

Evolution of the Guidelines for the Control of Tuberculosis in Elephants



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Zoobiquity

Zoobiquity: a species-spanning approach to medicine bringing doctors and veterinarians together to improve the health of all species and their habitats.



- Tuberculosis in Liz the elephant was used as an example at the recent conference at UC Davis (1-29-11)

Hawthorn Corporation Elephants

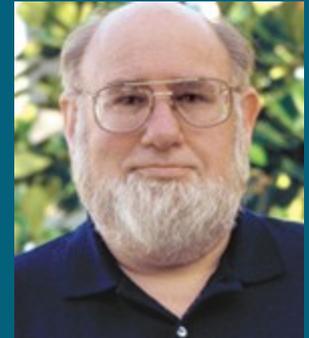


Lota (TB (+) 1997) **Joyce** (d. 8-96) **Hattie** (d. 8-96)
Dumbo (d. 12-94) **Tina** (d. 5-81)



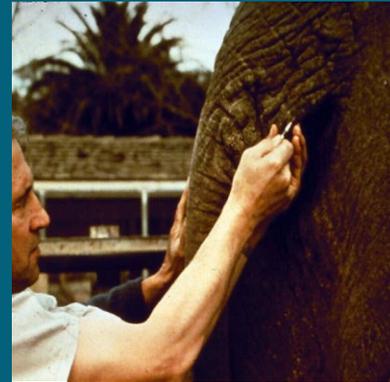
USDA Elephant TB Advisory Group - 1996

- Representatives from AAZV
 - Dr. Wilbur Amand, Dr. Susan Mikota, Dr. Doug Page
- Representatives from USDA
 - Dr. Miava Binkley, Dr. Mitch Essey
- Formed by USDA following the deaths of the 2 Hawthorn elephants
- Developed a diagnostic and treatment plan for the remaining 18 elephants in the herd



USDA Elephant TB Advisory Group

- Recommended a protocol for testing, treating and monitoring the Hawthorn animals
- Specific testing included:
 - Skin testing
 - ELISA (CSU)
 - BTB
 - Gamma Interferon
 - Histopathology
 - Culture



1996 USAHA Committee on Epizootic Attacks

Dr. Tom Holt



October 12-18, 1996

- Reported on the 2 elephant deaths from a circus touring CA



Lota – culture (+) 1997

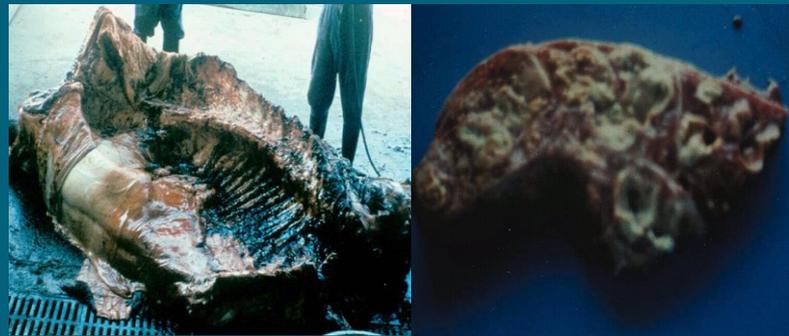
1996 USAHA Tuberculosis Committee

Dr. Mitch Essey

Oct. 12-18, 1996, Little Rock, AR

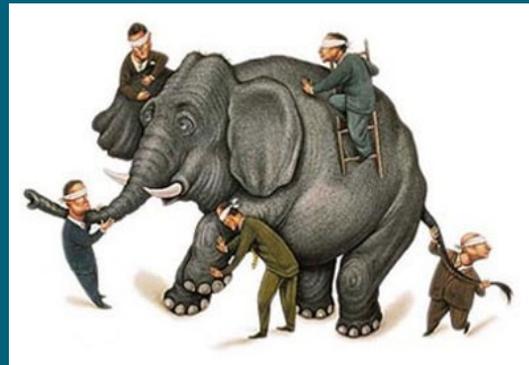


- Recommended the creation of a working group to discuss the control and eradication of bovine tuberculosis in zoological and exotic animals
- Outbreak of *M. bovis* in free-ranging white-tailed deer in MI



