

Lack of Maintenance in a Chemical Laboratory has Almost Caused an Accident

Wedad H. Al-Dahhan¹, Ali Abd Ali¹, Emad Yousif^{1*}

¹Department of Chemistry, College of Science, Al-Nahrain University, Baghdad, Iraq

*Corresponding Author: Emad Yousif, Department of Chemistry, College of Science, Al-Nahrain University, Baghdad, Iraq.

ABSTRACT

Safety rules have been strictly put in order to control or reduce the risk of working with chemicals. Unluckily, in some chemical laboratories, the story is absolutely different as people do not consider the hazard of chemicals they store or deal with. In this paper, we introduce an accident happened in a research laboratories in an educational institution. The damage to people or amenities was significantly minimised in this accident. However, it was about to make a catastrophe if not controlled. We emphasise here the importance of conducting regular safety tests and checks by qualified personnel as well as maintaining laboratories to evade any loss to people or properties.

Keywords: Chemical spill, maintenance, chemicals storage

INTRODUCTION

Along with our papers on safety measures in chemical laboratories [1- 6], there have been a great deal of interest towards maintaining a safe and ergonomic laboratories [7-9]. Herein, we report an accident occurred at a research laboratory in an educational institution.

Old labs often suffer from equipment aging and need time to frequent maintenance to ensure that they work safely. Lab referred to in the research left without any regular check, maintenance, and renovation. Consequently, many research laboratories were obsolete and lack to any safety equipment within.

Figure-1, A and B shows the fume hood and bench in one of the research laboratories at which the accident we report here occurred.



Figure 1(A). A very old bench with some serious damages. **(B)** An out dated fume hood with rusty cabinets.

These research laboratories need to be completely renovated including their water, and drain pipelines as well as electrical connections and installing power points.

Due to some financial shortages, there was no renovation or maintenance occurred on these facilities and they have all been used by postgraduate students to do research. As a matter of fact, there might be some minor maintenance occurred only if there is a fault reported by laboratory occupants. Attempts have been made to rehabilitate laboratories and improve infrastructure to improve safety [10-14].

ACCIDENT DESCRIPTION

In the 24th of October 2016, a chemical spill was noticed coming from a research laboratory which accompanied by a water flood. The water

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flood was caused by a blocked sink while a rusty and old water tap was dripping water at least 19 hours before the accident.



Figure 2. The entrance of the laboratory with chemical spills and water flood, a yellow chemical spill on the floor.

The yellow chemical spill was expanded as result of a water leakage from the sink as shown in figure 3 A. The cabinet underneath the sink was also used to store some dangerous chemicals as shown in figure 3 B.



Figure 3(A): a faulty tap dripping water into the blocked and damaged sink. **(B).** dangerous chemicals stored in a rusty cabinet below the sink.

Nobody can imagine the level of explosion, or fire which might happen at any instant if those chemicals were exposed to naked flames or high temperatures as nobody knows what is the chemical and how hazardous it is.

These chemicals must be stored in a safer place with reasonable ventilation. However, no one in this research laboratory reported that to the safety officer within the department.

This might be ascribed to two reasons; firstly, they did not happen to know the safety measures and how to manage their private chemicals inventory. Secondly, there was no regular check and test for any of research laboratories at least annually.

In this accident, the water was leaking from the sink and dripping on the chemicals below it in the cabinet which caused a flood of water and chemicals. Additionally, the pipe which goes from the sink to the drain is rusty, clogged and damaged as shown in figure 4.



Figure 4. The damaged and blocked pipe from the sink goes to the drain.

The drain pipes were also damaged and rusty as they were leaking contaminated water outside the building as shown in figure 5.

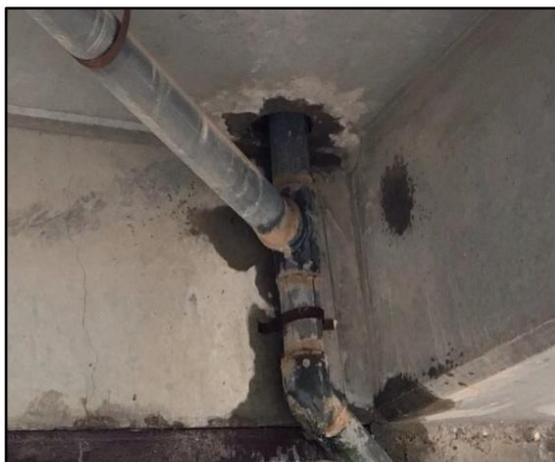


Figure5. *The leakage from damaged drain pipe*

CONCLUSION

The accident occurred will highlight the importance of offering a safe working laboratory and avoiding any tardy management of faults and problems. This can be achieved by conducting a regular and systematic check for all facilities particularly research laboratories.

