

WHISTLEBLOWING IN SCIENCE: IN THE LION'S DEN

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Title

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Abstract

With the growing emphasis on scientific integrity as a way to curb research misconduct, the “moral obligation to act” when a researcher observes a breach of integrity is becoming stronger. However, it takes a lot of courage to blow the whistle as it can have an enormous impact on the whistleblower’s career and personal well-being – and that of colleagues and researchers associated with the perpetrator. Therefore, it is important to be cognizant of the stressful process that accompanies the act of whistleblowing, to provide clear and accessible procedures to report misconduct, and to support whistleblowers throughout the process. Furthermore, it is essential that appropriate whistleblower protection measures are in place and enforced. Based on our review, we argue that an obligation to report scientific misconduct would currently do more harm than good.

Keywords

Whistleblowing, research integrity, research misconduct, retaliation, stress

1. Introduction

Several mediatized cases of scientific fraud, underscored by the grim picture of science Stuart Richie (2020) paints in his book “Science Fictions”, have increased awareness of the problematic conduct of scientists. The latter includes primarily outright fraud, referred to as research *misconduct* and defined as Falsification, Fabrication, and Plagiarism (FFP). However, less blatant practices to obtain or present one’s results as more exciting than they really are – called research *misbehaviour* or “questionable research practices” (QRPs) – are far more prevalent (Fanelli, 2009; John et al., 2012). Individually, these QRPs do little harm, but their collective negative impact on science’s trustworthiness and incremental progress is much larger than that of FFP.

Research integrity is increasingly emphasized as a countermovement able to restore trust in scientific results, scientists, and science itself. The movement is quickly gaining momentum and for example “open science” is promoted to produce and report sound, reliable results (Aarts et al., 2015; Maxwell et al., 2015; Shrout & Rodgers, 2018). Researchers are increasingly supported by top-down initiatives such as institutional research integrity policies and committees to investigate alleged misconduct (Resnik et al., 2015). Furthermore, in addition to institutional committees, many (supra)national committees have been installed to conduct independent investigations or provide second opinions (Resnik, Rasmussen & Kissling, 2015).

We honestly believe these developments will lead to better quality research and can possibly restore faith in science. However, it is illusory to think misconduct will cease to exist any time soon. Thus, science must rely on brave whistleblowers.

In this article we argue that the potential negative impact on whistleblowers in science is just too great and that this has a detrimental impact on science, too.

2. What makes someone a whistleblower?

An often-used definition of whistleblowing is Near and Miceli’s (1985):

“the disclosure by organisation members (former or current) of illegal, immoral, or illegitimate practices under the control of their employers, to persons or organisations that may be able to effect action” (p. 4)

Mansbach (2009) proposes a similar definition of whistleblowers:

“people who, having observed some type of illegal or wrongful conduct in their workplace, disclose their observations to either superiors in their employing organization, or to outside authorities who are in a position to help, such as journalists, legal authorities, or regulatory agents” (p. 365)

According to Jubb (1999) a whistleblower is someone who *publicly* reports misconduct, implying a breach of confidence (Bjørkel, 2016):

“a deliberate non-obligatory act of disclosure, which gets onto public record and is made by a person who has or had privileged access to data or information of an organisation, about non-trivial illegality or other wrongdoing whether actual, suspected or anticipated which implicates and is under the control of that organisation, to an external entity having potential to rectify the wrongdoing” (Jubb, 1999, p. 78)

Gunsalus (1998b) differentiates *internally* handled *complaints* from *external whistleblowing* and additionally claims the whistleblower should have “... unsuccessfully tried to get it resolved before going public” (p. 76).

We consider the definitions of Jubb (1999) and Gunsalus (1998b) as too strict: in the current research climate, *any* person who reports alleged misconduct to a competent authority should be considered a whistleblower, whether that person belongs to the same organization as the perpetrator and whether the misconduct is reported internally or not¹. Of course, this does not prevent the whistleblower from informing the press or the government when there is no reaction to the whistleblower’s report, or when the whistleblower thinks the response is insufficient or inappropriate. In our view, the latter is not necessary to become a whistleblower.

3. Whistleblowing is not without risk

3.1 Repercussions and retaliation

Whistleblowers generally expect to find a sympathetic ear when voicing their concerns and are confused when what they see as justified, non-confrontational requests for clarification are met with defensive reactions (Faunce et al., 2004; Kenny et al., 2020). Probably the last thing they expect is for their questions and concerns to be denied or brushed off, their efforts to gather information ignored or opposed, or hostility to be their part (Koocher & Seith-Spiegel, 2010; Vie, 2020). An astonishing 15 to 43% of all whistleblowers experiences some kind of pressure to drop their allegations (Lubalin & Matheson, 1999; Rhodes & Strain, 2004).

