ABSTRACT
In the United States, through nation-wide discussions, the procedures for handling allegations of research misconduct are now well established. Procedures are geared toward carefully treating both complainants and respondents fairly in accordance with the US framework. Other countries, which have their own cultural and legal framework, also need fair and legally compatible procedures for conducting investigations of allegations of research misconduct. Given the rapid growth of international collaboration in research, it is desirable to have a global standard, or common ground, for misconduct investigations. Institutions need clear guidance on important subjects such as what information should be included in the investigation reports, how the investigation committee should be organized once research misconduct allegation has been received, how to conduct the investigation, how the data and information obtained should be taken as evidence for vs. against misconduct, and what policies the investigation

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committee should follow. We explore these issues from the viewpoint of members of committees investigating accusations of research misconduct (hereafter referred to as “investigation committees”) as well as persons overseeing the committees in Japan. We hope to engender productive discussions among experts in misconduct investigations, leading to a formulation of international standards for such investigation.

Introduction

After reviewing previous guidelines from the Ministry of Education, Culture, Sports, Science, and Technology (MEXT 2006) and the Ministry of Health, Labor, and Welfare (MLHW 2007) of Japan, MEXT, MLHW, and other government agencies in Japan issued and put into effect the “Guidelines for Responding to Misconduct in Research” (hereinafter referred to as “the Guidelines”) in April 2015 (MEXT 2014; MHLW 2015). The 2015 Guidelines are different from previous versions in that the Guidelines require research institutions to respond more vigorously to allegations of research misconduct. In 2015 MEXT started making public announcements of findings of research misconduct on its website (based on investigations by research institutions in Japan).

The Standardization Committee (defined below), most of whose members have served as members of institutional investigation committees, knew from its own collective first-hand experience that investigation committees face a number of problems in conducting their investigations, and that the consequences of an investigation are considerable. Even a finding of research misconduct that is unsubstantiated could have dire consequences on the research career of the respondent. On the other hand, an inappropriate failure to find that research misconduct had occurred could seriously damage public trust in research. Thus, the validity and credibility of investigations is of paramount importance. However, although the core policy or guidelines of each institution provides a general framework for investigating allegations of research misconduct, neither the procedures for investigations nor the criteria for identifying research misconduct are standardized globally. Also, in many cases, a significant amount of time elapses between the filing of the initial allegation and the issuance of the final report of the investigation committee. This amplifies the psychological burden placed on the respondent due to rumors (which may be groundless), increases the costs of the investigation, and precludes the timely learning of lessons from the facts identified during the investigation. Thus, respondents, investigators, institutions, and the research community as a whole are likely to feel dissatisfied with the process regardless of the investigation results.
In light of the above, the Association for Promotion of Research Integrity (APRIN), a Japanese NGO, formed the Research Misconduct Investigation Standardization Committee (hereinafter referred to as “the Standardization Committee”) within the Medical and Life Sciences Working Group in order to help standardize 1) the procedures, 2) assessment and 3) decision-making in research misconduct investigations for global use by all countries, including Japan. In this regard, US has a history of more than a quarter century of discussions and policy making for the procedures at the levels of the government, academic societies, and institutions (UI 2009; UCSD 2018; OSU 2008; HMS 2005; VU 2012; NASEM 1992; HHS 2005). Recently, a checklist of items to include in investigation committee reports was proposed in the U.S. (Gunsalus, Marcus, and Oransky 2018). U.S. and a few European countries, such as Norway and Denmark, are unique, where they have government agencies to oversee institutional investigations and to have the authority to make final decision on alleged cases. U.S. is further unique, i.e., each institution has a “research integrity officer” or “coordinator” who has the authority conferred by the federal government to manage misconduct investigations (UI 2009; UCSD 2018; OSU 2008). In view of the rapidly increasing international collaborations in the research arena, we now need to have standardized procedure, assessment, and decision making for misconduct investigations that are globally applicable. In this regard, U.S. policies provide this effort with valuable references. In addition to the procedural matters, we sought a common ground for evidence assessment and decision making, i.e., “diagnostic criteria” for taking each piece of evidence as an indication for vs. against misconduct, and how to reach the final conclusion.