1996 USAHA TB Committee Resolution

- The USDA, APHIS, Veterinary Services, pursue the formation of an inter-industry working group to address the issues of tuberculosis in exotic animal collections, including, but not limited to zoos, menageries, circuses, and other single or multiple species collections.
- The formation of the WG received the support of the AAZV and AZA.



National Tuberculosis Working Group for Zoo & Wildlife Species – 1st Meeting

February 1997

Audubon Center for Research of Endangered Species, New Orleans

- Meeting hosted & chaired by **Dr. Susan Mikota (ACRES)**
- Members selected by Dr. Essey (USDA) & Dr. Amand (AAZV)
- Dr. Miava Binkley
- Dr. Janet Payeur
- Dr. Richard Montali
- Dr. Robert Cook
- Dr. Don Janssen
- Dr. Terry Norton
- Dr. Peregrine Wolff
- Dr. Joel Maslow



Mission of NTB WGZWS

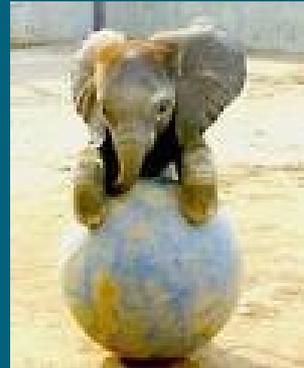
- To control and ultimately eradicate tuberculosis (*Mycobacterium tuberculosis* complex) and control other mycobacterial diseases in zoo and wildlife species.



Hattie, 1996

NTWGZWS Sub-Committees

- **Surveillance**
 - Establish a central data collection mechanism
- **Outbreak Management**
 - Develop guidelines for epidemiological work-ups
 - Develop guidelines for management procedures
- **Testing and Research**
 - Evaluate surveillance results
 - Evaluate existing and new diagnostic techniques
 - Develop testing protocols



2nd Meeting NTBWGZWS

June 20-22, 1997

White Oak Conservation Center, FL

- Dr. Susan Mikota
- Dr. Wilbur Amand
- Dr. Joel Maslow
- Dr. Mitch Essey
- Dr. Miava Binkley
- Dr. Janet Payeur
- Dr. Richard Montali
- Dr. Terry Norton
- Dr. Don Janssen
- Dr. Robert Cook



- Dr. Mike Dalrymple
- Dr. Werner Heuschele
- Dr. Vic Nettles
- Dr. Mort Silberman
- Dr. Charles Thoen
- Dr. Gary West
- Dr. Charlotte Quist
- Dr. Scott Citino
- Dr. Andy Teare
- Dr. Ramiro Isaza



3rd Meeting NTBWGZWS

Oct. 30 – Nov. 1, 1997

Houston, TX

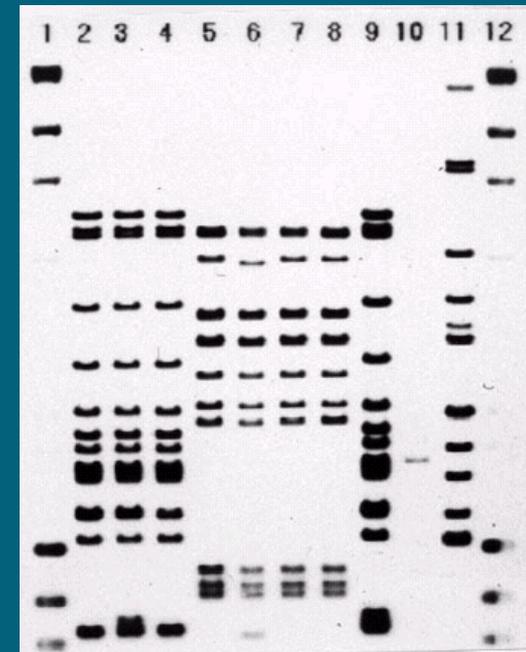
- Dr. Susan Mikota
- Dr. Wilbur Amand
- Dr. Mitch Essey
- Dr. Miava Binkley
- Dr. Andy Teare
- Dr. Richard Montali
- Dr. Werner Heuschele
- Dr. Gary West
- Dr. Ramiro Isaza.

