

The status of laboratory animal science in the year 2005 – a scenario

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Introduction

This decade is an exciting time, as we are now in the sixth year of the most important decade in the history of civilization because it will culminate in the millennium, the year 2000. As you know, the word is derived from the Latin, mille, meaning 1,000, so a millennium is a 1000-year anniversary. While there are Biblical meanings to the millennium, on a secular level it has come to mean a golden age in human history, a time to close the door on the past and embark on a new era. Such a time compels us to reexamine ourselves and our institutions.

We are all keenly aware that change is everywhere, regardless of country, culture, or organization. Conversations whenever laboratory animal specialists get together tend to focus on the problems or threats associated with change: new legislation, decreasing funds for research in the specialty, counterproductive competition between different journals in the field, increasing facility operating costs, the anti-research movement, otherwise known as the animal rights movement, and role conflicts between international, regional, and national laboratory animal science organizations. I think that it is a worthwhile exercise to try to identify major changes, and I would like to invite you to join with me in the discussion of how change presents opportunities. It is my hope that the opportunities identified in association with long-term trends will become individual and collective goals for laboratory animal scientists. I would like to also advocate that each of us make our best effort to assure harmony and complementation between national and international organizations.

Since my crystal ball is hazy and we cannot isolate trends affecting our specialty from trends in the broader world around us, I rely on the writings of John Naisbitt (Naisbitt & Aberdeen, 1991) for an enhanced awareness of the present and trends in society. I have selected three of the ten trends which he presents in his book, *Megatrends 2000*, which I feel are especially relevant to laboratory animal sci-

ence and provide an important perspective. Each of these trends represents change and opportunity. As I present these trends, it is important to ask three questions: i) what is the trend? ii) does it make sense? and, given this trend, iii) what are the opportunities for laboratory animal associations and their individual members?

The "Internationalization" of Laboratory Animal Science

Although this trend is not from Naisbitt, it is implied from a couple of his other trends involving globalization. He says that just as the post-war ideological cold war is waning, a new era of globalization has begun. I feel that there is a parallel acceleration of the "Internationalization" of laboratory animal science.

A number of factors are facilitating the trend of globalization or "Internationalization." While they include expanding travel and exchange among Europe, North America, and the Pacific Rim, perhaps most important is the transition from industrial societies to information societies and the unparalleled pace of global telecommunications. It has been said that the growth rate in Internet places us on a solid rocket booster and that there is a coming revolution that will transform the way we do teaching, research, and publishing as never before. Some officials say that a technology-driven restructuring of universities is only five to ten years away (Jacobson, 1994).

Currently, we are developing a pilot project using multimedia software for our audio-tutorial instructional materials for investigators, postdoctoral fellows, veterinary students, and animal technicians. Initially, or in a Phase I, these materials can be used in a library with the appropriate computer configuration. In Phase II, the materials will be on our university network and available to individuals at their desktop computers. In Phase III, they will be available anywhere, at any time. Faster versions of Internet, computer programs like "Mosaic" (which

make it easier to find things in network), a wireless world and two-way video conferencing are factors which are turbocharging information technology and will facilitate this realignment of the way we teach.

What will the library of the future be like? Libraries are undergoing increased scrutiny in an environment of unprecedented change. The way that scholarly information is created, distributed, and used is undergoing radical transformation. The rapid expansion of electronic information, especially the Internet, is having a profound influence on how individuals find information and on library services. Excess of, rather than access to, information is now the dominant issue. Access to information is increasingly dependent on technology, and individuals who are "technology have-nots" may be disenfranchised. Libraries are experimenting with providing access to information on a "just-in-time" basis rather than purchasing books and journals on a "just-in-case" basis. Libraries will continue moving toward an "electronic library," while preserving what is valuable from its past traditions (Okerson, 1994)

Interrelated to the question about libraries of the future is the perception that there is a crisis in scholarly publications and that, like any problem, it also presents potential and promise. It is up to everyone to decide how to position and align themselves to maximize opportunities for teaching and research. Two problems of the past will continue to inhibit the spread of technology: high costs and limited participation. However, people are either going to jump into this fast-moving stream or they're going to somehow get left behind!

