Practical Applications of the Scientific Method:
Lessons Learned from Veterinary Disaster Responses

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Lessons learned from deployments to a variety of disasters (floods, hurricanes, wild fires, plane crashes, etc.) have enlightened veterinary response teams to the assets and deficiencies often faced. Importantly, *all* disaster responders must be trained prior to deployment. Without doubt the untrained, unorganized responder quickly becomes a part of the problem in disaster response. Responders are given basic training in topics relevant to a disaster but after each disaster an assessment of the response provides an opportunity to adjust training or procedures to provide improved response at the next disaster. Disaster response plans are encouraged for government, businesses, and personal use. These plans usually require changes to meet the specific problems of an actual disaster.

Although the ideal would be to fully utilize the scientific method in making changes and determining training needs, this is an improbable task. In this discussion the scientific method will provide the skeletal framework for identifying, changing, and improving disaster response. For these topics the disaster scene becomes the laboratory and improvement in training becomes the end result.

An Overview of the Scientific Method (http://www.scientificmethod.com/index.html)

A good, short definition of the scientific method is as follows: "The scientific method is the basic method, guide, and system by which we originate, refine, extend, and apply knowledge in all fields of study." Importantly, while the method was largely developed by scientists, it is also a general method for all domains. Thus it is the complete method of problem solving and decision making.

Basic Steps of the Scientific Method. Over the last few centuries hundreds of model formulas for the steps or stages in the scientific method have been offered by various authors. Currently there are eleven steps and three supporting ingredients as the best model formula (SM-14) suitable as a standard for teaching and using the scientific method (Table 1).

Table 1: Basic Steps of the Scientific Method.

Guide to the Scientific Method	
PART 1 – ***Observation through***	**Part III** – ***Implementation or Peer Review***

Hypothesis
1. Curious Observation
2. Is There a Problem?
3. Goals and Planning
4. Search, Explore, and Gather the Evidence
5. Generate Creative and Logical Alternatives
6. Evaluate the Evidence
7. Make an Educated Guess

Part II – ***Challenge though Suspend Judgment***
8. Challenge the Hypothesis
9. Reach a Conclusion
10. Suspend Judgment
11. Take Action

Supporting Ingredients
Part IV – ***Action or Applied Ingredients***
12. Creative, Non-logical, Logical, and Technical Methods
13. Procedural Principles and Theories
14. Attributes and Thinking Skills

While the steps or stages are listed in the usual order of use, in actual practice they will often be used in a very flexible manner, as progress on complex problems is seldom smooth. In using the steps or stages there will be skipping ahead, backtracking, stalling, looping ahead or back, combining two or more ingredients, and use of various combinations. As you can imagine following the SM-14 is very expensive to take a problem to its conclusion. Thus an important feature of the scientific method is its flexibility. Noting this flexibility one might consider using a shortened model (SM-4) which is an abbreviated version of the SM-14 (Table 2).

Table 2: Shortened Model (SM-4) of the Scientific Method

SM-4 4-Step Short Model of the Scientific Method	Brief Description	Step or Stage of SM-14
Problem	*(Define carefully)*	#2
Alternatives	*(Search and generate)*	#5
Evaluate	*(Based on evidence select best)*	#6
Challenge	*(Check to be sure it is best)*	#8

Anyone who has responded to a veterinary disaster can certainly corroborate the existence of numerous problems. Regardless of the cause, whether natural or technological, the repercussions of most disasters are often similar, including impacts from infrastructure failures (electrical power, lights, water, sewage, etc.), hazardous materials spills, insufficient personnel, security breaches, animal escapes and injuries, untrained rescuers, well-intentioned volunteers with no organizational structure, lack of transportation and sheltering facilities, and many others. In all disasters, we should never lose sight of maintaining the well-being of the animals.

Practical Application of the Scientific Method in Veterinary Disaster Response

Six important lessons-learned will be discussed using the scientific method (SM-4) as a format. These lessons have been illuminated from responses to hurricanes, floods, forest fires, plane crashes, outbreaks of avian influenza in poultry, and through deployments to various special events in the United States (2002 Winter Olympics in Salt Lake City, Utah; 2008 Democratic National Convention in Denver, Colorado; and others).

LESSON 1: Veterinary Responders

Problem: The paramount problem in veterinary disaster response is the lack of a core group of veterinary personnel ready to respond. Individuals involved must first consider their personal welfare and safety, and then attend to the health, safety, and well-being of their family. Only after these have been attended to should the responders begin to concern themselves with deployment responsibilities. Too often heroic action is expected from disaster victims. Undoubtedly each disaster responder will feel an absolute commitment to "save their animals" but if there are deaths in the family, the house has been blown away, or there is no food to feed the children, it is difficult to expect one to focus on their occupation until they have addressed personal priorities.

