SCOPE

- Definitions.
- Classification of diseases of man, other terrestrial and aquatic animals.
- Disease patterns.
- Disease surveillance. Maps and grid references.
SCOPE

- Uses of GIS in disease mapping. Risk assessment, National animal disease information system. Epi info, TAD info etc.

- Diagnosis, treatment and control of transboundary animal diseases, travel diseases of man.

- Past and present disease control efforts e.g. JP 15, JP 28, PARC and PACE.
SCOPE

- Role of international organizations in disease surveillance.
- Emergency preparedness including early warning system and early reaction contingency plans for the control of major epizootics and TADs.
- Uses of computers in disease surveillance e.g. Internet, Electronic mail
D.V.M.’s are

- Doctors of Veterinary Medicine (DVMs) and as a result...
- Doctors of Very Many Species (DVMs) and as a result...
- Doctors of Very Many Situations (DVMs) and as a result...
- Determiners of Very Many Scenarios (DVMs)
Veterinary Public Health

- The sum of all contributions to the physical, mental and social well-being of humans through an understanding and application of veterinary science
Epidemiology

- The study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems.
Epizootiology

Epizootiology is a science which studies origin, distribution, frequency, development, determinants and extinction of animal health and disease at population level and based on their analyses defines and applies methods for creation, promotion, protection and restoration of population health by reducing, eliminating and eradicating diseases.
Surveillance is the ongoing and systematic collection, collation, analysis and dissemination of health data.
Disease Surveillance: CLASSIFICATION OF DISEASES
INFECTIONOUS DISEASES

- Bacterial
- Viral
- Parasitic
- Fungal
NON-INFECTIONOUS DISEASES

1) Nutritional diseases
2) Neoplastic diseases
3) Toxic substances
4) Genetic origin
5) Miscellaneous origin

What is the importance of these classes of diseases to DS OR epidemics/Pandemic?
ZOOONOTIC DISEASES

- Diseases of Animal transmissible to man and vice versa.
- 60% of human pathogens are zoonotic
- 75% of emerging diseases are zoonotic
- 80% of agents having a potential bioterrorist use are zoonotic pathogens
A trans-boundary disease

- Any disease which can spread easily at Regional or global level,

- Highly contagious or transmissible with a potential for very rapid spread, irrespective of national borders,

- Causing serious socio-economic and possibly public health consequences
Emerging and Re-emerging Diseases

- An emerging disease: a new infection resulting from the evolution or change of an existing pathogenic agent,

- A known infection spreading to a new geographic area or population,

- Or a previously un-recognised pathogenic agent or disease diagnosed for the first time with a significant impact on animal or public health.
Re-emerging Diseases: A disease in the previous category, earlier eradicated in a geographic location, but is resurfacing.

Examples?
A FOUR FOLD CLASSIFICATION OF EMERGING ZOONOSES:

- Type 1: From wild animals to humans (Hantaviruses)
- Type 1+: From wild animals to humans with further human-to-human transmission (AIDS);
- Type 2: From wild animals to domestic animals to humans (RABIES);
- Type 2+: From wild animals to domestic animals to humans, with further human-to-human transmission (SARS).
Some Diseases of Animals that are of Public Health Importance

- Rinderpest
- Foot and Mouth Disease
- Classical Swine Fever
- African Swine Fever
- Peste des Petits Ruminants (PPR)
- Contagious bovine pleuropneumonia
- Newcastle Disease
- Rift Valley Fever
- Brucellosis, TB, Anthrax
- Highly Pathogenic Avian Influenza
- Rabies
- Mad cow disease (Cruztfeld Jacobs Disease)
Infectious Disease Epidemiology

- The cause often known
  - An infectious agent is a necessary cause

- Two or more factors/determinants are involved:
  1. Humans
  2. Infectious agents (Helminths, bacteria, fungi, protozoa, viruses, prions)
infectious disease epidemiology: factors/determinants..

3. **Vectors**
   - Mosquito (protozoa-malaria), snails (helminths-schistosomiasis)
   - Blackfly (microfilaria-) onchocerciasis

4. **Animals**
   - Dogs and sheep/goats – *Echinococcus*
   - Mice and ticks – *Borrelia*
What is infectious disease epidemiology then used for?

