

SECTION 1: INTRODUCTION

This handbook is for teachers using the NJAS rules and regulations to guide students doing open-ended, inquiry-based research. It was written with safety for students and research organisms as a major concern. It consists of three sections: Section 1: FACILITATING JUNIOR HIGH/MIDDLE SCHOOL STUDENTS; Section 2: FACILITATING SENIOR HIGH STUDENTS; and Section 3: USEFUL INFORMATION FOR ADULT SPONSORS AND STUDENTS INVOLVED IN NJAS SCIENCE FAIRS. Each section is meant to stand “alone”; if the teacher has only senior high students, Section 1 of the guide would not be used. The complete handbook (and required forms) can be read and/or downloaded from the NAS/NJAS website at <www.neacadsci.org>.

Highlights from the handbook include the following information:

- Two forms are required for *all* junior high NJAS projects and three forms for senior high. (Senior high requires three because one form was divided into two separate forms.)
- On the Student Research Plan Form, the student identifies a particular problem and plans what experimental approach he/she will use to solve the problem. The completed form is submitted to the teacher who reviews it for compliance with local, state, and federal regulations and the NJAS guidelines.
- The other form(s) must be signed by the student and the student’s parent or guardian, and then by the teacher after he/she has reviewed it to make sure necessary signatures have been obtained by the adults involved in approving or supervising any part of the experiment.
- Student experimentation begins after forms are on file with the teacher.
- Additional forms and/or signatures are required only if the project requires special supervision by *qualified* adults because the research poses potential risk to the student and/or to the research organisms. These projects include almost all that involve the use of nonhuman vertebrate animals, human subjects, potentially pathogenic agents (all micro-organisms isolated and/or cultured from any environment are considered pathogenic, including bacteria and fungi but excluding protists), recombinant DNA, controlled substances, human/vertebrate animal tissue, and hazardous substances or devices.
- The rules and regulations for conducting experimentation with each of these “special supervision” subjects are outlined in Chapters 2-7 of Section 1 and Chapters 2-8 in Section 2 of the handbook. It is important that the teacher reads these rules and regulations *before* allowing students to do experimentation.
- Special supervision *must be* provided by a Qualified Scientist and/or a Designated Supervisor.
- Roles and Responsibilities of a Qualified Scientist: Must be thoroughly familiar with the local, state, and federal regulations that govern the student’s area of research. The Qualified Scientist and the teacher may be the same person, if that person is qualified. A student may work with a Qualified Scientist in another city or state. In this case, the student must work

locally with a Designated Supervisor (see below) who has been trained in the techniques the student will use.

- Roles and Responsibilities of Designated Supervisor: The Designated Supervisor is an adult who supervises a student's experiment. The Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student's project, and must be trained in the student's area of research. The teacher may act as the Designated Supervisor.
- The teacher must evaluate projects requiring special supervision and make sure criteria for the Qualified Scientist and the Designated Supervisor adhere to those set forth in the NJAS Guidelines.
- The teacher needs to either select the Qualified Scientist and/or the Designated Supervisor for the student or provide substantial input if the student is doing the selecting.
- It is important to be aware that the guidelines are not the same for the two different age groups (junior high and senior high) when the research requires special supervision due to the potential risk to students and/or the research organisms.

SECTION 1

Facilitating JUNIOR HIGH/MIDDLE SCHOOL Students

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These forms may be duplicated as needed for use in NJAS Science Fairs.

- Research Plan (Form 1A)
- Adult Sponsor Safety Assessment and Approval Form (Form 2A)
- Informed Consent Form (Form 3A)

SECTION 1: Facilitating Junior High/Middle School Students

Introduction

Section 1 includes information for guiding junior high/middle school students doing open-ended “science as inquiry” research following the NJAS Rules and Regulations. Each chapter is divided into parts for easy reference. For most projects the only chapters that will apply are Ch. 1 “Instructions for Facilitating Junior High/Middle School Students”, Ch. 9 “NJAS Science Fair Display and Safety Regulations”, and Ch. 10 “Copies of Forms Required for Junior High/Middle School Projects”. The remaining chapters are pertinent to projects requiring special instructions because the research poses potential risk to the student or to the human or animal subjects and requires the special supervision of a Qualified Scientist and/or a Designated Supervisor. These projects include almost all that involve the use of nonhuman vertebrate animals, human subjects, potentially pathogenic agents (all micro-organisms isolated and/or cultured from any environment are considered pathogenic, including bacteria and fungi but excluding protists), controlled substances, human/vertebrate animal tissue, and hazardous substances or devices.

It is important to be aware that the guidelines for doing research requiring special supervision are not the same for this age group of students as for high school students. Junior high/middle school students do not need to complete special forms like the high school students, but they are required to obtain signatures from qualified scientists and/or qualified supervisors. Another difference is that NJAS guidelines do not allow junior high/middle school students to do research on recombinant DNA, but senior high students may if the research is done at a federally registered research institution.

The NJAS Guidelines for junior high/middle school students were written to align with the Intel ISEF Science Fair Rules and Regulations. Many of the Rules and Regulations are the same; however, there are major differences in that Intel ISEF requires more forms be completed and more signatures from ISEF *before* experimentation may begin. It is permissible for junior high/middle school students entering the NJAS Regional Science Fair to use the ISEF forms in place of the NJAS forms. In this case, ISEF forms would be completed following *all* the ISEF Rules and Regulations and have the required signatures needed from the ISEF Scientific Review Committee.

It is recommended that all of Section 1 and Section 3 titled “Useful Information for Adult Sponsors and Students Involved in NJAS Science Fairs” be read and reviewed before facilitating students in their experimental research. Section 3 is subdivided by the following titles: Why Have Students Do Scientific Research? NJAS Science Project Categories With Descriptions, Steps to Doing Scientific Research, NJAS Guidelines for Field Research Projects, Constructing A Visual Aid Display for Science Project, Writing an Abstract for Science Research Project, Writing A Science Project Research Paper, Oral Presentation of Science Research Project, Judging Criteria for NJAS Science Fairs, Nebraska Junior Academy of Sciences Judge’s Score Sheet, and Book Reference List for Inquiry-Based Investigations.

Chapter 1: Instructions for Facilitating Research Projects

The purpose of this chapter is to help the Adult Sponsor gain a better understanding of the general guidelines involved in facilitating and/or supervising junior high/middle school students doing research projects for a Nebraska Junior Academy of Sciences (NJAS) Regional Science Fair.

Part A: Roles and Responsibilities of the Adult Sponsor

- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible not only for the health and safety of the student conducting the research, but also for the humans or animals used as subjects.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to a specific student project. These may include chemical and equipment usage, experimental techniques, research involving human or nonhuman animals, and cell cultures, microorganisms, or animal tissues. The issues must be discussed with the student when completing the **Student Research Plan (Form 1A)**.
- Some experiments involve procedures or materials that are regulated by state and federal laws. If not thoroughly familiar with the regulations, the Adult Sponsor needs to enlist the aid of a Qualified Scientist and/or a Designated Supervisor.
- Adult Sponsor is responsible for ensuring the student's research is eligible for entry in the Nebraska Junior Academy Science Fairs held in regions across the state.

