

Education Bureau Circular Memorandum No. 55/2013

From: Secretary for Education

To: Heads of all secondary schools

Ref: EDB/CDI/SC/909/5

Date: 16 May 2013

Results of the Survey on Laboratory Accidents in Secondary Schools in 2011/2012 School Year

(Note: This circular memorandum should be read by all secondary school heads, teachers of the Science Education Key Learning Area and laboratory technicians.)

Summary

The purpose of this circular memorandum is to inform schools of the findings of the Survey on Laboratory Accidents in Secondary Schools in the 2011/2012 school year.

Details

2. As one of the ways to monitor the standard of safety in secondary school science laboratories, surveys of laboratory accidents occurring at schools were conducted since the 1995/1996 school year. The survey for the 2011/2012 school year has been completed and the findings are summarised in the report at Annex. The report provides information on the categories and causes of common laboratory accidents in secondary schools. It also suggests measures by which schools can take to minimise laboratory accidents. Heads of schools are requested to bring the contents of the report to the attention of their science teachers and laboratory technicians.

3. A seminar will be conducted on 3 June 2013 to discuss the findings of the survey and ways to promote laboratory safety. For details of the seminar, please browse the Training Calendar of Education Bureau (Course ID: CDI020130153).

Enquiry

4. For enquiries, please contact the Science Education Section at 3698 3438.

Y. T. LAU
for Secretary for Education

c.c. Heads of Sections / Government Primary Schools – for information

**Report of the Survey on Laboratory Accidents
in Secondary Schools for the 2011/2012 School Year**

I. Background

As one of the ways to monitor the standard of safety in school science laboratories, survey of laboratory accidents occurring at schools were conducted since the 1995/1996 school year. From the 2002/2003 school year onwards, the survey has been conducted on a triennial basis. The findings from the survey are disseminated to all secondary schools to provide updated information on common laboratory accidents, so that preventative measures can be taken. This report presents findings of the survey for the 2011/2012 school year.

II. Results and Observations

2. A total of 401 secondary schools responded to the survey for the 2011/2012 school year, in which 285 (71%) reported that there were no laboratory accident cases. A total number of 348 accident cases was reported, while 324 students and 4 staffs were injured. Most of the injuries were minor. The great majority of the cases (97%) were due to carelessness of students. Detailed statistics of the survey is shown in the **Appendix**.

3. Cuts and heat burns/scalds were the most common laboratory accidents accounting for about 77% of the cases reported. A breakdown of the number of cases in different types of reported accidents is listed in the **Appendix**. The nature of each type of accident is summarised below:

(a) **Cuts:** Most cases involved small cuts caused by broken glass apparatus (e.g. test tubes, glass tubing) and tools (e.g. dissection instruments, blade). Injuries were mostly found on fingers and palms. About 49% of the cases under this category occurred in Science (S1-3) lessons and 32% in Biology lessons.

(b) **Heat burns or scalds:** Most cases were mainly caused by carelessness in handling hot objects (e.g. tripods, wire gauze, Bunsen burners, glassware, etc.), hot liquids or Bunsen flame. About 64% of the cases under this category occurred in Science (S1-3) lessons and 29% in Chemistry lessons. Slight heat burns on hands were most common.

(c) **Eye accidents:** All cases were minor ones. Many cases involved splash of liquid chemicals onto the eyes, giving rise to slight irritation or discomfort. The chemicals commonly

involved were copper(II) sulphate solution, dilute acids and alkalis. One case involved splash of chemicals onto a student's eyes when he/she washed the glassware without wearing safety spectacles after the experiment.

- (d) **Chemicals on skin:** Many cases involved spillage of chemicals during transfer, mixing or heating of chemical liquids. Concentrated sulphuric acid and dilute acids were the most common chemicals involved. In one case, chemicals splashed on a student when he/she erroneously poured concentrated sulphuric acid into a waste bottle containing alkalis. In another case, chemicals splashed on a laboratory technician's hands and face when preparing oxygen gas from a chemical reaction.
- (e) **Chemicals spillage:** All cases were minor ones. Most cases involved small-scale spillage of chemicals during transfer or heating. In one case, a student picked up a reagent bottle by the stopper only and then accidentally dropped the bottle and spilled the chemical. Besides, cases of spillage of the crude oil in a fractional distillation experiment were reported.
- (f) **Substances catching fire:** Only one case was reported in which a student inappropriately discarded a burnt magnesium strip with glowing end into a rubbish bin, leading to a fire. No injury was reported.
- (g) **Discomfort arising from inhalation of gases:** Only one case was reported in which a student mixed hydrochloric acid with iron(II) sulphide on a bench, leading to the production of hydrogen sulphide gas. No injury was reported though some students reported feeling discomfort. This experiment should be carried out in a fume cupboard.
- (h) **Bites by animals:** No case under this category was reported.
- (i) **Others:** All reported cases under this category were very minor ones. In a case, a student slipped on the wet floor, and hit the glasses of another student, resulting in a minor injury.

