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Safe Science: Be Protected!

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KNOWING WHEN AND WHEN NOT TO THROW DOWN THE GAUNTLET!

I. THE KNIGHT OF SCIENCE AND THE SUIT OF ARMOR!

The science teacher in some ways is a modern day "knight of old" with a suit of armor for protection against enemies. When working in the science laboratory doing an experiment or in the classroom doing a demonstration, the first line of defense is eye protection. However, conditions often require below the neck personal protective equipment (PPE) for the hands, arms, torso, legs and feet. Examples might include working with hot beakers and flasks that would require protection, working with hazardous chemicals, which could irritate skin, or working with bacteria, which could prove harmful to the hand with abrasions.

After engineering controls and administrative operations, the last resort for protection is personal protective equipment. This approach does not eliminate the hazards from the environment; it only protects the user of PPE.

The first order of business is a needs assessment to identify which type of PPE offers the best protection for a specific activity.

Safety wise, it is important to have a policy as to when personal protective equipment is necessary.

II. When should the gauntlet be worn?

The purpose of the laboratory glove is to shield the hand and lower arm from exposure to hazardous chemicals, microorganisms, electrical shock, perspiration, heat and other situations that could prove to be a burden to that area of the body. Without glove protection, dermatitis and other skin diseases often develop. There are professional standards and legal standards, which need to be addressed relative to glove ware. The first necessary action is to develop a protocol or guidelines for use of gloves in the science laboratory and classroom. The protocol/guidelines should not only address "when" but also "which" type of glove should be used.

General Glove Guidelines:

1. Gloves are designed for very specific types of situations. One type of glove does not fit all needs. The manufacturer's claims should be reviewed and followed. Use the gloves only under those conditions for

which they were designed. Types of gloves appropriate for secondary schools include:

A. Latex (microorganisms and biological material – latex is a known allergen for some people);
B. Butyl rubber (most acids);
C. Cotton (absorbs perspiration);
D. Asbestos (heat – caution – asbestos is a known carcinogen!);
E. Polyvinyl alcohol (organic compounds);
F. Nitrile rubber (insulates against electricity);
G. Neoprene (solvents).

Check Material Safety Data Sheets for the appropriate type of glove for maximum protection.

2. Be aware that over time, the glove barrier – physical and chemical - does change. Considerations need to be given to the following characteristics relative to use and disposal timelines:

A. Breakthrough time is how long it takes the chemical to compromise the barrier – outside to inside surface.
B. Degradation rating is a change in the physical properties of the glove such as hardening, cracking or swelling.
C. Permeation rate is the rate at which the chemical is absorbed on the surface, diffuses through the glove and is desorbed on the inside of the glove.

Manufacturers provide information resulting from laboratory testing on these characteristics for the consumer.

3. Always inspect gloves prior to use for cuts or compromised fabric.
4. Gloves differ in the amount of dexterity. This factor can be important when a high frequency of manipulation with small objects is required. Thinner gloves have greater touch sensitivity but provide shorted breakthrough periods.
5. Glove length is a factor when chemical splash is possible up the arm.
6. Reusable gloves should be washed and dried.
7. Disposable gloves are not durable and therefore have a short use life. Close inspection may require discard in a short amount of time.
8. Remember to wash hands with detergent after removing gloves and prior to leaving the laboratory. Do not touch fixtures such as doorknobs, light switches, phones, etc. until gloves are removed.
9. For teachers and students with allergies, there are hypoallergenic gloves available.
10. Glove removal is effected by peeling one off your hand starting at the wrist, moving toward the fingers. Do not allow the surface of the exposed glove to come in contact with the skin. When one glove is removed, use it to peel off the remaining glove.

III. Breastplate of Armor

When exposure to hazardous chemicals or chemical contamination exist, PPE is required over street clothes. Shorts and other skimpy type clothing

provide little protection from chemical or physical dangers in the laboratory. Laboratory coats can serve as general body protection below the neck when dealing with minor types of chemical spills, projectiles, sharps, splashes and fire in the laboratory. A laboratory coat with chemical and fire retardant ratings is preferred. It is a good practice to leave the coat in the laboratory when exiting. That way the risk of spreading chemical contaminants to other locations is reduced.

