

Disaster lessons learned: Apis mellifera and the art and science of communication

Paula A. Burgess, MD, MPH

ABSTRACT

Lessons learned from disaster responses often include failure of communication. The author of this editorial is an emergency physician and public health scientist with expertise in disaster response; the author is also an amateur beekeeper. The author whimsically compares and contrasts what honey bees know about communication to what disaster response professionals know. Perhaps, disaster response professionals can learn more about communication from the experts: honey bees.

Key words: disaster response, communications, lessons learned, honey bees

The first item on a list of “lessons-learned” following disaster responses in most instances could more aptly be labeled “lessons-we-cannot-seem-to-learn-no-matter-what”: ie, *communication systems fail in disasters*. I have personally and professionally, both as an emergency department (ED) physician and as a public health scientist, participated in postincident debriefings citing this as the number 1 “lessons learned” more often than I would like to admit.

I am also an amateur beekeeper. The more I learn about the honey bee, *Apis mellifera*, the more awe I have for the amazing art and science of communication within the hive. Honey bee society cannot function effectively without a sure-fire communication system; neither can a disaster response. Since we have not been able to learn the lesson of communication elsewhere, maybe we should examine some of the secrets of success of the honey bee.

In a successful hive, the issue of “who is in charge” is simply not in question. There is exactly one leader, the Queen, allowed per hive. Her job is clearly defined: to assure the success of the colony by laying fertilized eggs. Queenless honey bee colonies have no future, just like leaderless disasters are doomed to fail. If the Queen does not lay the fertilized eggs that become worker bees, the fate of the hive is death.

In emergency responses, our chain of command is often more a matrix of confusion. Sometimes multiple players vie for the lead, as though auditioning for the starring role in “the event.” From the beginning of an emergency response, there should be no confusion about who the leader is or what their role is. There should be no “auditions” allowed after the response has begun.

The queen’s stature is maintained partly by “queen substance,” 9 oxo-2-deceonic acid. That is, she needs some kind of marker that sets her apart and identifies her as Queen. For humans, this leader-scent is probably that *je-ne-sais-pas-quoi* natural leadership quality and charisma that can be detected by the astute and intuitive among us. Of course, identified human leaders must couple this leader-scent with appropriate knowledge, experience, and expertise. Then we could cloak or cap those leaders in appropriate colorful regalia that clearly identifies them as leaders. For those among us who are more pragmatic and less flamboyant, perhaps just a simple, unambiguous “leader” designation would do.

Effectiveness of the queen substance on the hive is dependent on actual contact between the Queen

and her workers. If the Queen does not maintain direct contact with her workers, the workers will begin rearing another queen. Similarly, it is essential for our leaders to stay in direct contact with the workers so that communication exchange can occur. If the workers in a disaster response do not develop trust in leadership through communication and contact, they may seek other leaders.

If the Queen is not spreading about the queen substance properly or functioning adequately in her role of egg-laying, the workers may use the technique of “balling” to kill the queen. The workers essentially suffocate the Queen by clustering tightly around her. Sometimes our human “leaders” linger despite inability to function, even after that inability has been detected and identified. The honey bee hive would never allow this, nor should we.

Workers in an emergency response may dedicate themselves to ensuring the success of the mission through complete support of the leader if that leader has the right leader-substance and has a real finger on the pulse of the situation. In contrast, if the leader is isolated and removed from the action, workers may no longer respond to leadership in a positive manner. They may in fact search for a new leader and even call for the resignation of the ineffective one. It should be some measure of reassurance to human leaders that the mandatory resignation process is less deadly than the honey bees’ “balling” behavior.

To communicate within a hive, the honey bees must all speak the same clear, effective language. Some of their best communication is through the language of dance. Through round dance and wagtail dances honey bees can communicate exact distance, source, and direction of food. The dance vocabulary is detailed, specific, and understood by all in the hive.

Different races and species of bees can play together peacefully, but when it comes time to gather the nectar and pollen, their round dances and wagtail dances may differ enough that essential communication cannot happen. Feeding places cannot be located when a hive bee talks to an outsider, and vice versa. Fundamental hive survival depends on speaking the same language and using the same vocabulary.

