Robert Dyar Labrador Memorial Lectureship in Epidemiology

Improving Global Health in the 21st Century:

Veterinary Medicine Stepping Up to the Plate to Protect Human Health and Well Being

Marguerite Pappaioanou, DVM, MPVM, PhD

“And it was so typically brilliant of you to have invited an epidemiologist.”
Veterinary Medicine is a Human Health Activity.

Acknowledgements

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Richard Tjalma
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Veterinary Oath

“.... I solemnly swear to use my scientific knowledge and skills for the benefit of society through the protection of animal health, the relief of animal suffering, the conservation of livestock resources, the promotion of public health and the advancement of medical knowledge.”

Unprecedented Opportunity

• Public awareness and focus on food safety
• Bioterrorism / Biodefense
• West Nile Virus- zoonotic emerging diseases - antibiotic resistance
• Concerns for the environment and biodiversity
Improving Global Health in the 21st Century:

Veterinary Medicine Stepping Up to the Plate to Protect Human Health and Well Being

Public Health

“is what we, as a society, do collectively to assure the conditions in which people can be healthy.”

Institute of Medicine, *The Future of Public Health*, 1988
On veterinary medicine and public health...
RA Tjalma, 1959

“Responsibility for the public health is not vested in any one group of individuals.”

“Veterinary medicine.... has certain obvious and well-defined public health responsibilities.”

“The veterinary clinician in practice has, in many instances, a well-defined responsibility for the health of his client as well as the health of his patient.”

The British Veterinary Journal.
215: 265-270.

The Vision of Dr. Richard Tjalma, 1959,
Continued

“The future of veterinary public health is limited only by the ability of the profession to recognize its opportunities and accept its responsibilities.”
“Human health provides the most logical unifying or apical cause in veterinary medicine’s hierarchy of values”

Calvin Schwabe, Veterinary Medicine and Human Health, 1984

Driving World Forces and Their Impact on Veterinary Medicine

- Rapidly increasing human population and urbanization
- Globalization of trade and movement of people
- Increased access to information
Rapidly Increasing Human Population

- 6.1 Billion people in 2000
- ~9.4 to 11.2 Billion in 2050


Rapidly Increasing Urbanization

- 2000
  - 47% world population living in urban areas
- 2030
  - 60% world population living in urban areas
Impact of Human Population Growth and Urbanization

- Human to human relationships are changing
- Human relationships with animals changing
  - Food animals
  - Wildlife
  - Companion animals
- Human health and well being take precedence

Protecting Human Health and Well being

- Food Security
- Safe Food and Water
- Healthy Environment
- Healthy Ecosystems
- Emerging Diseases, Zoonoses
- Bioterrorism/Defense
- Companion Animals
- Public Health Infrastructure
- Advances in medical science
Food Security and Safety

Source: New York Times Magazine, April 1, 2002

Foodborne Infections

- Worldwide
  - > 2 million people die from diarrhea caused by contaminated food and water each year

- U.S.
  - ~76 million persons experience foodborne illnesses (1 in 4 people)
    - ~325,000 hospitalizations
    - ~5,000 deaths
The Paradigm Has Changed

- Outbreaks of E. coli 0157:H7 with serious illness and deaths in young children
- Massive recalls of meat and ice cream
- vCJD and BSE in the UK
- Globalization; massive movement of livestock, poultry, fish across borders
- Zoonotic pathogens in healthy food animals (e.g., E. coli 0157, Campylobacter, Salmonella, Yersinia enterocolitica)

Intensity and Consolidation of Food Animal Production

- More animal protein needed with increasing human population
- Want healthy animals but not at cost of risks to human health
Call for Veterinary Leadership

- HACCP
  - Anticipates foodborne hazards
  - Institutes controls to prevent their occurrence in meat and poultry slaughter and processing plants
- Surveillance in humans and food animals
- Reduce prevalence of pathogens in animal reservoirs
  - Develop and implement effective on-the-farm preventive interventions
- Minimize antibiotic resistance

FoodNet
Active Sentinel Surveillance for Foodborne Infections in the US

- Campylobacter
- E. coli 0157
- Salmonella
- Listeria monocytogenes
- Vibrio
- Shigella
- Yersinia enterocolitica
- Cryptosporidium parvum
- Cyclospora cayetanensis
- Hemolytic Uremic Syndrome

