Guidance for Risk Assessment

Please find below guidance on conducting risk assessment by category:

A. Hazardous Chemicals

A proper risk assessment of chemicals must include review of the following factors:

Toxicity – the tendency of a chemical to be hazardous to health when inhaled, swallowed, injected or in contact with the skin.

Reactivity — the tendency of a chemical to undergo chemical change.

Flammability — the tendency of a chemical to give off vapors which readily ignite when used under normal working conditions.

Corrosiveness — the tendency of a chemical, upon physical contact, to harm or destroy living tissues or physical equipment.

When assessing risk, the type and amount of exposure to a chemical must be considered. For example, an individual's allergic and genetic disposition may have an influence on the overall effect of the chemical. The student researcher must refer to Material Safety Data Sheets (MSDS) provided by the vendor to ensure that proper safety precautions are taken. Some MSDS sheets (e.g., Flinn) rank the degree of hazard associated with a chemical. This rating may assist students and adult sponsors in determining risk associated with the use of a chemical. Information on pesticides can be obtained from the websites listed in the Sources of Information section of this document.

A risk assessment must include proper disposal methods for the chemicals used in an experiment. The Flinn Catalog (referenced in the Sources of Information section) provides information for the proper disposal of chemicals. If applicable, the student researcher must incorporate in the research plan disposal procedures required by federal and state guidelines.

B. Hazardous Devices

The documentation of risk assessment Risk Assessment (Form 3) is required when a student researcher works with potentially hazardous/dangerous equipment and/or other devices, in or outside a laboratory setting that require a moderate to high level of expertise to ensure their safe usage. Some commonly used devices (Bunsen burners, hot plates, saws, drills, etc.) may not require a documented risk assessment, assuming that the student researcher has experience working with the device. Use of other potentially dangerous devices such as high vacuum equipment, heated oil baths, and high temperature ovens must have documentation of a risk assessment.

C. Radiation

A risk assessment must be conducted when a student uses non-ionizing radiation beyond that normally encountered in everyday life. Non-ionizing radiation includes the spectrum of ultraviolet (UV), visible light, infrared (IR), microwave (NW), radiofrequency (RF) and extremely low frequency (ELF). Lasers usually emit visible, ultraviolet or infrared radiation. Lasers are classified into four classes based upon their safety. Manufacturers are required to label Classes II – IV lasers.

Projects involving radionuclides (radioisotopes) and X-rays must involve a careful examination of the risks associated with the study and appropriate safety precautions must be taken. Depending upon the level of exposure, radiation released from these sources can be a health hazard. A risk assessment must take into account the time of exposure, distance and shielding involved in the study.

1) A study of natural radiation that is no more than than encountered in everyday life is exempt from the following requirements.

2) All studies may not exceed the dose limits set by the Nuclear Regulatory Commission of 0.5 mrem/hr or 100 mrem/year of exposure.

3) If the voltage needed in the study is >10 kvolts, a risk assessment must be conducted. The study may be done at home or school, and SRC preapproval is not required.

4) A study using 10-25 kvolts must have a risk assessment conducted and must be preapproved by the SRC to assess safety. Such a study must be conducted in a metal chamber using a camera only, not direct view through glass. A dosimeter or radiation survey meter is required to measure radiation exposure.

5) All studies using > 25 kvolts must be conducted at an institution with a Licensed Radiation Program and must be preapproved by the Institutions' Radiation Safety Officer or the Committee which oversees the use of ionizing radiation to ensure compliance with state and federal regulations.

Environmentally Responsible Chemistry

The mission of environmentally responsible (green) chemistry is to avoid the use or production of hazardous substances during a chemical process. The principles of green chemistry are described on the EPA website in the Sources of Information section. The following principles must be incorporated into the research plan:

- Waste prevention
- Use of the safest possible chemicals and products
- Design of the least possible hazardous chemical syntheses
- Use of renewable materials

- Use of catalysts in order to minimize chemical usage
- Use of solvents and reaction conditions that are as safe as possible
- Maximization of energy efficiency
- Minimization of accident potential