Alternatives: Depending upon individual volunteers and volunteer organizations (humane groups) to be available, trained, credentialed, and responsive to intentional (explosives, nuclear, biological, chemical, cyber) and non-intentional (industrial or natural) disasters is an option but experience has shown that turf wars quickly arise leading to an impediment to effective response.

Evaluate: The illustration and labels in Figure 1 provide insight to the veterinary disaster response framework used in the United States.

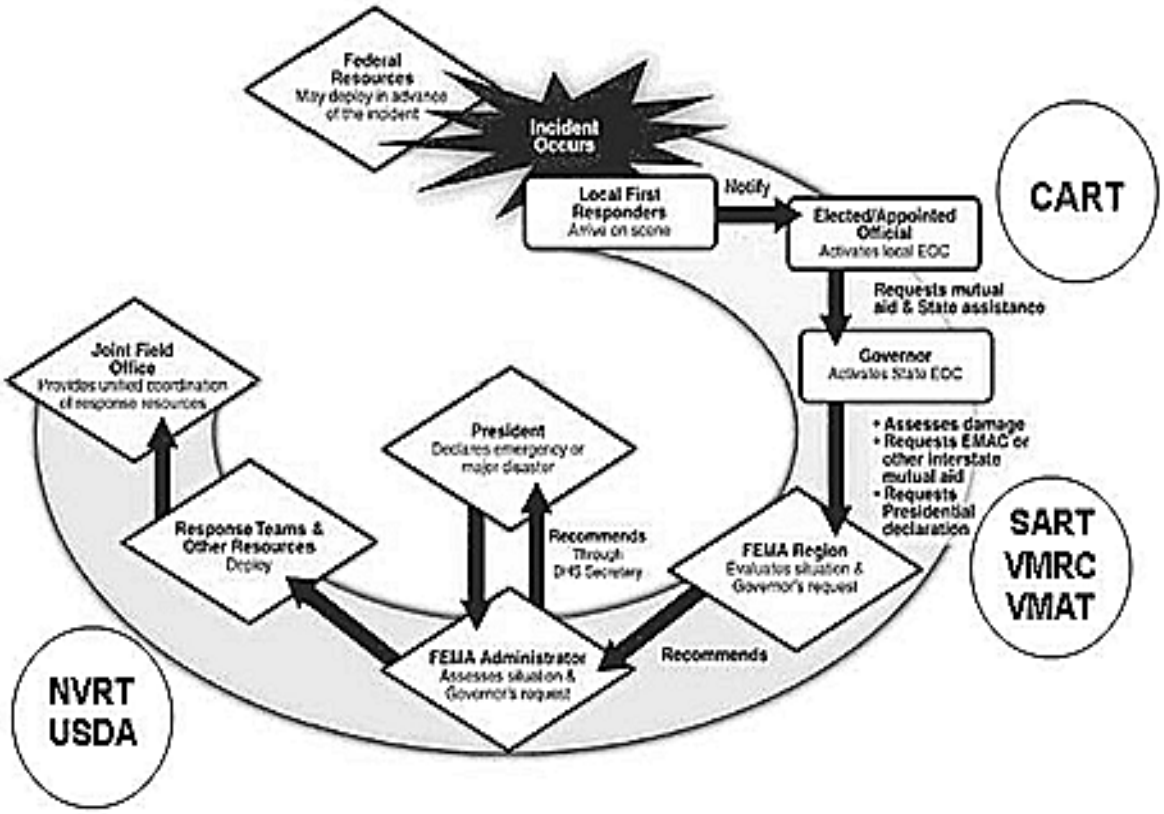

Figure 1: The progression of events leading to a response by local, state, and federal resources in the United States of America. CART = Community Animal Response Team; SART = Statewide Animal Response Team; VMRT = Veterinary Medical Response Team; VMAT = Veterinary Medical Response Team; NVRT = National Veterinary Response Team; FEMA = Federal Emergency Management Agency; and USDA = United States Department of Agriculture (Modified from public domain: http://www.fema.gov/pdf/emergency/nrf/nrf-overview.pdf)

Challenge: The existence of community and county preparedness plans greatly increases the self-reliance and effectiveness of assistance, contributing to a decrease of disaster-related mortality and morbidity. Community or county sources are termed community animal response teams (CARTs); at the state level are state animal response teams (SARTs), veterinary medical response corps (VMRCs), or veterinary medical assistance teams (VMATs); and finally, there are federally deployed national veterinary response teams (NVRTs).

