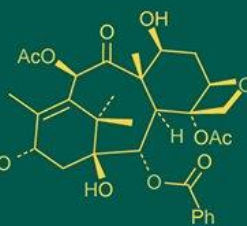
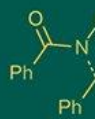


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Publication ethics, research misconduct and integrity challenges in veterinary, dairy, meat and agricultural sciences in developing countries

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Abstract

Publication of research findings is fundamental to the advancement of scientific knowledge and the credibility of the global research enterprise. Publication ethics provide a framework for ensuring transparency, originality, accountability, and integrity in scholarly communication, thereby safeguarding intellectual property, promoting responsible authorship, and maintaining public trust in science. Research misconduct represents a serious breach of these ethical and professional standards and includes practices such as plagiarism, fabrication, falsification, data manipulation, unethical authorship, redundant publication, salami slicing, and engagement with predatory journals. Such behaviours not only distort the scientific record but also erode the reliability and legitimacy of research outputs. To mitigate these risks, several international and national organizations—including the Committee on Publication Ethics (COPE), the World Association of Medical Editors (WAME), and regulatory bodies such as the University Grants Commission (UGC) in India—have established guidelines and policies to promote responsible research conduct. However, despite the existence of these frameworks, ethical violations remain prevalent, particularly in developing research environments. In the veterinary, agricultural, and dairy sciences, challenges such as limited access to plagiarism detection tools, restricted availability of high-quality bibliographic databases, financial constraints, high costs of open-access publishing, and inadequate infrastructure for secure data management and analysis further complicate the effective implementation of ethical standards. Addressing these challenges requires strengthened policy enforcement, enhanced institutional accountability, capacity building among researchers and administrators, and sustained awareness and training in research ethics. Establishing robust national and institutional mechanisms is essential for fostering a culture of integrity and for improving the quality, transparency, and credibility of scientific research in developing countries.

Keywords: Research misconduct, publication ethics, research integrity, plagiarism and falsification, predatory publishing, responsible research conduct

1. Introduction

Scientific research serves as a cornerstone for social, technological, and economic development, particularly in domains that directly affect human well-being, environmental sustainability, and food security. Research integrity and publication ethics form the foundation of this enterprise by ensuring that scientific knowledge is generated, reported, and disseminated in a transparent, accurate, and responsible manner. Ethical principles in research safeguard originality, accountability, fairness, and trust, thereby protecting the credibility of science and its value to society. Without ethical standards, scientific communication risks becoming unreliable, misleading, and socially harmful (Bonney and Donkor, 2021) [5].

Over the past two decades, developing countries have experienced a substantial expansion in research activity and scholarly publishing, driven by increased investments in higher education, the growth of academic institutions, and stronger emphasis on publication-based evaluation systems. While this growth has enhanced global knowledge production and visibility, it has also introduced new ethical challenges.

Limited access to high-quality research infrastructure, uneven training in research ethics, financial constraints, pressure to publish for career advancement, and insufficient institutional oversight have contributed to an increased vulnerability to research misconduct. As a result, ethical violations such as plagiarism, data fabrication and falsification, redundant publication, unethical authorship, and engagement with predatory journals have become significant concerns in many developing research environments (Smith, 2006) ^[29].

Ethics is especially critical in the life sciences because research findings often influence policies, professional practices, and societal outcomes. Inaccurate or dishonest research can result in flawed decision-making, misuse of resources, harm to animals and humans, and loss of public trust (Smith *et al.*, 2020) ^[28]. Research misconduct not only distorts the scientific record but also undermines the reliability of evidence used by practitioners, regulators, and policymakers. The consequences are particularly severe when misconduct occurs in applied sciences, where research outcomes directly shape interventions and technologies implemented at the field level.

Veterinary, agricultural, and dairy sciences occupy a unique position within the life sciences because they are closely linked to food security, animal health and welfare, environmental sustainability, rural livelihoods, and public health. Publications in these disciplines inform breeding strategies, disease control programs, nutritional management, food safety standards, climate-resilient farming practices, and rural development initiatives. Ethical lapses in these fields therefore have consequences that extend beyond academia and into farming communities, markets, ecosystems, and public health systems. Despite this importance, these disciplines have received relatively limited focused attention in discussions of research academic integrity publication compared to biomedical or clinical sciences (Patwardhan and Thakur, 2019) ^[24].