- Dr. Murray Fowler
- Diana Whipple
- Dr. Jim Peddie
- Dr. Linda Peddie
- Dr. Doug Page
- Dr. Dennis Schmitt



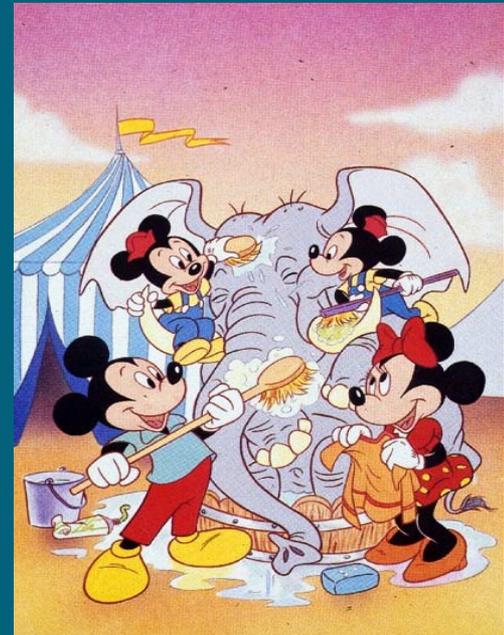
1997 Guidelines

- 5 new culture (+) elephants from IL & CA
- 4 CA (lanes 2-4, 9) elephants culture (+) for TB, different strain than IL (lanes 5-8) elephants based on RFLP
- **Guidelines for the Control of Tuberculosis in Elephants** completed and submitted to USDA Animal Care in November.
- The 1997 Guidelines specified criteria for the testing, surveillance and treatment of elephants for TB.

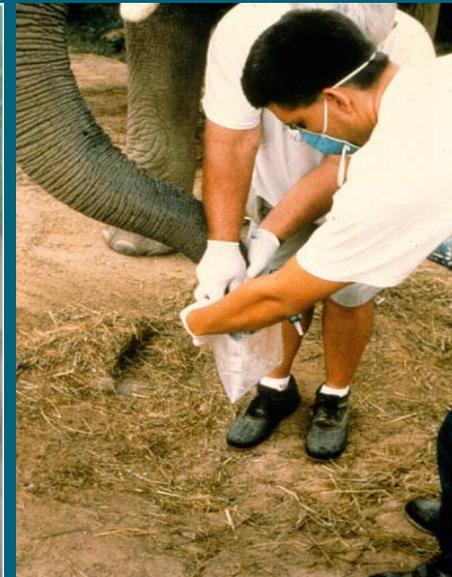


1997 Guidelines

- USDA required the **annual testing** of all elephants owned by licensed exhibitors and they covered:
 - The “triple sample” collection procedure
 - Ancillary screening / diagnostic tests
 - TB Management Groups based on culture results & exposure history
 - Anti-tuberculosis drugs, doses, routes of administration, blood levels
 - Necropsy procedures
 - Employee safety and health
 - Reporting procedures and multiple reference appendices