- **Community Programs** The first order of business for local agencies is to conduct vulnerability studies of each community or county, mapping specific locations of potential disasters and pinpointing potential associated risks; thus, each community or county knows the location of all animals that may be in harm's way. An inventory of existing resources to facilitate rapid mobilization during the emergency follows; it should include an up-to-date list of all trucks, trailers, and boats available to evacuate large animals, kennels, shelters, research animal holding facilities, and fairgrounds that house animals. Also important is a plan for carcass disposal in the event of a

large-scale veterinary disaster. This not only includes the intended means of disposal but also the equipment availability in order to complete this plan.

CART is one of the more common designations for local animal emergency planning, preparedness, and response networks. In some communities, the CART program is a network of agencies and nongovernmental organizations with volunteer participation routed through existing community organizations. Other communities, particularly ones with fewer volunteer organizations, may establish a program in which volunteers are affiliated directly with local government. While the exact format and nomenclature vary greatly, local disaster response programs share the following basic goals (Dennison 2009a):

- Create a unified network of community animal response resources in a system connected to local emergency management, to develop and execute the community animal emergency plan.
- Help communicate lead and supporting roles for various mission tasks to the network of stakeholders. This is particularly important since there is often high turnover of personnel in government and nongovernmental organizations, private-sector businesses, and community volunteers.
- Actively promote and create opportunities for volunteer involvement and provide a mechanism (e.g., insurance) to address volunteer liability and accident issues.
- Facilitate training and exercises.
- Support community preparedness outreach.
- Maintain standards and credentialing for local disaster response teams.

The community emergency manager is responsible for overall development of the local emergency operations plan, and works with local agencies and organizations in the community animal and agricultural sector, which do most of the planning for their specific area of expertise. The group that drafts the community animal emergency plan should include the community or county emergency manager and a handful of local animal or agricultural experts who prepares the first draft for discussion by a broader group of agencies, organizations, and individuals. Based on input from the stakeholders, the group develops further draft versions until the plan is ready for final approval by elected officials.

- **State Programs**. Once an event overwhelms local resources, the local emergency operations center notifies the state emergency operations center and requests assistance (deployment of state resources requires a written request). Each state develops mechanisms for addressing both animal and agricultural emergency management issues according to its statutes regulating these areas. In addition, each state has differing strengths and challenges, risks and resources, and a unique political environment. Thus states address these issues through a variety of programs and nomenclatures, typically including two mechanisms specifically for animal issues in disasters:
    1. State agencies (e.g., a department of agriculture, state veterinarian, or state emergency management agency) address these issues through their statutory authorities and partnerships with nongovernmental entities. State programs may supplement state agencies by helping to coordinate state-level stakeholders, building partnerships between the state and the private sector, supporting local animal or agricultural emergency response capacity,

developing private-sector funding resources, and facilitating the use and credentialing of volunteers, including animal professionals.

2. Groups in the second category are generally referred to by the acronym SART, which can mean a state animal response team, state agricultural response team, or state animal resource team, depending on the state involved. States have different interpretations of the role of their VMRC programs. VMRCs may fulfill some of the roles of a typical SART program (e.g., in Wyoming and Oklahoma) or exist in addition to it (e.g., in Colorado, North Carolina, Florida). In some states the VMRC is a unit of the Medical Reserve Corps (human) program (e.g., Colorado, Minnesota, Oklahoma), and in others it is a program of the chief animal health official (e.g., North Dakota, South Dakota, Montana, Idaho, North Carolina, Arizona). Some VMRCs focus on animal disease response and others have a broader mission, including all-hazards emergency response. In all cases, VMRCs provide a mechanism to mobilize trained and credentialed veterinary professionals from the private sector to support the state's emergency needs. Currently there are over 20 state VMRC programs (Dennison 2009b).

Animal health emergencies, such as disease outbreaks, are managed primarily under the statutory authority of the state's chief animal health official and the US Department of Agriculture. The role of SART or VMRC programs varies widely for these types of incidents, but their tasks might include the following (Dennison 2009b):

- Help to engage local and state stakeholders in raising awareness of animal health threats and to promote local and state mitigation and preparedness efforts.
- Promote awareness of animal health emergencies in basic training for individual volunteers.
- Include biosecurity information in outreach materials on animal and agricultural preparedness.
- Identify and train individuals and teams that can assist in mission tasks related to an animal health emergency response. Some states have invested substantial efforts in training private-sector veterinary medical professionals to respond under the chief animal health official during an animal disease emergency.
- Help to identify and develop auxiliary mission capabilities that might include mental health support, care for animals isolated on farms or animal facilities due to quarantine restrictions, public information and outreach, community surveillance, logistical support (e.g., provision of food and water, transportation, medications, and specialized equipment), and many more.