Part B: General Rules for ALL Junior High/Middle School Research Projects

- All projects must adhere to the Ethics Statement below.
Scientific fraud and misconduct is not condoned at any level of research or competition. Plagiarism, use or presentation of other researcher's work as one's own and fabrication or falsification of data will not be tolerated. Fraudulent projects will fail to qualify for competition in NJAS science fairs.
- All projects must adhere to all Federal, State and local laws and regulations.
- Recombinant DNA research is NOT allowed at any NJAS Science Fair.
- The use of photographs of persons should conform to school policy.
- Exhibits must adhere to NJAS safety regulations and size requirements (see Chapter 10).

Part C: Field Research Projects

- Many times important research is done outside the confines of the traditional setting. This type of research is often referred to as "field work" or "field research."

- Field research involves making careful observations in a given locale, and sometimes, comparing this survey to known data from other locales. It may involve the making of a detailed inventory of the living and non-living objects, or their characteristics, in a given geographic location, or the interaction among the objects.
- It always involves looking for the patterns in a well-defined area and the keeping of detailed field notes.
- The “controls” in this type of study are in the observational techniques that are used.
- Refer to Section 3: “NJAS Guidelines for Field Research Projects” for facilitating students doing this type of research.

Part D: Special Supervision REQUIRED for Certain Research Projects

- The Adult Sponsor must be aware that certain projects require special supervision by *qualified* adults. These projects include any involving human subjects, nonhuman vertebrate animals, pathogenic agents (all micro-organisms isolated and/or cultured from any environment are considered pathogenic, including bacteria and fungi but excluding protists), controlled substances, human/animal tissue, and hazardous substances or devices.
- The rules and regulations for conducting experimentation with each of these “special supervision” subjects are outlined in Chapters 2-7. It is important that the Adult Sponsor read these rules and regulations BEFORE allowing students to do experimentation that requires special supervision.
- The special supervision *must be* provided by a Qualified Scientist and/or Designated Supervisor.
- Roles and Responsibilities of Qualified Scientist:
 - Qualified Scientist should possess an earned doctoral/professional degree in the biomedical sciences. However, a master’s degree with equivalent experience and/or expertise in the student’s area of research is acceptable.
 - Qualified Scientist must be thoroughly familiar with the local, state, and federal regulations that govern the student’s area of research.
 - Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as outlined above.
 - Student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor who has been trained in the techniques that the student will use.
- Roles and Responsibilities of Designated Supervisor:
 - Designated Supervisor is an adult who supervises a student’s experiment.
 - Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student’s project, and must be trained in the student’s area of research.
 - Adult Sponsor may act as the Designated Supervisor.

- The Adult Sponsor has additional responsibilities if projects are done that require special supervision. They include:
 - Adult Sponsor needs to either select the Qualified Scientist and/or Designated Supervisor for the student, or provide a lot of input if the student is doing the selecting.
 - Adult Sponsor must evaluate projects requiring special supervision and make sure criteria for the Qualified Scientist and Designated Supervisor adhere to those set forth in the NJAS Guidelines.

Part E: Instructions for Completing Forms Required for ALL Projects

- Only two forms are required for ALL junior high/middle school NJAS projects. These are the **Student Research Plan (Form 1A)** that is completed by the student with teacher guidance/support and the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** that is signed by the appropriate responsible people.
- The first form completed is the **Student Research Plan (Form 1A)**. This form is completed by the student after he/she has picked and researched his/her topic. On this form the student identifies a particular problem and plans what experimental approach he/she will use to solve the problem. The Adult Sponsor needs to provide a lot of guidance and support to help the student in completing his/her Student Research Plan. The completed form is submitted to the Adult Sponsor. The Adult Sponsor must review the student's **Student Research Plan Form (Form 1A)** to make sure that experimentation is done within local, state, and federal laws and the NJAS Rules. After *final* approval, the Adult Sponsor should keep the original copy of **Student Research Plan Form (Form 1A)** on file for liability purposes and return a copy to the student. This form needs to be kept by the student and may need to be available the day of the science fair competition.
- The second form completed is the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**. This form is also required for ALL projects. The form must be signed by the Adult Sponsor, the student, and the student's parent or guardian. *If the project requires any special supervision*, the form must also have a Qualified Scientist and, if needed, the Designated Supervisor signature(s) on it (outlined in Part D above and explained in detail in the following chapters). The Adult Sponsor needs to review the student's completed form to make sure necessary signatures have been obtained by the adults involved in approving or supervising any part of the experiment. The Adult Sponsor keeps the completed **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** on file for liability purposes.
- Student experimentation may *NOT* begin until *after* both completed forms are on file with the Adult Sponsor.

Chapter 2: Projects Involving Human Subjects

Part A: Background Information

- The NJAS Rules, which follow federal regulations, exist to safeguard the rights and welfare of individuals who participate as research subjects and to protect the student researcher. When students conduct biomedical or behavioral research, they are directly responsible for protecting the rights and welfare of the participating human subjects. The psychological and physical risks must be carefully evaluated at the local level.
- The Adult Sponsor needs to read and be familiar with the information provided in this chapter *before* allowing any student to design/conduct experimental research involving human subjects.
- It is the responsibility of the Adult Sponsor to ensure *extra* support and guidance be given to junior high/middle school students doing research involving human subjects.

Part B: Roles and Responsibilities of the Adults

1) Adult Sponsor:

- Adult Sponsor must be familiar with the information provided in this chapter before allowing students to design/conduct experimental research involving human subjects.
- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible not only for the health and safety of the student conducting the research, but also for the humans used as subjects.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to a specific student project involving human subjects. The issues must be discussed with the student when completing the **Student Research Plan (Form 1A)**.
- Some experiments involve procedures or materials that are regulated by state and federal laws. If not thoroughly familiar with the regulations, the Adult Sponsor needs to enlist the aid of a Qualified Scientist and/or a Designated Supervisor.
- Adult Sponsor is responsible for ensuring the student's research is eligible for entry in the Nebraska Junior Academy Science Fairs held in regions across the state.
- Adult Sponsor must evaluate projects requiring special supervision and make sure criteria for the Qualified Scientist and/or Designated Supervisor adhere to those set forth in the NJAS Guidelines.
- Adult Sponsor needs to either select the Qualified Scientist and/or Designated Supervisor for the student, or provide a lot of input if the student is doing the selecting.

2) Qualified Scientist:

- Qualified Scientist must be a medical doctor or psychologist.

- Qualified Scientist must be thoroughly familiar with the local, state, and federal regulations that govern the student's area of research.
- Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as outlined above.
- Qualified Scientist must do a risk assessment while reviewing the project for approval.
- Qualified Scientist must directly supervise the experiment if risk assessment indicates "more than minimal risk", and if he/she is unable to directly supervise the experiment a trained Designated Supervisor is required.
- Student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor who has been trained in the techniques the student will use.

3) **Designated Supervisor:**

- Designated Supervisor is an adult who supervises a student's experiment.
- Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student's project, and must be trained in the student's area of research.
- Adult Sponsor may act as the Designated Supervisor.