4. Information on the usage of science laboratories in schools was also gathered in this survey and the following accidents rates were computed:

- (a) **Accident rate per 1,000 students:** The schools reported that in the 2011/2012 school year, there were 348 accidents cases and a total of 293,631 students (S1-7) studied science courses. This corresponded to an accident rate of 1.19 cases per 1,000 students

studying science courses, i.e. a 20% decrease when compared with the rate of 1.49 from the survey for the 2008/2009 school year.

- (b) **Accident rate per 10,000 practical periods:** The schools reported that in the 2011/2012 school year, a total of 966,811 periods were conducted with science practical activities, including student experiments, teacher demonstrations, preparation/try-out of experiments, project work and science club activities. This corresponded to an accident rate of 3.60 cases per 10,000 practical periods, i.e. a 7% decrease when compared with the rate 3.88 from the survey for the 2008/2009 school year.

III. Recommendations

5. Although accidents resulting in serious injuries rarely occur in school science laboratories, schools should continue to be on the alert and take active measures to reduce laboratory accidents to a minimum.

(a) Enhancing Safety Awareness of Laboratory Users

Different resources have been developed to enhance the safety awareness of laboratory users. Teachers and laboratory technicians may refer to the handbook "Safety in Science Laboratories (2012)" (http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/SHB_2012e.pdf) for the related information. New laboratory safety posters and hazard warning labels have been produced for schools to collect (http://cd1.edb.hkedcity.net/cd/science/laboratory/form_safety_Jan_2012.pdf). New safety equipment such as protective gloves has been included in the "List of Furniture and Equipment" for the New Senior Secondary (NSS) Science curricula. (<http://www.edb.gov.hk/en/sch-admin/sch-premises-info/furniture-equipment/primary-secondary-schools.html>)

Teachers, laboratory technicians and students could use these resources to prepare or conduct experiments safely. Besides, the following learning packages are available at the EDB website to facilitate teachers in planning and conducting lessons on laboratory safety:

- Learning and Teaching Resources on Safety in Science Laboratories (http://cd1.edb.hkedcity.net/cd/science/laboratory/SAFETY/safety_exemplars_e.pdf)
- Safety in Exploring Science (<http://resources.edb.gov.hk/~ses>)

(b) Risk Assessment

In the NSS Science curriculum, students are encouraged to conduct more inquiry-based experiments and scientific investigations. Risk assessment before practical activities is especially important to ensure safety in the laboratory. Teachers, laboratory technicians and also students should be able to recognise potential hazards, assess risks associated and take corresponding control measures and precautions to control the risks. Schools may refer to safety information about chemicals from material safety data sheets (MSDS) and other information to conduct a proper risk assessment. (http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/msds_ss_2000.pdf)

(c) Standing Committee on Laboratory Safety

Laboratory safety is everyone's responsibility. We need a constant and concerted effort to maintain the standard of laboratory safety in schools. In order to establish and maintain an effective safety management system, all secondary schools are advised to set up a standing committee on laboratory safety (SCLS) or a school safety management committee to better equip schools with capacity to deal with emergency situations. It is also important for the committee to meet regularly so that the members could coordinate and monitor the safety measures more closely, and review the laboratory management practices more systematically.

(d) Disposal of Chemical Waste

Improper disposal of chemical waste may lead to laboratory accidents. For proper handling of chemical waste, schools are strongly recommended to follow *the Guide on the Segregation, Packaging, Labelling and Storage of Laboratory Chemical Wastes for Schools* prepared by Environmental Protection Department, which is available at http://cd1.edb.hkedcity.net/cd/science/laboratory/waste/cw_e.htm.

IV. Concluding Remarks

6. The statistics of the survey revealed that the schools have not only maintained a high standard of laboratory safety, but also shown improvements in it. Nevertheless, schools should continue to take a proactive role in monitoring the standard of laboratory safety in their schools. Based upon the fact that about 97% of accident cases were due to carelessness of students, students' attitudes towards and knowledge of safe practices in laboratories should be enhanced. Laboratory safety should be emphasised for each and every practical activity. Risk assessments should be made in advance and suitable personal protective equipment should be worn when conducting experiments. For more guidelines and resource materials on laboratory safety, please refer to the website of Science Education – Laboratory Safety and Management at the following website: <http://www.edb.gov.hk/en/curriculum-development/kl/science-edu/ref-and-resources/lab-safety-and-management.html>.