13% of US Population
Concerns about Increasing Antimicrobial Resistance

- Increasing treatment failures for invasive salmonella infections in humans
- Few alternative antibiotics of choice for treatment (predominantly children)
Factors Contributing to Antimicrobial Resistance

- Pathogen mutations; genetic exchange
- Selective pressures in hospitals, nursing homes, day care centers, etc.
- Inappropriate and over use of antibiotics in human outpatient settings
- Use of antibiotics in food animals for disease control and growth promotion

Call for Veterinary Leadership

- Institute veterinary consultation when antibiotics are used
- Develop and implement on-the-farm interventions to reduce need for antibiotics
- Monitor antibiotic resistance, in humans and food animals, for trends over time
  - Evaluate effectiveness of interventions
  - Conduct follow-up studies to add to body of knowledge
- Monitor antibiotic use practices
- Advise on recommendations and guidelines, with human health highest priority
National Antimicrobial Resistance Monitoring System (NARMS)

- **Human**
  - 27 sites; ~50% US population
  - 17 antimicrobials
  - Salmonella, Listeria, E. coli 0157, Vibrio, Campylobacter, Shigella

- **Animal**
  - Cattle, swine, chicken, turkeys, exotics, dogs, horses, cats
  - 17 antimicrobials
  - Salmonella, Campylobacter, E. coli

Selected Trends, NARMS, 1996-2000

Percent Salmonella Isolates Showing Resistance

- * To Ciprofloxacin
- **To multiple agents including ceftriaxone
Concentrated Animal Feeding Operations

- ~ 450,000 in US
- 132 million metric tons waste (1997)
- Untreated manure applied directly to land as fertilizer or soil amendment, or discharged or leaked from storage lagoons
  - Zoonotic bacteria, viruses, protozoa; chemicals/agents including nitrates; antimicrobials; algae

Poor Outcomes for Human Health and Well Being

- Agricultural runoff greatest source of pollution for ~ 60% of “unfit” waterways in the US
- 40% of US surface water unfit for drinking, fishing, swimming, aquatic life
- Many disease outbreaks caused by contaminated drinking water, recreational water, and food
- Possibly chronic exposure to chemicals and agents via contaminated groundwater – health effects unknown
Veterinarians Protecting Healthy Environments

Veterinary Leadership in Responding to Environmental Health Concerns

- Harmful algal blooms
- Chemicals, disinfectants, pharmaceuticals in drinking water
- Exposures to pesticides and toxins
- CAFOs
- Chemical Terrorism Response
- Disaster Epidemiology and Assessment (Human/Natural)
- Exposures to excessive noise, heat and cold
- Cancer Clusters
Ecosystem Threats

- Human encroachment; movement of people
- Increased human contact with wilderness habitats
- Irrigation, deforestation altering habitats, animal & vector populations
- Human interventions/behaviors affecting patterns of disease transmission

“By Leaps and Bounds, Monkeys Overrun Japan”
Story by James Brooke, NY Times, April 12, 2002

Manatees Fighting for Survival
Emerging Infectious Diseases

- Translocation
- Human encroachment
- Ex situ contact
- Ecological manipulation
- Global travel
- Urbanization
- Biomedical manipulation
- Agricultural Intensification
- "Spill over" & "Spill back"

Wildlife EID
Domestic Animal EID
Human EID
Technology and Industry

Dasazak P. et.al.
Science 2000 287:443
Zoonotic Tuberculosis – A Risk to Rural African Communities?

