

ANIMAL PAIN

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Which nonhuman animals experience conscious pain? Common sense suggests that the answer is obvious for all mammals and birds: they do! But people's intuitions begin to waver when it comes to reptiles, amphibians, fish, or invertebrates. Do lobsters feel pain when boiled alive? A recent study by the Norwegian government said that they don't. But Norway has a significant lobster fishing industry to protect, so it's easy regard the study with suspicion.

Is there any hope that science will provide answers where common sense falters? This question is very important when thinking about animal welfare. All technologically advanced countries have laws designed to promote animal welfare. But many people think these laws don't go far enough. The general trend is towards making the laws have broader scope, reflecting changing relationships between animals and humans over the past century. Thus, the British Animals (Scientific Procedures) Act was amended in 1993 to extend protection to all mammals, birds, reptiles, fish, amphibians, and the common octopus. This list was intended to cover those animals judged capable of pain and suffering. The Canadian parliament has considered a different approach. Instead of attempting to list all the species capable of feeling pain, the Canadians have introduced bills that would expand the scope of protection to all animals capable of feeling pain. But which ever way the law is written, it's still necessary to know which animals actually do feel pain.

The United States' approach is similar to the British in that it depends on explicitly listing the protected species. Although the long term trend is towards more inclusive coverage, the recent legislation has recently gone in the other direction. In 1999, anti-vivisectionists brought a lawsuit against the U.S. Department of Agriculture (USDA) challenging the USDA's policy of exempting rats, mice, and birds (the majority of animals used in research) from inspections required under the Animal Welfare Act (AWA). Initially the USDA agreed to settle the lawsuit by including these animals in their inspections. But in 2002, the U.S. Congress responded to lobbying from the drug industry by amending the AWA to explicitly exclude these animals from the AWA requirements. The motives for excluding rats, mice, and birds, were clearly political, as it certainly can't be said that there's any scientific basis for discriminating between the pain-feeling capacities of rats and rabbits.

All of these laws require an answer to the question which animals feel pain. But even if one agrees that some animals feel pain consciously, it doesn't follow that it is impermissible to use them in research, agriculture, etc. Nevertheless, if it can be established which animals feel pain, this is relevant to the ethical issues because causing pain would require special justification if it is to be allowed at all.

What, then, does science tell us about animal pain? An important distinction is between nociception -- the capacity to sense noxious stimuli -- and pain. Nociception is one of the most primitive sensory capacities. Neurons that are specialized for nociception occur in many invertebrates, and have been studied in species including leeches and sea slugs. But these organisms have very tiny brains, and they have a relatively limited range of responses to nociception. Nevertheless they share the basic neural biochemistry of nociception. Pain is defined by the International Association for the Study of Pain as an unpleasant sensory and emotional experience. Because we can't directly ask them, a big problem with judging the pain felt by invertebrates and other animals is to determine to what extent emotions and unpleasantness are involved. One behavioral approach involves seeing how hard animals will work to avoid noxious stimuli. Another approach looks at the effects of analgesics and anesthetics, which have similar effects on mammals and birds as they do on humans. These drugs appear to be less effective for reptiles, amphibians, fish, and invertebrates, but it's hard to say whether this is because there's no unpleasant experience for them to relieve, or whether the drugs we use just happen to be designed to work better on animals more like us.

It also seems that the vertebrate spinal cord itself (even when severed from the brain) can react very precisely to noxious stimuli and even learn about relationships among painful stimuli. No brain is required for these capacities, so if we accept the phrase "no brain, no pain" then the kinds of reactions and learning shown by many invertebrates, which are comparable to those of the spinal cord in vertebrates, doesn't give very strong evidence of conscious pain experiences. It's important to note, though, that not all invertebrates should be considered equivalent -- many cephalopods (not just the common octopus protected by British law) seem to have a much more sophisticated range of cognitive capacities than the basic forms of learning found in sea slugs or the spinal cords of rats. Much more research would be needed to make more definitive claims, but one might worry about whether this research is ethical.

In vertebrates, nociceptive neurons go through complex neural gateways in the spinal cord that control the strength of the signal sent to the brain, and the brain also exerts a top-down influence on how much of the signal gets through. (The brains of sea slugs also exert some top-down influence.) The "classical" view of human pain holds that there are at least two pathways involved in the experience of pain in humans. One pathway is responsible for features of pain sensations such as its intensity and location (the sensory pathway). The other is responsible for how much one "minds" the pain or how unpleasant the pain is (the affective pathway). This classical two-systems view has not actually been rigorously examined in nonhuman animals -- and in fact it is very difficult to do so, because it's not clear how to "dissociate" the sensory and affective pathways in an experimentally rigorous way.