Publication plays a pivotal role in shaping the generation, validation, and circulation of knowledge in veterinary, agricultural, and dairy sciences. Through peer-reviewed dissemination, scientific publishing enables the verification of research findings and their translation into extension services, farm-level practices, and policy frameworks (Resnik, 2020; Marusic *et al.*, 2011) ^[25, 21]. Ethical publication ensures that data are accurate, methodologies are transparent, authorship is fairly attributed, and findings are reproducible, thereby allowing scientific knowledge to accumulate in a reliable and self-correcting manner (Fanelli, 2018) ^[9].

Conversely, unethical publication practices such as plagiarism, data manipulation, redundant publication, and predatory publishing distort the scientific record and weaken the credibility of evidence used for decision-making. In applied life science domains, where research directly informs animal health interventions, food safety standards, and rural development strategies, such distortions can misguide extension services and policy formulation, ultimately eroding trust between researchers, practitioners, and society (Shen and Bjork, 2015; Richtig *et al.*, 2018) ^[27, 26]. Maintaining ethical standards in publication is therefore essential not only for scientific credibility but also for the social relevance and practical utility of research in veterinary, agricultural, and dairy systems.

The rapid expansion of scientific publishing has not been matched by an equivalent strengthening of ethical research cultures in many developing countries, creating growing tensions within the scholarly ecosystem. This imbalance is particularly evident in the veterinary, agricultural, and dairy sciences, where applied research directly influences food security, animal health, public health, and rural livelihoods. Although international and national guidelines on publication ethics and research integrity exist, instances of misconduct continue to occur, suggesting persistent gaps in awareness, institutional capacity, regulatory enforcement, and systemic support for responsible research conduct.

Against this background, the present review seeks to address three key objectives:

- To examine the major forms of research misconduct relevant to veterinary, agricultural, and dairy sciences;
- To analyze the ethical, institutional, and structural challenges affecting research integrity in developing countries
- To discuss the implications of unethical research practices for scientific credibility, policy formulation, and professional practice, with particular reference to these applied life science domains.

By focusing on integrity challenges within this specific disciplinary and geographical context, this paper aims to contribute to a more nuanced understanding of research ethics in developing countries and to support the strengthening of institutional frameworks, educational initiatives, and policy mechanisms for promoting responsible and trustworthy scientific research.

2. Forms of Research Misconduct

The 3 majority cardinal signs of scientific research misconducts are Plagiarism, Fabrication, Falsification. Research misconduct refers to behaviours that violate the ethical and professional standards governing the conduct and reporting of research (Resnik, 2020) ^[25]. These practices distort the scientific record, mislead readers, and compromise the credibility of scholarly communication. In veterinary, agricultural, and dairy sciences—where research outcomes directly influence farming practices, animal health, food safety, and public policy—the impact of misconduct is particularly significant.

Moreover, the growing pressure to publish, combined with limited institutional oversight and uneven access to research support systems in developing countries, has heightened vulnerability to unethical practices in these fields (Shen and Bjork, 2015; Richtig *et al.*, 2018) ^[27, 26]. As a result, ensuring integrity in veterinary and agricultural research is not merely an academic concern but a societal imperative essential for sustaining trust in science and safeguarding evidence-based decision-making across food and livestock systems.

2.1 Plagiarism

Plagiarism involves the presentation of another person's ideas, data, words, or intellectual output as one's own without appropriate attribution. It includes verbatim copying, close paraphrasing without citation, self-plagiarism, and mosaic plagiarism. In developing countries, plagiarism is often exacerbated by inadequate training in academic writing, limited access to literature databases, and

language barriers that encourage copying rather than original expression. Plagiarism undermines academic honesty and devalues genuine scholarly effort (Padmaperuma *et al.* 2020) ^[23].

2.2 Fabrication

Fabrication is the deliberate invention of data, observations, experiments, or results that were never actually conducted. This misconduct generates false scientific knowledge, potentially misleading future research, policy decisions, and practical applications. In applied fields such as veterinary science, livestock health, and food technology, fabricated data can lead to ineffective or even harmful interventions. According to the European Code of Conduct, fabrication is defined as “making up results and recording them as if they were real” (Martyn, 2003) ^[19]. Essentially, it involves presenting invented data as genuine outcomes of experiments that were never performed. Fabrication may also include altering images or photographs to support a specific interpretation (Gerrets, 2016) ^[12]. Such unethical practices compromise the credibility of research and undermine trust in scientific findings.