- Community cattle in contact with M. Bovis infected African Buffalo
- Unknown BTB Status
- Human consumption of unpasteurized milk
- Close contact with cattle
- High HIV prevalence
- Limited awareness

Source: Dr. Anita Michel, ARC-Onderstepoort Veterinary Institute

Emerging Infectious Diseases
Infectious Diseases

- Major cause of death in the world
  - 14 million (25%) global deaths (WHO) annually
- Affect all people, regardless of age, gender, lifestyle, ethnic background, SES
- Cause suffering and death, and financial burdens on societies; affect economic development in poor countries

Major Disease Outbreaks in Humans, 1990’s

- Cryptosporidia, municipal drinking water, Milwaukee WI, 1993
- Hantavirus, rodents, SW U.S., 1993
- Plague, India, 1994
- Ebola, Zaire (DRC), 1996
- vCreutzveldt-Jacob Disease, Cattle, 1996
- Avian Influenza A, Chickens, Hong Kong, ‘97
- West Nile Virus, Birds, New York, 1999
- Nipah Virus, Swine, Malaysia, Singapore, 1998
- Anthrax bioterrorism, Florida, New York, New Jersey, 2001
### Infectious Organisms Pathogenic to Humans and Percent Zoonotic

<table>
<thead>
<tr>
<th>Type of Pathogen</th>
<th>#</th>
<th>Zoonotic (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viruses &amp; Prions</td>
<td>217</td>
<td>165 (76%)</td>
</tr>
<tr>
<td>Bacteria &amp; Rickettsia</td>
<td>538</td>
<td>269 (50%)</td>
</tr>
<tr>
<td>Fungi</td>
<td>307</td>
<td>113 (37%)</td>
</tr>
<tr>
<td>Protozoa</td>
<td>66</td>
<td>43 (65%)</td>
</tr>
<tr>
<td>Helminths</td>
<td>287</td>
<td>278 (97%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,415</td>
<td>868 (61%)</td>
</tr>
</tbody>
</table>

*Source, Taylor LH et al. 2001; Phil. Trans. R. Soc. Lond. B. Vol. 356:983-989*

### Emerging Infectious Organisms Pathogenic to Humans, That are Zoonotic

<table>
<thead>
<tr>
<th>Type of Pathogen</th>
<th>#</th>
<th>Zoonotic (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viruses &amp; Prions</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Bacteria &amp; Rickettsia</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Fungi</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Protozoa</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Helminths</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>175</td>
<td>132 (75%)</td>
</tr>
</tbody>
</table>

*Source, Taylor LH et al. 2001; Phil. Trans. R. Soc. Lond. B. Vol. 356:983-989*
Examples of Veterinary Leadership

• West Nile Virus
  - Detection; Surveillance of epidemic in birds; Clarifying role of horses

• Nipah Virus in Malaysia and Singapore
  - Epidemiology on farms, in swine, slaughterhouses

• Pneumonic tularemia, Massachusetts
  - Identification of new risk factors for human infection

• Hantavirus, SW U.S.
  - Epidemiology, surveillance, prevention

• Plasmodium falciparum malaria, Africa, Asia
  - Effectiveness of antimalarials, national treatment policies

Knowledge and Skills Needed for Veterinary Leadership in Healthy Environments, Ecosystems and Emerging Infectious Diseases

• Epidemiology, population and comparative medicine
• Public health; environmental toxicology, zoonotic, foodborne, emerging diseases, surveillance, disease prevention and control
• Wildlife disease management, natural resource use, and conservation (Terrestrial and Marine)
• Urban and environmental policy and planning
• Economics, policy analysis
• Communities’ relationships with animals
• Counseling in efficient animal production, manure management
• Risk Assessment, Management, Communication
Bioterrorism
Biodefense
Agroterrorism

Veterinary Leadership in Anthrax Bioterrorism Response

• Surveillance for human disease
• Participated in decision making
• Environmental cleanup- Capitol Hill
## Agents of Bioterrorism

<table>
<thead>
<tr>
<th>Category</th>
<th>Bacteria, Rickettsia, Toxins</th>
<th>Viruses</th>
<th>Total (% Zoonotic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Anthrax; Botulism; Plague; Tularemia</td>
<td>Smallpox Viral Hemorrhagic Fevers</td>
<td>6 (83%)</td>
</tr>
<tr>
<td>B</td>
<td>Brucellosis; Epsilon toxin of C. perfringens; Glanders; Staphylococcus, enterotoxin B; Q Fever</td>
<td></td>
<td>5 (80%)</td>
</tr>
<tr>
<td>C</td>
<td>Multidrug-resistant tuberculosis</td>
<td>Hantaviruses; Nipah virus; Tickborne encephalitis viruses; Yellow Fever</td>
<td>4 (80%)</td>
</tr>
</tbody>
</table>