'Triple Sample' Trunk Wash



Train to lower trunk

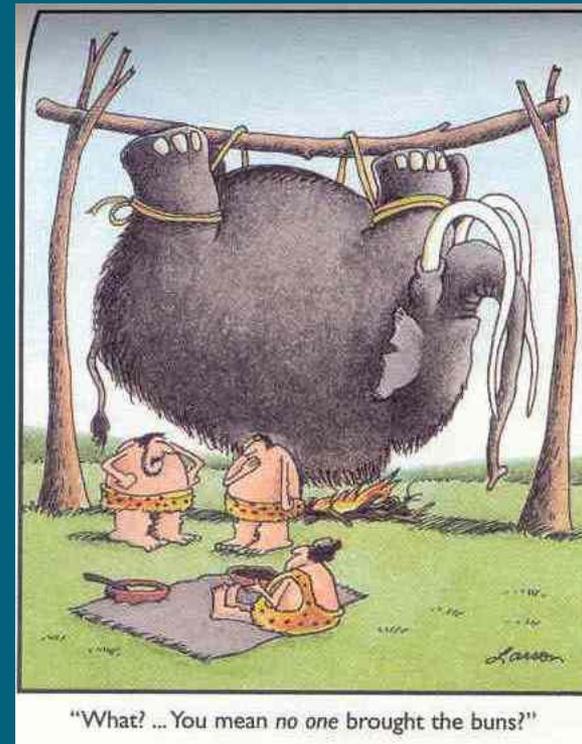
**Infuse 60 ml
Sterile saline
with 14" French
feeding tube**

**Train to expel
Contents into a
bag or bucket**

**Transfer 20-30 ml
To sterile tube/cup
FedEx frozen to
lab**

1997 Guidelines

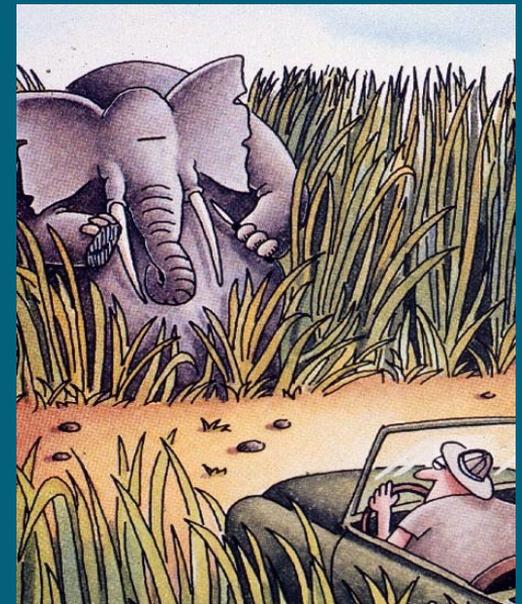
- A “**necropsy**” means an appropriate post-mortem examination performed by a qualified veterinarian experienced with that species, appropriate microbiological culture and histopathology of lesions, and other indicated testing and recorded in the animal’s medical record.
- Any animal found positive on culture will be required to undergo quarantine and/or treatment.
- ‘**Can’t Test - Can’t Move**’



“What! .. You mean no one brought the buns!”

1998 - 2000

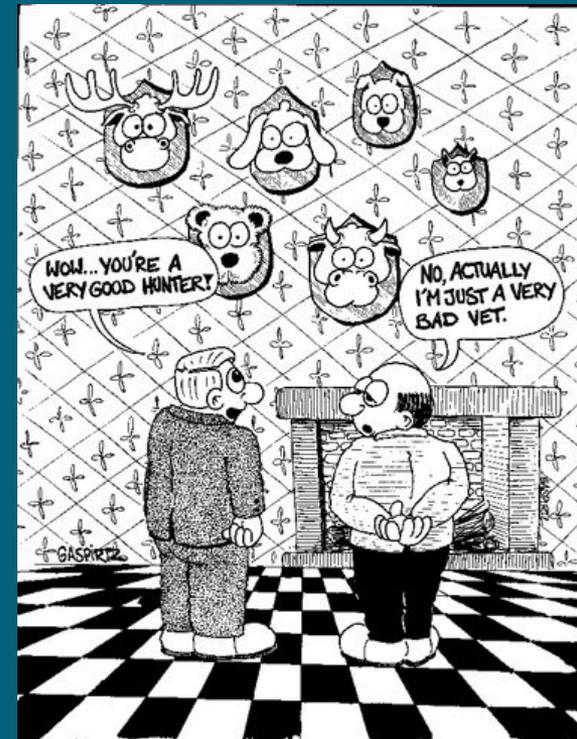
- 1998-2000, 16 *M. tuberculosis* culture (+) elephants from AR, FL & MO and 1 *M. bovis* culture (+) from DC
- The TB WG met in Omaha in October, 1998, in June, 1999 and in September, 2000 in New Orleans to discuss different sections of the Guidelines
- With knowledge gained from the index herd and additional elephant TB cases, the Guidelines were revised in 2000.



