Anthrax in the Artic Region

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Understanding and Responding to Global Health Security Risks from Microbial Threats in the Arctic

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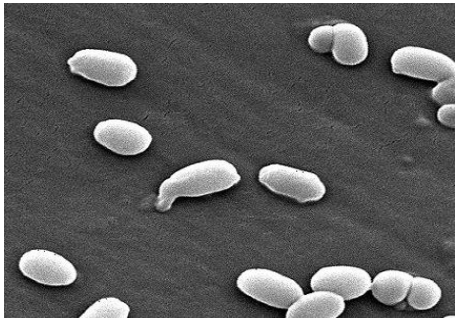
Background

Anthrax Epidemiology and Infectious Cycle

Anthrax Epidemiology and Infectious Cycle

- Naturally occurring zoonotic disease caused by Bacillus anthracis
  - Gram-positive, capsulated, spore forming rod (bacillus)
- Significant veterinary and public health importance
  - 1613 Europe: >60,000 human deaths
  - 1800s: 20-30% deaths/year in cattle and sheep in France
  - Current human burden: 2,000 to 20,000 cases/year worldwide
  - Largest modern epidemic: Zimbabwe (1978-80) -10,000 human cases

Cycle of *B. anthracis* Infection



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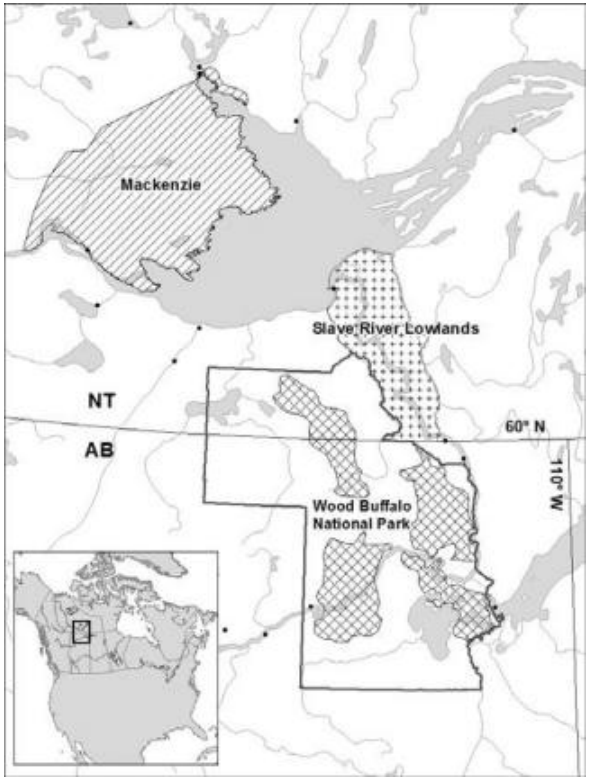
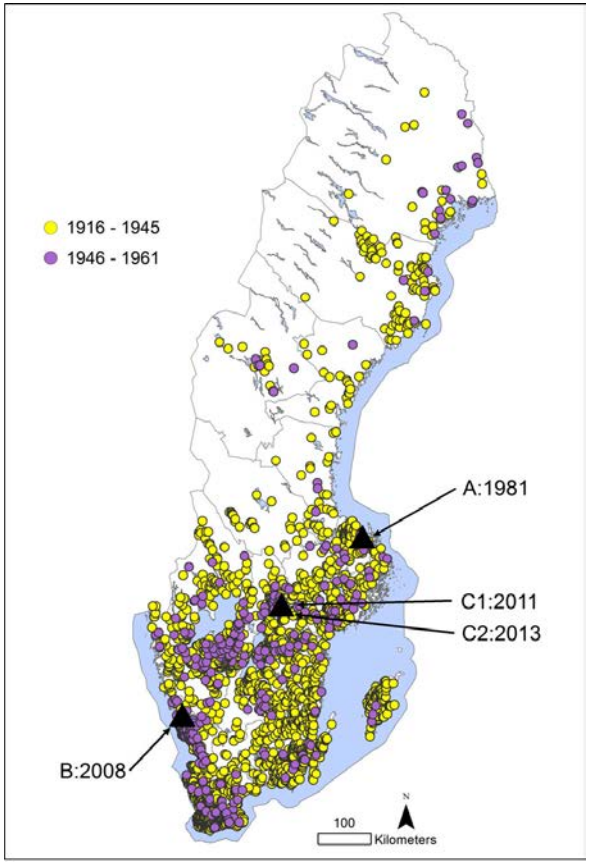


