

# 12. Transparency and Ethics in Chemical Laboratories

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## Transparency and Ethics in Chemical Laboratories

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### ABSTRACT

Chemical precisionists must continuously develop and enhance their cognition and general awareness through research, innovation, teamwork, collaboration, and community outreach. Through their knowledge, chemists may act as role model and advisors to benefit societies and protect the environment for next generations. Transparency which is widely considered by researchers as a pillar for moral interaction through all work related subjects, moreover, in chemistry it has been considered as a research subject in many categories including chemical lab environment, safety regulation, honesty and clearance in data management, in addition to decision making and handling moral responsibility. This article is going to discuss some examples of lack of transparency, openness, and honesty in regard to data management and publishing and the impact they have on providing safe working laboratories and healthy environment.

### Introduction

Ethics or ethics philosophy is the adherence with what is considered morally accepted or unaccepted, what behavior is right, and which is wrong. It also applies for any theory or system of moral ethics [1]. The words ethics and morals usually mentioned when there is a role that distinguished between what is right and wrong, given that the most known definition of ethics is the roles of behaviors that distinguish between what is accepted and unaccepted morally [2]. Cambridge dictionary of philosophy refers to the interference and correlation between the word's morals and ethics, also, refers to the limitedness of the word ethics to refer to moral ethics in general for a person or a group [3]. In correlation the word "transparency" means openness communication and accountability. It is the literal definition of a transparent subject that you can see through. For instance, in public service, it means that all the decisions and procedures considered should be published to the public, more over it the decisions should be explained and discussed by public unless it's bad for the wider interest [4].

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Chemical practitioners must enhance the positive awareness, general understanding and evaluation of chemistry role, and that has to build up through research, innovation, and teamwork in addition to the communication with the community and acceptable ethics, in a goal to act as role model, directors and advocates for chemical awareness and chemical security for the sake of humankind and preserving environment for next generations [5]. The responsible organizations should provide a continuous materialist and moral support to workers in field to insure a highest degree of employee ethics which contribute in the happiness of humanity and environmental protection [6].

#### Chemical Laboratory Environment:

Safety procedures and roles is written to protect the workers from unsafe work practices and exposures to dangerous materials. Also, the follow up and imposing roles of safety to build a safe and healthy lab will definitely encourage the safety culture inside the workplace [7]. Environmental impact of teaching and research increases in educational institutions through their in lab and out lab activities, because it produces a small amounts of waste most of them are very dangerous

[8]. As a result, educational chemical labs are considered highly dangerous places which require extreme interest applying international standards for chemical lab to insure workers and visitor's safety.

For instance, lab supervisor has informed head of department and safety manager about some cases of uneasiness and shortness of breath for some students in addition to lab supervisor himself. The case has been announced transparently by lab supervisor looking for some solution for this emergent problem. A team has been collected, and after investigation the team found the presence of different chemicals, some known and some of them are unknown preserved unsystematically in irrelevant containers which leads to area saturation with fumes and contaminating the lab.

#### **Using a Dangerous Chemical without Supervision:**

Chemical substances differ widely by type and amount of danger, chemical substances known as Pyrophorics, has tendency to flame out automatically by sensing air, these types of chemicals should be handled specifically by trained chemists who can handle them safely [9]. Here we can consider a case study when Sanji Sh. (23 years), lab assistant in California University used tertiary butyl lithium a Pyrophorics material without sufficient knowledge. Sanji used a syringe to transfer the material in a normal aired box which led to an explosion after touching the air, unfortunately she died after 18 days due to the burns on her body [10]. By evaluating and investigating the accident we conclude that the responsibility is distributed between educational institution, supervisor, safety supervisor and lab peers, all have partial responsibility about the incident. This incident had a severe impact on safety regulations in united states, a number of researches in regards to chemical explosion and fire has been conducted in the purpose of strengthen lab safety regulations [11-13].

#### **Openness, Honesty, and Transparency in Data Handling:**

Openness, honesty and transparency are terms that the researcher and administration must possess, they are part of the scientific ethics that will advance scientifically and administratively in a manner that secures the research process and secures its various aspects. Hiding data and information that should be already shared might it exposes others to danger and the responsible researcher to accountability and reprimand.

A PhD student submitted (5) samples of unknown substances with insufficient data in ceramic containers and ask to be heated to 400°C for four hours, the student hasn't present enough data about the components of same in a fear of research idea leakage.

The lab supervisor had doubts about the material might burn and ask for further information about the chemicals used and how dangerous are they if they burned, the student replays by insuring their safety, and that he has already tried treating them at these temperatures rang without any issues. Unfortunately, this confirmation in addition to the wellness of the lab supervisor to help the student was enough to start the experiment neglecting the fact that they don't have enough data. The results were fast, after 10 minutes, the workers in lab sensed a distinct, suffocating odor and three hours samples have been taken out from the furnace and it contained charred and has embers on them.