The list of possible repercussions is long (Faunce et al., 2004) and their prevalence is staggering: Less than half of whistleblowers in science – between one in three (Lubalin & Matheson, 1999) and 40% (Koocher & Seith-Spiegel, 2010) – reports *not* to have experienced a negative impact. Repercussions range from destroying the whistleblower’s professional reputation (Rothschild, 2013; Satalkar & Shaw, 2018) or labelling them as “troublemaker” (Satalkar & Shaw, 2018); to undermining whistleblowers’ support and isolating or blacklisting them – within the organization or within the entire field (Kuhar, 2008; 2009; Rothschild, 2013; Tiitinen, 2020); to resignation (12%), eliminating the whistleblower’s function, not renewing their assignment, or being denied tenure (9%; Lubalin & Matheson, 1999; Malek, 2010). Less severe retaliatory measures include delayed reviewing of manuscripts or grant proposals, reducing or cancelling financial resources, and cutting down support staff (Rhodes & Strain, 2004). Senior researchers may side with their colleagues against junior whistleblowers without knowing the facts (Couzin, 2006; Vie, 2020). Whistleblowers’ credibility and judgment may be openly questioned (Couzin, 2006; Vie, 2020) or they may be portrayed as mentally unstable and unreliable individuals (Kenny et al., 2019). Although Lubalin and Matheson (1999) concluded that whistleblowers rarely experience long-term negative consequences, more recent evidence shows that whistleblowers easily get stigmatized even when their allegations prove to be true (Satalkar & Shaw, 2018). It is of little comfort that the more serious repercussions are the least common (Lubalin et al., 1995; Lubalin & Matheson, 1999).

¹ Literature about ‘external’ whistleblowers in science is scarce. Most research, including the research discussed in this paper, deals with whistleblowers who belong to the perpetrator’s organization.

Institutions may be inclined to urge whistleblowers to keep their suspicions to themselves. The motives are obvious: They may want to prevent a formal investigation into the behaviour of a single researcher slowing down an entire research group. Similarly, they may fear negative publicity and reputational damage when one of their researchers becomes the subject of a misconduct investigation or want to avoid financial losses when lingering investigations take up time and resources or when research funding is reduced or redeemed (Olesen et al., 2019; Rhodes & Strain, 2004; Sieber, 1999; Teixeira da Silva, 2017; Titus et al., 2008). Although this circling of the wagons (Sieber, 1999) is comprehensible considering the strong sense of identity and solidarity that characterizes scientific research (Rhodes & Strain, 2004; Swazey, 1999), it has an enormous impact on whistleblowers.

3.2 Stress, mental health and identity

Please note that the research discussed in this section mainly stems from non-research settings, sometimes investigating only whistleblowers who went public. Therefore, findings must be generalized to science with caution. Undeniably, however, whistleblowers often experience enormous stress.

3.2.1 Stress and mental health

Stress-related complaints such as headaches, problems with memory, problems concentrating, sleeplessness (van der Velden et al., 2019), fatigue, gastrointestinal symptoms, and weight loss are prevalent in whistleblowers (Couzin, 2006). 69% of whistleblowers experiences worse physical well-being and poorer health (Resnik, 2016; Rothschild, 2013; van der Velden et al., 2019). They tend to consume more coffee, smoke more tobacco, or isolate themselves socially (Park & Lewis, 2018). Feelings of guilt, self-blame, loneliness (Kenny, 2018), anxiety and anger may compromise their psychological well-being and even symptoms indicative of burn-out, anxiety disorder, depression and post-traumatic stress disorder have been reported (Kenny et al., 2019; Resnik, 2016; Rothschild, 2013). van der Velden et al. (2019) report symptoms of depression and severe to very severe anxiety reaching clinical levels in half of the whistleblowers in their sample, which is comparable to the prevalence among cancer patients or post-disaster victims.

Self-doubt is prevalent: “am I not exaggerating, how certain can I be, needn’t I be more certain, ...” (Couzin, 2006; Faunce et al., 2004; Kenny, 2018; Olesen et al., 2019; Titus et al., 2008; Vie, 2020), often used in combination with the other symptoms to dismiss the whistleblower as mentally unstable or mentally ill by opponents (Kenny et al., 2019).