Salb A, Stephen, C, Ribble C, Elkin B. Descriptive Epidemiology of Detected Anthrax Outbreaks in Wild Wood Bison (*Bison bison athabascae*) in Northern Canada, 1962-2008. Journal of Wildlife Diseases, 50(3), 2014, pp. 459–468



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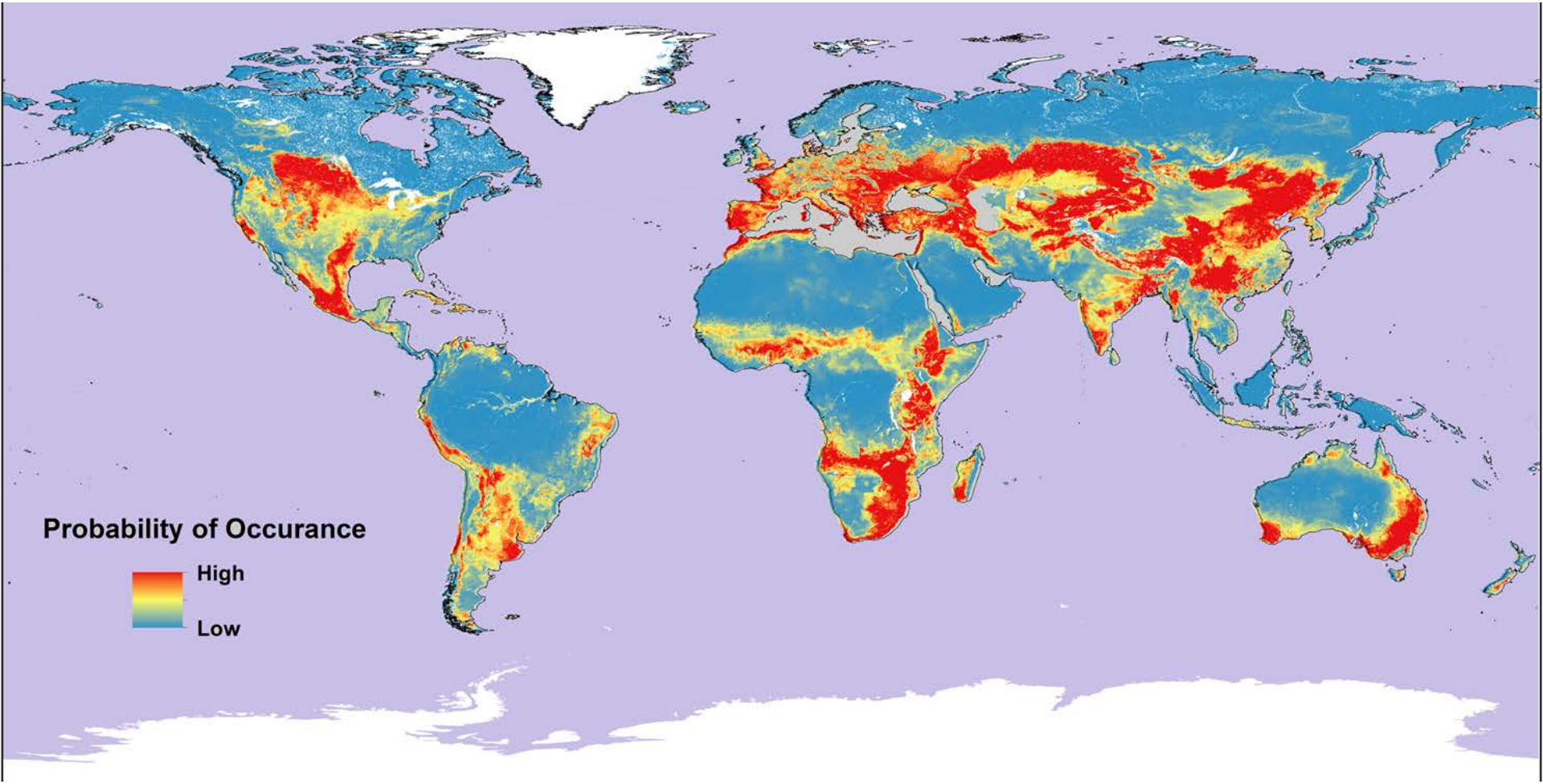
Assessing Risk

