500
1,000
500
Herd reactor rate
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1951
1956
1961
1966
1971
1976
1981
1986
1991
1996
2001


MT Cases of Human Brucellosis by Year
5
4
3
2
1
0
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011
Cases

CONSEQUENCES FOR AFFECTED LIVESTOCK OPERATIONS

- Slaughter of infected animals
- Long term quarantine of herd
- Multiple testing
- Limiting on marketing of animals
- Restrictions on grazing
- Stigma
- Neighboring herds tested

RB51

- Approved for use February 1996 for calves
- Able to differentiate "wild type" exposure from immunization
  - Lacks LPS-O antigen that causes antibody response on serologic or milk tests
- Infectious to humans
  - Serologically negative upon testing post-exposure
  - CDC registry of human exposures
  - 32 documented exposures as of 1998

NOW WHAT?

- No "preventive" animal vaccine
  - Livestock
  - Wildlife
- Spatial / Temporal Separation most effective

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