## Veterinary Leadership in Preparation, Prevention, Response

- Disease surveillance in humans and animals
  - Participation of veterinary diagnostic and animal health laboratories, zoonotic infections
  - Reporting by wildlife/zoo, food, companion, equine animal practitioners on important vectors, animals with diseases of public health and foreign animal health importance
  - Reporting by veterinary pathologists
  - Syndromic surveillance in humans
Benefits of Companion Animals

- Friendship
- Emotional support
- Reduce blood pressure
- Promote physical activity
- Eyes for the Blind
- Ears for the Death
- Seizure-Alert
- Legs and “hands” for the disabled
- Therapy for the Unwell
- Search and rescue
- Sport and recreation
- Detect meat and agricultural products
- Detect contraband
- Track quarry
Percent Households with Pets in the US

- Owning dogs: 32%
- Owning cats: 27%
- Owning dog or cat: > 50%

Source: AVMA, U.S. Pet Ownership & Demographics Sourcebook, 1997

Utilization of Veterinary Services by Pet Owners

- Owners using services of veterinarian in previous two years:
  - Dog: 88.7%
  - Cat: 72.9%
  - Horse: 66.3%
  - Bird: 15.8%

Source: AVMA, U.S. PetOwnership & Demographics Sourcebook, 1997
Human Diseases and Injuries with Serious Health Consequences Acquired from Dogs and Cats

- Dog bite injuries
- Cat scratch disease
- Toxocarial Larva Migrans
- Congenital toxoplasmosis

An opportunity to promote public health...

Recommendations for Veterinarians

How To Prevent Transmission of Intestinal Roundworms from Pets to People

Three guidelines address transmission of intestinal roundworms and hookworms from dogs and cats to people and recommend counseling of dog and cat owners and well-timed preventive anthelmintic treatments for pets.

- Counsel pet owners about zoonotic infections and how to prevent them
- Treat pets for Toxocara, hookworms, other parasites; immunize pets against rabies and other diseases
- Advocate community measures to reduce the burden of toxocara eggs in the environment
- Reduce numbers of stray, unwanted, rejected animals
Prevention Information on CDC’s Web Site
http://www.cdc.gov/ncidod/diseases/pets/index.htm

Introduction
Pets provide many benefits to humans. They comfort us. They give us companionship. However, some animals can also transmit diseases to people. These diseases are called zoonoses.

In general, Centers for Disease Control and Prevention (CDC) encourages people to enjoy the benefits of common household pets. By following CDC’s simple health tips on the healthy pets, healthy people Web site, you can help keep your pet, yourself and your family healthy.

While pets can carry diseases, it is important to know that you are more likely get these diseases from contaminated water, soil, and food. In addition to reading our materials on pets, we encourage you to also read CDC’s general information on each disease. Links to CDC’s general information pages are located below.

Veterinarian’s on the Front Line Can Prevent This from Happening
Dog Bite Injuries

- Estimated 4.7 million bites per year
- 800,000 require medical care
  - 446,000 non-emergency care visits
  - 321,000 emergency room visits
  - 13,000 hospitalizations
  - 20 fatalities
- > $250 million per year

Call for Veterinary Leadership

- Assist owners on pet selection
- Provide behavioral counseling

www.cdc.gov/safeusa/dogs/dogs.htm
“Good Clinical Practice”

- Thorough history
- Thorough physical exam
- Provide preventive care
  - Vaccinations
  - Fecal examination, de-worming
- Treat as needed
- Counsel on public health

Public Health Surveillance

Domestic and Global Disease Prevention and Control
Selected Non-zoonotic Contributions

• Public Health Surveillance and Informatics
• HIV/AIDS Surveillance (Dr. Kate Glynn)
• Vaccine Preventable Diseases
• Data standards, NCHS
• Antimalarial drug effectiveness (Dr. Peter Bloland)

NGOs - Global Health

• Dr. Jim Zingeser, Carter Center, Atlanta

• Chief Technical Officer on Trachoma Control Program
Advancing Medical Research

- Principal and co-investigators in research for all areas mentioned
- Animal Models, collaboration with other health sciences
- Development of vaccines
- Nutrition and chronic diseases
- Xenotransplantation
- Genomics
- Diagnostic tools
- Other
- Laboratory animal veterinarians
How Are We Doing, as a Profession, in Stepping Up to the Plate?