Ecological Niche Modeling

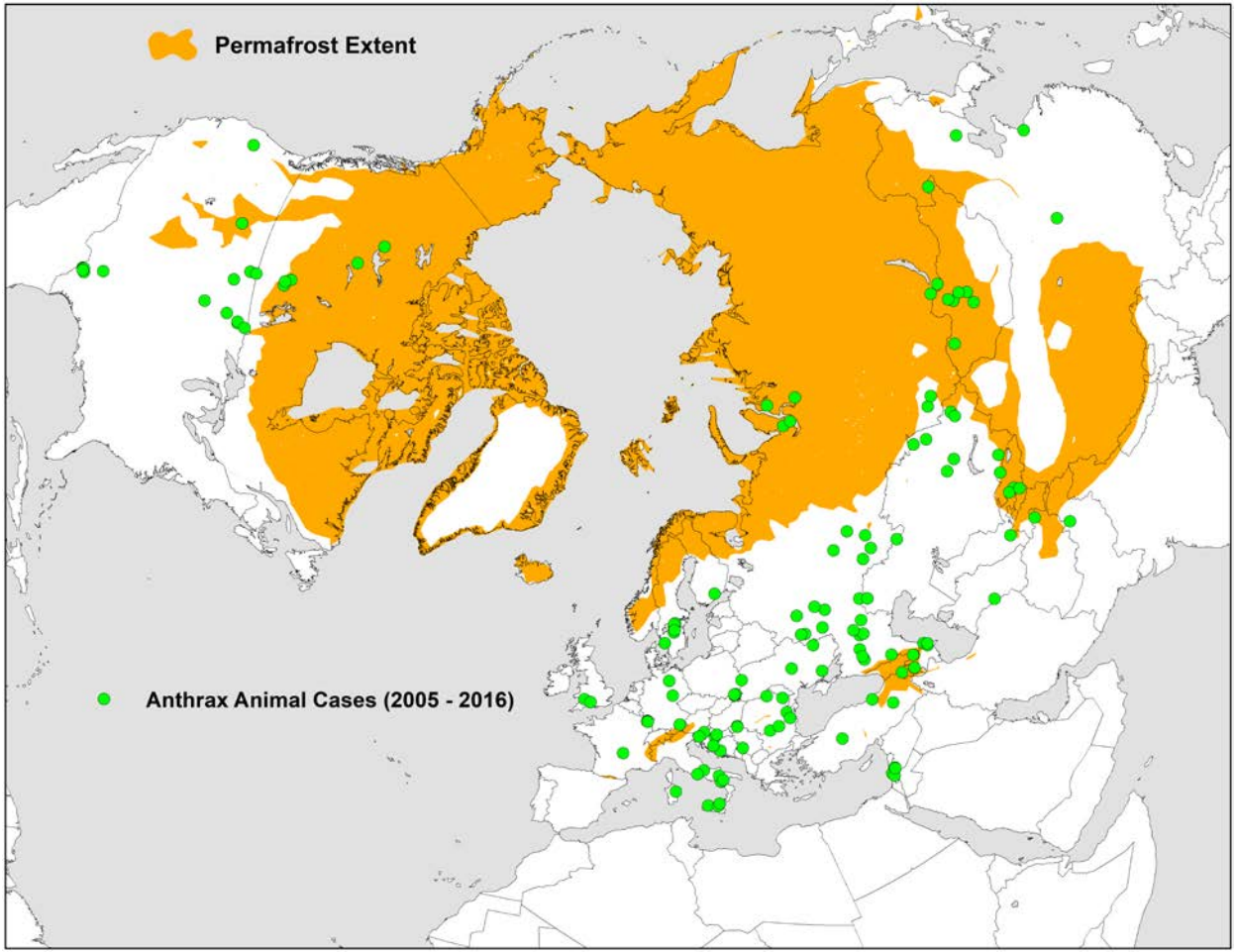
Ecologic Niche Modeling

- Ecologic niche modeling (ENM) is the process of using computer algorithms to predict the geographic distribution of pathogens based on ecologic and environment variables
- ENM uses
  - Environmental variables (e.g., temperature, precipitation, and elevation derived from digital maps or satellite data)
  - Ecology inputs (e.g., soil characteristics, vegetation coverage)
  - Species' locality data (e.g., outbreak locations)
- Distribution models can be used to show areas suitable for pathogens to exist

