

COMMENTARY

What's in a Name?

The Argument for Changing the Name of IAEMS and Its Affiliated Societies

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Keywords: IAEMS; environmental mutagenesis; genomics; genetic toxicology; toxicogenomics

Abstract

We identify trends over the past decades in membership in societies affiliated with the International Association of Environmental Mutagen Societies (IAEMS), and we also highlight findings in a recent review by L.D. Claxton et al. [Environ Health Perspect, in press] regarding the numbers of papers published per year using genetic toxicology assays. These analyses reveal a decline or at best a static level of membership in IAEMS-affiliated societies, as well as a decline in the number of papers published per year using genetic toxicology assays—with the exception of those using comet assays, which already have begun to plateau. In contrast, toxicogenomics and computational toxicology are becoming increasingly prominent relative to environmental mutagenesis research in most research institutes, reflecting the ascendancy of these areas of environmental toxicology. We conclude that changing the name of IAEMS and its affiliated societies to reflect these changes might enhance membership and publication by welcoming a broader range of scientists into these societies. Although various names are possible, we think that changing the name of these societies to “Environmental Genomics Society” may help to make our societies more attractive to a broader range of scientists, resulting in an increase in membership and an acceleration of the incorporation of genomic methods into environmental research.

Introduction

The IAEMS and some of its initial member societies, such as the EMS, EEMS, and JEMS, have reached or are approaching 40 years of age [1], and this provides an opportunity to reflect on both the past successes and future opportunities of IAEMS. In particular, we should use this occasion to consider the developments in the field of environmental mutagenesis and to

assess the membership of the societies, the scientific trends in our field, and possible changes that might revitalize our societies and welcome new members from new areas of science.

While one of us (DeMarini) was President of the IAEMS (2005-2009), he initiated a conversation among the leadership of the various IAEMS-affiliated societies to explore the idea of changing the name of IAEMS and its societies. The reasons for this are outlined below. However, this effort was informal and did not proceed to the level of a formal proposal to the societies. Consequently, the new President of the IAEMS, Stefano Bonassi, appointed both of us to formalize the arguments for changing the name and to present our thoughts to the IAEMS Executive Board and Council for consideration and discussion—with a final version of the argument to be presented to the leadership and members of the affiliated societies for further discussion.

To address this issue, we review in this Commentary the current diversity of names of the IAEMS-affiliated societies, as well as the lack of clarity and visibility of these names to scientists (and certainly to non-scientists) outside of our field. We also present a brief historical review of (a) the membership of the IAEMS-affiliated societies, (b) the decline in environmental mutagenesis research in some public institutions, and (c) the numbers of publications in the specific area of genetic toxicology over the past 40 years. Based on these various considerations, we then suggest several possible new names, with the aim of placing any proposed new name within the context of contemporary science. Finally, we review some of the obstacles to changing the name, as well as summarize our position on this matter.

The Problem of Recognition of Our Current Name

The IAEMS-affiliated societies have a variety of names already and exhibit some diversity in this regard. Some of the examples include the Latin American Association of Environmental Mutagenesis, Carcinogenesis, and Teratogenesis (ALAMCTA) and the Mutagenesis and Experimental Pathology Society of Australasia (MEPSA). In addition, most of us have had the experience of telling a scientist (and certainly non-scientists) that we do environmental mutagenesis, and then we see that our colleague does not understand what that is. We have all had to explain the meaning of EMS to many people over the years. Thus, our current name does not (and never has) communicated clearly the type of work that we do—even to scientists outside of our immediate field. A number of members and leaders from the various affiliated societies have confirmed this problem to us.

Membership and Research Trends

Some obvious success stories of our societies over the past 40 years include the growth of the field of environmental mutagenesis around the world, especially in the emerging economies of China, India, and Brazil, among other regions. This is reflected in the growing membership in those societies, increased publications from scientists in those countries, and the recent request by the Brazilian society to become a member of IAEMS. Likewise, in the older, established societies, an increasing body of research presented at the annual meetings is in the fields of genomics, bioinformatics, molecular epidemiology, and computational toxicology, among other areas, reflecting the development of these fields of genomic science, especially as they relate to environmental exposures.