- **Federal Programs**. The federal government maintains a wide array of capabilities and resources that can assist state governments in responding to incidents. In addition to the provisions of the Stafford Act, the National Response Framework (NRF) defines how the nation responds to emergencies and disasters (www.fema.gov/emergency/nrf/). Based on best practices and stakeholder input, the NRF presents guiding principles that enable all response partners to prepare for and provide a unified national response to disasters and emergencies, from the smallest incident to the largest catastrophe. Federally deployed veterinary response teams are termed national veterinary response teams (NVRT). The United States Department of Agriculture (USDA) also has veterinarians and trained volunteers available for response. Lastly the National Medical Response Team (NMRT)

is deployed as a counterterrorism team specializing in decontamination procedures in affected humans and service animals. With this mission, there are veterinarians assigned to the NMRT to manage and treat working dogs and horses.

LESSON 2: Organizational Structure

Problem. An incident is an occurrence, either caused by humans or a natural phenomenon that requires response actions to prevent or minimize loss of life or damage to property and/or the environment. Examples of incidents include:

- Fire, both structural and wild land.
- Natural disasters, such as tornadoes, floods, ice storms, or earthquakes.
- Human and animal disease outbreaks.
- Search and rescue missions.
- Hazardous materials incidents.
- Criminal acts and crime scene investigations.
- Terrorist incidents, including the use of weapons of mass destruction.
- National Special Security Events, such as Presidential visits or the Super Bowl.
- Other planned events, such as parades or demonstrations.

Given the magnitude of these types of events, it's not always possible for any one agency alone to handle the management and resource needs. Partnerships are often required among local, State, and Federal agencies. These partners must work together in a smooth, coordinated effort under the same management system.

Alternatives. Utilize organizational units and specialty teams to respond to the various incidents. These units are not part of the unified command, common mission, nor are they dependent upon other units for completion of their tasks.

Evaluate. The Incident Command System, or ICS, is a standardized, on-scene, all-hazard incident management concept. ICS allows its users to adopt an integrated organizational structure to match the complexities and demands of single or multiple incidents without being hindered by jurisdictional boundaries. ICS has considerable internal flexibility. It can grow or shrink to meet different needs. This flexibility makes it a very cost effective and efficient management approach for both small and large situations/incidents. The ICS organizational structure develops in a top-down, modular fashion that is based on the size and complexity of the incident, as well as the specifics of the hazard environment created by the incident. As incident complexity increases, the organization expands from the top down as functional responsibilities are delegated.

The ICS organizational structure is flexible. When needed, separate functional elements can be established and subdivided to enhance internal organizational management and external coordination. As the ICS organizational structure expands, the number of management positions also expands to adequately address the requirements of the incident. In ICS, only those functions or positions necessary for a particular incident will be filled.

All levels of a growing ICS organization must have a clear understanding of the functional actions required to manage the incident. Management by objectives is an approach used to communicate functional actions throughout the entire ICS organization. Figure 2 shows the 5 major management components of the ICS.

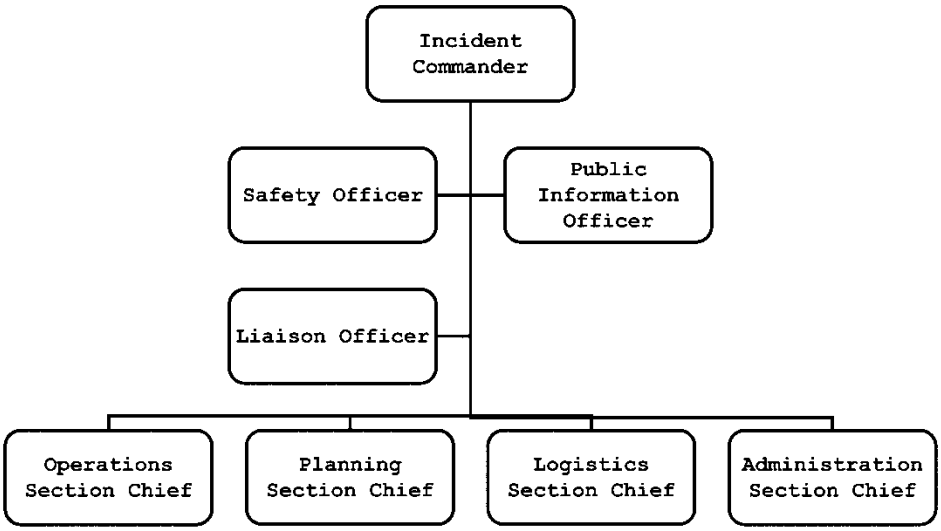

Figure 2: Basic organizational structure of the incident command system. The command structure is followed by operations, planning, logistics, and administration.

Challenge. **"**NIMS" is the National Incident Management System developed as a result of Homeland Security Presidential Directive 5 (HSPD-5). It is intended to provide a cohesive nation-wide management system allowing all levels of government and private sector organizations to work together during an incident. ICS is a subcomponent of NIMS along with Multi-Agency Coordination System (MACS) and the Public Information System.