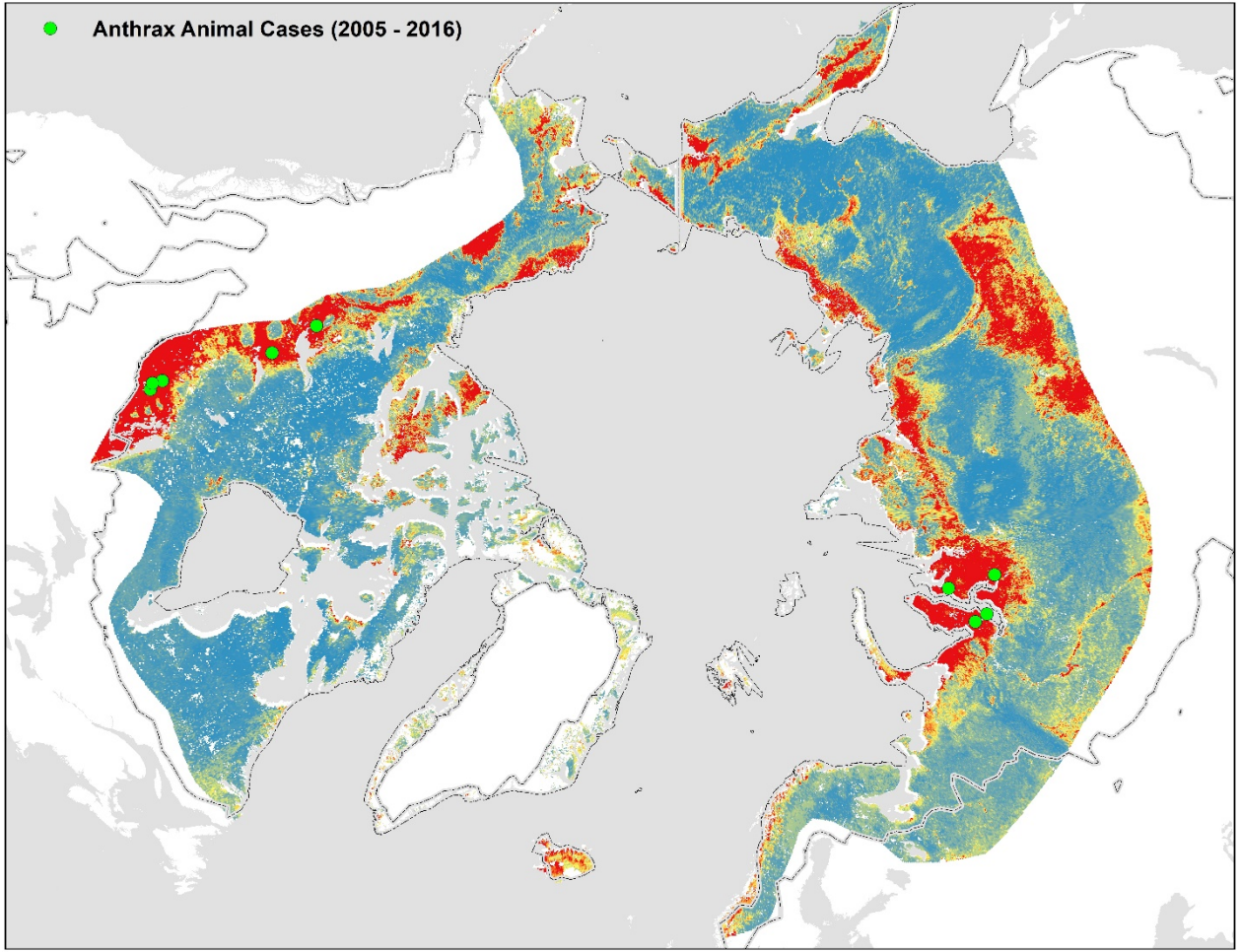
Predicted Areas Suitable for *B. anthracis* Spore Survival – Worldwide