Personal relationships may come under pressure as well: approximately half of whistleblowers reports (seriously) compromised relationships with family members (Kenny, 2018; Rothschild, 2013; van der Velden et al., 2019) and 50% to 78% reports experiencing difficulties in trusting others (Rothschild, 2013; van der Velden et al., 2019).

3.2.2 Problems with identity

Our professional roles substantially influence how we define ourselves and allow us to contribute to society (Sieber, 1999). Prior to blowing the whistle, whistleblowers are often perceived as high achieving, respected and dedicated individuals, strongly vested in their organization (Kenny et al., 2019; 2020; Rothschild, 2008; 2013). Similarly, most researchers are passionate about science and strongly dedicated to the goals of their institute (Kenny et al., 2020; Mansbach, 2009; Rothschild, 2008; 2013). Consequently, being personally attacked and ostracized may feel like an important part of their identity is taken from them (Kenny, 2018) and observing the organization whose goals they

are protecting by following its rules turn against them must be intensely confusing (Kenny et al., 2020; Rothschild, 2008; 2013).

3.3 Impact beyond those directly involved

The majority of potential whistleblowers is well aware that their allegations may damage their relationships with colleagues (Rhodes & Strain, 2004) and may harm “innocent bystanders”. Especially junior researchers are at the losing end when scientific papers have to be retracted, or when labs are shut down (Allen & Dowell, 2013; Hussinger & Pellens, 2017; Malek, 2010; Olesen et al., 2019; Rhodes & Strain, 2004; Satalkar & Shaw, 2018). This type of collateral damage is particularly likely in interdisciplinary research and large consortia (Olesen et al., 2019).

Couzin (2006) reports how an entire lab at the University of Wisconsin was shut down because the head of the lab had falsified data. Although the graduate students were given the opportunity to continue their research elsewhere, for most of them this basically came down to (almost) starting over. Consequently, three graduate students abandoned their research – at that point already collectively having invested 16 years in their lab’s research².

Another tragical example is David Marx, in 2000 working as a young research assistant with Harvard assistant professor Karen Ruggiero. When Ruggiero was found guilty of data fraud, all three of Marx’s publications were retracted. He nevertheless managed to obtain his PhD, but his inferior publication record strongly reduced his chances of getting a postdoc position. Eventually, he could start working at the university of Groningen, under the supervision of ... Diederik Stapel (Verfaellie & McGwin, 2011). When Stapel’s data manipulation was uncovered in September 2011, Marx had already secured an assistant professorship at the University of California in San Diego, having published 16 papers, of which 13 were co-authored by Stapel. Although Marx was fully exonerated of all blame, seven of his publications had nevertheless to be retracted.

3.4 Positive consequences of whistleblowing

Not all whistleblowers experience negative consequences and not all consequences of whistleblowing are negative. 15% of whistleblowers report that they have developed a clearer vision of themselves as ethical, moral individuals through (or despite) their experiences, that their self-confidence has improved (Lubalin et al., 1995), and that they have only become more committed to the goals of their organization (Lubalin & Matheson, 1999; Rothschild, 2008; Kenny et al., 2020). The majority of whistleblowers also reports that they knowingly would do the same again, even despite the negative consequences they experienced (Lubalin & Matheson, 1999; Rothschild, 2008) – in fact, they would do more, sooner and with more agency (Koocher & Seith-Spiegel, 2010).

In the US, the False Claims Act allows whistleblowers to file so-called “qui tam” lawsuits in the name of the government to recover wrongly spent federal funding. Whistleblowers can be assigned up to 30% of the recovered budget. Although qui tam lawsuits are exceptional, in 2019 a whistleblower received 33,8 million dollars for unveiling scientific fraud at Duke University (Science News Staff, 2019).

² Allen and Dowell (2013) describes a similarly moving testimony of a scientist; and Cyranoski (2015) provides an account of the far-reaching consequences of whistleblowing in science.

4. Whistleblowing as a process

Instead of viewing whistleblowing as a single act, it is better considered as a process (Bjørkel, 2016; Near & Miceli, 1985; Vie, 2020) consisting of four phases: 1) the discovery of the potential wrongdoing, 2) assessing the seriousness of the problem and the whistleblower's options (Allen & Dowell, 2013; Bonito et al., 2012; Couzin, 2006; Resnik, 2016; Rothschild, 2013; van der Velden et al., 2019)³, 3) taking action, which can consist of a direct confrontation or reporting the wrongdoing to the relevant authority, but also of remaining silent (or gossiping, or maintaining the system), and 4) the reaction of the organization. The latter may or may not be targeting the whistleblower, may or may not be satisfactory to the whistleblower and may or may not leave the whistleblower with feelings of closure⁴. If the latter is not the case the whistleblower will return to the second phase and move through the process again.