2.3 Falsification

Falsification is the deliberate manipulation of research materials, methods, or data to misrepresent the true results. It includes selective reporting, omission of unfavourable outcomes, image alteration, and improper statistical adjustments, producing misleading conclusions (Martyn, 2003) ^[19]. Essentially, data may be added, removed, or changed to create a biased or “cherry-picked” outcome. As Irving Hexham notes, cited by Ahuja and Kumar (2022) ^[1], falsification is “the deliberate attempt to deceive the reader by presenting modified material as one’s own accurate work.” Such misconduct undermines scientific integrity and erodes trust in research findings.

2.4 Unethical Authorship Practices

Authorship misconduct includes gift authorship (crediting individuals who did not contribute significantly), ghost authorship (excluding legitimate contributors), and coercive authorship (forcing inclusion of senior personnel without contribution). Such practices undermine fairness, accountability, and transparency in academic collaboration and weaken the ethical foundation of scholarly publishing.

2.4.1 Other Unethical Research Practices

1. **Cheating:** Using unauthorized materials, copying, collaborating without permission, or employing electronic devices deceptively to gain academic credit.
2. **Assisting:** Helping others commit academic dishonesty, such as taking assignments/tests for someone or providing materials for cheating.
3. **Tampering:** Altering or interfering with evaluation tools or academic records.
4. **Substitution/Impersonation:** Taking exams or submitting work on behalf of another person, or allowing someone else to substitute.
5. **Deception:** Providing false information to instructors, e.g., false excuses for missing deadlines or claiming submission of work not done.
6. **Sabotage:** Deliberately hindering others’ work, such as disrupting experiments or damaging resources.

7. **Duplicity:** Submitting the same or substantially similar work for credit in multiple courses without approval.
8. **Unauthorized Collaboration:** Working with others or using their materials during assignments or exams without permission.
9. **Collusion:** Supporting another’s malpractice, such as permitting one’s work to be copied or submitted by someone else.

2.5 Redundant Publication and Salami Slicing

Redundant publication refers to publishing the same data or results in multiple journals without proper disclosure, while salami slicing involves dividing a single substantial study into several minimal publishable units. Both practices inflate publication records artificially, waste editorial and reviewer resources, and distort academic evaluation metrics.

2.6 Duplicate and Redundant Publication

Duplicate or redundant publication refers to the practice of publishing the same research findings in multiple journals, books, or online platforms without proper acknowledgment (King *et al.*, 2001) ^[16]. To prevent this, many journals follow the principle of single submission, wherein a manuscript can only be considered by one journal at a time until formally rejected (Angell and Kassirer, 1991) ^[3]. Authors bear primary responsibility for avoiding redundant publications, as such practices constitute poor scholarship, waste editorial resources, and diminish the originality and credibility of scientific literature (Menezes *et al.*, 2014) ^[22].

2.6.1 Predatory Publishing

Predatory journals exploit the open-access publishing model by charging publication fees without providing genuine peer review, editorial oversight, or quality control (Beall, 2012; King *et al.*, 2009) ^[4, 17]. Researchers in developing countries are particularly at risk due to limited awareness, institutional guidance, and pressure to publish. Publication in such outlets undermines scientific integrity and contaminates the literature with unreliable findings, posing serious challenges to research credibility in veterinary, agricultural, and dairy sciences.

Predatory journals have significantly undermined the integrity of scientific publishing by bypassing standard editorial practices, lacking transparency, and using aggressive solicitation strategies (Richtig *et al.*, 2018) ^[26]. In India, predatory publishing has expanded rapidly, with estimates suggesting that more than 8,000 such journals were producing over 400,000 articles annually by 2015 (Patwardhan, 2019) ^[24]. This growth is largely driven by institutional pressure to publish for academic advancement and doctoral eligibility, fostering a “publish or perish” culture that prioritizes quantity over quality (Lakhotia, 2017) ^[18].

3. Regulatory and Ethical Frameworks

To promote responsible research conduct, several international and national organizations have established ethical guidelines and standards.