The Standardization Committee gathered researchers with a wide range of expertise, including researchers and educators knowledgeable in issues related to research misconduct, individuals who had been editors of scientific journals, and individuals who had recently been members of teams that investigated research misconduct allegations. The Standardization Committee met about once a month for 2 years starting in July 2017. As mentioned in the Acknowledgments section of the Standardization Committee report, a few experts from the United States contributed to our discussions. The Standardization Committee has already published a part of its conclusions as a list of the key points that should be considered by the committees investigating misconduct allegations (APRIN 2018).

After publishing the list, the Standardization Committee continued discussion on issues such as

- how to handle allegations of misconduct,
- how the investigation committee should be organized,
- how to conduct the investigation,
- how the data and information obtained should be taken as evidence for vs. against misconduct occurrence,
Our discussion hoped to address the various issues encountered in misconduct investigations, many of which were initially raised some 30 years ago. Thus, a research misconduct investigation led by the University of California, San Diego in 1985 led to seminal discussions of the wide range of issues that arise in such investigations, most of which are still remarkably pertinent today (Engler et al. 1987). We now summarize the committee’s discussions here. The points of the discussions are listed in the accompanying table “Considerations in Investigating Allegations of Research Misconduct” along with related descriptions from *the Guidelines*. Although various fields of research have somewhat different codes of conduct that may affect rulings on allegations of misconduct, there is a fundamental code of conduct common to all fields of scientific research, because research misconduct is always “the intentional, knowing, or reckless publication of inauthentic information.”

**Goal of the standardization committee and applicable types of misconduct**

The conclusion of investigations must include 1) whether the published data are authentic, i.e., factual, and 2) if those are not, whether misconduct was the cause. Our discussions will center around fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results, as defined by the (HHS 2005) and others. However, we also consider other inappropriate practices, such as inappropriate data handling, p-hacking, and HARKing (Hypothesizing After Results are Known) as defined later (AMS et al. 2015, 20). We refer to misconduct mainly in the medical and life science field but will make our discussion relevant to all research fields and applicable for all countries. This article is intended for individual researchers, investigation committees, and institutional officials that oversee them.

**Responsibility of institutions in conducting investigations**

Research misconduct investigations impose an enormous burden on research institutions. However, regardless of its size, no institution is exempt from the responsibility to conduct an investigation. A misconduct investigation can involve more than one institution when, for example, the researcher in question has changed affiliations or the allegation is against publications from a multi-institution research collaboration. In the case of Japan, *The Guidelines* stipulate that as a general rule, the institution at which the respondent is currently affiliated shall investigate the case. However, since retention of research data in general is the responsibility of the research
institutions where research was carried out, the data and records relevant to
the alleged misconduct are likely to have been retained at the respondent’s
previous, rather than current, institution. Thus, to conduct an efficient and
fair investigation, we strongly recommend that previous institutions coop-
erate with current institutions. *The Guidelines* also indicate that when the
researcher in question is currently affiliated with more than one institution,
as a general rule, the investigation should be carried out jointly by the
institutions concerned, with the central role being played by the institution
where the respondent conducted most of the research activities involved in
the allegation.\(^1\) Such a rule is necessary to avoid cases where neither institu-
tion is willing to undertake an investigation of the allegations of misconduct.

The composition of the investigation committee is critical for a fair and
unbiased investigation. There are no guarantees that all members of the investiga-
tion committee will have previously served as members of a misconduct investiga-
tion committee because each committee is formed when an allegation is raised and
administrative staff who served in previous investigations may have been trans-
ferred to other positions. It is, therefore, reasonable for research institutions to
create, revise, and keep a list of potential candidates for investigation committees,
from both inside and outside, together with descriptions of their expertise and
experience of research misconduct investigation. It is desirable that, in the future,
a third-party institution or organization, for example, an academic society, could
provide consultation or personnel to investigation committees, or perhaps, could
even be entrusted with conducting investigations.\(^2\) Although such an arrange-
ment is geared toward benefiting small-scale institutions in particular, institutions may
be skeptical about accepting this opportunity due to lack of confidence in the
protection of confidentiality.

**The role of the investigation committees**

Investigation committees formed by universities and other research institutions
are obligated to promptly proceed with the investigation while conforming to the
institutional rules consistent with *the Guidelines*. They are required to submit to
the Government office the summary of their conclusions about the occurrence or
nonoccurrence of research misconduct and to provide supporting details as
appropriate.\(^3\) If the research tainted by misconduct was possibly supported by
public fund(s) as often described in the Acknowledgment section, it is required to
verify the relationship between the research and the fund(s). To identify the grant
that funded the tainted research, however, the investigation committee should not
rely solely on the information in the manuscript.