In dealing with more serious types of chemicals (corrosives) in the laboratory, preparation and storage rooms, aprons are an appropriate alternative. Aprons which are multiple-layered decrease the rate of absorption and provide for improved protection again hazardous materials such as corrosives. In the case of secondary school level work, use of aprons should be an expectation by teachers for students and themselves. The exception to apron use is in physics laboratories where they can actually be a trip/fall safety hazard. This results from laboratory activities requiring bending or stooping. However, in the case requiring hazardous chemicals in a physics laboratory, aprons are a must!

The laboratory coat and apron should also provide protection for legs and feet. Like gloves, aprons and coats vary in the types of material and level of protection sought. Material Safety Data Sheets should be consulted as to the type of personal protective equipment required.

IV. And What Say Ye For The Sabaton?!

The knight armor included protection from the head helmet to the foot sabaton. Feet need to have personal protection when exposed to hazardous chemicals, sharps or being subjected to force from falling objects. Open-toed shoes, sandals, high heels, cloth shoes or shoes with openings for ventilation provide little or no protection and should be prohibited from laboratories during experimentation. Leather or other impermeable material is best for use.

V. When The Day Is Done, Is The Battle Won?

Working in a science laboratory or classroom is an ongoing safety battle, which warrants continuous attention. Most accidents can be prevented through conditioned behaviors. Those that cannot can be reduced in severity by using appropriate armor or personal protective equipment. Remember, armor is more than eye protective ware!

LIVE LONG AND PROSPER SAFELY!

RESOURCES:

Occupational Safety and Health Administration: http://www.osha.gov
American National Standards Institute: http://www.ansi.org
Canadian Organizations Government Standard Sites: http://www.safetysmart-magazine.com/page-bin/links'canadianorg.htm
European Agency for Safety and health at Work:
http://uk.osha.eu.int/about/list.stm

About the Laboratory Safety Institute

The Laboratory Safety Institute (LSI) is a non-profit educational organization whose mission is to make health and safety an integral and important part of science education, work, and life. LSI provides educational programs, member and non-member services, publications, audio-visual and reference materials, and responds to requests for information.

LSI was founded in 1978 as The Laboratory Safety Workshop by James A. Kaufman, Ph.D. His experience working for the Dow Chemical Company convinced him that schools and colleges were not doing enough to encourage health and safety. Studies by LSI and others have shown the accident rate at schools and colleges to be 100 to 1000 times that of Dow and DuPont.

Since 1978, Dr. Kaufman has trained over 50,000 science educators and scientists. His brand of safety training is a unique blend of technical information, practical and inexpensive solutions, humor, and accounts of accidents drawn from a collection of over 5,000 examples. In 2002, LSI organized the first international conference on safety in science education.

LSI has produced two lab safety, training audio-visuals: The One-Day Lab Safety Audio Course (5.5 hours) and The Two-Day Lab Safety Video Short Course (eight, 90-minute VHS cassettes or DVD diskettes).

LSI publishes a newsletter: "Speaking of Safety" (three issues per year).

LSI offers lectures, seminars, short courses (CEUs and academic credit), audit and inspections, and regulatory compliance and safety program development consultations throughout the world for academic, industrial, medical, and government laboratories.

LSI operates an Internet discussion list, LABSAFETY-L, and maintains an informative website (http://www.labsafety.org).

LSI is supported by corporate sponsors, agencies, associations, generous individuals, its members. Members receive a newsletter subscription, use of the audio-visual and reference lending libraries without rental fee, a 10% discount on most LSI publications, a 5% discount on training and consultation services, and use of the Toll Free, 24-hour Lab Safety Information Hotline.

The Journal of Chemical Education called The Laboratory Safety Institute "A national resource for safety conscious science teachers". If you would like to help support the efforts of The Laboratory Safety Institute: (1) Subscribe to "Speaking of Safety", (2) Become a member of LSI (partially tax deductible), (3) Make a contribution (tax deductible), and Become a Volunteer.

Free copies of our "Laboratory Safety Guidelines", Publications List, Audio-Visual Lending Library List, and Introduction to The Laboratory Safety Institute (containing seminar schedule and membership Information) are available on request. For more information about LSI, contact:

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