On the other hand, there is clear evidence for a decline or a lack of growth in membership in some of the societies that were initial founding members of IAEMS, such as the EMS, EEMS,

and JEMS. For example, the EMS has had little growth in membership for more than 25 years, and although membership has fluctuated over the past quarter century, it currently resides at ~530. The current estimated membership of IAEMS through its affiliated societies is ~5,000. This number has not changed substantially in decades. As some of the older societies have become smaller, some of the newer ones have become larger. However, the total IAEMS membership appears to have remained much the same for decades. Nonetheless, there may be some exceptions. For example, the UKEMS has attracted an increasing number of attendees at its meetings in recent years (D. Phillips, personal communication). Another important point to make is that the UKEMS has done extensive educational outreach and certification training for many years, and this might be an effective way of generating interest in scientists who might want to join IAEMS-affiliated societies and attend the meetings.

Ironically, the generally static level of membership in the IAEMS-affiliated societies exists at a time when new and exciting areas of science that are related to environmental mutagenesis are growing and making remarkable achievements. This is especially true for genomic science, which has been incorporated increasingly into the annual meetings of our societies. In fact, the trend in this direction is obvious, with a concomitant reduction in environmental mutagenesis. Whether this development is “good” or “bad” is not our point here. Instead, we simply note this important trend, and we suggest that the names of our societies should reflect more properly what, in fact, our scientific membership does.

We propose that there is a relationship between the names of our societies, which leave outsiders wondering what environmental mutagenesis is, and our static or declining membership. We suggest that the increasing presence of genomic science in our meetings and among our membership should be reflected in the names of our societies. This would make the broader

purpose and interests of our societies immediately more clear to outsiders, and it would enhance the attractiveness of our societies to new members, increasing the vitality and sustainability of our societies.

Environmental Mutagenesis Research

The U.S. federal government laboratories, where much of environmental mutagenesis was born and developed [2], has reduced environmental mutagenesis research programs and increased those in genomic science or computational toxicology. For example, there has been a decreased emphasis in environmental mutagenesis at the U.S. EPA, and such work is performed at the NIEHS/NTP largely through contract laboratories. Likewise, the U.S. National Laboratories at Oak Ridge, Livermore, Brookhaven, and Los Alamos have largely replaced environmental mutagenesis research with various types of genomic science. The U.S. FDA continues to have a large, environmental mutagenesis group at the National Center for Toxicological Research in Jefferson, AR. However, given the nature of the institution, their focus is almost exclusively on drugs and not larger environmental issues. In addition, the genetic toxicology test battery is still required for submission of pharmaceuticals to regulatory agencies.

Funding for academic researchers from government agencies in applied environmental mutagenesis has also diminished over the decades. In contrast, environmental mutagenesis is still a prominent research area in many other research institutions in other countries in Europe, Asia, and Latin America; however, even in those regions of the world, genomic science is fast replacing traditional environmental mutagenesis research. As this change has occurred, our societies have failed to successfully attract a critical mass of scientists in genomic science, and they have not promoted adequately the potential application of genomic science with

environmental concerns. We think that this accounts for some of the static membership in the IAEMS-affiliated societies.

Publications Using Genetic Toxicology Assays

Claxton et al. [2] have performed an analysis of the numbers of journal articles published from 1971 to 2009 using key words to identify some of the main assays in the field of genetic toxicology, such as the *Salmonella*, mouse lymphoma $Tk^{+/-}$, *HPRT*, micronucleus, and comet assays. This analysis reflects much of the output of science in the field of genetic toxicology and environmental mutagenesis; however, it does not capture much of the basic mutagenesis and DNA repair research in the field, which largely does not use the assays noted above.