**“Not too close, Higgins,
This one’s got a knife”**

2001-2003

- 7 new TB (+) elephants from MO, IL, CA & FL and 2 relapses from IL & FL
- Antibiotic drug resistance to first line anti-tuberculosis drugs – isoniazid (4), rifampin (2), PZA (3) & streptomycin (4)
- 1 case of *M. bovis* - normally PZA resistant
- Difficulty in treatment administration, blood levels and toxicities
- WG meeting again in January 2002 to revise the Guidelines



'Wow, you're a very good hunter'
No, actually I'm a very bad vet

2004 -2005

- 1 new TB elephant from TX and 1 still positive after treatment
- **Elephant TB Research Workshop** organized and hosted by Dr. Michele Miller at Disney's Animal Kingdom and Dr. Susan Mikota



Lota at Elephant Sanctuary

2005 TB Elephant Workshop Goals

- Assess the status of experimental diagnostic tests
- Evaluate experience gained from elephants that have been treated for TB
- Identify specific areas of research that will advance our knowledge of the diagnosis and treatment of TB in elephants



2005 Workshop Participants

May 21-22, 2005

- Wilbur Amand
- Ray Ball
- Genevieve Dumonceaux
- Freeland Dunker
- Karin Hamilton
- Ramiro Isaza
- Gretchen Kaufman
- Scott Larsen
- John Lehnhardt
- Bill Lindsay



Orlando, FL

- Konstantin Lyashchenko
- Joel Maslow
- Susan Mikota
- Michele Miller
- Richard Montali
- Janet Payeur
- Dennis Schmitt
- Stephen Scott
- Denise Sofranko
- Ray Waters



Diagnostic Recommendations

- Create a set of reference sera that can be used to validate future assays
- All elephants have ante-mortem annual trunk wash cultures and serum collected and banked
- Perform retrospective epidemiological review of culture positive elephants using new serologic data
- Frequent serum collection of treated elephants for serologic monitoring (every 6 months minimum)