So far I've briefly described some analogies and disanalogies between the human pain system and what's found in a variety of different animals. For some people, the existence of these analogies is sufficient to establish that other animals experience pain consciously. Sometimes the analogy is bolstered by statements about how closely related humans are to other animals, but of course this addition carries less weight as we get further away from the great apes and other primates. For others, the disanalogies weigh more heavily. For every similarity between the behavior or neurology of humans and other nonhuman animals, there is a dissimilarity that can be used to deny the inference to conscious pain in nonhumans. Without any theoretical reason for saying what are the relevant analogical properties, the result is something of an impasse.

One way forward would be to give a theory of consciousness and explain how the anatomical, physiological, neurological, and behavioral evidence relates to the theory. Some philosophers think that consciousness requires high level cognitive abilities, such as being able to think about your own mental states, and they think that this kind of self-reflective, conceptual understanding of mental states is beyond most if not all nonhuman animals. On this view, the various kinds of analogical evidence that are available are only relevant if it can be shown how it relates to the self-reflective nature of consciousness. For this reason, the fact that many chimpanzees, some other great apes, and perhaps some dolphins appear capable of recognizing their own mirror images is also taken to support the idea that they are capable of consciously experiencing pain. But this highly cognitive theory of consciousness is not scientific consensus, so we can't say that science gives straightforward support to the view that (at most) only a few other animals experience pain (or anything else) consciously.

Still, the radical denial of consciousness to the vast majority of animals gets one thing right: anyone who wants to go beyond straightforward arguments by analogy, which already are biased in favor of species more closely related to humans, will need to explain more precisely *why* the available evidence supports attributions of conscious pain.

What kind of approaches are there to answering these questions? It's especially important to say why conscious pain is functionally useful to animals so that we can look for the relevant functionality in a wide variety of species. It might seem obvious that pain is functional. Doesn't feeling the pain of a pin prick cause you to withdraw your hand, which is good for protecting you against injury? But this is not so obvious once we realize that the withdrawal reflex starts before any pain is consciously experienced, and the pain-withdrawal reflex can be managed entirely through a spinal-cord circuit (although it can also come under top-down control). What about learning from painful stimuli? Here we need to be careful, because there are different kinds of learning, some of them unconscious. So not all learning is going to provide equally strong evidence of conscious pain.

Consciousness seems, however, to play a central role in some cases where there is learning about the consequences of actions (in what psychologists call "operant conditioning") and where there is learning about two stimuli with a time gap between them (called "trace conditioning"). Although a scientific approach still doesn't yet provide clear answers here, the fact that learning sometimes depends on *noticing* the relationship between two temporally separated stimuli, or between a behavior and its consequences, seems to suggest that there is a role for something like consciousness. Using a variety of analgesic drugs such as morphine, it appears to be possible to make some noxious stimuli detectable in a sensory way, as measured by withdrawal reflexes, while diminishing the affective component to the point where the animal does not change its overall behavior. From here it would be possible to study the effects on learning, and possibly find different roles for the different components of the sensory experience.

Of course, a determined skeptic might continue to insist that no amount of anatomical, physiological, and behavioral evidence can tell us anything about the conscious nature of animal experiences. But this view would equally rule out the possibility of studying human consciousness. A less radical but equally determined skeptic points to the limited cognitive abilities of animals to use language, or to engage in higher conceptual thinking about mental states. But such skeptics haven't provided any scientific methods for testing their claims that consciousness serves only these functions. The fact that we know that consciousness is involved in our own language use and self-consciousness, does not imply that it isn't involved in other cognitive abilities.

The conscious experience of pain is not just an "alarm bell" telling us when and how to act so as to minimize tissue damage. It seems to be intrinsically involved in helping us learn quickly about new kinds of threats. But there remains much we don't know about how this all works, in humans and in other animals. Nociception-based learning and central (top-down) modification of nociception are both found in the sea slug, but its range of learning abilities is much less sophisticated than mammals and other vertebrates. The learning capacities of invertebrates with more sophisticated nervous systems, like the cephalopods, have not been thoroughly studied. In fact, it has only been done for a very limited range of vertebrates.

If science is to help answer the question with which we started, there is a need for lots more work in this area. While the unfolding scientific story about the functions of pain across the animal kingdom is more complicated than we have yet imagined, there is nothing to indicate that it is beyond our ability to understand it. But there are, of course, questions about the ethical propriety of doing more of this kind of work, precisely because it might cause morally objectionable pain. It may seem obvious to common sense that we don't need to be doing this work on dogs, but there are many other cases where common sense fails us, and we must make an ethical decision about the price of knowledge.

Further Reading

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