Part C: Rules and Regulations Involving Human Subjects

Rule 1: Research on human subjects under the age of 18 does *not* need approval by a Qualified Scientist on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** and does *not* require use of the **Informed Consent Form (Form 3A)** for the following:

- a) Research conducted in established settings:
 - (1) involving normal educational practices
 - (2) on individual or group behavior or characteristics of individuals, such as studies of perception, cognition, game theory, or test development, where the investigator does not manipulate subjects' behavior and the research will not involve stress to subjects. (See point 2 of "Possible Risk Activities" for clarification)
- b) Research involving observation of legal public behavior.
- c) Research involving collection or study of existing publicly available data.

Rule 2: The Adult Sponsor must have the **school administration** review any tests, surveys or questionnaires to be used in the project for a risk assessment using the information provided in Part E "Evaluating Risk" *before* the Qualified Scientist reviews the project for approval.

Rule 3: All other human research projects (including surveys, professional tests, questionnaires and studies in which the researcher is the subject of his/her own research) *must have* the

Student Research Plan (Form 1A) reviewed and approved by a Qualified Scientist (medical doctor or psychologist) *before* experimentation begins. The project *may require* that the human subjects sign the **Informed Consent Form (Form 3A)** or school policy may require that the **Informed Consent Form (Form 3A)** be used.

Rule 4: Observational studies and related data collection *must have* the **Student Research Plan (Form 1A)** reviewed and approved by a Qualified Scientist (medical doctor or psychologist), but projects are not required to have the human subjects sign the **Informed Consent Form (Form 3A)**. However, school policy may require that human subjects use the **Informed Consent Form (Form 3A)**.

Rule 5: Any proposed changes in the **Student Research Plan (Form 1A)** by the student after approval by the adults on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** must have subsequent approval *before* such changes are made and *before* experimentation begins/resumes.

Rule 6: *Copies* of the approved **Student Research Plan (Form 1A)** and **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** must be available for review by the NJAS Regional Director (or his/her representative) and the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Rule 7: It is illegal to publish or display information in a report that identifies the human subjects directly without written informed consent. (Public Health Service Act, 42 U.S.C., 241(d).) Use the **Informed Consent Form (Form 3A)**.

Part D: Assessing Risks and Choosing a Study Group

- When choosing a study group, the criteria for selecting the subjects should be clearly defined. In other words, students should ask questions that will define the exact study population. For example, if students want to study nondiabetic males, they should make sure to ask the appropriate questions that would eliminate diabetic individuals. Similarly, in studies where exercise is involved in the project, the student researcher should determine that the research subject is not at risk by exercising, e.g., the subject has no cardiac or respiratory disease/disorder. Once a population is chosen, students need to evaluate the potential risks involved (see Part E: “Evaluating Risk”).
- Parents have the right to deny participation of their child as a human subject in any study (including those involving standardized tests or student-prepared tests, questionnaires and surveys). The Adult Sponsor must have the **school administration** review any tests, surveys or questionnaires to be used in the project for a risk assessment using the information provided in Part E “Evaluating Risk” *before* the Qualified Scientist reviews the project for approval. If there is “more than minimal risks” the **Informed Consent Form (Form 3A)** is required for all subjects.
- Copies of tests, surveys or questionnaires that will be used in the project must be provided to parents with the **Informed Consent Form (Form 3A)**.

- The **Informed Consent Form (Form 3A)** is a) required for subjects under 18 years of age (except as noted in Rule 1 in Section B), b) required for all subjects when “more than minimal risk” is determined by the Qualified Scientist (medical doctor or psychologist) and c) is strongly recommended for all projects involving human subjects.

Part E: Evaluating Risk

- In evaluating risk, use the following Federal definition of “minimal risk” as a guide:
No more than minimal risk exists when the probability and magnitude of harm or discomfort anticipated in the research are not greater (in and of themselves) than those ordinarily encountered in DAILY LIFE or during performance of routine physical or psychological examinations or tests.

- The following are examples of activities or groups that contain *more than minimal risks*:

Possible Risk Activities:

1) Exercise

2) Emotional stress resulting from invasion of privacy (See Privacy Act of 1974 45CFR5B). Questions on sexual activities or preferences, AIDS testing and results, suicide attitudes, divorce and its effects on psychological well-being all should be considered overtly invasive or high-risk and thus require the **Informed Consent Form (Form 3A)**. Student researchers should always carefully evaluate controversial questions for compliance with federal regulations.

3) Ingestion or physical contact with any potentially hazardous materials. This rule applies to the student researcher as well as the human subject(s).

Risk Groups:

- Any member of a group that is naturally at-risk (e.g., pregnant women, individuals with diseases such as cancer, asthma, diabetes, cardiac disorders, psychiatric disorders, dyslexia, AIDS, etc.).
- Special vulnerable groups covered by federal regulations (e.g., children, prisoners, pregnant women, handicapped or mentally disabled persons, economically or educationally disadvantaged persons). Additional safeguards are applied to these subjects because they have been judged as vulnerable to coercion or undue influences.

Part F: Instructions for Facilitating Projects Involving Human Subjects

- Students need to address the following questions as part of the “Description in detail of method or procedures” on the **Student Research Plan (Form 1A)**:
 - Why are human subjects necessary for the research?
 - What are the research procedures in which human subjects will be involved?
 - What are the possible discomforts or risks that may reasonable be expected by participation in research?
 - What procedures will be used to minimize risks?
 - Will human subjects be required to sign an **Informed Consent Form (Form 3A)** before participating in the research?

- Will the parent/guardian of human subjects be required to sign an **Informed Consent Form (Form 3A)** before participating in the research?
- Copies of tests (standardized and student-prepared), questionnaires, surveys, etc. to be used in the research *must be attached* to the **Student Research Plan (Form 1A)**.
- NJAS requires that the Adult Sponsor have the **school administration** review the entire **Student Research Plan** with attachments (**Form 1A**), do a risk assessment using the information provided in Part E “Evaluating Risks”, and approve the project *before* the Qualified Scientist reviews the project for approval.
- If the risk assessment indicates there is “more than minimal risk” the **Informed Consent Form (Form 3A)** is required for all subjects and a sample copy of the **Informed Consent Form** *must be attached* to the **Student Research Plan (Form 1A)**.
- The **Student Research Plan** with attachments (**Form 1A**) is submitted to a medical doctor or psychologist (unless review/approval is not required for project as noted in Rule 1-Part B).
- The medical doctor or psychologist reviews the **Student Research Plan** with attachments (**Form 1A**) and does a risk assessment.
- If the project is not approved, the student must redesign the **Student Research Plan (Form 1A)** with the guidance of the Adult Sponsor. The *revised Student Research Plan (Form 1A)* must be resubmitted to the medical doctor or psychologist for approval if using human subjects.
- If the project is approved and the medical doctor or psychologist agrees to the responsibilities as listed on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**, he/she signs the form as the Qualified Scientist.
- If the Qualified Scientist determines “more than minimal risk” is involved to the human subjects, the Qualified Scientist must directly supervise the project. If the Qualified Scientist *cannot* be present during the experimentation, a Designated Supervisor (role and responsibilities defined in Part B) must agree to supervise the experimentation and *must sign* the “Designated Supervisor Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- After the **Informed Consent Form (Form 3A)** has been signed by the school administrator, Adult Sponsor, and Qualified Scientist, copies should be made for distribution to each human subject. The Adult Sponsor should collect all copies of this form signed by the human subjects and keep them on file for liability purposes.
- Experimentation on human subjects begins *after* the **Student Research Plan (Form 1A)** has been approved, the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** has *ALL* the needed signatures, the **Informed Consent Forms (Form 3A)** have been signed and collected from the human subjects, and the Adult Sponsor has *all* the completed forms on file.

