RESEARCH ARTICLE

Review and analysis of safety policies of chemical journals

Advances in chemistry are highly dependent on the procedures published in peer-reviewed journals. Some chemistry journals require authors to address safety considerations in their manuscripts but others do not. In this study, we examined 726 chemistry journals from 28 publishers to determine if they require the author to mention safety precautions. Journals supply information for authors that generally mention safety in two places. In the guidelines for authors, which are widely read by prospective contributors, 8% mention safety. Most journals have ethics guidelines of which 59% mention safety.

In order to determine the effectiveness of safety policies 100 articles from each of six journals that published research that involved extensive syntheses were selected. The results of the search indicated that the target compounds were mentioned 107 times but only one mention carried any safety precaution.

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INTRODUCTION

Advances in chemical sciences build on the results of others which are peer-reviewed and published in reputable journals. Unfortunately, too many peer-reviewed papers make no mention of the hazards and risk-minimization activities that were often developed in concert with the research. Langerman mentions this problem in a recent commentary[1]: "A researcher today, going back in JACS or JOC to the early 1900s will find a detailed explanation of how the work was done, but they will not find any description of the hazards involved. Even if the synthesis of an organometal poly azido detonated the first six times the chemist did it, the published paper will very likely not mention it."

As knowledge progresses one might hope that safety notifications are more common. In this study, we searched the publication guidelines for 726 chemical journals to see if safety information is required and how this requirement is communicated to authors. We then searched 600 manuscripts published in early 2015 from journals that describe synthetic chemistry to determine if the authors communicated that a particular chemical mentioned in the paper was designated as a Particularly Hazardous Substance.

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PUBLICATION SAFETY REQUIREMENTS COMMUNICATED TO AUTHORS

Every journal has a web site that provides information to potential authors often with hyperlinks to other pages. In general, the journal's safety information requirements are found in one of two different environments, described below.

Journal Guidelines for Authors

Journal guidelines are set by the specific journal and usually appear under a name such as "guidelines for authors." The guidelines inform the author of the scope of the journal and the content that should be contained in the author's manuscript. These guidelines frequently describe different types of manuscripts that are accepted by the journal and the format for the prepared manuscript.

Ethics Guidelines

Most journals have ethics guidelines that present the values and standards each publisher expects of its journal authors. Ethics guidelines can include but are not limited to, plagiarism, data manipulation, simultaneous submission, and authorship criteria. Ethics guidelines are often common to all journals of a particular publisher but some are found within the journal guidelines for authors. Other journals do not have readily apparent ethics guidelines that do not appear on the journal home page or on links from the home page or on the publisher's home page. It is possible that ethical requirements are located elsewhere within the web of information.

A small poll asked researchers about their familiarity with ethics guidelines and their perceptions of the important issues mentioned in these guidelines.

EVALUATING JOURNAL SAFETY REQUIREMENTS

Selecting Journals

A total of 726 chemistry journals were examined. All chemistry journals with an impact factor placing them in the top 40, all American Chemical Society (ACS) journals, all Royal Society of Chemistry (RSC) journals as well as

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nearly all the chemical offerings from Springer, Elsevier, Wiley, and Taylor & Francis were included. In all, 28 publishers were represented in the group.

The list of 726 does not include every chemistry journal. To be included on the list the journal must be currently publishing and accepting manuscripts, contain peer-reviewed chemistry manuscripts that are written in English, and have available guidelines for authors. Journals that specialize in review articles and databases were omitted because safety warnings might have been present in the primary publications but deleted from the reviews.

Locating Safety Information

The journal and ethics guidelines were searched for the following four safety keywords: "caution," "hazard," "danger," and "safety." Guidelines that contained any of those words were further examined to evaluate the safety information required in the manuscript.

Evaluating the Effectiveness of Safety Guidelines

To determine the effectiveness of the guidelines a subset of the 726 journals was chosen for closer examination. Because most people feel that many chemical reactions have inherent risks that can be mitigated by proper safety procedures, journals that described the synthesis of new compounds were selected. One hundred journal articles were examined for each of the following journals: *The Journal of Organic Chemistry* (published by the ACS), *Organic and Biomolecular Chemistry* (RSC), *Catalysis Letters* (Springer), *Tetrahedron* (Elsevier), *The European Journal of Organic Chemistry* (Wiley), and *Organic Preparations and Procedures International: The New Journal for Organic Synthesis* (Taylor & Francis). The articles were all published between January and May 2015 other than for the Taylor & Francis publication which required a longer time period to accumulate 100 articles. Only original papers were examined; review articles would be unlikely to include safety warnings. Each of the 600 articles was searched for the presence of the four safety keywords as well as for mention of the following 11 compounds: butyl lithium, lithium aluminum hydride, silane, germane, hydrogen peroxide, hydrofluoric acid, trifluoroacetic acid, phosphine, diazomethane, white phosphorous, and arsine. These reagents were chosen because they are useful chemical reagents and all can be found on published lists of Particularly Hazardous Substances.[2–4] The OSHA Laboratory Standard (29 CFR 1910.1450(e)(viii)) does not include a list of Particularly Hazardous Substances but requires that employers protect and train workers who handle "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity.[5] These terms are interpreted by safety professionals at individual organizations who publish lists of Particularly Hazardous Substances and the methods by which the organization safeguards the health of its workers.

RESULTS

Location of Safety Information

Journal Guidelines for Authors

Only 62 of the 726 journals included a safety keyword in their journal guidelines for authors but three of the 62 equivocated by stating it was optional, or needed under special circumstances. Thus, only 59 journals (8% of the Chemistry journals surveyed) included a safety keyword in the journal guidelines for authors. It is logical to infer that journals that do not mention safety in their guidelines do not require mention of safety in their manuscripts. Table 1 depicts the number of journals by each publisher along with the number of journal guidelines for authors that contained a safety keyword and the percentage of journals by the publisher that mentioned a safety keyword in the author guidelines.

Ethics Guidelines

The ethics guidelines of journals from 28 different publishers were examined. Three publishers – ACS (48 journals), RSC (38), and Taylor & Francis (82) have ethics guidelines that include a safety keyword as do 217 of 221 Elsevier journals. These publishers largely have one ethics statement, which includes a safety keyword, referenced by their journals. The other three publishers in Table 1, DeGruyter, Springer and Wiley, did not have a consistent ethics policy for their journals. The ethics statements differed among journals from the same publisher; some lacked an ethics statement, some had a separate ethics statement and some had the ethics statement in the author guidelines. Of those journals that had ethics statements, some included a safety keyword and others did not.

Of the six publishers that had ethics guidelines that included a safety keyword (ACS, RSC, Elsevier, Wiley, DeGruyter and Taylor & Francis), four publishers stated that any "unusual hazards" inherent in the chemicals, procedures, or equipment should be clearly stated in the manuscript. None defined "unusual hazard."

Table 1. Appearance of Safety Keywords in Journal Guidelines for Authors. Organized by Publisher.

	ACS	RSC	Springer	Elsevier	Wiley	Taylor & Francis	DeGruyter	Other Publishers
Total number of journals	48	38	132	221	148	82	29	28
Journals with safety keywords	39	0	0	10	5	0	0	5
Journals without safety keywords	6	38	132	211	143	82	29	23
Other	3	0	0	0	0	0	0	0
Percentage of journals mentioning a safety keyword	83%	0%	0%	5%	3%	0%	0%	18%