Vie (2020) describes how whistleblowers often try to address the wrongdoing themselves initially (if that is within their power) and subsequently only discuss their options with colleagues, report the problem internally, or escalate the allegations to the chair of the department, dean, ombudsperson, or scientific integrity committee if their prior efforts are ineffective. During every step they weigh the damage caused by an investigation against that caused by the problematic situation and estimate their own risk – all based on the limited information they have access to (Malek, 2010; Satalkar & Shaw, 2018; Shaw, 2018). As already mentioned, repercussions are most often unexpected (Kenny et al., 2020) and cannot be precisely computed, although potential whistleblowers can often informally get a sense of how receptive their organization is to allegations of misconduct (Gunsalus, 1998b; Lubalin et al., 1995; Titus et al., 2008; Vie, 2020).

Consequently, not just the personal attacks and retaliation that follow the act of whistleblowing are impactful, the path leading up to it may be even more stressful and many of the symptoms may develop long before a whistleblower steps up.

5. Should researchers be obliged to report misconduct?

Whether researchers should be obliged to report misconduct or not, is subject to debate. Jubb (1999) defines whistleblowing explicitly as a “deliberate non-obligatory act” (1999). However, the Committee on Science, Engineering, and Public Policy of the American National Academy of Sciences postulated in 2009:

“It is easy to find excuses to do nothing, but someone who has witnessed misconduct has an unmistakable obligation to act” (p. 19).

A similar obligation to report could be read from the IEEE (“Institute of Electrical and Electronics Engineers”; www.ieee.org, 2006) Code of Ethics, which prescribes their members are bound

“To uphold the highest standards of integrity, responsible behavior, and ethical conduct in professional activities. [To] hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, to protect the

³ This phase can develop into “months of tortured deliberation” (Allen & Dowell, 2013, p. 340).

⁴ It should be noted that for reasons of confidentiality and privacy, sanctions may be imposed, but not communicated publicly. This may, wrongly, create the impression that “nothing happens”. It is not easy to resolve this issue (the authors thank Dr. Inge Lerouge for bringing this to their attention).

privacy of others, and to disclose promptly factors that might endanger the public or the environment” and

“to assist colleagues and co-workers in their professional development and to support them in following this code of ethics”.

Still, in 2000 only 29% of American research performing organizations explicitly obliged their employees to report scientific fraud (CHPS Consulting, 2000; more recent numbers are lacking). In Europe, many universities’ ethical codes feature a moral duty, “the expectation” or “the encouragement” of researchers to report misconduct (e.g., in Belgium: www.vcwi.be or The Netherlands: Nederlandse Gedragscode Wetenschappelijke Integriteit, 2018).

Moreover, exactly what would be the subject of the obligation to report is unclear, because definitions of misconduct vary. Consensus seems to exist about FFP, but less so about QRPs, despite their substantial negative impact on the reliability of science (Resnik, 2019). The U.S. Office of Science and Technology Policy (OSTP) strictly restricts “research misconduct” to FFP, although Resnik (2019) argues this is appropriate because the OSTP has to establish legally enforceable norms that do not allow room for interpretation. However, the Public Health Service Policies on Research Misconduct also adopts the strict OSTP definition (Department of Health and Human Services, 2005), as does the Office of Research Integrity (ORI), leaving QRPs untouched.

International research has shown that the national codes of conduct of the top research and development funding countries all include FFP in their definition of research misconduct, whereas QRPs are not systematically mentioned (Resnik, Rasmussen & Kissling, 2015). In contrast, six out of ten American research performing organizations do mention QRPs in their ethical codes, often even *anything that goes against scientific integrity* (Resnik et al., 2015; Resnik, 2019). Similarly, the European Code of Conduct for Research Integrity by ALLEA (All European Academies, 2017, p. 8) lists, apart from FFP, explicit examples of unacceptable “further violations of good research practice that damage the integrity of the research process or of researchers”, explicitly stating that the list is not exhaustive. Consistent with the European Code of Conduct, most European member states include other forms of misbehaviour in addition to FFP in their national integrity guidelines (Godecharle et al., 2013).

Although scientists themselves seem convinced that research integrity entails the *moral duty* to report breaches of integrity (Satalkar & Shaw, 2018), reality is different: most misconduct is (still) *not* reported to the ORI (The Gallup Organization, 2008). This is remarkable, considering the US National Academy of Sciences prescribes the obligation to report (Committee on Science, Engineering, and Public Policy, 2009; Titus et al., 2008). At the same time, in light of the above it is certainly understandable and indeed in half of the cases in which no action is taken “fear of personal cost” is the justification (Vie, 2020).