While the new technologies are exciting, perhaps it is apropos to point out Naisbitt's notion that the other side of high tech coin is high touch. The implication is that the successful laboratory animal specialist will not necessarily be the most technically skilled, but the individual who knows people (especially investigators) in addition to knowing how to access and disseminate knowledge.

However, globalization in the broader sense is not free of conflicts, and I would like to point out the hypothesis of Huntington, as I feel we should ask whether his thesis has any implications for our specialty (Huntington, 1993). It is his opinion that the great divisions among humankind and the dominating source of potential future conflict are cultural, in contrast to nation states, and that the conflicts of

the future will occur along the cultural fault lines separating civilizations. A civilization or culture is defined as the highest cultural grouping of people and the broadest level of cultural identity people have short of that which distinguishes humans from other species. In *A Study of History*, Arnold Toynbee identified 21 major civilizations, but only a few exist in the contemporary world, i.e., Western, Confucian, Japanese, Islamic, Hindu, Slavic-Orthodox, Latin American, and African.

Differences among civilizations are not only real, they are basic, and include language, tradition, and religion. The people of different civilizations have different views of the relations between God and man, parents and children, husband and wife, and the relative importance of rights, human and animal. The conclusion of a review of comparative studies of values in different societies was that "the values that are most important in the West are least important worldwide." These differences in basic values are a source of conflict. Although at a superficial level much of Western culture has permeated the rest of the world, at a more basic level many Western concepts differ fundamentally from those prevalent in other civilizations. Western ideas of the separation of church and state, the rule of law, democracy, human and animal rights have little resonance in Islamic, Confucian, Hindu, Buddhist or Orthodox cultures. Western efforts to propagate such ideas produce instead a reaction against "Imperialism" and a reaffirmation of indigenous values, as can be seen in the support of religious fundamentalism by the younger generation in non-Western cultures.

The point that I would like to make is to put on the table not only the question of whether there is a "universal civilization" but also whether there is a universal position among laboratory specialists on animal welfare or rights and, if not, whether we will be setting up conflicts within our specialty along the cultural fault lines separating civilizations.

The Era of Women in Leadership

The days of women as a type of minority in the work force are over. Based on my experience during the past 30 years, women have increased from a minority of around 10% to a critical mass ranging from 35 to 50% in our department at the University of Washington today, depending on whether the group is faculty, staff, or postdoctoral fellows. The number of women in veterinary schools today is 50% or more, and it is not uncommon for them to occupy a

majority of elected student leadership positions. Another point is that the motto for personnel policies in 1990's is flexibility—and includes day care, maternity leave, and flexible time.

According to Naisbitt, to be a leader today, it is no longer an advantage to have been socialized as a male. Women may even have a slight advantage since they need not “unlearn” old authoritarian behavior to run their departments. The authoritarian military model of management, which most men in my generation learned, is being replaced. The dominant principle of organization has shifted from management in order to control an organization to leadership to bring out the best in people and respond quickly to change. This approach shuns traditional hierarchy and is based on vision, commitment, shared power, and responsibility. In other words, the manager as order giver is being replaced with the manager as teacher, facilitator, and coach.

An implication of this trend is that laboratory animal science organizations should make a special effort to make room for women, as well as ethnic minorities, in positions of responsibility and leadership. Perhaps our associations should be considering opportunities for leadership training. I personally welcome the many strengths the second X chromosome adds to our endeavours and, given the number of capable women in the pipeline today, perhaps the old cliché that “we ain't seen nothing yet” is apropos!

The Age of Biology

Number eight in Naisbitt's list of 10 megatrends is the Age of Biology. Naisbitt says that as we move into the next millennium, biotechnology will be as important as the computer.