Numbers, Distribution, Commitment

• Too few working in public health right now
• Too few upcoming veterinarians interested in disciplines outside of companion animal medicine (we need more!)
  ➢ ~ 75,000 veterinarians in the US
  ➢ ~ 75% in private clinical practice (6-8% interested in food animal)
  ➢ > 6% are in teaching and research
  ➢ Regulatory medicine, Public Health, Private Industry, Uniformed Services
U.S. Veterinarians in Public Health

- Private practitioners
- Local/County Health Departments
- State Health Departments
- Federal Government
  - DHHS: CDC, FDA, NIH
  - USDA: APHIS and FSIS
  - EPA
  - DoD
- Colleges of Veterinary Medicine, Medicine, Schools of Public Health
- Industry/Drug Companies (Human/Animal)
- NGOs

State Public Health Veterinarians

- Main link between human, agriculture, wildlife health
- Surveillance for zoonotic diseases
- Prevention and control of zoonotic diseases
California Public Health Veterinarian
Veterinary Public Health Section

- Rabies prevention and control
- Bacterial (brucellosis, leptospirosis, tularemia), Parasitic, Viral and Rickettsial (West Nile surveillance)
  - Psittacosis Control Program
  - Turtle salmonellosis
- Animal bites
- Food safety
- Wild Animal Importation Program

Veterinarians at CDC

- ~ 80 veterinarians currently at CDC (~2% of professional workforce)
  - Epidemiologists/Programs/Management ~ 70
  - Laboratory Animal Medicine ~ 3-5
  - Epidemic Intelligence Service Officers ~ 8
- 189 (9%) of 2,104 EIS Officers, 1951-2002
- 118 since 1977: 80% employed by federal and state governments; 20% academic positions, industry, other
Where Veterinarians Are Employed at CDC

- National Center for Infectious Diseases
  - Bioterrorism
  - Foodborne and Diarrheal Diseases
  - Food Safety
  - Meningitis and Special Pathogens
  - Bacterial Zoonoses
  - Viral and Rickettsial Diseases
  - Vector-Borne Infectious Diseases
  - Parasitic Diseases
  - Global Migration and Quarantine

Where Veterinarians are Employed at CDC

- Environmental Health
- Injury Prevention and Control
- National Immunization Program
- HIV/STD/TB Prevention
- National Center for Health Statistics
- Occupational Safety and Health
- Chronic Disease Prevention and Promotion
- Epidemiology Program Office, Office of Global Health
Developing Leaders for Tomorrow
Innovative Programs at
US Veterinary Colleges

- Preventive Veterinary Medicine and Public Health Degree Programs
- Food Safety
- Environmental Toxicology
- Healthy Ecosystems and Emerging Diseases
- International Programs

Challenges

- Our own limited and narrow perception of what “veterinarians do”
- Our lack of confidence in multidisciplinary settings
- Our tendency to communicate solely within the profession
- Our hesitation to provide leadership on controversial issues, speak out, take risks
- Our tendency to wait to be invited by others
- Letting demand for veterinary services be shaped by others rather than develop and implement our vision
Current and Future Market for Veterinarians and Veterinary Medical Services, U.S., 1999, KPMG Mega Study

“Some growth is expected in the small but important areas of public health, environment, and food safety...

We learned that the veterinarians’ role in these areas is not generally recognized or understood by consumers.”

Public Awareness of Veterinarian’s Role, KPMG Report, 1999

<table>
<thead>
<tr>
<th>Awareness that Veterinarian’s Work in</th>
<th>Non-pet Owners</th>
<th>Pet Owners</th>
<th>Horse Owners</th>
<th>DVMs/VMDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Safety</td>
<td>11%</td>
<td>17%</td>
<td>37%</td>
<td>?</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>28%</td>
<td>33%</td>
<td>47%</td>
<td>?</td>
</tr>
<tr>
<td>Public Health</td>
<td>17%</td>
<td>24%</td>
<td>34%</td>
<td>?</td>
</tr>
</tbody>
</table>
WHO/FAO Expert Committee on Veterinary Public Health, 1975

“... because veterinarians are not involved in the care of human patients in the hospital or the clinic, the veterinarian’s health science role is not fully understood by many of those who visualize the health sciences as functioning almost exclusively in that setting.”