Transparency and fairness also must be ensured when forming an inves-
tigation committee. The credibility of the investigation committee’s conclu-
sions is based on the absence of financial as well as non-financial conflicts of
interest between potential committee members and respondents or
complainants. In order to avoid conflicts of interest, a list of potential committee members should be presented to both the respondents and complainants, and they should be provided with the opportunity to express their opinions.

The criteria for making a finding of misconduct may vary somewhat depending on the research field because there are field-specific codes of conduct. The institution’s code of conduct may define research misconduct more narrowly or broadly than the Guidelines. In borderline cases, the finding on the misconduct allegation may be affected by the views of the investigation committee members.

Response to the complainant and preparation for investigation

The compliance departments of research institutions receive varying numbers of misconduct allegations. Because investigation of research misconduct demands an enormous investment of human resources, upon receiving an allegation it is critical to verify that the allegation is scientifically reasonable, credible, and is not based on a personal grudge or raised in bad faith. This key process requires the competence to assess the scientific credibility of the allegation and experience of research misconduct investigations that allow the determination of whether the allegation is free of malicious intentions. Thus, this task would better be entrusted to at least two individuals, one with the knowledge required for scientific credibility assessment and the other with misconduct investigation experience such as a Research Integrity Officer or the equivalent. The complainant will be interviewed to ascertain the contents of the allegation. Once scientific validity and lack of malicious intention are verified, the allegation will be proceeded to the next step. The individuals who initially assessed the allegation are best excluded from the formal investigation, to allow the investigation committee to examine the allegation without any preconceived ideas. If it is found that the allegation is based on malicious intention, appropriate actions should be taken against the complainant in accordance with institutional policies. According to the Guidelines, such complainants may be subject to having their name made public, to termination appointment, or even to criminal charges.

Raising an allegation may incur serious disadvantages for the complainant. Therefore, the utmost care should be exercised to prevent disclosure of an allegation, and the identity of the complainant must be kept confidential. Students and junior faculty members are often cited as typical examples of vulnerable complainants. However, even full professors might be susceptible to retaliation or face damage. It is recognized that many well-intentioned complainants suffer personal and professional harm after raising an allegation. Institutions should take all reasonable and practical steps to protect the position and reputation of complainants.
When an allegation of research misconduct is received, the potential respondent must be appropriately notified of the allegation. The notification should occur quickly after the allegation is received, reviewed, and determined to be credible. The notification to the respondent should coincide with sequestering all data relevant to the allegation that will be reviewed by the investigation committee. Relevant data include both handwritten and digitalized research records and e-mail communications with coauthors and relevant others. To sequester digitalized information, copying entire hard disks is recommended.

**Institutions’ obligations concerning research misconduct allegations**

Upon receiving an allegation, some research institutions may be tempted to try to avoid the enormous burden of conducting an investigation. Research institutions may also want to avoid the administrative burden of mandated reporting to government ministries and agencies, damage to the values and reputation of the institution that exposure of misconduct entails, and the penalty of having to return research grants and/or to pay fines.

Whether or not the institution can build a framework whereby an investigation committee can investigate research misconduct allegations fairly and transparently rests on the institution’s crisis management ability. Setting up a standing committee overseeing the activities of investigation committees would help secure transparency and consistency of misconduct investigations. In the Internet society of today, research misconduct allegations are discussed on increasingly diverse and numerous platforms, with social networking services (SNS), which often function as post-publication peer review sites and pre-print servers providing opportunities to discuss questions about the contents of uploaded pre-review research manuscripts. Furthermore, various types of software have been developed which provide better chances to detect image manipulation and text plagiarism. Research institutions and investigation committees must be aware of current trends and make efforts to judge allegations transparently and fairly.

All allegations should be handled consistently by institutions. Any unjustifiable dismissal of an allegation due to pressures, either internal or external, to cover up or conceal an allegation is unacceptable. The Duke University case shows us how serious the consequences can be if allegations are overlooked (Science News Staff 2019).