Nonetheless, the data show that the number of papers using the *Salmonella* mutagenicity assay peaked at ~500 per year in the early 1980s and declined to ~200 per year for the past decade. There have been only ~20-30 papers published per year using mammalian-cell mutagenicity assays for each of the past 25 years. The numbers of published papers using various versions of the micronucleus assay reached ~100 papers per year in the early 1990s and has remained at that level for the past 20 years. One area of growth involves the comet assay, which has grown to ~700 papers per year during the past 5 years, but the annual frequency of papers published using even this assay has begun to plateau. We encourage readers to consult Claxton et al. [2] for further analyses and in-depth discussion of this and related matters.

The number of submissions to *Mutagenesis* has increased steadily in recent years (D. Phillips, personal communication). Although a special case, there has been discussion for more than a decade of expanding the number of pages and frequency of publication (to one issue per month) of *Mutat. Res.—Rev.* However, the numbers of acceptable submissions have not grown

sufficiently over the years to justify such an expansion (D. DeMarini and M. Waters, personal communication). We recognize that an analysis of the *number* of papers published per year does not reveal the *topics* these papers cover, nor does it document the shift that has, in fact, occurred with these journals from publishing papers on environmental mutagenesis to publishing papers on toxicogenomics and computational toxicology. Nonetheless, these data reflect the limited growth of the field defined narrowly as environmental mutagenesis or genetic toxicology. In some ways, the field has been highly successful and “worked its way out of a job.” This is especially true in the pharmaceutical industry where the standard mutagenicity test battery largely eliminates mutagenic molecules from consideration for further drug development.

Again, these data reflect the fact that the science of genetic toxicology is a greatly reduced research area relative to the past 20 years and, as noted for the U.S. federal laboratories, has been eclipsed by genomic science. This decline is also clearly linked to the changes in the pharmaceutical and chemical industries, particularly consolidation of companies, as well as outsourcing of standardized genetic toxicity testing. This has resulted in a much smaller number of researchers in this field, which has now become routine, leaving a smaller number of scientists (especially scientists in industry) available to join the IAEMS-affiliated societies.

Proposed Name Change

As with everything, things have changed in our field and in our societies, and we should no longer ignore these facts. Instead, we should consider whether even an additional change should also be made—such as a change in the name of IAEMS and its affiliated societies that would reflect the changes noted above.

For the reasons listed above, including the decline or static situation in terms of membership and publications [2], along with the enormous growth in genomic science, and computational toxicology, it is apparent that the name of our society should reflect these changes. Thus, it seems imperative to us to consider changing the name of our societies to better reflect what, in fact, is actually occurring in our laboratories in our field—the application of genomic science to medicine, environmental science, and public health.

One obvious generic choice that would reflect the changing nature of our science would be the “Environmental Genomics Society.” However, many other variations could be imagined, such as “Genomics and Public Health Society,” “Society of Genomics and Environmental Science,” “Environmental Mutagenesis and Genomics Society,” “Environmental Genetics and Public Health Society,” etc. The reader can imagine additional alternatives. However, both of us strongly favor “Environmental Genomics Society” or EGS, which would result in changing IAEMS to IAEGS, and replacing the “M” with “G” in the acronyms of the affiliated societies. It is an orthodox base substitution, considering that there is no “M” in DNA but there certainly is a “G.”

In the book titled *Environmental Genomics* [3], the Preface states “Environmental genomics seeks to predict how an organism or organisms will respond, at the genetic level, to changes in their external environment. These genome responses are diverse and, as a result, environmental genomics must integrate molecular biology, physiology, toxicology, ecology, systems biology, epidemiology, and population genetics into an interdisciplinary research program. Environmental genomics is a generic term that applies to all studies examining the impact that environmental conditions have on gene transcription, protein levels, the stability of the genome itself, or the diversity of the genomes in a population.” We fully agree, and this

definition fits the research agenda and scope of our societies perfectly. For this reason alone, we find the name “Environmental Genomics Society” to be appropriate, appealing, and clear.

This name is particularly suitable if we intend genomics to have a broad meaning, which we would suggest is the case. For example, according to the U.S. EPA [4], “the term genomics encompasses a broader scope of scientific inquiries and associated technologies than when genomics was initially considered....Genomics is the study of all the genes of a cell, or tissue, at the DNA (genotype), mRNA (transcriptome), or protein (proteome) levels.” The meaning of genomics can encompass epigenetics as well, such that “...genomics includes understanding of somatic genetic and epigenetic changes and their role in disease process” [5]. Another clear definition that comports with our sense of the phrase has been stated by Field et al. [6] who describe environmental genomics as the application of genomic technologies for understanding the impact of environmental changes on living organisms.