Based on the previous we conclude that a formal obligation to report research misconduct is not recommended, at least not without a profound change in mentality and appropriate measures to protect whistleblowers from retaliation (Shaw, 2018; Vie, 2020). Indeed: although researchers acknowledge that not reporting breaches of research integrity is in itself a breach of integrity (Satalkar & Shaw, 2018), potential whistleblowers still have plenty of reasons not to report research misconduct and misbehaviour (Couzin, 2006), including:

- Not wanting to accuse falsely (Titus et al., 2008)
- Fear of repercussions (whether or not based on previous negative experiences) or lack of trust in the institute's protection of whistleblowers (Satalkar & Shaw, 2018; Vie, 2020)
- Reaching the personal threshold of risk-tolerance (Vie, 2020)
- Being dependent on the accused – as well as the institute – for publications, funding, tenure, and employment (Allen & Dowell, 2013; Couzin, 2006; Olesen et al., 2019)
- Power imbalance: being dependent or not being able to exert enough influence – in particular in Eastern cultures junior researchers must avoid confronting authority figures (Horbach et al., 2020; Olesen et al., 2019; Satalkar & Shaw, 2018; Vie, 2020)
- Out of friendship or sympathy not wanting to harm the career of the alleged perpetrator and settling things informally (Koocher & Seith-Spiegel, 2010; Satalkar & Shaw, 2018; Sieber, 1999; Titus et al., 2008)
- Being convinced one is too distant from the problem and should not get involved (Koocher & Seith-Spiegel, 2010)
- Being convinced someone else should report the misconduct, will do, or has already done so (Koocher & Seith-Spiegel, 2010; Olesen et al., 2019; Titus et al., 2008; Vie, 2020)
- Fearing that reporting the misconduct and the following investigation will do more harm than 1) the actual wrongdoing and 2) the positive consequences it will have for science and society (Malek, 2010)
- Fearing that the investigation will take up lots of time (Olesen et al., 2019) which cannot be devoted to doing research (Titus et al., 2008)
- Lack of trust that the report will be taken seriously (Vie, 2020), that the misconduct will be investigated thoroughly and fairly (Lubalin et al., 1995; Rhodes & Strain, 2004; Titus et al., 2008; Vie, 2020), or will be corrected (Vie, 2020) – in their analysis of 120 ORI misconduct cases, DuBois and colleagues (2013) established that there had been a previous unsuccessful report in 28% of the cases.

Taken together, this may explain why misconduct can go on for a long time before it is officially reported and investigated – DuBois and colleagues (2013) report periods between 3,8 and 4,2 years. Furthermore, remaining silent or not acting is perfectly justifiable if the deliberation process indicates that reporting the wrongdoing would be an act of self-destruction (Vie, 2020). Labelling potential whistleblowers who decide not to sacrifice their career as immoral, is immoral in itself (Fischhoff et al., 2021; Malek, 2010; Shaw, 2018; Vie, 2020).

6. How can whistleblowing get out of the dark?

As long as researchers who report wrongdoing are perceived as “traitors”, misconduct will be able to fester. A change in mentality is needed, not only in the attitude towards whistleblowers but in the research culture in general.

6.1 Protect whistleblowers

Recent research integrity guidelines are very clear about protecting whistleblowers against retaliatory measures: the PRINTEGER Statement includes a dedicated paragraph (“§ 10. Implementing Safe and Effective Whistle-Blowing Channels”; Forsberg et al., 2018); the ORI, in accordance with the Public Health Service Policies on Research Misconduct, posits that institutes should do whatever they can to protect the position and reputation of whistleblowers, witnesses and

members of committees,^{5, 6} and should protect them from repercussions (ori.hhs.gov (a)); the ALLEA Code of Conduct states: “Institutions protect the rights of ‘whistleblowers’ during investigations and ensure that their career prospects are not endangered.” (ALLEA, 2017, p. 10). Empirical research moreover shows that the protection of whistleblowers facilitates misconduct reports (Mechtenberg, Muehlheusser & Roider, 2020; Wallmeier, 2019).