**Retention of raw data and its value as evidence in research misconduct investigation**

Research data such as experimental records, laboratory notebooks, and clinical records are important evidence in a misconduct investigation. Of
utmost importance is to sequester raw data. As mentioned earlier, relevant research data can be handwritten or digitalized records and include e-mail communications with coauthors and collaborators. The investigation committee should make best effort to secure research data at the earliest stages of the investigation. Depending on institutional rules, these records may formally be the property of the institution. In practice, however, retention of these records is often entrusted to researchers. Research institutions should clearly stipulate to researchers the required data retention period in their institutional policies and also assist researchers in retaining the records. It is desirable for both researchers and institutions to retain records for at least 5 years, after the publication of the research and for up to 10 years if institutional capability allows, as suggested by a task force organized by SCJ (SCJ 2015). Different data retention periods must be applied depending on the type of data, and the requirements for retention may vary widely in terms of space, technology, cost, and other factors.

Data are critical evidence to prove the authenticity of reported research results. Therefore, researchers can protect themselves from unsubstantiated allegations by not only keeping all data but also complete records for the details of the experiments, including the input date and time and the names of the people who input the data. Digitalization of data is recommended because it makes it easier to search for the key data later on. Data retention is not just to protect researchers but is researchers’ responsibility to the public.

Misconduct investigations consist mainly of the verification of the authenticity of research publications and the search for the cause of inauthenticity when authenticity is unclear. The importance of identifying the cause of inauthenticity is to gather information for possible recovery of public funds that may have been used inappropriately, to accumulate knowledge for prevention of future misconduct, and to achieve social justice.

“Judging alleged misconduct” or the reason for “clarifying the background of alleged misconduct” and the scope of the investigation

When interviewing witnesses, including coauthors, potential existence of conflict of interest that each interviewee has, either directly or indirectly, with the respondent or complainant should be fully recognized. Witnesses can have teacher–student relationships or rivalry with the respondent or complainant. The publication in question may be of critical importance for witnesses in acquiring degrees or research funds or in obtaining a job.

When examining or questioning witnesses, utmost caution should be exercised to be fair and to look only for the truth. Collection of information from witnesses should aim to clarify the roles that the coauthors as well as the respondent played in the research in question and to determine who was
responsible for the misconduct, if any. In addition, witness examinations should aim to determine the presence or absence of a pattern of the respondent’s inappropriate practices and to unravel the underlying motives. For a fair witness interview, it is important to avoid disclosing the committee’s view on the potential presence or absence of misconduct and to avoid asking leading questions. Also, questions should be carefully worded so as not to make witnesses feel that they, too, are subjects of the investigation. Note that an investigation may reveal that coauthors may be responsible for research misconduct.

Interviews with complainants and respondents also should be carefully managed. Institutional policies should have a rule as to whether participation of third-party individual(s) is allowed at hearings from the complainant or respondent to support the interviewee and to create a secure environment. Prior to the interview, however, the accompanying individual should be made aware that they must not interfere with the proceedings of the investigation.

It is recommended that the above interviews and hearings be recorded and, desirably, transcribed professionally for future review.

Criteria for making a finding of “misconduct” and temporal relationship between research misconduct investigation and the effective date of guidelines and rules

For sound development of science, it is ideal to correct or amend errors in research publications as soon as they are found. One of the important criteria for determining whether errors in publications were due to misconduct, is what guidelines and regulations were effective at the time of publication of the research in question; the current regulations should not be applied retroactively. Scientific integrity of a given publication should be evaluated in light of the scientific knowledge prevalent in the research field at the time of publication, rather than on the basis simply of present knowledge.

As mentioned above, pre-print servers and other systems are currently making on-line research manuscripts available in their pre-review stage or while they are under review. Discussion may be warranted as to what stage in the publication process should be regarded as the “publication date.” At present, the date of acceptance of a manuscript by a refereed journal is the currently prevailing criterion.

Instances when the scope of an investigation may be broadened

Investigation Committees often find it necessary to look into the respondent’s publications more than those alleged publications in order to learn the
respondent’s general habit of conducting research. A recent statistical analysis showed that research misconduct offenders tend to be habitual offenders (Kuroki and Ukawa 2018). If one research publication is found to involve misconduct, investigation into the respondent’s other publications will generally be warranted. This step of investigation may involve examinations of the respondent’s grant application(s) and progress report(s). Similar misconduct found in other publications may affect the sanctions against the respondent. Examination of the respondent’s other publications may also influence the recovery of public funds and ensures the integrity of the published research record. In Japan, authenticity of the published data is checked by volunteer experts in the relevant research field in collaboration with the investigation committee. Serious commitment from experts is required to fully examine the authenticity of the published papers of the respondents.