- The Adult Sponsor keeps the completed forms on file for liability purposes. Students with projects involving human subjects *must* have **copies** of the completed **Student Research Plan (Form 1A)**, the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**, and all signed **Informed Consent Forms (Form 3A)** available for review by the NJAS Regional Director (or his/her representative) and the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Part G: Sources of Information

- 1) CFR, Title 45 (Public Welfare), Part 46-Protection of Human Subjects (45CFR46)
- 2) Penslar, R. L., Institutional Review Board (IRB) Guidebook, (1993). Washington, DC: ORRP-NIH

3) Belmont Report, April 18, 1979

Above documents available from:

Office for Protection From Research Risks (OPRR)

National Institutes of Health

6100 Executive Blvd., Suite 3B01, MSC 7507

Rockville, MD 20892-7507

phone: 301-496-7041, fax: 301-402-0527

email: ohrp@osophs.dhhs.gov

website: <http://ohrp.osophs.dhhs.gov/polasur.htm>

Division of Human Subject Protections

phone: 301-402-0527

To have documents faxed call: 301-594-0464

American Psychological Association

750 First Street, NE

Washington, DC 20002

phone: 202-336-5500

website: <http://www.apa.org>

Information for students: <http://www.apa.org/science/infostu.html>

Information regarding publications: <http://www.apa.org/science/pubs.html>

Educational and Psychological Testing

Standards for educational and psychological testing. (1999). Washington, DC: AERA, APA, NCME.

To order call: (800) 628-4094.

<http://www.apa.org/science/standards.html>

Chapter 3: Projects Involving Non-Human Vertebrate Animals

Part A: Position Statement on Use of Animals in Pre-College Science Research

(This position statement has been substantially borrowed from the Science Service and the Intel ISEF position statement on the use of animals, and has been modified to conform with the NJAS Rules and Regulations.)

Science Service affirms its conviction that the humane use of animals by students under qualified adult supervision is necessary and important for learning about the life sciences. As science educators, one of our major roles is to establish guidelines for the appropriate use of animals in precollege research projects and in classrooms. We are committed to the promulgation and strict enforcement of existing rules that were designed to ensure the humane and proper treatment of any animal used in our science competitions.

NJAS follows the majority of the International Rules and Guidelines that were written to teach students about the humane treatment of animals as well as respect for all living things. Alternatives are encouraged and must be explored during the pre-approval process. The requirement for prior project review and approval as well as the direct supervision of student research has raised the quality of scientific research in the pre-collegiate arena and protected the welfare of animals. Science Service, the International Science and Engineering Fair Scientific Review Committee, and the Nebraska Junior Academy of Sciences promote and enforce these guidelines and have processes in place to ensure those competing are in compliance.

Science Service has taken the responsibility of establishing the comprehensive guidelines for student science research. They are widely accepted and are becoming the standard for pre-college science research. These guidelines are reviewed annually and are appropriately more strict and comprehensive than those of the federal government. We believe prohibition of animal based research projects at the NJAS and the Intel ISEF affiliated fairs will eliminate these established guidelines governing animal use. If animal research projects at NJAS and Intel ISEF are eliminated, unregulated and unsupervised animal research at the secondary and lower level will increase. Students will proceed with experimentation without rules or guidelines undoubtedly resulting in the proliferation of inhumane science projects and classroom activities. National and state mandated educational standards that require scientific inquiry will be seriously compromised. This action would be detrimental to science education and animals, and would not serve the public interest.

Part B: Background Information

- Students proposing research on non-human vertebrate animals should explore all possible alternatives. If vertebrates are used for research and testing, the student researchers and Adult Sponsors are responsible for granting the animals every humane consideration for their comfort and well being before, during, and after the research.
- Studies involving animals in their natural environment as well as animals in zoological parks with no interaction between the experimenter and the subject animal(s) do **NOT** require “Qualified Scientist Statement” signatures on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- The **Student Research Plan (Form 1A)** must include specific information and requires special instructions in order to comply with NJAS Rules and Regulations (see Part F for instructions).
- Certain research that is permissible for high school students may not be appropriate for junior high/middle school students.

Part C: Roles and Responsibilities of the Adults

1) **Adult Sponsor:**

- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible not only for the health and safety of the student conducting the research, but also for the nonhuman vertebrates used as subjects.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to research involving nonhuman vertebrates. The issues must be discussed with the student when completing the required forms.
- Adult Sponsor needs to read and be familiar with the information provided in this chapter *before* allowing any students to design/conduct experimental research involving nonhuman vertebrate subjects.

2) **Qualified Scientist:**

- Qualified Scientist must be a veterinarian.
- Qualified Scientist must be thoroughly familiar with the local, state, and federal regulations that govern the student's area of research.
- Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as outlined above.
- Student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor who has been trained in the techniques the student will use.

3) **Designated Supervisor:**

- Designated Supervisor is an adult who supervises a student's experiment.
- Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student's project, and must be trained in the student's area of research.
- Adult Sponsor may act as the Designated Supervisor.

4) **Animal Care Supervisor:**

- Animal Care Supervisor is required for all nonhuman vertebrate animal projects.
- Animal Care Supervisor must be familiar with the proper care and handling of research animals used in the project.
- Qualified Scientist or Designated Supervisor usually serves as the Animal Care Supervisor.
- Adult Sponsor, if familiar with proper care and handling, can serve as the Animal Care Supervisor.

Part D: Rules and Regulations Involving Vertebrate Animals

Rule 1: Alternatives

- Alternatives to the use of nonhuman vertebrate animals for research **MUST BE** explored and discussed. Alternatives may include replacement, reduction or refinement.
- The three Rs of animal experimentation:
 - Replace* vertebrate animals with invertebrates or lower life forms whenever possible.
 - Reduce* the number of animals whenever possible. (Do not reduce numbers beyond statistical validity.)
 - Refine* experimental protocols to lessen pain or distress to the animals.
- NJAS Rules and the ISEF International Rules encourage any non-invasive and non-intrusive studies (i.e., observational, behavioral, and natural history studies) that do not affect an animal's health or well-being by causing stress, discomfort, pain or death. The NJAS Rules follow the ISEF International Rules that allow intrusive studies on vertebrate animals and invertebrate animals that have advanced nervous systems **ONLY** when lower vertebrates or other alternatives are not suitable.
- Examples of possible alternatives are listed below:
 - a) Cells and tissue cultures
 - b) Plants, yeast and fungi
 - c) Mathematical or computer models
 - d) Invertebrates with more primitive nervous systems (i.e., protozoa, planaria, insects)
 - e) Primary tissue or cell explants from humanely euthanized animals

Rule 2: The NJAS Rules and the ISEF International Rules define an animal as any live, nonhuman vertebrate, mammalian embryo or fetus, bird eggs within three days (72 hours) of hatching, and all other vertebrates at hatching or birth.

Rule 3: Students performing animal research must follow local, state, and federal regulations. Research conducted at registered research institutions (e.g., university lab, medical center, NIH, etc.) must be reviewed and approved by that institution's Animal Care and Use Committee. Invasive studies which duplicate previous research by others should be avoided.