Concretely, this implies that whistleblowers’ anonymity and confidentiality should be optimally safeguarded (The Gallup Organization, 2008), although subject to a number of conditions. Anonymous reports, for example, preclude contacting the whistleblower for additional information or a testimony. Moreover, anonymous complaints increase the risk of unfounded accusations with the only aim to harm the accused (Bonito et al., 2012; note, however, that when a whistleblower goes straight to the press, institutions may have no other option than to investigate and respond to the allegations). Nonetheless, whistleblowers’ names and details can and should remain out of the investigation, or at least be concealed to the accused (cf. below; it should be noted that some cases of image manipulation or plagiarism are so obvious that it does not matter whether the whistleblower remains anonymous or not⁷). Furthermore, most guidelines agree that only “good-faith” whistleblowers should be protected (ori.hhs.gov (b); Bjørkel, 2016) and researchers who knowingly make false accusations are considered guilty of misconduct themselves (ALLEA, 2017; Bouter & Hendrix, 2017; Forsberg et al., 2018).

Obviously, also the accused should be protected: against false accusations (Lubalin & Matheson, 1999; Wallmeier, 2019), against leaks, and against unwarranted reputational damage (Bouter & Hendrix, 2017; Shaw, 2018). As the PRINTEGER Statement states: “Researchers accused of misconduct are innocent until proven guilty. Their privacy must be protected throughout the whole investigation process in accordance with applicable legislation” (Forsberg et al., 2018, § 11). Similarly, the ORI mandates research institutes to guarantee confidentiality of both whistleblowers and those accused of misconduct.

6.2 Formal procedures that are clearly communicated

Precise, clear, and *formal* procedures should translate guidelines into discrete, appropriate, prompt and potent reactions to misconduct allegations (ALLEA, 2017; Faunce et al., 2004; Forsberg et al., 2018; Titus et al., 2008). Whistleblowers’ rights as well as their responsibilities should be spelled out together with the measures in place to protect both whistleblower and accused (Bouter & Hendrix, 2017; Forsberg et al., 2018). Preferably, an independent and impartial committee is installed within research institutes to investigate allegations of misconduct, whenever necessary a national or federal committee can assist. Subsequently, the procedures should be made easily accessible, communicated widely, emphasized repeatedly (ALLEA, 2017; Allen & Dowell, 2013; DuBois et al., 2013; Forsberg et al., 2018; Rhodes & Strain, 2004), and evaluated – and, if necessary, updated – at least yearly (Forsberg et al., 2018).

⁵ The ORI exonerates whistleblowers from the burden of proof and from any responsibility for the quality of the investigation once they filed their complaint. The same reversal of the burden of proof is included in the recent EU Whistleblower Directive.

⁶ The new EU [Directive 2019/1937 of the European Parliament and of the Council of 23 October 2019 on the protection of persons who report breaches of Union law. PE/78/2019/REV/1](#) extends the protection against retaliatory measures to facilitators: “a natural person who assists a reporting person in the reporting process in a work-related context, and whose assistance should be confidential”, which means that also confidants and members of committees should be protected.

⁷ The authors are grateful to Dr. Wouter Vandevelde for bringing up these two exceptions-to-the-rule.

Guiding potential whistleblowers to the right person or body for questions, concerns, and allegations and explaining the different types of investigation that (could) follow each of those will increase their confidence to report misconduct, at the same time creating realistic expectations (Olesen et al., 2019; Shore, 1998; The Gallup Organization, 2008; ori.hhs.gov (a)). A person or official body to contact with questions or concerns before a formal procedure is initiated – such as an ombudsperson or a confidant – can persuade whistleblowers to come forward (Forsberg et al., 2018; Olesen et al., 2019). Having *multiple* confidants avoid uncomfortable situations in which potential whistleblowers have to approach someone from their research group or department⁸. Preferably, ombudspersons and confidants are experienced (or retired) researchers, familiar with their institution’s internal policy and with the necessary interpersonal skills to counsel both early career and senior scientists (Fischhoff et al., 2021).

Finally, while such formal procedures are becoming increasingly widespread (Resnik, Rasmussen & Kissling, 2015; Resnik et al., 2015), increasing interdisciplinarity and internationalization may necessitate harmonization efforts (Resnik, Rasmussen & Kissling, 2015; Resnik et al., 2015; Rhodes & Strain, 2004).

6.3 Guidance and support throughout the process

Apart from formal procedures guiding misconduct investigations, a procedure to guide the first contact with the potential whistleblower is highly recommended (Bonito et al., 2012). Bonito et al. (2012) list four topics that should be discussed during an initial meeting: 1) the investigative process and the major steps leading up to the final conclusion, including a rough timeline; 2) anonymity and confidentiality; 3) the mandatory protection of whistleblowers against retaliation; and 4) possible negative consequences for the whistleblower⁹.