Worldwide Distribution of Permafrost



Potential Anthrax Areas – Artic Region



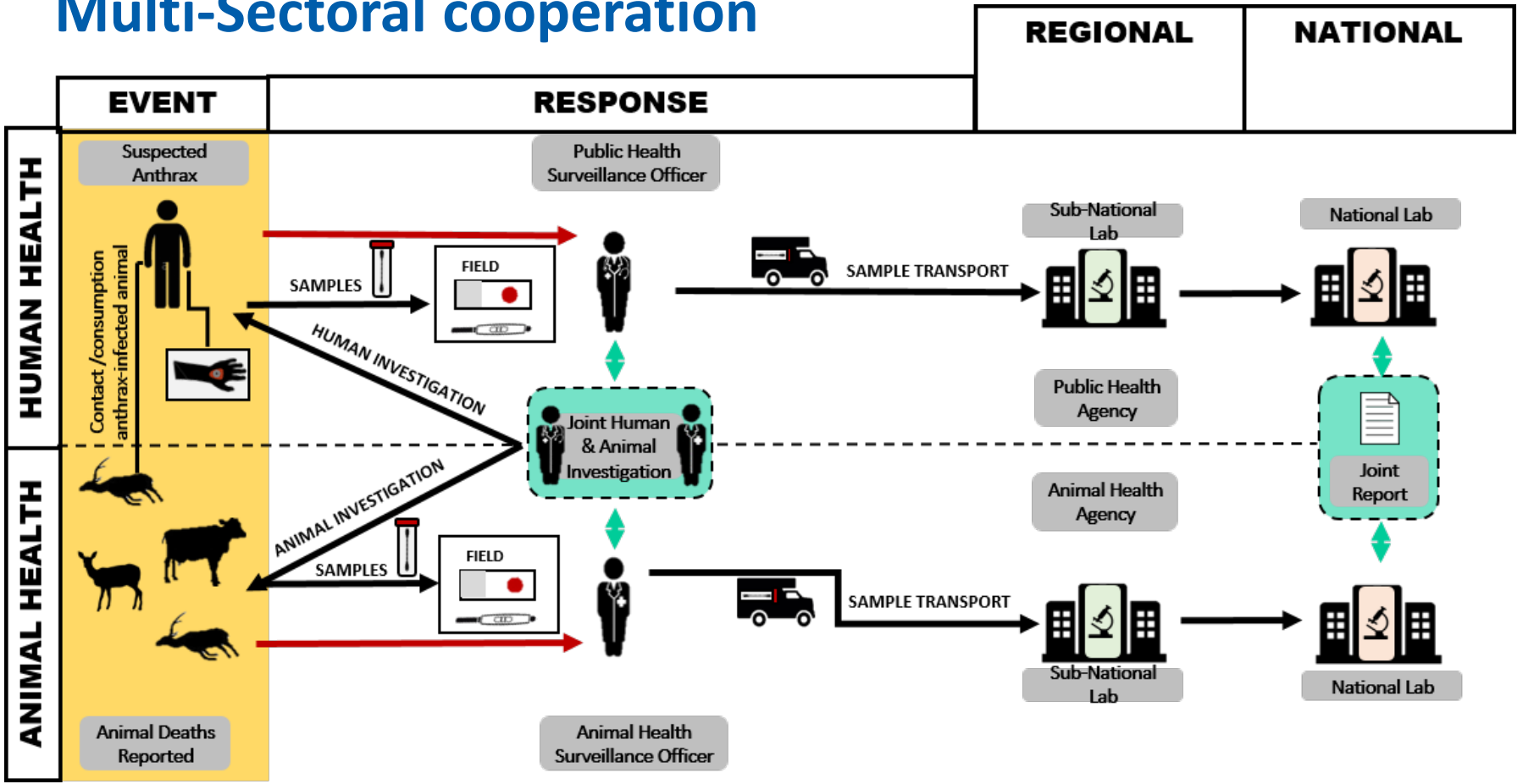
Anthrax Prevention and Control

Framework for Enhancing Anthrax Prevention and Control

Building Capacity to Detect Anthrax Emergence

- Surveillance definition: Collection, collation and analysis of health data that enables the prompt dissemination of the information to those who need to know, in order that appropriate action may be taken
  - Detection of anthrax requires veterinary or human healthcare providers
  - Confirmation of reports of suspicious anthrax cases requires appropriate laboratory support
  - Reporting requires mechanisms for easy communication of cases

Multi-Sectoral cooperation



Multi-Sectoral cooperation

- Control of anthrax among humans depends on the multi-sectoral integration of veterinary, wildlife, and human health surveillance and control programs
- Local level:
  - Capacity for diagnosis and case management, including treatment and health education, case and outbreak investigation
- Regional level:
  - Support to the local level on epidemiological investigations and initiation and monitoring of control measures

Multi-Sectoral cooperation

- National Level:
  - Formulate national policies to promote a One Health approach
  - Allocate resources based on the surveillance information
    - Resources and policies should be for prevention and control, including vaccine, carcass disposal, and quarantine
  - Provide technical support (e.g. laboratory or epidemiological) to the intermediate and local levels as appropriate
  - Responsible for reporting summary surveillance information to international authorities such as WHO and OIE

Thank You

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.