The purpose of the National Response Framework is to ensure that all response partners across the Nation understand domestic incident response roles, responsibilities, and relationships in order to respond more effectively to any type of incident. The Framework is written especially for government executives, private-sector and nongovernmental organization leaders, and emergency management practitioners.

The Framework provides structures for implementing national-level policy and operational coordination for domestic incident response. The term "response" as used in this Framework includes the following: 1) Immediate actions to save lives, protect property and the environment, and meet basic human needs. 2) The execution of emergency plans and actions to support short-term recovery.

Incidents begin and end locally, and most are managed at the local level. Many incidents require unified response from local agencies, the private sector, and nongovernmental organizations. Other incidents may require additional support from neighboring jurisdictions or the State. A small number require Federal support. National response protocols recognize this and are structured to provide additional, tiered levels of support. A key concept in the National Response Framework is as follows: A basic premise of the Framework is that *incidents are generally handled at the lowest jurisdictional level possible*.

The number, type, and sources of resources must be able to expand rapidly to meet needs associated with a given incident. The Framework builds on the National Incident Management System (NIMS). Together, the Framework and NIMS help to ensure that all response partners use standard command and management structures that allow for scalable, flexible, and adaptable operational capabilities.

The National Response Framework is comprised of the core document, the Emergency Support Function (ESF), Support, and Incident Annexes, and the Partner Guides. The core document describes the doctrine that guides our national response, roles and responsibilities, response actions, response organizations, and planning requirements to achieve an effective national response to any incident that occurs.

The following documents provide more detailed information to assist practitioners in implementing the Framework:

- Emergency Support Function Annexes group Federal resources and capabilities into functional areas that are most frequently needed in a national response (e.g., Transportation, Firefighting, Search and Rescue).
- Support Annexes describe essential supporting aspects that are common to all incidents (e.g., Financial Management, Volunteer and Donations Management, Private-Sector Coordination).
- Incident Annexes address the unique aspects of how we respond to seven broad incident categories (e.g., Biological, Nuclear/Radiological, Cyber, Mass Evacuation).
- Partner Guides provide ready references describing key roles and actions for local, tribal, State, Federal, and private-sector response partners.

These documents are available at the NRF Resource Center, http://www.fema.gov/NRF. Training in ICS is available to everybody and can be found at the following website: http://www.training.fema.gov

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LESSON 3. Training

Problem: Veterinary responders are characterized by their willingness to help, availability for deployment, knowledge of veterinary medicine, and compassion for animals. Unfortunately the curricula in veterinary education leave little available time to teach important topics in disaster medicine. Training prior to deployment is not only necessary to understand the variety of scenarios likely to be encountered but it also must be thought of as essential for survival of a responder.

Alternatives: Lessons learned in Hurricane Katrina provided numerous examples of individuals and organizations wanting to assist. Unfortunately, these groups had little to no training in disaster response, had no concept of command structure in a disaster, and thus found themselves contributing more to the existing problems. There can be no alternative to the requirement for training prior to deployment.

Evaluate: As you can expect, the number of topics to list as ***core*** is difficult. Based upon our experiences in a variety of disasters all should develop a core group of topics and develop training materials and exercises to provide the responder with a basic understanding of important topics (Figure 3).

Figure 3: Suggested core training topics for veterinary disaster responders.

Challenge: A total of 10 veterinary responders who had numerous deployments to a variety of disasters were contacted and each was asked identify to rank order their five most important topics for veterinary disaster response. Table 3 provides the results of this poll.

Table 3: Consensus Training Topics for Veterinary Disaster Response Personnel.

Rank	Consensus Topic
1	Incident Command and Organizational Structure
2	Core Training
3	Triage
4	Communication
5	Biosecurity
Others	Risk Assessment, Equipment, and Cache Supplies

The core training provided to veterinary responders is very important as seen in Table 3. Also evident from this poll was a perceived failure to provide training in incident command and organizational structure. Although this is the most important training topic for these responders, it is not that we have neglected this topic. An important element in developing a preventative strategy is to begin with a basic understanding of the national incident management system (http://training.fema.gov/IS/NIMS.asp). Currently most state and federal disaster responders are required to complete ICS - 100, 200, 700, and 800. These self-paced, online courses definitely provide an understanding of the need for flexibility and adaptation during a disaster. Additional training is directed to facility-based needs. Currently, training in ICS is viewed by most responders as core, required training. Thus, we submit that incident command and organizational structure continues to be the foundation for all disaster responders. In abidance with the scientific method, following each deployment after-action reporting is required of participants. From these reports and assessment of training can be attained and often changes are made to improve the next deployment experience.