3.1 International Guidelines

Several international organizations play a central role in promoting ethical standards and integrity in scholarly publishing. The Committee on Publication Ethics (COPE) provides practical guidelines to help editors and publishers

manage ethical issues such as plagiarism, authorship disputes, and data integrity. The World Association of Medical Editors (WAME) emphasizes editorial independence, transparency, and accountability, while the International Committee of Medical Journal Editors (ICMJE) offers widely accepted recommendations on authorship criteria, conflict of interest disclosure, and manuscript preparation.

In addition to publishing standards, international agencies also support ethical research conduct more broadly. The Online Resource Centre for Ethics Education in Science and Engineering (ORCEESE) of the National Science Foundation offers educational materials and training resources to strengthen ethical awareness, particularly in the preparation of research proposals. Similarly, the National Institutes of Health (NIH) has issued guidance on managing conflicts of interest in biomedical research and publication (Graf *et al.*, 2014; Cooper *et al.*, 2006) ^[13, 6].

Technological tools further support these ethical frameworks. Plagiarism detection services such as CrossCheck, operated by CrossRef, enable publishers to screen manuscripts for textual similarity against extensive

databases of published literature. Moreover, an increasing number of journals now require authors to submit raw or supplementary data to improve research transparency, reproducibility, and accountability (Enserink, 2012; Marusic, 2010) ^[8, 20].

Although no system can completely eliminate misconduct, the combined efforts of international organizations, policy guidelines, and technological tools significantly reduce unethical practices and strengthen trust in scientific publishing. These mechanisms are essential because even a single case of serious misconduct can undermine the reputation of individual researchers, institutions, and the scientific community as a whole.

3.2 National Frameworks in Developing Countries

In India, the University Grants Commission (UGC), Indian Council of Agricultural Research (ICAR), and various institutional ethics committees have developed policies on plagiarism, authorship, and responsible research conduct. However, uneven enforcement, limited training, and infrastructural constraints reduce the effectiveness of these frameworks in practice.

Category	Similarity Range	Interpretation	Action/Consequence
Category 0	Up to 10% overlap	Minor and acceptable textual overlap	No corrective action required
Category 1	More than 10% and up to 40%	Moderate similarity detected	Author is instructed to revise or withdraw the manuscript
Category 2	More than 40% and up to 60%	High level of textual duplication	Manuscript must be withdrawn; one annual increment is withheld; supervision of new Master's and Ph.D. scholars is restricted for two years
Category 3	More than 60% overlap	Very high and unacceptable similarity	Manuscript must be withdrawn; two annual increments are withheld; supervision of new postgraduate and doctoral students is prohibited for three years

(University Grants Commission, 2018) ^[31]

4 Ethical and Structural Challenges Affecting Research Integrity in Developing Countries

Research integrity in developing countries is shaped by a complex interaction of ethical, institutional, economic, and cultural factors. While international standards for responsible research conduct exist, their effective implementation is often constrained by structural limitations and systemic pressures within research ecosystems.

4.1 Institutional and Infrastructural Constraints

Research integrity in developing countries is often constrained by weak institutional and infrastructural support. Many universities and research organizations lack adequately trained research ethics committees, dedicated research integrity offices, and standardized systems for monitoring and addressing misconduct. Limited access to plagiarism-detection software, high-quality bibliographic databases, secure data repositories, and statistical support further reduces the capacity to prevent, detect, and respond to unethical practices. Financial constraints also restrict investment in digital infrastructure, staff training, and long-term capacity building essential for transparent and reproducible research.

Although digital tools such as DupliChecker, Viper, PlagTracker, Turnitin, iThenticate, and WriteCheck assist in identifying textual similarity across large datasets, similarity scores alone cannot establish misconduct and must be interpreted carefully by experts (Juyal *et al.*, 2015) ^[15]. In the absence of strong institutional oversight and interpretive capacity, these technological and structural limitations create significant gaps in the effective monitoring,

prevention, and enforcement of responsible research practices.

4.2 Publication Pressure and Incentive Structures

Academic evaluation systems in many developing contexts emphasize quantitative indicators such as the number of publications rather than the quality, impact, or ethical rigor of research outputs. This “publish or perish” culture creates incentives for questionable practices, including salami slicing, duplicate publication, authorship manipulation, and submission to predatory journals (Ferris and Winker, 2017; Smith *et al.*, 2020) ^[10, 28]. Early-career researchers and doctoral students are particularly vulnerable, as career progression and degree completion are often tied to mandatory publication requirements.