The student has been called to be asked about the nature of chemicals used, and what was the fumes elaborated due to sample burned and the results were astonishing, Nickel (II) nitrate hexahydrate & Chromium Nitrate Nonhydrate are oxidizing agents, any by contacting other burning materials, it causes a fire that evolve a toxic gases resulted from thermal decay of sample. The student has been informed about how dangerous the problem was, and it was clear enough that the student didn't know the aspects of danger related to burn these materials. Especially, when there was no usage of MSDS documents, to understand the risk of handling such materials, in addition to, the necessity to the transparency in showing data for the testing chemists to help conduct the work safely.

#### **Transparency and Ethics in Scientific Publishing:**

Scientific publishing means of sharing new knowledge. Chemists must promote and share scientific knowledge obtained from research and innovation through communication, scientific writing, and publishing for sustainable development. They must maintain honesty and integrity as a standard throughout the publishing process, in a way that meet the highest possible standards of veracity and data reproducibility without plagiarism. It is also the responsibility of editors who observe others to ensure that scientific writing is free from defects and errors [5].

There are two theories for why researchers misbehave sometimes. The first theory is based on the “bad apple” theory, which implies that most researchers are ethical, but only researchers who are basically morally corrupted, economically desperate, or suffering from mental issues commit these sorts of bad behavior. Second, misbehavior might also have happened according to the theory of “fatigue” or “imperfection” because of the work environment related to work pressures, incentives, and restrictions which encourage some people to misbehave, such as: pressure to publish, obtain a grant, contract, professional ambition, and the pursuit of profit or fame [2].

#### **Decision Making and Copping with Moral Responsibility:**

What happens when there are many issues relating to devices and equipment's in a chemical factory is crucial. A company in India has overlooked all the mistakes and behaviors of its staff, not to mention, issues with the outdated equipment's. The company didn't set a budget to repair the factory as it should be, also, the workers did not object and accept to work under unhealthy and dangerous conditions, to preserve their jobs in a fear of getting fired. The results were devastating, 45 tons of Methyl Isocyanate (MIC) leaked to the city of Bhopal in December 1984 [14]. This gas is very dangerous; it can irritate the skin and can cause permanent damage to the eye. 2ppm of the gas can destroy human respiratory system, and damage the lungs and might lead to death according to United States environmental protection agency [15].

3000 city residents have died in three hours, the number of casualties reached 15000 in the first three days, after that about 25000 people have died, in addition 500000 residents who still suffer chronic disease due to the gas. The absence of moral ethics and transparency resulted in a humanitarian disaster that the city still suffers from complications.

#### **Conclusion:**

The ethical charter for any profession includes the guiding rules for the practice of a profession to improve its ideals and support its concept, and despite the importance of defining practices and priorities within a particular profession, it might be imposed by coercion but even more sufficiently by commitment and that the only way to judge a particular profession is the behaviour of

the members of that profession towards it, and the preservation of the values trust, respect, competence and dignity. Deviating from ethical behaviour can lead to impact people health and damage property, and the cases reviewed in this article are only some simple examples of indifference, absence of professional and moral responsibility, and lack of transparency in professional institutions.

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#### **Conflict of Interest:**

There is no known conflict for the presented work.

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### الشفافية والأخلاقيات في المختبرات الكيميائية

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#### الخلاصة:

يجب على المتخصصين في الكيمياء تطوير وتعزيز إدراكهم ووعيهم العام بشكل مستمر من خلال البحث والابتكار والعمل الجماعي والتعاون والتواصل المجتمعي. يعمل الكيميائيون من خلال خبراتهم كمستشارين لإفادة المجتمعات وحماية البيئة للأجيال القادمة. الشفافية التي يعتبرها الباحثون على نطاق واسع ركيزة للتفاعل الأخلاقي من خلال جميع المواضيع المتعلقة بالعمل، علاوة على ذلك، في الكيمياء تم اعتبارها موضوعًا بحثيًا في العديد من الفئات بما في ذلك بيئة المختبرات الكيميائية، تنظيم أمور السلامة، الأمانة في إدارة البيانات، بالإضافة إلى اتخاذ القرار والتعامل مع المسؤولية الأخلاقية. سنتناول في هذا المقال بعض الأمثلة في الشفافية والصراحة والصدق فيما يتعلق بإدارة البيانات ونشرها وأثرها على توفير مختبرات عمل آمنة بيئيًا وصحياً.

الكلمات المفتاحية: الشفافية، الأخلاق، المختبرات الكيميائية، الأخلاقيات

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