Rule 4: Procurement

- All animals must be legally acquired.
- Animals should be healthy and free of diseases that can be transmitted to humans or other animals.
- Animals may not be captured from or released into the wild without approval of authorized wildlife and public health officials.
- All animals are classified as laboratory animals on the first day of study. **Student Research Plan (Form 1A)** must be submitted for review and approval by a veterinarian *before* experimentation begins.

Rule 5: Housing

- NJAS and the Intel ISEF accepts two basic animal care guides on the care and use of laboratory animals: *Federal Animal Welfare Act*, and the *Guide for the Care and Use of Laboratory Animals*. For farm animals, use the *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (Agri-Guide)*. (See Part H: “Sources of Information for Animal Care and Use” for listings.) Any deviations from these guides must be approved by an Animal Care Supervisor.
- Animals must be housed in clean, ventilated, comfortable environments compatible with the standards and requirements appropriate for the species used. Animals must have adequate lighting, humidity and controlled temperature (with as little variation as possible), and have sanitizable cages of adequate sizes for the typical activities and social interactions of the species (unless individual housing is dictated by experimental protocol).
- The conditions above are especially critical with experiments involving small, common laboratory animals (*e.g.*, mice, rats, hamsters, guinea pigs, gerbils, rabbits). The health and well-being of the animals should always be the highest consideration. Because the school setting is not always suitable, the student's home environment setting needs to be compared to the school setting by the student *and* the Adult Sponsor when deciding where to house the animals and conduct the experiment. Which setting is the best for maintaining the environment, housing and husbandry standards?

Rule 6: Husbandry

- Animals must be treated kindly and cared for properly.
- Animals must be given a continuous, clean (uncontaminated) water and food supply. Food should meet the nutritional requirements of the particular species. Watering and feeding devices should be cleaned frequently.
- Proper care must be provided at all times including weekends, holidays, and vacation periods. Animals must be observed DAILY to assess their health and well-being.
- Cages, pens, and fish tanks must be cleaned frequently. A highly absorbent bedding should be used in cages and pens. Hardwood chips are recommended (do not use cedar) and can be obtained from local pet or feed stores. Do not use newspaper or paper towels because inks may be carcinogens and adversely affect liver enzyme function.
- If an unexpected illness or emergency occurs, animals must have proper veterinary medical and nursing care under the direction of a veterinarian.

Rule 7: Experimental Conditions

- **Experiments designed to kill vertebrate animals are not permitted.** However, experimental designs incorporating humane euthanasia are permitted.
- Experimental procedures that cause unnecessary pain or unnecessary discomfort or unnecessary death to any vertebrate animals, including operant conditioning with aversive

stimuli and predator/prey experiments, **are prohibited** (e.g., mammals, birds, reptiles, amphibians, fish).

- Research on animals involving anesthetics, drugs, thermal procedures, physical stress, organisms pathogenic for humans or other vertebrates, ionizing radiation, carcinogens, mutagens, tumors, or surgical procedures **must be directly supervised** by a Qualified Scientist or Designated Supervisor within a hospital, school, or clinical/research institution.
- The use of alcohol, acid rain, insecticide, herbicide and heavy metal in toxicity or behavioral studies on live vertebrates **is prohibited**.
- Research in nutritional deficiency, ingestion, inoculation or exposure to hazardous or reputedly toxic materials or drugs is permitted to proceed only to the point where signs or lesions of the deficiency or toxicity first appear. Appropriate measures must then be taken to correct the deficiency, toxicity or drug effect, if such action is feasible. If not, the animal(s) must be euthanized.
- Food or water deprivation should be appropriate to the species, but may not exceed 24 hours.
- Weight loss is one significant sign of stress or toxicity. **Maximum permissible weight loss or growth retardation** (compared to controls) of any experimental or control animal(s) **is 15 percent**.
- **LD 50**: LD means lethal dose or death rate. **A death rate of 50 percent or greater** in any group or subgroup, by design or as an unexpected result of experimental procedure **is not permitted** and the project will fail to qualify for competition.

Rule 8: Euthanasia

- Proper euthanasia at the end of experimentation for tissue removal and/or pathological analysis is permitted.
- Only the Animal Care Supervisor, Qualified Scientist, or the Designated Supervisor may perform euthanasia. **Student researchers may perform euthanasia only in an emergency.**
- Methods of Euthanasia
 1. **Acceptable** Methods of Euthanasia: administration of barbituric acid derivatives in conformance with applicable laws; inhalation of gas anesthetic in a well ventilated area; induced narcosis with carbon dioxide or nitrogen for common laboratory animals; use of MS-222 and hypothermia with subsequent cervical dislocation for cold-blooded aquatic species.
 2. **Unacceptable** Methods of Euthanasia: injection of air, or any product containing strychnine, curare, succinylcholine or other neuromuscular blocking agents; guillotine, decapitation and cervical dislocation without prior anesthesia; exhaust fumes; chloroform or ether; stunning blows to the head; microwaves. These methods are unacceptable for student research projects regardless of who conducts the procedure.

Rule 9: Any proposed changes in the **Student Research Plan (Form 1A)** after initial approval by a veterinarian must have subsequent approval before such changes are made and before experimentation resumes.

Rule 10: *Copies* of both the **Student Research Plan (Form 1A)** and the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** must be available for review by the NJAS Regional Director (or his/her representative) and the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Part E: BRIEF Summary of Rules & Regulations Involving Vertebrate Animals

- Must adhere to the Position Statement on Use of Animals in Pre-College Science Research.
- Alternatives to the use of vertebrate animals for research must be explored.
- All studies involving nonhuman vertebrate animals must have a Qualified Scientist (exceptions given in Part A: “Background Information”).
- Proper animal care must be provided daily including weekends, holidays and vacations.
- Experiments designed to kill vertebrate animals are not permitted.
- Experimental procedures that cause unnecessary pain or discomfort or death on any vertebrate animals, including operant conditioning with aversive stimuli and predator/prey experiments, are prohibited (e.g., mammals, birds, reptiles, amphibians, fish.)
- LD(50) or higher in any group or subgroup is not permitted.
- Students may not perform euthanasia, except in emergency situations.
- Use of alcohol, acid rain, insecticide, herbicide, and heavy metal in toxicity or behavioral studies on live vertebrates is prohibited.
- Proposed research *must be reviewed and approved* by a veterinarian before experimentation begins.
- *Copies* of both forms must be available for review at a NJAS Science Fair competition.

Part F: SPECIAL Instructions for Completing the Student Research Plan (Form 1A)

- The **Student Research Plan (Form 1A)** asks for a description of methods and procedures. Projects that involve vertebrate animals require a detailed description that includes the specifics listed below:
 - 1) Describe in detail how the animals will be used. Include methods and procedures, such as experimental design and data analysis. Identify the kind of animal, number of animals proposed for use, and where they will be obtained.

- 2) Describe the procedures that will minimize the potential for discomfort, distress, pain and injury to the animals during the course of experimentation. Invasive studies which duplicate previous research by others should be avoided. Any procedures that will cause discomfort to animals is *strongly discouraged*.