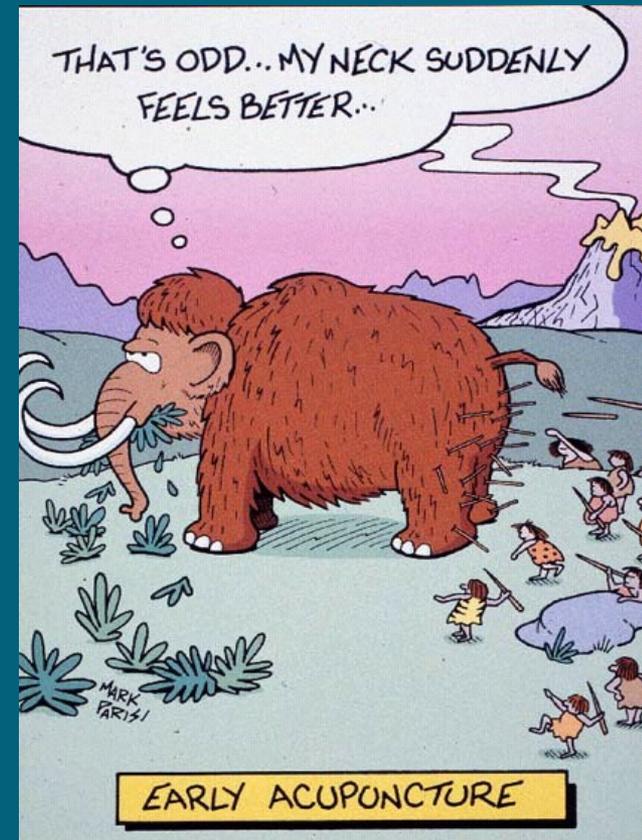
Diagnostic Recommendations

- Correlate retrospective and future necropsy data with diagnostic test results and clinical history
- Further studies of pathobiology of *M. szulgai* and other non-TB mycobacterial infections in elephants
- Request speciation of all mycobacteria isolated from elephants



Treatment Recommendations

- Investigate new routes of treatment – transdermal & inhalation
- Review current TB drug therapy
- Create an information sheet regarding clinicopathologic changes associated with drug toxicities
- Investigate new TB drug options
- Pilot pharmacokinetic studies
- Use serologic tests (ELISA, RT, MAPIA) to monitor treated elephants every 3 - 6 months along with culture



2006 Elephant TB Workshop

September 25, 2006

Tampa, FL

- Susan Mikota
- Genevieve Dumonceaux
- Wilbur Amand
- Freeland Dunker
- Murray Fowler
- Ramiro Isaza
- Scott Larsen
- Bill Lindsay
- Joel Maslow

- Janet Payeur
- Dennis Schmitt
- Scott Terrell
- Ray Waters
- Konstantin Lyashchenko
- Denise Sofranko
- Bruce Carter

Met to determine progress on the action plans developed in May 2005.

2006 WG Met at USAHA

October 12 - 18, 2006

Minneapolis, MN

- WG met and discussed RT & MAPIA
- MAPIA has potential to monitor response to treatment
- *M. szulgai* – evidence that this organism was distinguished by MAPIA
- Atypical mycobacteria not cross reactive with RT & MAPIA
- Discussed mechanics of RT & MAPIA
- Discussed biologics licensing requirements



- Wilbur Amand
- Michele Miller
- Genevieve Dumonceaux
- Freeland Dunker
- Scott Terrell
- Bruce Carter
- Denise Sofranko
- Les Stutsman
- Murray Fowler
- Ramiro Isaza
- Gretchen Kaufman
- Bill Lindsey
- Konstantin Lyashchenko
- Ellen Wiedner
- Dennis Schmitt
- Janet Payeur

2006 USAHA TB Committee

October 16, 2006

Minneapolis, MN

- **Dr. Michele Miller** reported on the previous workshops in 2005 & 2006 and discussed recommendations that would be changed in the revision of the 2003 Guidelines.
- Additional data on TB diagnostic tests (Chembio Rapid Test, MAPIA) showed promise for ability to detect infection in elephants, but not licensed yet.



Diagnostic Recommendations

- Revisions will provide improved interpretation of diagnostic tests, treatment regimens, and monitoring methods.
- New classification system for associated with contact/travel restrictions & treatment/monitoring recommendations



2007 USAHA TB Committee

October 18-24, 2007

Reno, NV

- **Dr. Michele Miller** reported on the draft 2007 Guidelines which incorporated the addition of the recently licensed Chembio ElephantTB STAT-PAK Assay and additional options for culture positive elephants.
- **Dr. Kathleen Connell**, Chair of the TB Committee at the request of the AAZV Wildlife TB Working Group formed the Elephant TB Scientific Advisory Subcommittee to review and revise the draft 2007 Guidelines and report back to the committee in 2008.



USAHA Tuberculosis Committee

- **Elephant TB Scientific Advisory Sub-Committee**
- Members included:
 - Janet Payeur
 - Ray Waters
 - Kathy Orloski
 - Michele Miller
 - Chuck Massengill
 - Susan Mikota