RECOMMENDATIONS

Based on the aforementioned information regarding this accident which was controlled from being even worse we recommend to do the following precautions:

- Renovating this laboratory and all other similar laboratories. The renovation must include all sinks, water drains, and pipes.
- The drain should be connected to the pipe coming from the sink directly using a PVC pipe instead of using ordinary tubes.
- The fume hoods must be replaced any way, and the new fumehoods should be supplied with ventilation fans of variable speed. In this regard, it is highly recommended to have a cabinet with each fume hood which can be used to store chemicals. This cabinet must be ventilated as well by connecting it to the fume hood ventilation channel.
- All chemicals must be classified according to their risk score, e.g. toxic chemicals must be put together and to be separated from other non-toxic ones with no direct exposure to people and other chemicals.
- Hygroscopic and air sensitive chemicals must be at least stored in desiccators or any dried cabinets to avoid any contaminations and to maintain their stability.
- Regular check and test for all fume hoods, sinks, powerpoints, and other supplementary equipment in the laboratory must be performed by a professional personnel and the report must be handed in to the safety officer to be kept in their records.
- Reporting any fault or damage to the safety officer who will organise a “fault report form” and this form must be signed by the occupant of the research laboratory.
- All chemical reactions must be performed inside the fume hood with pulling sash down at all times.

- Maintaining an ergonomic manual handling of chemicals to avoid any spills or contaminations.
- Organic, oxidising agents or corrosives, and toxic chemicals waste must be collected in containers with appropriate labels and signs and must be kept inside the fume hood to be treated later.

REFERENCES

- [1] Al-Zuhairi A., Al-Dahhan W., Hussein, Rodda K., Yousif E., Teaching Laboratory Renovation, *Oriental Journal of Physical Sciences*, 1, 31-35. (2016).
- [2] Ali A., Shaalan N., Al-Dahhan W., Yousif , For a Safer Working Environment with Hydrofluoric Acid in Iraqi Industrial Plants, *Open Journal of Safety Science and Technology*, 6, 77-80.(2016).
- [3] Shireen, R., Al-Dahhan, W., Al-Zuhairi, A., Hussein, F., Rodda, K. and Yousif, E., Fire and Explosion Hazards Expected in a Laboratory, *Journal of Laboratory Chemical Education*, 4, 35-37. (2016).
- [4] Al-Dahhan W., Al-Zuhairi A., Hussein F., Rodda K., Yousif E., Laboratory biological safety cabinet (BSC) explosion, *Karbala International Journal of Modern*, 2, 276-279.(2016).
- [5] Al-Zuhairi A., Al-Dahhan W., Hussein F., Rodda K., Yousif E., A Vision to Promote the Forensic DNA Facility at Al-Nahrain University in Terms of Safety Measures, *Oriental Journal of Physical Sciences*, 2,(2017).
- [6] Yousif E, Al-Dahhan W., Ali A. , Jber N. , Rashad A. A Glimpse into Establishing and Developing Safety Measures in the Department of Chemistry, College of Science, Al-Nahrain University in 2016. *Orient J Phys Sciences*; 2(2). (2017)
- [7] National Research Council, *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards*, National Academy Press, 2011.
- [8] Gile TJ. *Ergonomics in the Laboratory*. *Laboratory Medicine*, 32, 263-267. (2001).
- [9] American Chemical Society, *Safety in Academic Chemistry Laboratories*. 5th Edition, 1990.
- [10] Ali A Shaalan N, Al-Dahhan W, Hairunisa N, Yousif E , A Technical Evaluation of a Chemistry Laboratory: A Step Forward for Maintaining Safety Measures. *Oriental journal of physical Sciences* 2:68-71.(2017).
- [11] Hussein F, Al-Dahhan W, Al-Zuhairi A, Rodda E, Yousif E , Maintenance and Testing of Fume Cupboard *Open Journal of Safety Science and Technology* 7: 69-75. (2017).

Lack of Maintenance in a Chemical Laboratory has Almost Caused an Accident

- [12] Yousif E, Al-Dahhan W, Abed R, Al-Zuhairi A, Hussein F, Improvement of A Chemical Storage Room Ventilation System. Journal of Progressive Research in Chemistry 4: 206-210.(2016).
- [13] Yousif E, Al-Dahhan W, Ali A, Rashad A, Akram E, Mind What You Put in a Furnace: A Case Study for a Laboratory Incident. J Environ Sci Public Health 1: 56-61. (2017).
- [14] Yousif E, Al-Dahhan W, Ali A, Rashad A, Akram E, Mind What You Put in a Furnace: A Case Study for a Laboratory Incident. J Environ Sci Public Health 1: 56-61. (2017).
- [15] Al-Dahhan W, Al-Zuhairi A, Yousif E, Shireen R, Hussein F, Bad filling ionic liquid sample in split tube furnace. Interdisciplinary Journal of Chemistry, 2(2): 1-3. (2017)