LESSON 4: Veterinary Triage

Problem: During a disaster, triage must be conducted with the purpose of doing the greatest good for the largest number of patients. Rapid examination followed by classification of patients according to the urgency of their treatment needs is critical. Veterinary disaster triage begins with the assessment of 1) the medical needs of the patient and 2) the medical resources available. As compared to disaster triage in human medicine, triage results and treatment decisions are different because of the differences between human and veterinary medicine. Veterinary disaster responders have little to no experience in triage decision making. Triage calls for an organized approach to multiple patients and ensures that the most critical animals are identified and normalized first.

Alternatives: Undoubtedly we would like to "save them all" following a disaster. Unfortunately the lack of available facilities and resources severely impacts veterinary disaster responders. If every animal, injured or normal, were to be treated, resources would quickly be depleted. Included in these "resources" would be places to house and care for the animals. Thus, it is imperative veterinary responders keep in mind that our goal must first be to protect the lives of humans and then direct our attention to animals. Triage techniques must be utilized by first responders, disaster response veterinary personnel, and finally definitive care veterinarians. Through each step the purpose for triage is provide the greatest good for the largest number of animals.

Evaluate: Triage in veterinary medicine involves three systems: Field triage, medical triage, and mobile veterinary unit triage.

Field Triage. Requires experienced veterinarians or rescuers and usually does not involve the individual examination of animals. More commonly, the animals are observed and decisions are made. Field triage is designed to identify animals most likely to benefit from the available care under austere conditions. It divides animals into three categories: 1) those that will likely die regardless of how much care they receive. Coded color = Black; 2) those that will survive whether or not they receive care. Coded color = Green; and 3) those who will benefit significantly from austere interventions. Coded color = Red.

Field Triage

Triage Category	Triage Color	Explanation
Immediate	**Red**	Might benefit from austere interventions
Minor	**Green**	Walking wounded but likely to survive
Dead, Dying, or Euthanatize	**Black**	Dead, dying, or euthanatize

Advantages of the veterinary field triage system include the following: focuses resources appropriately; requires an experienced triage team; tough decisions are made and adhered to; and after the disaster is over, the team retrospectively examines decisions and dedicates themselves to an improved performance.

Medical Triage. Medical triage is done rapidly and involves examining individual animals. One approach is to use the following four physiological criteria (RPPN): 1) **R**espiration/minute, 2) **P**ulse rate/minute, 3) **P**ulse pressure (although subjective, pulse pressure has a linear relationship to stroke volume. Therefore, if the pulse pressure is decreased (as you might see in shock) the stroke volume is also likely decreased), and 4) **N**eurological status. Coding in medical triage using RPPN is seen in the following table:

Medical Triage

Triage Category	Triage Color	RPPN*
Immediate	**Red**	Abnormal RPP
Urgent	**Yellow**	Abnormal PPN
Minor	**Green**	"Normal" RPPN
Dead, Dying, or Euthanatize	**Black**	Mortal Wounds or Severely Abnormal Neurological

* RPPN = **R**espiration, **p**ulse rate, **p**ulse pressure, and **n**eurological status.

In veterinary triage, it is important to recognize that limitations of treatment and injuries for certain species will effect the triage assessment. For example a fractured femur in a dog may be tagged **Yellow**, but a fractured femur in a horse will be tagged **Black.** A relatively small number of animals can overwhelm the veterinary medical system necessitating the implementation of the field triage system discussed above.

Medical triage **always** begins with a reassessment of patients. **Immediate** and **Urgent** patients go to the treatment area, where they are treated based on severity and resources. Those patients who need limited resources with a high probability of surviving will probably be treated first. **Minor** casualties go to an observation area where they are periodically reassessed. Patients who do not respond to treatment are re- tagged and sent to the observation area or euthanatized. One critical difference in veterinary triage (versus human) is that the category of patients that will die regardless of how much care they receive, and those that will suffer for the lack of care, will be euthanatized.

Mobile Veterinary Unit Triage: The term "mobile veterinary unit" signifies it is unlikely we will know beforehand what sort of facility might be available during a disaster that will allow

us to provide more intensive treatment of ill or injured animals. It may be a tent, a mobile veterinary vehicle, an undamaged veterinary hospital, or a large covered arena or warehouse. Triage in a mobile veterinary unit utilizes a physiological systems approach entitled Veterinary Systems Triage and Rapid Treatment (V-START). The physiological systems priorities in V-START are as follows: 1) respiratory, 2) cardiovascular, 3) hemorrhage, 4) neurological, 5) musculoskeletal, and 6) other (abdominal) injuries. The coding system used in V-START is as follows:

Mobile Veterinary Unit Triage

Triage Category	Triage Color	Physiological System Involvement
Immediate	**Red**	Respiratory, Cardiovascular, (Hypothermia, Hyperthermia)
Urgent	**Yellow**	Cardiovascular, Musculoskeletal, Neurological, Abdominal Injuries
Minor	**Green**	Musculoskeletal, Neurological, Abdominal Injuries
Dead, Dying, or Euthanasia	**Black**	Dead or dying when initially assessed. Mortal wounds not compatible with "Quality of Life" issues. Euthanasia.