4.3 Limited Awareness, Educational gaps and Training in Research Ethics

Formal education in research ethics and integrity is frequently absent or insufficient in undergraduate and postgraduate curricula (Anderson *et al.*, 2007) ^[2]. As a result, researchers may lack awareness of ethical standards, authorship norms, data management practices, and acceptable publication behavior. This knowledge gap increases the risk of unintentional misconduct and weakens researchers' ability to recognize and avoid unethical publishing environments.

4.4 Financial and Access Barriers

High article processing charges for reputable open-access journals, limited institutional subscriptions to journals and

databases, and restricted access to training resources disproportionately affect researchers in developing countries. These barriers encourage the use of low-quality or predatory outlets and limit engagement with high-impact, ethically rigorous publishing platforms (Richtig *et al.*, 2018; Lakhota, 2017) ^[26, 18].

4.5 Cultural and Governance Challenges

Hierarchical academic cultures may discourage junior researchers from questioning unethical practices by senior colleagues, supervisors, or institutions. Weak enforcement mechanisms, lack of transparent investigation procedures, and fear of retaliation further reduce reporting of misconduct (Fanelli, 2018) ^[9]. In some cases, ethical violations are normalized or tolerated due to systemic constraints and competitive pressures.

4.6 Veterinary, Agricultural, and Dairy Sciences

In applied agro-vet sciences, these challenges are particularly significant because research findings directly influence animal health interventions, food safety policies, agricultural practices, and rural livelihoods. Weak research integrity can therefore have tangible social, economic, and public health consequences, making the need for strong ethical governance especially critical in these domains (FAO, 2018; OIE, 2019; Indian Journal of Animal Sciences editorials, 2021) ^[11, 14].

5 Implications of Unethical Research Practices for Scientific Credibility, Policy, and Practice

Unethical research practices have far-reaching consequences that extend beyond individual researchers and institutions, affecting the credibility of science, the formulation of public policy, and the effectiveness of professional practice. In applied life sciences such as veterinary, agricultural, and dairy sciences, where research directly informs animal health management, food safety regulation, and rural development strategies, the impact of misconduct can be particularly damaging (Steen *et al.*, 2016) ^[30].

5.1 Impact on Scientific Credibility

Research misconduct undermines the trustworthiness of the scientific record. Fabricated or falsified findings distort the evidence base, making it difficult for other researchers to replicate results. This erosion of credibility weakens peer review, damages the reputation of institutions and journals, and reduces public confidence in science. In fields that rely heavily on empirical data—such as disease surveillance, nutrition trials, and breeding programs—even a small number of unethical studies can contaminate entire areas of research (Fanelli, 2018; Steen *et al.*, 2016) ^[9, 30].

5.2 Impact on Policy and Decision-Making

Public policies in veterinary public health, food safety, animal welfare, and agricultural sustainability are often based on scientific evidence. When that evidence is flawed due to misconduct, policies may be ineffective, misguided, or even harmful. For example, fabricated data on disease prevalence or vaccine efficacy can lead to inappropriate regulatory responses, inadequate disease control measures, or misallocation of public resources. In developing countries, where institutional capacity is limited and policy decisions are highly dependent on published research, the

risks associated with unreliable science are amplified (Resnik, 2020; FAO, 2018) ^[25, 11].

5.3 Impact on Professional Practice and Society

Veterinary practitioners, farmers, extension professionals, and food safety authorities rely on scientific research to guide interventions and management practices. Unethical research can result in the adoption of ineffective treatments, unsafe technologies, or environmentally harmful practices, thereby compromising animal health, human health, and livelihoods. Furthermore, the persistence of misconduct contributes to a culture of cynicism (Marusic *et al.*, 2011; OIE, 2019) ^[21, 32].

5.4 Broader Consequences for Developing Countries

In developing countries, unethical research practices exacerbate existing challenges such as limited funding, weak regulatory oversight, and unequal access to high-quality journals and databases. Misconduct not only wastes scarce resources but also undermines international collaboration and reduces the global visibility and credibility of research from these regions (Lakhota, 2017) ^[18]. This creates a cycle in which low trust discourages investment, capacity building, and policy engagement.