Part G: Instructions for Facilitating Projects Involving Vertebrate Animals

- Studies involving animals in their natural environment as well as animals in zoological parks with no interaction between the experimenter and the subject animal(s) do **NOT** require the signature of a Qualified Scientist or Designated Supervisor on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- To conduct any other research with vertebrate animals the student (and/or Adult Sponsor) *must* enlist the help of a veterinarian (Qualified Scientist) and a qualified Animal Care Supervisor.
- The **Student Research Plan (Form 1A)** *must be* submitted to a veterinarian for review. If the project is approved, the veterinarian signs the “Qualified Scientist Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** and agrees to supervise the experiment.
- If the Qualified Scientist cannot be present during the experimentation a Designated Supervisor must agree to supervise the experimentation and must sign the “Designated Supervisor Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- After completion, the two forms (**Forms 1A and 2A**) are submitted to the Adult Sponsor.
- Experimentation begins only after the two forms are on file with the Adult Sponsor.
- The Adult Sponsor keeps the completed forms on file for liability purposes. Students with projects involving vertebrates *must* have **copies** of the completed **Student Research Plan (Form 1A)** and the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** available for review by the NJAS Regional Director (or his/her representative) and the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Part H: Sources of Information for Animal Care and Use

1) *Guide for the Care and Use of Laboratory Animals, Institute of Laboratory Animal Resources (ILAR)*, National Research Council, 1996. <http://www4.nas.edu/cls/ilarhome.nsf>

2) *Principles and Guidelines for the Use of Animals in Precollege Education* (a free pamphlet from ILAR)

To order contact:

National Academy Press

2101 Constitution Avenue, NW

Lockbox 285, Washington, DC 20055

phone: 888-624-8373 or 202-334-2590

fax: 202-334-1687; website: <http://www.nap.edu>

3) Federal Animal Welfare Act (AWA)
7 U.S.C. 2131-2157
Subchapter A - Animal Welfare (Parts I, II, III)
Above document is available from:
Animal Care
Animal and Plant Health Inspection Service (APHIS)
U.S. Department of Agriculture
12th & Independence Avenue, SW, Washington, DC 20250
<http://www.aphis.usda.gov/ac/info.html>

4) *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (Agri-Guide)*
American Dairy Science Association
1111 N. Dunlap Avenue, Savoy, IL 61874
(217) 356-3182
<http://www.adsa.uiuc.edu>

Part I: Sources of Information for Alternative Research and Animal Welfare

1) The National Library of Medicine provides computer searches through MEDLINE under the key phrase "Animal Welfare".

Reference Librarian
National Library of Medicine
8600 Rockville Pike, Bethesda, MD 20894
1-888-FIND-NLM or 1-888-346-3656
(301) 496-5983
<http://www.nlm.nih.gov>

2) National Agriculture Library (NAL) provides reference service for materials that document a) Alternative Procedures to Animal Use and b) Animal Welfare.

Animal Welfare Information Center
National Agriculture Library
5th Floor, 10301 Baltimore Blvd.
Beltsville, MD 20705-2351
phone: (301) 504-6212, fax: (301) 504-7125
website: <http://www.nal.usda.gov/awic>

3) Institute of Laboratory Animal Resources (ILAR) provides a variety of information on animal sources, housing and handling standards, and alternatives to animal use through annotated bibliographies published quarterly in ILAR Journal.

Institute for Laboratory Animal Research (ILAR), NAS 347
2101 Constitution Avenue, NW
Washington, DC 20418
phone: (202) 334-2590, fax: 202-334-1687
email: ILAR@nas.edu

<http://www4.nas.edu/cls/ilarhome.nsf>

Quarterly bibliographies of Alternatives to the Use of Live Vertebrates in Biomedical Research and Testing may be obtained from:

National Library of Medicine

8600 Rockville Pike

Bethesda, MD 20894

1-888-FIND-NLM or 1-888-346-3656

<http://www.sis.nlm.nih.gov>

4) Euthanasia Guidelines

1993 Report of the AVMA Panel on Euthanasia published in the Journal of the American Veterinary Medical Association (JAVMA), Vol. 203, No. 2: 229-249, 1993.

Part J: Sources of Information for Other Federal Laws That May Apply

1) Endangered Species Acts (16 U.S.C. 1531)

U.S. Fish & Wildlife Service

Division of Endangered Species

Department of the Interior

1849 C Street, NW

Washington, DC 20240

<http://endangered.fws.gov/whatwedo.html>

Chapter 4: Projects Involving Pathogenic Agents

Part A: Background Information

NJAS strongly discourages junior high/middle school students from doing projects involving micro-organisms other than with protists and Baker's or brewer's yeasts. If research with micro-organisms is conducted it must be done with the following guidelines.

- For purposes of NJAS Rules and Regulations ALL micro-organisms isolated from the environment are considered pathogenic with the exception of protists.
- Projects involving protists isolated from the environment are exempt and **do NOT** require a Qualified Scientist signature on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- Projects involving agricultural use of animal waste as fertilizer are exempt and **do NOT** require a Qualified Scientist or Designated Supervisor signature on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- Projects using micro-organisms purchased through a biological supply company and known to be non-pathogenic are exempt and **do NOT** require a Qualified Scientist or Designated Supervisor signature on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.

- Projects using E. coli strain K12 and Baker's and brewer's yeasts are **not** considered to involve pathogens and **do NOT** require a Qualified Scientist or Designated Supervisor signature on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.

Part B: Roles and Responsibilities of the Adults

1) Adult Sponsor:

- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible for the health and safety of the student conducting the research.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to research involving pathogenic agents. The issues must be discussed with the student when completing the required forms for ALL projects.
- Adult Sponsor needs to read and be familiar with the information provided in this chapter *before* allowing students to design/conduct experimental research involving pathogenic agents.

2) Qualified Scientist:

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Qualified Scientist must be a medical doctor or medical technologist.

- The Qualified Scientist must be thoroughly familiar with the local, state, and federal regulations that govern the student's area of research.
- Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as outlined above.
- Student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor who has been trained in the techniques the student will use.

3) Designated Supervisor:

- Designated Supervisor is an adult who supervises a student's experiment.
- Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student's project, and must be trained in the student's area of research.
- Adult Sponsor may act as the Designated Supervisor.

Part C: Rules and Regulations Involving Pathogenic Agents

Rule 1: Students are allowed to experiment with pathogenic agents as long as the students adhere to federal regulations and guidelines, which are designed to protect the safety of

researchers. Carelessness and improper techniques in working with pathogenic and non-pathogenic agents can lead to laboratory- and/or field-contracted infections.

Rule 2: Research involving pathogenic agents must be approved by a Qualified Scientist (medical doctor or medical technologist) *before* experimentation begins.

Rule 3: Pathogenic agents are disease-causing agents such as bacteria, viruses, viroids, prions, rickettsia, fungi, or parasites. For purposes of these rules, the term “Pathogenic Agent” applies to ALL pathogenic agents whether they infect humans, vertebrates, invertebrates or plants.

Rule 4: When using pathogenic agents, student researchers and their Adult Sponsors are required to follow standard microbiological practices, as defined in *Biosafety in Microbiological and Biomedical Laboratories* (see reference listing in Part E “Sources of Information”).