**Determining whether or not the error was made “intentionally, knowingly, or recklessly”**

Making a finding of fabrication or falsification requires determining that a research publication contains inauthentic data and, when a lack of authenticity is found, then, determining the level of intent. Thus, at first, evidence for vs. against authenticity should be weighed. Raw data such as experimental records and laboratory notebooks that the respondent submits are of critical importance in validating conflicting evidence.

Once inauthenticity is established, the next step is to determine whether the inauthenticity resulted from misconduct, i.e., done intentionally, knowingly, or recklessly. The following factors help establish the existence of misconduct:

- Researcher’s intentionality can be assessed from the impact that the inauthenticity has on the conclusions of the publication and from the relatedness among multiple inauthentic publications.
- Publications containing several instances of inauthentic data can be taken as indicative signs for “intentionality,” “knowingly,” or “Reckless disregard of standard practice.”
- Negligence of acceptable research practice in the relevant research community can also be taken to indicate that there was failure in the obligation to carry out “the researcher’s fundamental duty of care,” even if this is not explicitly mentioned in guidelines.

**Relationship between “misconduct” and “retraction of a paper”**

Instances may occur where critically important data for the published conclusions are questioned, and the raw data with proven authenticity are found to show a pattern different from the published data, an error can then be
concluded. A request to the publisher either to retract or correct part(s) of the publication will, then, follow. In this instance, retraction of a paper means that the data or data analysis was incorrect, but does not necessarily mean that the retracted publication involved misconduct. In cases where raw data are not available to verify authenticity of questioned data, the investigation committee should recommend retraction of the published paper. The recommendations of the investigation committee should be communicated by the institution to the respondent, corresponding author, and the publisher.

Responses from the respondent

As noted above, researchers are obligated to retain raw data such as experimental records and laboratory notebooks. The investigation committee will evaluate the authenticity of those data based on the entries such as the dates and conditions of experiments. Materials submitted by the respondent that are not among the raw data that the committee initially sequestered should not be regarded as authentic. It is very common that when the raw data are different from the published data, the respondent claims “a mistake in transcribing” or an “honest error.” Irrespective of the respondent’s claim, the investigation committee must determine the presence or absence of misconduct based on the preponderance of the evidence for vs. against it. This contrasts to the beyond-a-reasonable-doubt rule employed in criminal trials. Sometimes the raw data and/or other materials of critical importance for investigation may be missing. If raw data and other materials have been discarded for justifiable reasons, e.g., in the case of allegations filed after the institution’s data retention period has expired, cases can be closed after a preliminary investigation. However, if the respondent discarded the data before that, the respondent will be charged with violation of institutional policies, even if the respondent did not intend to commit research misconduct.

In some cases, when respondents are confronted with the allegations or with unquestionable evidence of research misconduct, respondents admit to the research misconduct. Admissions may occur at any step of the research misconduct process. Admissions must be carefully reviewed by the preliminary or standard investigation committee to determine whether the admission is an attempt to accept responsibility for a limited set of problems, thereby covering up additional issues of research misconduct. The respondent should be notified that their admission to some misconduct will not lead to closure of the investigation until the full scope of the misconduct is revealed. If the institution believes the admission includes the full scope of the misconduct, the case can be closed after a preliminary or standard investigation.

Research institutions must handle allegations of misconduct with utmost care because the outcome affects not only the public interest but also profoundly affects the respondent’s personal interests. Once a researcher is
found to have engaged in misconduct, the researcher will be subjected to sanctions by funding organizations, the affiliated institution and the society, inflicting severe damage to the researcher’s personal and public life. In view of these serious consequences, the investigation committee may hesitate to make conclusion of misconduct. However, fair research misconduct investigations are also important for securing social justice. Thus, an investigation committee must uphold their research misconduct findings, regardless of the academic and/or social rank of the respondent, if the evidence supports their conclusion.

**Descriptions deemed as plagiarism**

Plagiarism occurs when information or text from previous research publications, including the author’s own, has been used without proper citation. (Note that plagiarism can also involve use of unpublished material, software, research frameworks, etc., without proper citation.)