Challenge. Organized veterinary triage categories have been applied during disasters since 2005. During this time careful records were kept in order to reassess triage decisions following the incident. Each time reassessment was carried out, slight changes were made in the categories and the end result is provided in the tables seen above. One critical finding is that field triage is rarely utilized by animal responders. This is attributed to the lack of training and the mindset of rescue personnel that all animals can be saved. Rarely should veterinarians be utilized in field triage and animal rescue. In most major disasters, true triage begins when the animals are brought to a central receiving area where veterinarians are staged for triage, treatment, animal identification, and sheltering.

Future deployments will likely result in more triage training for rescue personnel and will reduce the burden of large numbers of animals being immediately transported for medical care even when the animals have no apparent injuries or illnesses.

An even larger issue looms on the horizon. This issue is the triage of food animal species that are housed in large numbers. Individual examinations are not practical and much needs to be done to establish exactly how triage will be accomplished for these animals. Currently, we utilize field triage guidelines in managing large animal species for veterinary disaster triage.

LESSON 5: Communications.

Problem: Effective communication is based upon mutual understanding. In a disaster scenario there are three communication issues that must be addressed: 1) Effective verbal communication skills, 2) communication equipment, and 3) knowledge and experience of responders in using communication devices. Failure in any of these issues compounds the difficulties experienced during a disaster.

Alternatives: Disasters invariably destroy infrastructure associated with communication. Hand-held radios are not considered private and broadcasting with these devices will be especially troublesome when non-essential personnel intercept radio messages and use the information to convey erroneous or misleading guidance to the public. Too often radio frequencies are jammed from over-use in a disaster. Additionally, radio communications often comes across as a "direct order" rather than effective communication where one is trying to get the listener to accept the sender's position from their point of view. This often requires lengthy radio usage, a luxury not afforded in disasters.

Evaluate: As mentioned above, effective communication is characterized by a speaker acknowledging a listener's opinion while at the same time working to convince the listener to accept a position from their point of view. This is best accomplished through effective use of body language and tone of voice. One must learn to exude calmness and control in communication.

Communication equipment for veterinary disaster responders is usually minimal. If the equipment is available, responders must understand how to use the equipment, learn to be brief (25 – 30 seconds), use proper etiquette in identifying who you are and who you are calling, use "clear text" or "clear speech" as a method of communication that does not involve codes or proprietary phrases (it is simply speaking on the radio as you would in person), and know how to close out a radio communication. The equipment should be reliable, interoperable, scalable, readily available, resilient, durable, and redundant. Ease of use, as well as cost to implement, are also a considerations.

No names, phone numbers, or locations should be spoken over a hand-held radio in case of possible interception of the conversation by third parties.

Challenge: An effective leader has effective communication skills. These are derived from working with people, acquiring supervisory skills, conveying knowledge of the disaster scenario, exercising confidence in his/her knowledge base and demeanor, and placing responder safety as the primary goal in any exercise or deployment. Equipment used should be in good working order, have an adequate supply of appropriate batteries logistically available, and users of the equipment have trained for proficiency in radio communication skills.

It is important for your group to have a pre-arranged code that will signal danger for anyone using it. There should be a code for command officers to alert field personnel that they need to drop what they are doing and leave the area NOW! There should also be a code to alert team members or command officers that someone in the field is in danger. The code should be distinctive and known only to the rescuers and not the general public. For example, if the command staff has determined the area to be unsafe, they will announce over a PA system a code phrase such as "Sanctioned Rest!" and this will trigger an egress. Also, if emergency vehicles are on scene and you hear all their horns going off at one time this is often a signal to evacuate the area.

LESSON 6: Biosecurity

Problem: Biosecurity (biological risk management), in the context of animal responders during a disaster , refers to measures taken to keep disease agents out of populations, herds, flocks, or groups of animals where they do not already exist, and the measures taken to prevent animal responders from spreading a disease when leaving the site of an emergency. Included in the topic is protection for the responder from the hazards encountered in a disaster.

Alternatives: Biosecurity measures are generally practiced in a somewhat casual manner. The responder may wear gloves, boots, and occasionally dons a mask in the event of infectious diseases or extremely dusty conditions. Few understand or practice biosecurity in the sense of protecting the farm or even protecting oneself.