Rule 5: *Organisms collected, isolated, and/or cultured from any environment during student research projects are considered pathogenic with the exception of protists. Raw or partially-processed human or animal waste is considered to contain pathogenic agents.*

Rule 6: Student research with pathogenic agents may be performed only under the direct supervision of an experienced Qualified Scientist (medical doctor or medical technologist) or Designated Supervisor in an institutional laboratory, including a school if facilities are adequate and appropriate.

Rule 7: *Studies involving pathogenic agents are prohibited in a home environment, but specimens may be collected at home.*

Rule 8: Studies on microorganisms with multiple antibiotic resistance must be conducted at a Registered Research Institution.

Rule 9: Any proposed changes in the **Student Research Plan (Form 1A)** by the student after initial approval by a medical doctor or medical technologist (Qualified Scientist) must have subsequent approval *before* such changes are made and *before* experimentation resumes.

Rule 10: *Copies of the two required forms must be available for review by the NJAS Regional Director (or his/her representative) and/or the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.*

Part D: Instructions for Facilitating Projects Involving Pathogenic Agents

- To conduct research with pathogenic agents the student (and/or Adult Sponsor) must enlist the expertise of a Qualified Scientist (medical doctor or medical technologist) with a microbiology specialty to oversee the project.
- The **Student Research Plan (Form 1A)** is submitted to the Qualified Scientist for review.

- If the Qualified Scientist approves the project and agrees to supervise the experimentation, then he/she must sign the “Qualified Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- If the Qualified Scientist cannot be present during the experimentation a Designated Supervisor must agree to supervise the experimentation and *must sign* the “Designated Supervisor Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- After completion, the two forms (**Forms 1A and 2A**) are submitted to the Adult Sponsor.
- Experimentation begins only after the two forms are on file with the Adult Sponsor.
- The Adult Sponsor should keep all the forms on file for liability purposes. Students with projects involving pathogenic agents *must* have copies of the completed **Student Research Plan (Form 1A)** and the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** available for review by the NJAS Regional Director (or his/her representative) and the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Part E: Sources of Information___

Biosafety in Microbiological and Biomedical Laboratories
(BMBL) - 4th Edition. Published by CDC-NIH, To order contact:
Office of Health and Safety
Centers for Disease Control and Prevention
1600 Clifton Road, NE Mailstop F05
Atlanta, GA 30333
website: <http://www.cdc.gov/od/ohs/biosfty/biosfty.htm>

Bergey's Manual of Systematic Bacteriology (four volumes).
(1984, 1986, 1989), Baltimore: Williams & Wilkins.
To order contact:
Lippincott Williams and Wilkins
P.O. Box 1600, Hagerstown, MD 21741
phone: (301) 223-2403 or (800) 638-3030
<http://www.lww.com> or <http://www.cme.msu.edu/bergeys/>

American Type Culture Collection
(703) 365-2700; 1(800) 638-6597 (US, Canada, & Puerto Rico)
<http://www.atcc.org>

Chapter 5: Projects Involving Controlled Substances

Part A: Background Information

Controlled substances include Drug Enforcement Administration (DEA) classed substances, prescription drugs, alcohol, and tobacco. These substances must be acquired and used according to existing local, state, and federal laws.

Part B: Roles and Responsibilities of the Adults

1) Adult Sponsor:

- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible for the health and safety of the student conducting the research.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to research involving controlled substances. The issues must be discussed with the student when completing the required forms for ALL projects and the special forms required for research involving controlled substances.
- Adult Sponsor needs to read and be familiar with the information provided in this chapter before allowing any students to design/conduct experimental research involving controlled substances.

2) Qualified Scientist:

- Qualified Scientist should possess an earned doctoral/ professional degree in the biomedical sciences. However, a master's degree with equivalent experience and/or expertise in the student's area of research is acceptable. Qualified Scientists include medical doctors.
- Qualified Scientist must be thoroughly familiar with the local, state, and federal regulations that govern the student's area of research.
- Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as outlined above.
- Student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor who has been trained in the techniques the student will use.

3) Designated Supervisor:

- Designated Supervisor is an adult who supervises a student's experiment.
- Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student's project, and must be trained in the student's area of research.
- Adult Sponsor may act as the Designated Supervisor.

Part C: Rules and Regulations Involving Controlled substances

Rule 1: Students are allowed to experiment with controlled substances as long as the students adhere to federal regulations and guidelines, which are designed to protect the safety of researchers.

Rule 2: Student researchers must adhere to all federal regulations governing controlled substances. For further information, contact the regulatory agencies listed in Part E “Sources of Information”.

Rule 3: Production of alcohol is federally regulated and students must contact the Bureau of Alcohol, Tobacco and Firearms for regulations (see Part E “Sources of Information” for contact information).

Rule 4: Only under the *direct supervision* of a Qualified Scientist or Designated Supervisor may a student use any federally-controlled or experimental substances for experimentation.

Rule 5: Any proposed changes in the **Student Research Plan (Form 1A)** by the student after approval by a Qualified Scientist and/or Designated Supervisor must have subsequent approval *before* such changes are made and *before* experimentation begins/resumes.

Rule 6: *Copies* of the two required forms must be available for review by the NJAS Regional Director (or his/her representative) and/or the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Part D: Instructions for Facilitating Projects Involving Controlled Substances

- To conduct research with controlled substances the student (and/or Adult Sponsor) must enlist the expertise of a Qualified Scientist (medical doctor) to oversee the project.
- The **Student Research Plan (Form 1A)** is submitted to the Qualified Scientist for review.
- If the Qualified Scientist approves the project and agrees to supervise the experimentation, then he/she must sign the “Qualified Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- If the Qualified Scientist cannot be present during the experimentation a Designated Supervisor must agree to supervise the experimentation and *must sign* the “Designated Supervisor Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- After completion, the two forms (**Forms 1A and 2A**) are submitted to the Adult Sponsor.
- Experimentation begins only after the two forms are on file with the Adult Sponsor.
- The Adult Sponsor should keep all the forms on file for liability purposes. Students with projects involving controlled substances *must have copies* of the completed **Student Research Plan (Form 1A)** and the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**

available for review by the NJAS Regional Director (or his/her representative) and the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Part E: Sources of Information

Prescription Drugs

Superintendent of Documents

U.S. GPO

Washington, DC 20402

(202) 512-1800

http://www.access.gpo.gov/su_docs

Alcohol, Tobacco and Firearms

The Bureau of Alcohol, Tobacco and Firearms

650 Massachusetts Ave., N.W.

Washington, DC 20226

<http://www.atf.treas.gov>

Distilled Spirits and Tobacco Branch - (202) 927-5000

Firearms & Explosives Division - (202) 927-8300

Narcotics and Addictive Drugs

The Drug Enforcement Administration*

Information Services Section

2401 Jefferson Davis Hwy., Alexandria, VA 22301

Washington, DC 20537

phone: (202) 307-7255; website: <http://www.usdoj.gov/dea>

*Contact appropriate state agencies concerning additional regulations.

Chapter 6: Projects Involving Human or Nonhuman Vertebrate Animal Tissue

Part A: Background Information

- Several types of tissue are exempt, and do **NOT** require prior approval by a medical doctor (Qualified Scientist). These tissues include:
 - Plant tissue
 - Established cell and tissue cultures (e.g., those obtained from the American Type Culture Collection). Identify culture source and catalog number in the Student Research Plan Attachment.
 - Meat or meat by-products obtained from food stores, restaurants, or packing houses
 - Hair
- Projects using tissues that are exempt *do NOT* require the “Qualified Scientist Statement” signature on **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.