Plagiarism can occur regardless of the section of the paper in which the inappropriate citation practices occurred (e.g., Introduction, Methods and Materials, Discussion, etc.). However, the evaluation of the appropriateness of the citation will vary depending on the accepted practice of each research field.

One plagiarism-related issue involves publication in the “proceeding,” which is often published following research conferences. Using some materials from the proceeding in a paper to be published in a refereed journal is commonly, although not always, permissible as long as the prior publication in the proceeding is mentioned in the Acknowledgment section.

Another issue is the use of material from published papers in doctoral theses. At a minimum, this should be mentioned in the Acknowledgment section of the thesis, but some institutions also require signed approval from each coauthor of the publication(s). Submitting or publishing a part(s) of a dissertation as an original contribution for publication in scientific journals may be viewed as self-plagiarism or duplicate submission and/or publication by some journals. To avoid this circumstance, many universities allow the student to place a hold on making all or part of a thesis openly available until the work has been published in a refereed journal.

**Inappropriate research practices**

While public and private funding for life science research is growing, poor reproducibility of published research results has been a serious concern in biomedical research (Collins and Tabak 2014). Fabrication and falsification produce false findings, cause a lack of reproducibility of research results, and adversely affect the progress of, and trust in, science. There are other types of inappropriate research practices that cause a lack of reproducibility. These
practices, known as questionable research practice (QRP), however, are commonly not recognized as research misconduct at present. Recently, a report to the National Academies of Sciences, Engineering, and Medicine of the United States stated that some QRP, such as using misleading statistical analysis, is far more serious than merely being “questionable” and called these detrimental research practices (DRP) (NASEM 2017). In the near future, those may be classified as misconduct and become the subject of investigations by institutional committees.

Among such inappropriate practices, “hypothesizing after the results are known” (HARK) deserves particular attention. HARKing is, in essence, the act of publishing research originally designed as exploratory research as if it was hypothesis-driven research from the beginning, by attaching a hypothesis that was formulated after the data were obtained, which is conveniently consistent with the observed results. Such a retrospectively obtained hypothesis must not be evaluated through statistical procedures that would have been applicable if it had been formulated in advance of collecting the data. Rather it must be treated as a new hypothesis to be statistically tested against new data collected in the future. Although HARKing has not been the subject of misconduct investigations thus far, it is arguably a type of falsification.

Attention should also be paid to another inappropriate practice involving statistical analysis, namely p-hacking, in which, many parameters are measured and statistically analyzed, but only data for correlations with low p-values are published.6

There are also unique problems for the life science. In this field, there is a level of experience in certain methods, procedures, and use of equipment that can affect the outcomes of experiments. Amidst stringent competition, some researchers may want to hide such knowledge to avoid providing their competitors with any benefit. However, the reality is that only after the published findings have been reproduced by other researchers will the original research findings be proven credible and the authors of the original report be positively evaluated. Until recently, scientific journals had only limited space and were often not able to publish the details of experimental procedures. However, online supplements now allow presentation of extensive information. Mandatory requirements for sharing details of methods and results are expected, on one hand, to promote development of new research, and on the other, to deter the temptation to commit fabrication and falsification.

Research misconduct, research instruction, and research ethics education

When misconduct surfaces, both institutional and personal responsibilities must be examined. A finding of misconduct always raises a question about the adequacy of researcher’s institution as an environment fostering high ethical
standards. If any problem is found in the environment, institutional responsibility should be examined along with, but separately from, individual responsibility. A responsible institution is one where senior institutional officials demonstrate and communicate a commitment to improving the research environment and providing educational tools for researchers to efficiently conduct their research with integrity and honesty (Titus, Wells, and Rhoades 2008).

Responsibility of individual researchers, particularly of young researchers, must be assessed from a different viewpoint. Currently, graduate students are given increasing opportunities to learn research ethics in the forms of lectures, e-learning, seminars, and workshops provided by institutions. Many undergraduate and some high school students, as well, receive research ethics education, also. Thus, students are not exempted from being the subject of research misconduct investigations. That said, instructors and principal investigators must share responsibility when students who are not yet full-fledged researchers engage in misconduct (Bird 2001). In such cases, research instructors may be held liable for both their direct involvement as a researcher and indirect involvement as an instructor and mentor (Wright, Titus, and Cornelison 2008, 323–336).