Challenges

• Our own limited and narrow perception of what we do
• Our lack of confidence in multidisciplinary settings
• Our tendency to communicate solely within the profession
• Our hesitation to provide leadership on controversial issues, speak out, take risks
• Our tendency to wait to be invited by others
• Letting demand for veterinary services be shaped by others rather than develop and implement our vision
Composition of Selected Institute of Medicine Committees

<table>
<thead>
<tr>
<th>IOM Report</th>
<th># Committee Members</th>
<th># Veterinarians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future of Public Health, 1988</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>Emerging Infections, 1992</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>Biological Threats and Terrorism, 2002</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>The Emergence of Zoonotic Diseases: Understanding the Impact on Animal and Human Health, 2002</td>
<td>18</td>
<td>0 (8 of 24 speakers)</td>
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<tr>
<td>Assuring the Health of the Public in the 21st Century, 2003</td>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

Challenges

- Our own limited and narrow perception of what we do
- Our lack of confidence in multidisciplinary settings
- Our tendency to communicate solely within the profession
- We have not earned the trust of other partners to put public health first
- Our hesitation to provide leadership on controversial issues, speak out, take risks
- Letting demand for veterinary services be shaped by others rather than develop and implement our vision
“The Best Way to Predict the Future is to Create It.”

Source, Poster on Innovation

“…..What are you veterinarians going to do for the public health?”

Dr. Joseph Mountin, Assistant Surgeon General, US Public Health Service, to Dr. James Steele, 1947
We will--

- Protect human health and well being in all that we do
- Demonstrate by deed as well as by word that public health is our highest priority.
- Say YES, when asked to contribute
- Prove that we can be trusted to come through when needed

We will ....

- With confidence and commitment, share what we know, speak up, participate, lead!
- Participate in national, international multidisciplinary meetings
- Publish manuscripts in cross-disciplinary journals; address public health implications of findings.
We will....

• Seek positions of responsibility, influence, and authority
• Bring expertise in human, agriculture, and wildlife together to solve problems important to human and animal health

We will

• Recruit and accept larger number of students into veterinary colleges expressing interest in different options; support and reward them.
• Communicate with veterinary students at the earliest time possible that there are different fields to consider, all of equal value
• Provide basics in epidemiology and public health in curricula such that graduates can fulfill our responsibility to promote public health
We will....

- Recruit veterinarians for graduate work in special programs and public health.
- Recruit veterinarians to apply and enter CDC’s Epidemic Intelligence Service.
- Recruit qualified veterinarians to apply for positions in local, State, Federal agencies, Academia, Industry, NGOs.

We will...

- Broaden the view of the profession as to what veterinarians do
- Bring stakeholders together, develop and implement strategic plan, with realistic objectives, outcomes, activities defined.
  - Accreditation
  - Licensing
  - Specialty Boards and Colleges
  - Practice Standards
  - Continuing Education
Fundamental knowledge and skills needed for success

- Clinical skills, comparative medicine
- Epidemiology, public health, population medicine.
- Problem solving
- Interpersonal skills
- Work effectively in multidisciplinary teams
- CONFIDENCE
- Communication skills
- Leadership, Management, Flexibility/Change
- Political skills

Final Thoughts

- Veterinary Medicine is a human health activity
- Human health and well being must be our highest priority, we must act unwaveringly on that commitment in all that we do
- Veterinary medicine protects human health and well being through several pathways, all valuable
- We must broaden the perspective of what veterinarians do
Final Thoughts

• Talented veterinarians are providing leadership in all aspects of our profession
• Substantial opportunities exist for veterinarians to step up to the plate and make a difference
  ➢ We need greater numbers of veterinarians to work in all these fields

Step Up to the Plate and "Just Do It"