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Dissection: The Scientific Case for a Sound Medical Education
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Let me begin by pointing out some areas in which I agree with Jonathan Balcombe. First, he promotes parsimony in the use of animals for teaching. I agree that the fewer animals used in teaching, the better. Balcombe presents substantial empirical evidence supporting alternatives to dissection for high school and undergraduate students, and I have no quarrels with these studies. More telling, Balcombe notes that students “are not a homogeneous body of knowledge acquirers.” I too believe that all students do not learn in the same manner and that a well-rounded education provides as much variety as possible, so that those who learn in different ways are equally well served.

However, I disagree when Balcombe attempts to judge the merits of dissection apart from the setting in which it is employed. When learning biology at the high school or undergraduate level, particularly for nonbiologists, alternative methods of learning animal anatomy appear to be adequate for a majority of students. Most of these students do not enter medical or veterinary medical colleges. What is critical is that the professional colleges, to produce competent graduates, provide sufficient hands-on animal experience with both live and dead animals.

The level of learning and rigor of questioning in the majority of studies Balcombe cites for high school and undergraduate students do not approach the rigor of anatomical understanding expected of students in medical and veterinary medical programs. These students must know and understand complex interactions among physiological systems and manifestations of a disease or injury state. A
small subset of extraordinary students may be able to obtain this depth of knowledge through a textbook or computer program. However, most students cannot accomplish this. Therefore, to ensure our students’ adequate understanding, a variety of teaching modalities, including dissection, is pedagogically desirable.

In addition, although Balcombe dismisses as “empty rhetoric” the concern that computer simulations do not duplicate the experience of working with animal tissue, I assert that the sensitivity gained to the feel and smell of fresh or fixed animal tissue is in itself a core component of a medical education, apart from students’ mastery of anatomical facts.

Although alternative methods of learning anatomy may be sufficient for factual regurgitation, most cannot provide the real-life, three-dimensional understanding of anatomy learned in hands-on dissection. In histology, for example, where students routinely learn by viewing a microscope and a television monitor, one of the most difficult problems teachers face is getting students to consider spatial analysis—the three-dimensional aspects of the tissue—while interpreting two-dimensional sections. In gross anatomy, students have the three-dimensional object directly in view, which is never as apparent in any computer screen presentation. And again, in addition to learning the simple anatomical facts, medical students need opportunities to develop hand and eye coordination and to learn the texture of tissues and the amount of pressure that needs to be applied to a scissors or probe or scalpel. It hardly can be claimed that a computer screen and mouse equal this level of hand–eye coordination and tissue “feel.”

Far from being a passive learning experience, as Balcombe suggests, anatomical dissection as taught at the University of Illinois clearly involves “learning how to learn.” Indeed, many veterinary programs, including ours, do not teach animal dissection in an isolated manner. They combine it with palpation of live animals and the viewing of radiographs and images from computed tomography and MRI dissections, which add to conceptual learning of the assembled body in three dimensions for both hard and soft tissues. In all stages of dissections, students working in small groups discuss what is being viewed; typically, some are prosecting, some reading, and all questioning one another on the features being observed. Group learning is active learning, and widely touted as a preferable strategy.

Balcombe attempts to further his argument against dissection with a discussion of nonanimal surgical training in veterinary education. He acknowledges, “veterinary medicine can be fairly seen as most needing student experience with animals” and says it “presents a stringent challenge for the application of alternatives.” Most veterinary schools, including ours, now employ some form of “alternative tracks” to learning surgery. Although I affirm that students should be allowed to choose that option, I suggest that a good grounding in anatomical dissection is a tremendous boon to their ability to learn surgery by “alternative methods.” Could learning solely through computer and plastic models be adequate preparation for surgery? When students’ first surgeries are their first contact with animal tissue,
can we really expect that pain and suffering in their animal patients will be avoided? I suggest that for most students some minimum amount of live and dead animal contact is required for success in the final 2 years of the doctor of veterinary medicine program and as practitioners after graduation.

Both Balcombe and I laud using realistic models to teach spatial recognition of organs by palpation. As I have said, the fewer animals used in teaching, the better. Some manual dexterity in suturing patterns and anatomical landmarks for dissection of surgical planes can be gained by using models. This is a standard part of the curriculum in most institutions. Our students learn gross anatomy by dissection, histology by tissue sections, and psychomotor skills by fabric and plastic manipulations as well as by cutting and suturing fresh chicken breasts. The latter cut and sew like living tissue, have odor and color, but do not bleed or heal. Because of this preparation, our students can perform as their first surgery a spay or neuter in an animal who recovers after anesthesia and becomes a better candidate for adoption.

Bringing students to the level of knowledge and confidence to conduct their first surgery successfully as a survival experience takes multiple steps. Although using models helps to develop student manual dexterity, I believe that hands-on experience with animal tissue is equally critical for developing the understanding needed to take those steps to surgery with a living animal. For most students, it is not pedagogically sound to go from a computer simulation to a plastic model to living tissue. For students who plan to practice medicine, the more exposure they have to the sight, smell, and texture of tissues, the better their preparation to become confident clinicians.

On a note tangential to the central pedagogical issues, I want to comment on some ethical paradoxes at play in animal use in education. Balcombe asserts that animal cadavers for use in alternative surgical programs in veterinary education can be obtained ethically, “for example, from companion or stray animals euthanized for medical reasons.” If this is so, surely we also could use ethically acquired cadavers in teaching gross anatomy. I understand that existing veterinary alternative programs have trouble securing adequate numbers of animal cadavers. There also is the concern that animals euthanized for medical reasons may be, by the nature of their problem, inadequate models for teaching normal form and function. Meanwhile, tens of thousands of animals are euthanized each year, not only because of overpopulation among feral animals, but also because owners are unwilling to deal with behavior problems. We in veterinary education, as well as those promoting antidissection, seriously should take up these issues to seek ethical solutions.

There are tradeoffs in all decisions on where animals are used in teaching. The use of animals is costly, and it can be argued acceptably that it is cheaper to use other methods. Until last year, the University of Illinois used live animals in nonsurvival demonstrations in physiology. I believe those exercises were beneficial for learning not only physiological principles but also safe animal handling.
and restraint; venepuncture; intubation; anesthesia and monitoring; the effects of bleeding; the control of bleeding; and the sight, smell, and feel of live tissues. Well-designed and well-conducted physiology laboratories provide a depth of understanding of the complexities of physiological processes that, for most students, cannot be duplicated by textbooks or existing computer programs. We now provide students with some of this hands-on experience through rotation during the first 2 years in a walk-in community practice. There, students carry out routine procedures of restraint and sample collection under clinical guidance. Our continued goal is the overall quality of the educational experience.

I conclude that animal dissection may be eliminated for students who are not pursuing medical careers. However, if the students intend to devote their lives to animal medicine, animal production, or research using animals, then dissection is an experience that, for most such students, provides an invaluable basis for education.