In addition, a factor often recognized as a primary cause of research misconduct cases is improper instruction or pressure to commit misconduct from the head of a laboratory, which creates a closed community. It can be difficult for students or junior researchers to resist such pressure. The National Science Foundation of the United States calls for such inappropriate pressure from a senior researcher to be dealt with as stringently as research misconduct itself in NSF Important Notice No. 144.

Sometimes it is found that researchers followed improper methods of image processing that should not be used in publishing research in life sciences. If these researchers instruct students and young researchers, such improper research methods may be handed down to the next generation of researchers. While assessing the respondent’s responsibility as a researcher, the quality and opportunity of institutional research ethics education and promotion should be considered, in addition to the code of conduct in the particular research field. It is now mandatory for institutions receiving public fund(s) to provide researchers with research ethics education. The appropriateness of research instruction and research ethics education should also be considered when sanctions against the respondent are sought. However, the quality of research ethics education is irrelevant in cases where researchers do not faithfully participate in research education programs (IOM and NRC 2002, 39–43).

**Evaluation of the roles in misconduct**

Once a research publication is found to have involved misconduct, the roles and the nature of involvement in the misconduct must be clarified in detail for each
Often, students, postdoctoral fellows, and junior faculty may have been involved in generating the inauthentic data; however, the role of the corresponding author and other senior authors also must be evaluated to determine whether this/these author(s) was/were aware that the data were inauthentic, but allowed it to be published anyway. The corresponding authors’ obligation is not limited to functioning as a window of communication with the scientific journal to which the research manuscript has been submitted. Corresponding authors must ensure the authenticity and transparency of the submitted manuscript by securing from all authors the proof of data authenticity and agreement on the contents of the submission. Consequently, the corresponding author’s involvement is of equal importance in the investigation to that of the respondent. When a case involves graduate students, they are not exempted from the investigation simply because they are students. Roles played in misconduct should be clarified for all individuals involved, as well as the causes of misconduct. Authorship-related issues, such as corresponding authors not fulfilling their duties, authorship given to individuals who do not deserve it, or authorship denied to individuals who do deserve it, may surface in the course of an investigation.

**Reporting investigation results**

Investigation committees are obligated to determine whether or not misconduct occurred but are not tasked with deciding on sanctions for misconduct. Once it is determined that misconduct has occurred, the investigation committee must assess, based on the evidence, the degree of maliciousness of the misconduct and the involvement and roles of the respondent and others, as well. The investigation committee will report the results of the investigation to the research institution; the research institution will then report the results to the government, funding agency(s), and the journal(s).

When investigating the relationship between the use of public funds and the publication in which misconduct has occurred, the descriptions in the Acknowledgments section and in research progress reports are used as evidence, and the scientific and academic relationships between the publicly funded research projects and the research publications involving misconduct are examined. However, these descriptions should not be used as the sole evidence because the descriptions in the Acknowledgments section and the reports can be erroneous due to the researchers’ intentional or unintentional misrepresentation.

**Disclosure of investigation results: institutions’ response**

It is the duty of the institution, not the investigation committee, to make cases public in which misconduct was found to have occurred. The institution’s policy, not the investigation committee, will determine what to disclose to the
public, and for how long. Sharing investigation results may facilitate standardization of the criteria for concluding presence vs. absence of misconduct. However, such sharing is associated with many practical problems that need to be considered. For these reasons, this article discusses the pros and cons of disclosure of misconduct cases as one of the investigation-related issues.

When a research misconduct investigation makes a finding of misconduct, the research institution makes this information public in an effort to minimize the social loss secondary to the misconduct. The researcher’s name is not disclosed in misconduct cases published on the MEXT website in Japan. However, some institutions have disclosed the researchers’ names in their own public announcements, following their own institutional regulations. It is still controversial to what extent information should be disclosed.