Evaluate: Responders need to understand and practice the basics of a valid farm biosecurity plan. These basics are described as follows:

- First identify the most likely risks and 'control points' on the farm where biosecurity measures can be readily implemented to prevent the introduction of diseases.
- Introduction of new animals to the farm or animals returning from a livestock show are the greatest risk for introducing disease. Having a plan to isolate "new" animals well away from other animals for at least two weeks is very important.
- Determine how members of the public, tradesman, veterinarians, vehicle traffic will be regulated to minimize the risks of introducing disease.
- Decide on effective cleaning and disinfection procedures to reduce pathogen levels.

Why should a herd or flock manager adopt a biosecurity plan? "An ounce of prevention is worth a pound of cure". Every flock or herd manager hopes to raise livestock profitably and it is well documented that diseased animals are not as profitable, thus it is in the producer's best interest to adopt a biosecurity plan. Comprehensive biosecurity programs have already been adopted by many poultry and pork producers in the USA. With the relatively large number of birds or hogs housed in a modern production unit, disease prevention, rather than disease treatment, is already in practice. In the event of a disaster, animal response personnel may be asked to assist**,** and do not want to be responsible for further breakdowns in biosecurity. Biological risk management procedures must be followed before and after entering animal facilities. Efforts must be prioritized to address those factors posing the greatest risk of disease introduction.

When planning to respond to a farm disaster, certain procedures should be followed prior to entry. If possible, contact the farm to discuss the farm's requirements for biosecurity in terms of clothing, animal contact, showing, etc. If no specific requirements are defined, the responder will, at a minimum, set the example by using measures that would seem prudent for a well-managed farm. Expect to be asked, or at the very least, inform the farm manager of your recent contact with animals in other herds or visits to foreign countries. Avoid unnecessary animal contact when responding to livestock facilities. For observing outside buildings or fences, new disposable plastic boots or footwear should be used. All outerwear of the responder must be clean (not worn on any other farm since being cleaned and disinfected) if it is necessary to be in buildings, alleyways, lots, pens, or pastures normally accessible to the herd. Disposable coveralls and disposable plastic boots and gloves are recommended. Clean laundered coveralls and clean disinfected boots may be acceptable. Protective face masks and head covers may be necessary in situations where responders may be exposed to dusty animal housing or if there is potential for aerosol transmission of zoonotic diseases (Q-Fever, avian influenza). If an emergency responder is entering a premise in which there is known zoonotic disease such as avian influenza, a higher level of eye and respiratory protection will be necessary e.g., full face

mask with air filters. Plastic storage containers with sealing lids can be used for storing and transporting the new and/or clean coveralls and disposable boots, head covers and dust masks etc. When leaving the farm, protective outer clothing warn on the farm should be removed before entering the vehicle and left on that farm if at all possible for appropriate disposal. Reusable clothing should be placed in a plastic bag and sealed until they can be laundered. Reusable boots should be scrubbed free of debris with water, soaked in disinfectant solution, and then placed in a plastic bag or other container for transport allowing the disinfectant to dry upon them.

Challenge: Guidelines suggested when the responder must visit multiple farms are as follows:

- Visit as few farms as possible having the same species on any given day.
- Farms with a full-time livestock production unit should be visited first.
- Keep the number of responders to the minimum required to do the job. For biosecurity, it would be better to have multiple small response teams visiting multiple farms rather than one large response team that visit all the farms.
- Use disposable plastic boots if the visit requires entering animal facilities. If animal contact is necessary, disposable gloves, boots, and coveralls should be worn and disposed of appropriately before going to another animal facility.
- Request that each farm supply as much equipment as possible for use on their own animals (nose-leads, snares, buckets, brushes, etc.). Clean and sanitize all transported equipment before and after use at each location.
- Leave used disposable items (boots, coveralls, gloves, etc.) at the farm where they were used. All items can be sealed in a small trash bag for convenient disposal by the owner. If clean and contaminated items are to be transported in the responder' vehicle, separate containers for each should be used to prevent cross-contamination.

Any disaster is going to have catastrophic impacts on the farm. Not only will there be significant financial consequences but there are numerous psychological impacts on the farmer who has spent his/her lifetime developing profitable livestock. A disaster will be devastating. Animal responders are there to help. Don't add to the devastation through carelessness or a lack of knowledge. Show compassion for the animals ***and*** for the animal owners!

Conclusions:

Training and managing a disaster response team requires time, money, devoted volunteers, and knowledge of the variety of scenarios likely to be encountered. Without doubt all disaster response will first fall upon local groups. When these groups are overwhelmed there must be a plan to gain assistance from surrounding communities, counties, and even the government. All training and planning for a disaster is accomplished ***before*** the disaster. Important to the development of credentialed responders is a performance evaluation which must be conducted after each deployment. The modified scientific method lends itself to such an evaluation and will assure a better response at the next disaster. Animals will be a secondary priority in disaster response but there must be people and plans to deal with the myriad of animal issues in every disaster.

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