6.3.1. The process.

Informing potential whistleblowers about every step in the process, preferably with material aids like flowcharts or an illustrated timeline, provides guidance. It helps them to prepare for what is coming as well as to perform “mental rehearsal” – similar to how it is used in other domains to prepare for, or cope with, stress and pressure (Allen & Dowell, 2013; Bonito et al., 2012). How and when whistleblowers will be updated during the course of the investigation should be explained and frequent updates are necessary to contain stress levels, even if message are limited to “the investigation is still ongoing” (Allen & Dowell, 2013).

6.3.2. Anonymity and confidentiality.

A confidential investigation protects the whistleblower, but also benefits the accused and the investigation itself. Rumour travels fast and can cause great damage, especially if it selectively narrates one side of the story (Allen & Dowell, 2013). Of course, whistleblowers can express their preference regarding anonymity and whether they would like an internal procedure, but institutions are nevertheless obliged to report some forms of misconduct, for example when laboratory animals or human participants are treated unethically (Shore, 1998)¹⁰.

⁸ The authors are grateful to Shila Abdi for this valuable suggestion.

⁹ Bonito et al. (2012) have published a checklist that can guide this conversation.

¹⁰ In the US, discussing a hypothetical case can solve this: “what should I do in case I supposedly observed ...”. ORI has developed an online interactive game in which this initial conversation can be experienced: <https://ori.hhs.gov/TheLab/TheLab.shtml>.

6.3.3. Whistleblower protection against retaliation.

Whistleblowers need to be certain that they can safely report misconduct, a need that is potentially enhanced by prior experiences with rejection or negative reactions in response to clarification requests (Koocher & Seith-Spiegel, 2010; Vie, 2020). Hence, they should be duly informed about the procedures that will protect them, their career, and their reputation from retaliation, about how retaliatory measures are prevented and punished, and about where and how they can report repercussions.

6.3.4. Possible negative consequences.

Whistleblowers often have no idea what they are up to – not even in terms of time investment (Rothschild, 2013; Kenny et al., 2020), let alone in terms of possible negative consequences. Nonetheless, although they are a major source of stress and therefore crucial in making an informed decision, negative consequences are least often addressed during initial sessions (Allen & Dowell, 2013).

Bonito et al. (2012) and Kenny et al. (2020) recommend providing additional practical and material assistance and maybe even professional – confidential – counselling for whistleblowers who experience negative consequences. Investing in the (evidence-based) training of confidants, ombudspersons, research integrity officers and committee members is equally important: they need not only follow the procedures meticulously, but they also need to be well equipped to fulfil their role (Gunsalus, 1998b).

6.4 Institutional policies and culture

Apart from the measures described above, institutions can make an important contribution to whistleblower protection and, in doing so, foster research integrity.

First and foremost, institutions should publicly – but anonymously – report about misconduct investigations, communicating outcomes, corrective measures taken, and measures against whistleblower retaliation (Forsberg et al., 2018). This will establish a positive precedent which increases potential whistleblowers' confidence in their institutions' ability to accurately investigate suspected research misconduct (Satalkar & Shaw, 2018; Vie, 2020).

Secondly, institutions should reflect on what they can do to accommodate collateral damage. For example, what happens to graduate students and their projects over the course of an investigation into their supervisor or when their research funding is retracted due to a senior researcher's misconduct (Couzin, 2006)? Shaw (2018) argues that institutions should ensure that junior researchers (i.e., PhD students and postdocs) can complete their project in a different lab or at a different institution in such cases. Similarly, it may be recommended for "external" funders to develop explicit policies for such situations, preferably in partnership with institutions. Not only would this minimize arbitrariness, it would also assist potential whistleblowers in estimating the potential damage caused by a misconduct report.

Thirdly, institutions should enforce compliance to ethical codes at all levels, including management (Rhodes & Strain, 2004). When powerful researchers act as if the rules are only there for others, potential whistleblowers will perceive this as hypocrisy and may remain silent, or go straight to the press (Fauce et al., 2004; Gunsalus, 1998b; Malek, 2010; Satalkar & Shaw, 2018; Titus et al., 2008).

Rhodes and Strain (2004) have suggested to hold institutions accountable for research misconduct instead of individual researchers, as is already the case with the ethical treatment of laboratory animals and human participants. Both institutions and researchers are fully aware that infringements

may lead to immediate discontinuation of research activities and funding. This is a potent incentive to enforce the legislation top-down and welcome whistleblowers as “guardians” of good research, as perpetrators pose too big a risk. Although Rhodes and Strain’s proposal may be far-fetched, it is interesting. Particularly institutions who willingly do not address obvious or known misconduct corrupt science and risk to inflict (much) greater damage if they don’t do everything in their power to prevent it from happening again.