Some people argue that in order to secure fairness, the investigation results should be disclosed even when the allegation is not upheld by the investigation. Their intention is to share how the investigation developed and how the investigation committee reached their ruling as knowledge that can be used by others and in the future. Such disclosure may also help convince the public that a finding of no misconduct was justified by the evidence and was not an institutional cover-up. Alternatively, even the mere mention of a researchers’ name connected to a research misconduct process can have damaging consequences on their professional careers. In this regard, the Guidelines indicate that the results of an investigation shall not, as a rule, be made public when it is determined that misconduct has not occurred, whereas the results should be made public if the case under investigation has leaked out or if unintentional errors have been uncovered in the publication, or if the allegation was determined to be lodged out of malice. Some respondents themselves may ask that the results be made public. Publicizing an investigation resulting in a finding of no misconduct can fully clear the respondent of the alleged misconduct. It is a recent trend that an ongoing misconduct investigation may become widely known through the Internet or personal networks among researchers. The respondent of an allegation that is found unsubstantiated can suffer from harmful rumors unless the investigation results are published. Under such circumstances, the respondent should be allowed to publicize the results with the caution not to harm any individuals. In this case also, the utmost care should be taken to protect the complainant of goodwill.

Investigation of research misconduct allegations typically involves hearing from those who are directly or indirectly concerned with the case to gather valuable information. The investigation committee occasionally asks for cooperation of these witnesses on the condition that the hearing results are not to be disclosed, as handling of investigation results requires the most meticulous care. Thus, while publishing the research misconduct findings may be relevant to correcting the scientific literature, full disclosure of investigation proceedings may have inadvertent consequences on other honorable parties.
Public and social sanctions should have an appropriate and finite term. Thus, appropriate and finite terms should be set for the publicizing of investigation results by institutions and for other public disclosure of information. Unfortunately in this current age, online public disclosures may be everlasting. While disclosure of misconduct information is necessary for sound development of scientific research, it is not desirable for publicizing misconduct cases to only serve the purpose of punishment.

**Concluding remarks**

The consensus of the Standardization Committee is that researchers and administrative staff designated as investigation committee members should be familiar with the matters discussed in this article.

Today, information on cases of research misconduct that occurred in research conducted using public funds in Japan is available, owing to their publication by government agencies and research institutions. However, behind-the-scene procedural issues, such as how an investigation proceeds, what standards are used, and what problems are encountered by the committee, are neither revealed nor shared as experience-based knowledge. This article is a first attempt to examine these issues, although not comprehensively or thoroughly. It is hoped that this article will serve as a reference for persons who take part in research misconduct investigations for the first time, and will also engender global discussions among experts in this field.

In the future, questions about conducting fair and transparent research misconduct investigations will include such issues as the size of institution, unique issues related to human subjects research and international collaborative research. The authors of this article look forward to receiving feedback from those who participate in misconduct investigations and make use of the considerations described in this article.

**Notes**

1. It is reasonable for the respondent’s current institution to play the major role in the investigation. Under certain circumstances, the burden of investigation could be lighter if the respondent’s previous institution conducts the investigation, either solely or playing the leading role. The raw data are likely to be found at the previous institution where the research in question was carried out because research data in principle are the property of the institution. The individuals, who were involved or remember the details of the time when the research in question was conducted, are likely to be found at the previous institution. When public funds are to be returned, it is the previous institution where the research in question was conducted that would have to return the funds. Even in the case of a joint investigation, it seems best for one institution to be designated to lead the investigation and to carry the responsibility of mandated reporting.
2. The ORI is responsible for advising research institutions on their investigations and finding any misconducts that they have overlooked. See (Dahlberg and Davidian 2010).
3. Background and outline (the reasons for the discovery, the content of the allegation, the background of the investigation, etc.), investigation (investigation system and survey content), results of investigation (the type of specified misconduct that has been identified, the researcher involved in the specified misconduct, the expenses and research subjects in which the specified misconduct occurred, the specific details of the specified misconduct, and the conclusions and reasons for judgment), details of measures taken by the investigation organization (suspension of spending of competitively awarded funds, personnel actions regarding relevant persons, recommendation for withdrawal or retraction of papers, etc.), causes of occurrence of specified misconduct and recurrence prevention measures (management system of the research institution at the time when the misconduct occurred, the state of development of necessary regulations, and measures to prevent recurrence). Abstracted from (MEXT 2014).
4. Major examples are PubPeer (https://pubpeer.com/) and Retraction Watch (http://retractionwatch.com/). Accessed 25 February 2020.
5. Major examples are arXiv (http://arXiv.org), bioRxiv (https://www.biorxiv.org) and medRxiv (https://connect.medrxiv.org). Accessed 25 February 2020.
6. The American Statistical Association has also released a statement on the issue of focusing on \( p \)-values without understanding the context (ASA 2016).

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