Science Education Section

Education Bureau

May 2013

**Statistics of the Survey on Laboratory Accidents
in Secondary Schools for the 2011/2012 school year**

Summary of Survey Results

Number of schools responded	401
Number (percentage) of schools reported laboratory accidents	116 (29%)
Total number of accident cases	348
Number of accident cases per school	0.87
Total number of students injured*	324
Total number of staff injured*	4
Accident rate per 1,000 students studying science courses**	1.19
Accident rate per 10,000 practical periods	3.60

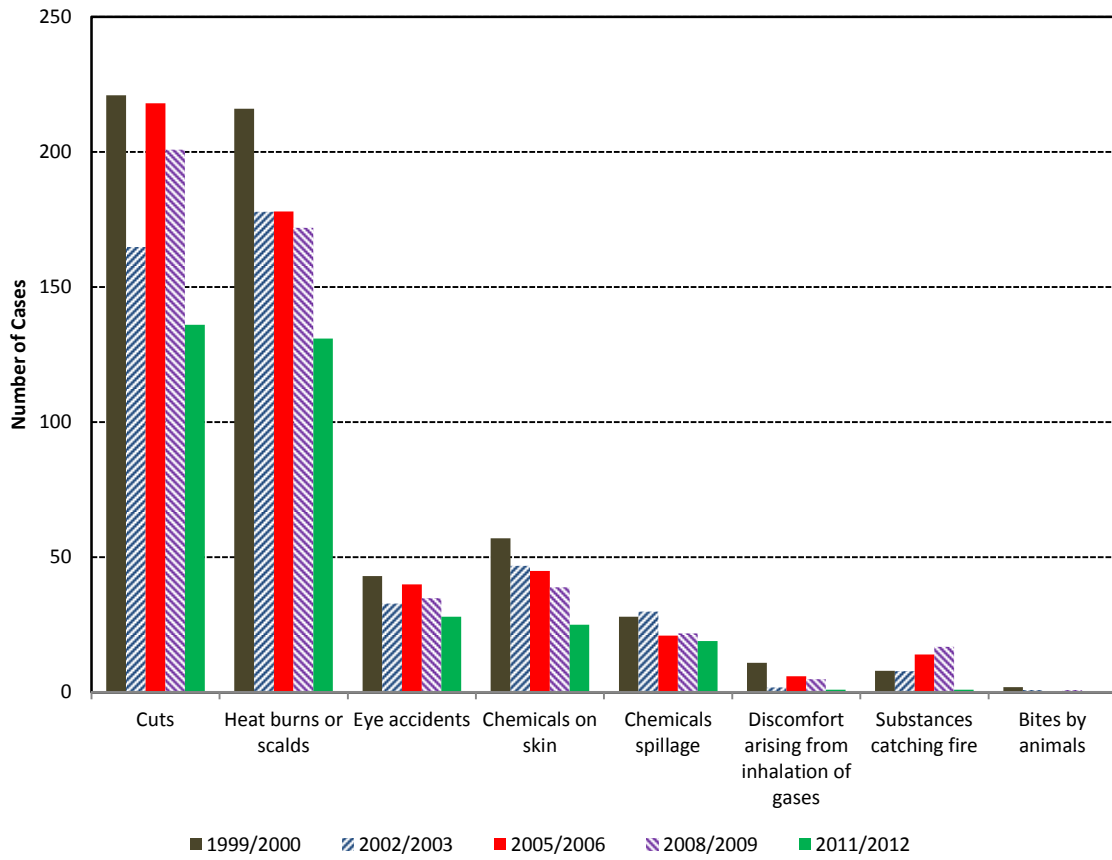
* Most of the injuries were minor ones, e.g. minor cuts or scalds on hands.

** In 2011, the traffic accident rate in Hong Kong was 2.2 cases per 1,000 population; the industrial accident rate in all industries was 23.6 cases per 1,000 workers.

Type of accident	Number of cases	Percentage
Cuts	136	39.1
Heat burns or scalds	131	37.6
Eye accidents	28	8.0
Chemicals on skin	25	7.2
Chemical spillage	19	5.5
Discomfort arising from inhalation of gases	1	0.3
Substances catching fire	1	0.3
Bites by animals	0	0.0
Others with personal injury	7	2.0
Total	<u>348</u>	

Subject	Number of cases	Percentage
Science (S1-3)	189	54.3
Biology	54	15.5
Chemistry	87	25.0
Physics	10	2.9
Integrated Science (S4-6)	8	2.3
Total	<u>348</u>	

**Surveys on Laboratory Accidents in Secondary Schools
1999/2000 - 2011/2012 School Years**



Number of cases:	586	464	522	502	348
Number of schools responded:	448	422	464	459	401