5.5 Implications for Veterinary, Agricultural, and Dairy Sciences

Misconduct in veterinary, agricultural, and dairy sciences has direct and tangible consequences. Unethical practices can lead to ineffective disease control strategies, unsafe food products, flawed breeding programs, and misinformed policy decisions, ultimately compromising both human and animal health (FAO, 2018; Resnik, 2020) ^[11, 25]. Moreover, such misconduct erodes trust between researchers, practitioners, farmers, regulatory authorities, and consumers—a critical component for the successful implementation of scientific innovations in applied life sciences (Marusic *et al.*, 2011; Fanelli, 2018) ^[21, 9]. In contexts where research outcomes directly influence agricultural practices, animal welfare, and rural livelihoods, the stakes of misconduct are exceptionally high.

6. Recommendations

To mitigate the risk of unethical research practices and promote research integrity, the following interventions are recommended:

6.1 Mandatory Ethics Training: Integrate research ethics, authorship norms, and publication ethics into undergraduate, postgraduate, and professional training programs.

6.2 Strengthen Institutional Oversight: Establish robust ethics committees, research integrity offices, and compliance units within universities and research organizations.

6.3 Enhanced Access to Tools: Provide widespread access to plagiarism detection software, bibliographic databases, and secure data repositories.

6.4 Reform Evaluation Systems: Shift academic assessments from quantity-based metrics to quality, societal relevance, and ethical compliance.

6.5 Awareness of Predatory Practices: Educate researchers about predatory journals, duplicate publications, and other unethical publishing practices (Shen and Bjork, 2015; Richtig *et al.*, 2018) ^[27, 26].

7. Policy Implications and the Way Forward

Ensuring ethical conduct in research and publication requires not only individual responsibility but also supportive institutional and policy environments. Governments, academic institutions, publishers, and funding agencies must work together to create systems that discourage misconduct and reward integrity.

8.1 Strengthening National Research Integrity Systems

National offices for research integrity should independently handle allegations of misconduct, monitor compliance, and promote awareness. Transparent and accountable structures are essential to ensure fair adjudication and enforcement (Anderson *et al.*, 2007; Fanelli, 2018) ^[2, 9].

8.2 Institutional Capacity Building

Universities and research institutions must invest in:

- Ethics training programs for students and researchers,
- Dedicated research integrity and compliance units,
- Access to plagiarism detection software and research databases,
- Standard operating procedures for handling misconduct.

Embedding ethics education into undergraduate and postgraduate curricula—especially in veterinary, agricultural, and dairy sciences—will cultivate ethical awareness early in researchers' careers.

8.3 Reforming Academic Evaluation Systems

The current emphasis on publication counts and impact factors encourages quantity over quality. Evaluation systems should prioritize:

- Quality and originality of research,
- Societal relevance and applicability,
- Ethical compliance and transparency,
- Open science and reproducibility.

Such reforms can reduce incentives for unethical behaviour.

8.4 Role of Journals and Publishers

Editors and publishers play a critical role in safeguarding integrity through:

- Rigorous peer review,
- Use of plagiarism detection tools,
- Transparent correction and retraction policies,
- Clear ethical guidelines for authors and reviewers.

Collaboration among journals to share information about misconduct cases can further strengthen prevention efforts.

9. Limitations of the Study

This paper is primarily conceptual and based on a synthesis of existing literature, policy documents, and ethical guidelines. It does not include empirical data or case studies from specific institutions or regions. Future research could benefit from quantitative and qualitative studies examining the prevalence, causes, and consequences of misconduct within specific scientific disciplines and national contexts (Marusic *et al.*, 2011; COPE, 2019) ^[21, 7].

10. Future Research Directions

Future studies should explore:

- Discipline-specific patterns of misconduct,
- Effectiveness of ethics training programs,
- Impact of open-access publishing on ethical practices,
- Perceptions of research integrity among early-career researchers,
- Role of digital technologies in detecting and preventing misconduct.

Such research will provide evidence-based insights for strengthening research integrity systems.

11. Conclusion

Ethical research and publication practices are fundamental to the credibility, usefulness, and social legitimacy of science. In veterinary, agricultural, and dairy sciences—where research outcomes directly affect animal welfare, food safety, environmental sustainability, and public health—integrity is not only an academic concern but also a societal responsibility.

Developing countries face unique structural, economic, and institutional challenges that complicate ethical compliance. Addressing these challenges requires coordinated efforts involving policymakers, institutions, journals, educators, and researchers. By fostering a culture of integrity, transparency, and accountability, scientific communities can ensure that research serves its intended purpose: the advancement of knowledge for the benefit of society.

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