- Identification of causes of new, emerging infections, e.g. HIV, vCJD, SARS
- Surveillance of infectious disease
- Identification of source of outbreaks
- Studies of routes of transmission and natural history of infections
- Identification of new interventions
Routes of transmission

Direct

- Skin-skin (Herpes type 1)
- Mucous-mucous (STI)
- Across placenta (toxoplasmosis)
- Through breast milk (HIV)
- Sneeze-cough (Influenza)
Routes of transmission

Indirect

- Food-borne (Salmonella)
- Water-borne (Hepatitis A)
- Vector-borne (Malaria)
- Air-borne (Chickenpox)
Transmission: CASES

Index – the first case identified
Primary – the case that brings the infection into a population
Secondary – infected by a primary case
Tertiary – infected by a secondary case

Susceptible
Immune
Sub-clinical
Clinical
Factors Influencing Disease Transmission

Agent
- Infectivity
- Pathogenicity
- Virulence
- Immunogenicity
- Antigenic stability
- Survival

Environment
- Weather
- Housing
- Geography
- Occupational setting
- Air quality
- Food

Host
- Age
- Sex
- Genotype
- Behaviour
- Nutritional status
- Health status
HOW does this fit in with DRM?

- The interdependence of humans, animals, and their environment has never been more important than now.

- The most prominent issues putting pressure on global health today include:
  1. The dramatic emergence and spread of zoonotic diseases,
  2. Contamination of food, water and soil, bioterrorist events, and degradation of resources and habitats.
Co-operation between the veterinary and medical professions must be strengthened to combat these and other emerging threats to the world food supply.

It is of ever-increasing importance to provide safe and adequate food and water for the world's human population.
HOW does this fit in with DRM?

3. Current global health challenges have prompted a call for:

- more holistic,
- collaborative,
- action-oriented approaches

Toward the goal of logical and practical solutions.
4. Veterinarians have pivotal obligations, opportunities, and Contributions in:

- Enhancing public health,
- Recognising and responding to zoonotic disease transmission,
- Maintaining food and water quality, and
- Promoting wildlife and ecosystem health.
CHALLENGES.......

- Ecotourism
- Climate change
- Human population growth
- Livestock population growth
- Rapid urbanisation
- Changing farming systems
- Forest encroachment/ Habitat Destruction
- Globalisation of trade
International trade and travel

- The movement of people, animals, and agricultural products can quickly spread disease pathogens around the world.

- Globalisation of the food supply has spread livestock and agricultural crop diseases into previously unaffected areas.

- Inadequate cargo inspections worldwide allow infected animals, insect vectors, and diseased plant/Animal products introduction into geographic areas where natural parasites, predators, and host resistance may be lacking.
Emerging disease and wildlife

- Travelers can be in the middle of a tropical jungle one day and in London the next, leading to emergence of West Nile virus in North America, and AIDS and SARS globally.

- Not only a problem for human health but are a major threat to animal welfare and to wildlife species conservation.

- A study of the drivers of disease emergence in wildlife showed that human movement of pathogens by trade and travel is the most important.
Emerging disease and domesticated species

- Also threatens domesticated species, such as the threat West Nile virus poses to the US racehorse industry.

- Therefore, the medical, veterinary, and wildlife conservation professions share a common agenda.

- And recognising it as a common problem is a start.
The role of veterinarians and VPH professionals

- Expertise in traditional surveillance and control of zoonoses.
- Broader perspective for responding to emerging and re-emerging infectious disease issues.
- To develop and implement guidelines for the diagnosis and prevention of zoonotic diseases.
EMERGENCY PREPAREDNESS
Steps in planning a surveillance system

- Establish objectives
- Develop case definition
- Determine data source or data collection mechanism
- Develop data collection instrument
- Field-test methods
- Develop and test analytic mechanism
- Develop dissemination mechanism
- Assure use of analysis and interpretation
- Evaluation
Case definition

- Clinical versus laboratory
- Level of case definition (suspected, probable, confirmed)
- Example Influenza:
  - **Suspected**: A person with sudden onset of fever $>39^\circ C$, respiratory symptoms, myalgias, headaches
  - **Probable**: A suspected case, epidemiologically linked to laboratory-confirmed case
  - **Confirmed**: A suspected case with virus isolation or direct antigen detection
Data source and data collection mechanism