Folks from the worlds of Emergency Medical Services, Emergency Departments, and Public Health

have enough shared language to manage day-to-day operations. However, we know from experience that this is often not the case in disaster situations. We must share vocabularies, wavelength frequencies, and communication technology to effectively work together in a time of crisis.

The honey bee hive functions all day every day under the same incident command structure that is used in times of duress. Daily conversations occur on the same “radio frequencies” as are used in times when the hive is threatened. Our success in emergency operations improves when emergency systems of communication and command structure are the same as those used for day-to-day activities.

In a successful hive, not only does the Queen bee know exactly what her job is and how to do it, worker bees all know their jobs and how to do them effectively and efficiently. There is no confusion about who is supposed to do what, and no overstepping of boundaries. Nobody tries to do anybody else’s job. In contrast, our emergency response operations often lack clear division of labor and clear and specific job descriptions.

While the worker bee’s job is very specific at any point in time, its description is dependent on age and experience. Each worker bee moves through specific jobs in an orderly fashion depending on life stage and the needs of the colony, from scavenger to nurse to water-carrier to guard to forager. Job assignments based on experience make sense for emergency response operations.

Recent mapping of the honey bee genome indicates that different genes are activated during different parts of the life and work cycle. Identifying genetic markers or using genetic engineering to match individuals with jobs would raise the ethical hairs on our backs, but helping people find the jobs to which they are temperamentally and experientially best suited makes perfect sense.

The “spirit of the hive” is to work or die. The field bee often dies laden with pollen and nectar, ie “with her boots on.” When the honey bee can no longer do her job in an effective way and be an asset to the colony, she removes herself from the hive. If she lacks the grace to commit suicide or leave the hive voluntarily, she will be forced out for the good of the hive. Too bad that we in disaster response do not have the grace

to remove ourselves from the operation when we no longer have anything of value to add. We do, however, have mechanisms for removal of ineffective workers and leaders who perhaps should be more often utilized.

The honey bee society is a socialist one. Everything is done for the collective good of the hive. There is a common goal, without prima donnas, egoists, or those seeking fame, fortune, or recognition. No individual is seeking personal gain. Every individual, except the queen, is expendable; and even she can be replaced. Successful emergency response operations depend on this kind of collective good works. The response is apt to fail if individuals harbor their own ego-centric goals of fame, fortune, or recognition.

The hive society depends on sharing the wealth, ie, the honey. Therefore, they share. Scientific studies show that if six hive bees are given radioactively labeled sugar, over half of the foragers in a hive of 24,000 show radioactivity in only 5 hours. The ultimate wealth, or end product, of successful emergency response operations is lives saved and quality of life maximized. Sharing these kinds of successes within our community of disaster response should be its own reward.

The concrete version of wealth in the disaster response community is funding. Funding attached to emergency response sometimes is sequestered and silo-ed. We would do better if we shared this wealth

appropriately inside and outside of our own response communities.

Of course, there are major differences between honey bee hive operations and emergency response operations. All of the workers in the hive are females. The only males are the drones, and their only function is to mate with a virgin queen. Otherwise, the drones perform no real work in the hive. They sit around on bushes, chatting, and waiting for the Queen's maiden flight. Only one drone will be successful in mating the Queen. That success results in genital evisceration of the drone, and death. The queen receives his genital trophy. As a woman, I will refrain from comparison and analysis to emergency response operations and leave the reader to decide whether gender role similarities exist in disaster response.

If you are interested in learning more about the fascinating honey bee culture, here are some suggested readings.^{1,2}

Paula A. Burgess, MD, MPH, 201 W. Ponce de Leon Avenue, Unit Number 32, Decatur, Georgia 30030.

REFERENCES

1. Longgood W: *The Queen Must Die: And Other Affairs of Bees and Men*. New York: Norton and Company, 1985.
2. Caron DM. *Honey Bee Biology and Beekeeping*. Connecticut: Wicwas Press, Cheshire, 1999.