The best response to whistleblowing is, however, preventing misconduct from happening and intervening before problems occur (Kumar, 2010) – obviating the need for whistleblowers (Allen & Dowell, 2013; Vie, 2020). The best way to do this is to develop ethical leadership and to promote a culture of research integrity (Gunsalus, 1998b; Rhodes & Strain, 2004; Satalkar & Shaw, 2018; Sieber, 1999; Titus et al., 2008; Vie, 2020). A non-defensive culture of collective openness in which questions about data, procedures and theories are a *central part of scientific practice* defuses problems as indictment against the institute (Allen & Dowell, 2013; Gunsalus, 1998b; Koocher & Seith-Spiegel, 2010; Rhodes & Strain, 2004; Rothschild, 2013; Satalkar & Shaw, 2018). In such a culture it is the most natural thing to help each other stay on track (Koocher & Seith-Spiegel, 2010), junior researchers learn by example about responsible behaviour and *good* research (Shaw, 2018), and opportunities for misconduct are minimized (ALLEA, 2017; Satalkar & Shaw, 2018; Titus et al., 2008; The Gallup Organization, 2008). This attitude can – and *should* – be installed and reinforced throughout careers, starting from the undergraduate level (ALLEA, 2017; Bouter & Hendrix, 2017; Faunce et al., 2004; Gunsalus, 1998b; Rhodes & Strain, 2004). In their “Three P’s of Misconduct Education – Prevention, Protection, Progress” Allen and Dowell (2013) bring together several skills that should be taught in ethics courses as well as in labs and research groups.

6.5 What whistleblowers can do to protect themselves

Without a doubt the most important advice to whistleblowers is: study and follow the procedures in detail. Know who to file the complaint with and in what form (Bouter & Hendrix, 2017; Gunsalus, 1998a; ori.hhs.gov (a)). Apart from that, a well substantiated report offers the best protection. Hence, potential whistleblowers should consider whether there are potential alternative explanations for what they discovered – sloppiness, an honest mistake, poor judgment from their side, Subsequently, they should appraise which documentation is relevant and collect as much information as possible to substantiate their allegations, to avoid word-against-word situations. Finding strength in numbers and filing a collective complaint – if several individuals have been affected – can substantiate a case and sabotage in advance efforts to question the whistleblower’s mental health or expertise (Bouter & Hendrix, 2017; Fischhoff et al., 2021; Gunsalus, 1998a).

Reflecting on what they want to achieve and how they will know they have achieved it can aid whistleblowers to distinguish personal from professional grievances – and to set realistic goals and expectations. Furthermore, allegations should be formulated as neutrally and factually as possible, preferably only after getting a second opinion from an expert or advisor (who may be a confidant or ombudsperson, but a trusted colleague who does not belong to the same research group or institute as well; Bouter & Hendrix, 2017; Gunsalus, 1998a). Vie (2020) recommends mobilizing social support as soon as possible – even before the report is filed.

Finally, whistleblowers should exercise patience: collecting and judging evidence takes time. A lasting investigation is most probably not a sign of intentional delay or a cover up but of thoroughness. However, as discussed above, regular updates about the state of the investigation may alleviate concerns.

Keith-Spiegel, Sieber and Koocher (2010) have published an online manual for whistleblowers (via <http://www.ethicsresearch.com/free-resources.html>).

7. Conclusion

Undoubtedly, many problems are dealt with informally or are solved after maybe a fierce discussion. Those are the cases we don't hear of and in most cases starting a direct dialogue is indeed preferred. However, surprisingly often even those who constructively point out potential problems experience hostility and negative consequences – and that is when whistleblowing can have a huge negative impact on the whistleblower. That is exactly why whistleblowers should be properly protected, by safeguarding anonymity and confidentiality, and by protecting them from retaliations. Furthermore, whatever factors are withholding researchers from reporting misconduct should be dealt with at every level. As long as blowing the whistle cannot be done safely, an obligation to report misconduct is inappropriate.

The time is probably right to regard whistleblowers as the keepers of objective and sound research, of institutions' reputation, and even of public goods. Rather than trying to discourage or silence whistleblowers out of fear of reputational damage, institutions should embrace reports of research misconduct as opportunities to improve their research climate – and their reputation.

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