Data source
- notifiable diseases
- vital statistics
- survey
- laboratory
- member of the public, media
- other information sources, e.g. sanitary data, meteorological data, immunisation, nutrition

Data collection
- passive versus active
Surveillance for West Nile Virus

West Nile virus can be sampled from the environment by:

- the pooling of trapped mosquitoes,
- testing avian blood samples drawn from wild birds and dogs and sentinel monkeys,
- as well as testing brains of dead birds found by various animal control agencies and the public.
Early Warning Signals

- Clustering of cases or deaths in time &/or space
- Unusual increase in cases/deaths 2 or more linked cases
- Even a single case of epidemic prone diseases in tribal/poorly accessible area
- Unusual isolate in laboratory
- Shift in age distribution of a disease
- High vector density in local area
- Natural disasters
Dissemination mechanism

- Directly to all who need to know
- Press release to the public
- Reports, bulletins
- Others
Assure use of analysis and interpretation

Control measures
- rapid response
- case management
- prevention programme

Planning/policy making
- epidemic preparedness
- policy modification
- prediction and future planning

Feedback to the system
West Nile control is achieved through mosquito control by:

- Eliminating mosquito breeding sites,
- Larviciding active breeding areas and
- Encouraging personal use of mosquito repellents
Surveillance functions

Core function
- Reporting
- Detection
- Investigation & confirmation
- Analysis & interpretation
- Action / response

Support function
- Training
- Supervision
- Resources provision
- Standards / guidelines
What is CDC doing about WNV (Core vs Support functions)

- Coordinating a nation-wide electronic database where states share information about WNV
- Helping states develop and carry out improved mosquito prevention and control programs
- Developing better, faster tests to detect and diagnose WNV
- Creating new education tools and programs for the media, the public, and health professionals
- Opening new testing laboratories for WNV
- Working with partners on the development of vaccines
Summary

- Surveillance - Backbone for early detection & control of disease outbreaks
- Should cover whole country under Integrated Disease Surveillance Programme in phased manner with emphasis on:
  1. Laboratory strengthening
  2. Rapid Response capabilities
- Country’s surveillance system with special focus on early detection and response - in place, being further strengthened, modernized and geared up to deal with epidemic emergencies
Summary

- Establishing an animal health surveillance system to detect new cases is essential in providing early warning for veterinary and human public health authorities.

- Raising awareness of the risk factors and educating the populace on preventive measures is also key; especially, where there are no vaccines or treatment for epidemic; e.g. Nipah Virus.
PREVIOUS SURVEILLANCE PROGRAMS
Rinderpest in Africa


- Second attempt to eradicate RP: the Pan-African Rinderpest Campaign program from 1988 to 1999. The PARC program = fight against RP with vaccination and sero-surveillance campaigns to check the immunity of animals.

- The Pan-African Control of Epizootics (PACE) program, operational from 1999 to 2006, helped countries to develop the epidemiological capacity to conduct the surveillance for rinderpest; essential for RP-free accreditation.
PACE PROGRAM

- Resources were given to public services to put in place networks (trainings, Equipments…).
- Surveillance of RP, but also CBPP and other epizootics.
- Improvement of the distribution of services and drugs to breeders.
- 32 countries were involved.
- 72 millions of euros involved, almost 54 dedicated to the 32 countries.
RECOMMENDATIONS

- Although rinderpest is eradicated, Africa should remain vigilant against possible future re-emergence of rinderpest.

- Surveillance and Monitoring is a continuous process
ROLE OF INTERNATIONAL ORGANISATIONS
InterAfrican Bureau for Animal Resources

- Charged with the responsibility of eliminating rinderpest from Africa. Has moderated all the rinderpest eradication programs.
The widespread occurrence of rinderpest after World War II was a main reason for the founding of the Food and Agriculture Organization (FAO) in 1945.
The objective of the final phase of the rinderpest eradication initiative was to ensure that freedom from the disease is actually achieved and getting this finding officially approved by the OIE.

Which provides for a great opening of new trade opportunities
QUESTIONS ????
Discuss a known epidemic disease eradication program/project?