We also note that there are definitions of environmental genomics that do not describe our sense of the phrase. For example, Wikipedia [7] defines environmental genomics as a synonym or analog of metagenomics, ecogenomics, and community genomics, i.e., the study of genetic material recovered directly from environmental samples. Similar interpretations of the phrase are given by other authors and institutions [8-11]. Despite these definitions, there are ample examples [3-5] where the phrase “environmental genomics” is defined in terms that describe precisely the type of work performed by members of the IAEMS-affiliated societies.

Finally, the meaning of the word “environmental” includes not only air, water, soil, and dwellings, but also everything that is exogenous to our genetic composition, such as food, drugs, voluntary habits, and lifestyle. The IAEMS-affiliated societies are interested not only in the adverse effects of contaminated air, soil, and water on our health, but also on the role that other

environmental exposures, such as those from the diet and pharmaceutical agents, might have on health—both adverse and protective. The involvement of pharmaceutical and food industries in these societies has been an area of long-standing interest from the beginning 40 years ago and remains so today. The term “environmental” in the name for these past 4 decades has seemed suitable to accommodate this area of research, and we assume that it can remain suitable in the coming years; thus, we have retained it in our proposed new name of Environmental Genomics Society. In our view, the term “environmental genomics” is similar to “gene-environment interactions,” but with a broader meaning.

Concerns Regarding Changing the Name

We recognize that a name change should be considered carefully because it has substantial consequences. In particular, IAEMS and nearly all of its affiliated societies are registered as legal entities in their respective countries. Thus, any name change would require some legal efforts (and money) to alter the registration and official documentation of the various societies. Beyond that, however, is the psychological impact that such a change might involve. We all have a sense of nostalgia, and for many older members, the IAEMS-affiliated societies have been the primary or even the only scientific society to which they have ever belonged. Thus, eliminating the name may seem too drastic a change to many.

However, as interesting as the past may have been, we owe it to future generations to assure that they will have a scientific society that is just as interesting for them as it was for us. We need to consider the opportunities for the future growth of our societies rather than bask in the joys of the past. If we are so enamored with our society that we do not want to change its name, then we may well see the demise of our respective society because we will have loved it to

death. If we truly respect and admire what our societies have done, then we need to do what is right to enable them to flourish in the future. Young, new investigators are the future of not only our science but our societies, and our inability to attract and retain large numbers of them is due to our failure to embrace change.

Conclusions

A name change might open up the IAEMS and its affiliated societies to a whole new group of scientists in the field of environmental genomics and bioinformatics who are looking for a professional home but have not yet found one. It also might accelerate the incorporation of genomic science into environmental science, which would be of considerable value to public health. A name change would enhance membership and begin to grow the societies, many of which have not experienced any growth for more than 25 years.

We think that some reflection on the past and present is needed to provide direction for the future, and we would like to encourage a discussion of this issue among our member societies. A name change could rejuvenate and revitalize our societies by providing a welcoming professional home for scientists in the changing field of environmental mutagenesis—excuse us; we mean the field of environmental genomics, for the next 40 years.

To facilitate communication among people interested in the topic of this Commentary, the IAEMS has established a link on their website at www.iaems.net where comments and discussion can be posted; we encourage you to submit your thoughts and ideas through this forum.

Conflict of interest

The authors have no competing interests to declare.

Acknowledgments

We thank the 2009-2012 IAEMS President Stefano Bonassi, IAEMS Officers and Councilors, and other colleagues for their constructive discussions on the subject of this Commentary. This work was supported by the intramural research program within the National Health and Environmental Effects Research Laboratory of the U.S. Environmental Protection Agency; and by the Department of Health Sciences, University of Genoa. This manuscript was reviewed by the National Health and Environmental Effects Research Laboratory, U.S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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