Outbreak How Can Your Pathologist Help You?

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Animal shelters create a unique environment for the emergence and propagation of infectious diseases. Some of them cause significant physical illness and fatality while others manifest in more moderate chronic disease that can become just as problematic. Infectious agents such as viruses and bacteria require hosts in which they can reproduce. The amplification of hundreds to millions of infectious particles is even higher when there are many bodies available. Shelters provide the perfect environment for many infectious disease risk factors to occur and spread. These factors include transportation, stress (immunosuppression), increased contact (crowding), poor nutrition, other concurrent diseases, high animal turnover, and indiscriminate use of antibiotics.

Although it is not always necessary to get an exact diagnosis for every sick animal in a shelter it becomes more important when more animals than usual are ill. The diagnostic information is also crucial when there is odd or unusual manifestation of what was considered to be the "same old" disease. The life of microbes is not static and many of these pathogens are very capable of evolving and changing quickly. The chances of this happening increase when there are more hosts in which to mutate. For this reason it is important not only to figure out what is causing high mortality in the shelter but also to catch new and emerging pathogens early in the course of their evolution. An emerging infection is one that has newly appeared in the population, or one that has existed but is altered in incidence, geographic range, or character (virulence, unique species).

Recognizing that there is a problem

Obviously most shelters do experience some infectious disease amongst their animals some of the time. It is difficult for a large transient population that is housed closely together not to. However, many sick animals, chronic disease or outbreaks should be the exception not the rule. This lecture will not focus on treatment as almost all outbreaks or severe illness in shelters is caused by having too many animals under one roof. Therefore, the first line of treatment and defense strategy when confronted by exceptional disease problems is to work toward decreasing the population.

Ideally all shelters would have unlimited resources to investigate every illness with full diagnostics. Unfortunately this is rarely the case and shelters must weigh the cost of contacting labs, submitting samples, running tests and performing necropsies with the risk of not doing so. The question is often when to start running these diagnostics and when to save the money and focus instead on treatment i.e. getting the population moving and adopted in order to decrease crowding.

Step one: Is there an outbreak?

It is vital that the shelter be able to recognize early that "something is not right". The shelter needs concrete data to confirm this initial observation. Statistics are needed not only on the shelter's typical disease prevalence but also data on disease manifestations. An initial question to consider when faced with what seems like an outbreak or "new" disease is to ask "is this situation/disease different from one month ago, or more importantly "is it different from the same time last year". This sort of inquiry allows shelters to step back from the urgency of the current problem and focus on the reality of the situation. Having good shelter statistics is very helpful. Some questions to ask when faced with the possibility of an outbreak or new disease are:

- Is there a higher proportion of animals getting sick?
- Is the severity of illness worse than usual or are the animals no longer responding to treatment?
- Are animals dying from what is normally mild disease?
- Are different types of animals getting sick (e.g. adults)?
- Has staff or members of the public complained of similar illness in their own pets?

Step two: Begin to record the outbreak

This requires comprehensive and accurate record keeping. It may be best to designate one shelter staff member to write down all details and to coordinate a diagnostic plan and course of action. The records should include not only how many animals are affected but also information on the type of symptoms, when they began, which animals are affected (age, location, source), treatments tried etc.

Step three: Necropsy and save tissue from any animal that dies

All too often animals die and are disposed of before any contact with an infectious disease expert or pathologist has been made. In fact by the time any help has been sought it is long after the initial wave of disease has passed and most if not all susceptible animals are gone. It is important to obtain as much information as possible on ANY animal that dies. This is especially true if death is due to a suspicious infectious disease (URI, diarrhea etc.).

Always perform necropsies on all animals that die unexpectedly in shelters. This may find a cause specific to that animal (e.g. intestinal foreign body) but, if not, the time spent may turn out to be vital to the ensuing investigation. In addition to gross necropsy, tissue/fluid should be saved from suspect infectious animals. Tests that can be done on samples include:

- Culture
- Cytology (impression smears)
- PCR (polymerase chain reaction)
- Serology
- Histology

Each of these tests requires specific sampling and handling. More details on cadaver handling, necropsy, sampling and testing will be covered in the lecture. In addition a chapter on necropsy for animal shelters will be available in the new Shelter Medicine Infectious Diseases text book to be published by Blackwell®. If it is not yet clear that tissue/samples will be sent for diagnostics they can be frozen or fixed in formalin. Although not ideal they may become important to the investigation (they can always be discarded later if not used).

Step four: Contact your laboratory/veterinary university

While there are many options for food animal necropsy/diagnostic services the availability of help with small animals is variable. Some state and veterinary schools can be of service. Contact these institutions and laboratories for information on cost and accessibility. However, biopsy ("necropsy in a bottle") and microbiology services are readily available.

Once it has been decided that diagnostic services are needed to determine the cause of disease then speak with your laboratory/veterinary school regarding their policies and procedures. Information on the most common causes of outbreaks in shelters can be found on the UC Davis Koret Shelter Medicine Program's website (www.sheltermedicine.com). This website has copious information on diseases such as parvo, panleukopenia and kennel cough. Most of what a shelter would need to manage outbreaks of these diseases can be found here.

Step five: Necropsy several animals, collect and submit fresh samples for immediate analysis.

Finding the true cause of infectious disease outbreaks can be a complicated process. It is made more difficult if samples or bodies are not handled properly. Necropsy must be done almost immediately after death; a delay of even a day may render the investigation useless. Refrigeration helps but does not stop the decay process. In order for the necropsy and subsequent pathology to be useful it is likely that more than one body is needed. A definitive diagnosis is much more likely if a minimum of two animals are necropsied and sampled, more being even better. For this reason the shelter will improve its chances of getting answers if qualified/trained staff conduct the necropsies. It will also help if contact with the pathology laboratory for instruction (step four), and coordination of shipping multiple samples is done early in the investigation.

Conclusion

Necropsy and diagnostic testing are important tools for shelters. These procedures and tests may help in identifying the cause of disease outbreaks, help manage the outbreak, provide information on treatment options and help prevent outbreaks in the future.

When a pathogen is unusual or acting in an unusual manner then knowing the distribution, transmission patterns and behavior of it is critical to early and accurate diagnosis. Collecting that information must begin at the shelter. In short, identification of emerging and reemerging infections depends heavily on astute observation, good record keeping, systematic and appropriate tissue/body handling, good pathology and associated diagnostics.

These steps provide a start by which a shelter will hopefully learn what is causing the outbreak. The shelter can then decide on the best course of action that will save the most lives. Diagnostics may also help prevent this sort of outbreak from happening again. However, laboratories and pathologists can only do so much; the most work needs to be done by the shelter.