If Edward Jenner, the discoverer of smallpox vaccine, were alive today, he would be delighted at the incredible development of vaccinia virus. It is being reconstructed to serve as a molecular tour bus that carries foreign genes into unsuspecting organisms. As a result of the proteins derived from the foreign genes, immunity against the donor of the gene can result. Such genetically engineered vaccines are rapidly approaching practicality for vaccination against such dread diseases as rabies and rinderpest. At some point of time in the future, one may be able to vaccinate against several diseases at once by inserting genes from mouse hepatitis virus, Sendai virus, mouse polio virus, and other murine pathogens into vaccinia and vaccinating mice against several diseases at once! Trials in humans with vaccinia

virus expressing AIDS virus antigens are in progress. However, the novelty of these vaccinations and the idea of genetically engineered vaccines leads some members of the public to view these procedures with alarm, just as Jenner's contemporaries did in the 1800s. We all know that safety cannot be over-emphasized. These vaccines will need to be tested in animals for safety and efficacy just as vaccines in the past were tested, such as polio and measles. This testing implies a role for laboratory animal specialists.

The deciphering of the human genetic code may well prove to be the greatest scientific discovery of the century. The use of molecular probes for diagnosing or studying the pathogenesis of animal and human diseases such as simian immunodeficiency virus in nonhuman primates and cystic fibrosis in humans are merely an example of the forerunners of things to come!

The era of gene splicing was ushered in by Mighty Mouse, which was the result of injecting growth hormone genes from a rat into a fertilized mouse egg. The potential for these techniques to generate mouse models of human genetic diseases and for gene therapy of human diseases has just been scratched. For example, naturally-occurring cystic fibrosis has not been recognized in animals but genes from humans with the disease have been transferred to mice, and animal models of the disease have resulted.

The implications of The Age of Biology for laboratory animal scientists are numerous. While a decline in the number of animals used in biology and medicine has been predicted by some, we are literally seeing an explosion in the mouse populations at the University of Washington. This increased number of mice is associated with the development of transgenic animals.

The opportunities this age presents are tantalizing; genetics should be emphasized even more in the training of laboratory animal specialists at all levels, because, as the New York Times put it, “The science of genetics is fast becoming what geneticists always knew it was: the central and most provocative science of life.”

The animal rights/animal welfare issue will not get buried among a pile of economic realities, which some would prefer to think, but rather will be with us and will become increasingly important in the Age of Biology as it adds a number of new ethical issues.

In this Age of Biology, we cannot lose sight of the

fact that research is the lifeline of laboratory animal medicine and science and that a basic strength of our specialty is the contribution of new knowledge of the biology and diseases of experimental animals and their role as models of human diseases. A question we must ask ourselves is how well are we, as laboratory animal scientists, fulfilling our responsibilities to advance knowledge? Although as busy practitioners, it is easy to think that we are doing enough to treat sick animals, teach investigators and technicians, design new facilities, review research protocols, and keep up with current literature, is it reasonable to ask us to advance knowledge too? I believe it is.

The essence of professionalism whether in art, literature, or medicine is to solve problems. Only thereby do veterinarians perform as artists and distinguish themselves from other purely service groups in an institution. For those of us in a demanding practice of laboratory animal medicine, I think that one can still select one, just one, out of the many puzzling questions we encounter. It should be a question about which one can collect quantitative data that can be sorted and analyzed, and after studious collection and analysis over time, the individual will know a little more that would advance knowledge. The discipline of constantly collecting, sorting, and analyzing data will also nourish one's skills as a practitioner (*Kornberg, 1976*).

Summary

Three trends are producing changes and associated opportunities: (1) the Internationalization of Laboratory Animal Science, with implications for our specialty journals and the risks of not considering different values in different cultures; (2) the Decade of Women in Leadership, and the strength this brings to our associations, to the extent that we take advantage of these many leadership qualities; and (3) The Age of Biology, and the opportunity for individuals with our background and training to contribute to the lifeline of laboratory animal medicine and science.

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