- All body fluids, including saliva and urine, are to be considered tissues for the purposes of student research. They are **NOT** exempt tissues and do require the “Qualified Scientist Statement” signature on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.

Part B: Roles and Responsibilities of the Adults

1) Adult Sponsor:

- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible for the health and safety of the student conducting the research.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to research involving human and nonhuman vertebrate animal tissue. The issues must be discussed with the student when completing the required forms.
- Adult Sponsor needs to read and be familiar with the information provided in this chapter *before* allowing any students to design/conduct experimental research involving human and nonhuman vertebrate animal tissue.

2) Qualified Scientist:

- Qualified Scientist should possess an earned doctoral/professional degree in the biological or medical sciences. Depending on the type of tissue being used in the project, Qualified Scientists might include: medical doctors, veterinarians, biologists, or biochemists.
- Qualified Scientist must be thoroughly familiar with the local, state, and federal regulations that govern the student’s area of research.
- Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as outlined above.
- Student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor who has been trained in the techniques the student will use.

3) Designated Supervisor:

- Designated Supervisor is an adult who supervises a student’s experiment.
- Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student’s project, and must be trained in the student’s area of research.
- Adult Sponsor may act as the Designated Supervisor.

Part C: Rules and Regulations Involving Human or Nonhuman Vertebrate Animal Tissue

Rule 1: Research involving human or nonhuman vertebrate animal tissue must be approved by a Qualified Scientist *before* experimentation begins.

Rule 2: Students conducting research on human blood, blood products or other body fluids must follow one of these conditions: a) tissue fluids are documented free of HIV and hepatitis B and C before the student receives them; b) tissues are handled in accordance with standards and guidelines set forth in Occupational Safety and Health Act, 29CFR, Subpart Z, 1910.1030 – *Blood Borne Pathogens*. In either condition, a Qualified Scientist is required to supervise the experimentation.

Rule 3: Students who use teeth in a research project must use those which are not capable of causing disease; regardless of the source (human, primate, shark, etc.) i.e. they must be sterilized. The method of decontamination should be determined by the mentor, but autoclaving is recommended (121 degrees Celsius for 30 minutes.)

Rule 4: Any proposed changes in the **Student Research Plan (Form 1A)** by the student after initial approval by a Qualified Scientist must have subsequent approval *before* such changes are made and *before* experimentation resumes.

Rule 5: *Copies* of both completed forms (**Forms 1A and 2A**) must be available for review by the judges and the NJAS Regional Director (or his/her representative) at the Regional Science Fair competition.

Part D: Instructions for Facilitating Projects Involving Human and Nonhuman Vertebrate Animal Tissue

- All projects involving human and non vertebrate animal tissue *require* completion of the “Qualified Scientist Statement” on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** *except* for those projects using “exempted” tissue as outlined in Part A: “Background Information”.
- The student (and/or Adult Sponsor) must enlist the expertise of a Qualified Scientist who has thorough knowledge of the student’s area of research.
- The **Student Research Plan (Form 1A)** is submitted to the Qualified Scientist for review.
- If the Qualified Scientist approves the project and agrees to supervise the experimentation, he/she must sign the “Qualified Scientist” Statement on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.
- After completion, the two forms (**Forms 1A and 2A**) are submitted to the Adult Sponsor.
- Experimentation begins only after the two forms are on file with the Adult Sponsor.
- The Adult Sponsor should keep all the forms on file for liability purposes. Students with projects involving animal tissue *must have copies* of the completed **Student Research Plan**

(Form 1A) and the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)** available for review by the NJAS Regional Director (or his/her representative) and the judges at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder.

Part E: Sources of Cultures

American Type Culture Collection
1081 University Boulevard
Manassas, VA 20110-2209
(703) 365-2700 or (800) 638-6597
<http://www.atcc.org>

Carolina Biological Supply Company
Main Office and Laboratories
2700 York Rd.
Burlington, NC 27215
(336) 584-0381 or (800) 334-5551
<http://www.carolina.com>

Chapter 7: Projects Involving Hazardous Substances or Devices

Part A: Background Information

Students conducting research involving hazardous substances or devices must adhere to federal and state regulations governing hazardous substances or devices which are designed to protect the safety of the researchers.

Part B: Roles and Responsibilities of the Adults

1) Adult Sponsor:

- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible for the health and safety of the student conducting the research.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to research involving hazardous substances and devices. The issues must be discussed with the student when completing the required forms for ALL projects and the special forms required for research involving hazardous substances and devices.
- Adult Sponsor needs to read and be familiar with the information provided in this chapter *before* allowing any students to design/conduct experimental research involving hazardous substances and devices.

2) Designated Supervisor:

- Designated Supervisor is an adult who supervises a student's experiment. Appropriate individuals might include: chemistry teachers (for research involving flammable or explosive compounds), physic teachers (for research involving lasers or radiation), or police (for research involving firearms).

- Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student's project, and must be trained in the student's area of research.
- Adult Sponsor may act as the Designated Supervisor.

Part C: Rules and Regulations Involving Hazardous Substances or Devices

Rule 1: The use of hazardous chemicals and equipment, firearms, radioactive substances and radiation require proper supervision by a Designated Supervisor. The Designated Supervisor must be directly responsible for overseeing the student experimentation.

Rule 2: Student researchers working with hazardous substances or devices must follow proper safety procedures for each chemical or device used in the research. Flammable, explosive or highly toxic chemicals are of particular concern. Also included are mutagens and carcinogens as well as chemical mixtures found in pesticides.

Rule 3: For all research requiring a Federal and/or State Permit, the student/Designated Supervisor will be expected to have the permit prior to the onset of experimentation.

Rule 4: Use of radiation and radioactive substances are tightly regulated. Students should strictly adhere to safety standards of the authorized institution where such substances/devices are used in the research.

Rule 5: Students under 21 are prohibited by federal and most state laws from purchasing and/or handling smokeless powder or black powder for science projects. (For further regulations, contact the Firearms & Explosives Division of the Bureau of Alcohol, Tobacco, and Firearms listed in Part E "Sources of Information".)

Rule 6: Differentiation between hazardous and non-hazardous chemicals can best be determined by utilizing the Materials Safety Data Sheets (MSDS).

Rule 7: *Copies* of all signed forms, certifications, and state or federal permits (if required) *must be* available for review by the NJAS Regional Director (or his/her representative) at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder on the display table.

Part D: Instructions for Facilitating Projects Involving Hazardous Substances or Devices

- The student (and/or Adult Sponsor) must enlist the expertise of a Designated Supervisor (see Part B for role and responsibilities) who has thorough knowledge of the student's area of research.
- The **Student Research Plan (Form 1A)** is submitted to the Designated Supervisor for review.
- If the Designated Supervisor approves the project and agrees to supervise the experimentation, he/she must sign the "Designated Supervisor Statement" on the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**.

- After completion, the two forms (**Forms 1A and 2A**) are submitted to the Adult Sponsor.
- Experimentation begins after the two forms are on file with the Adult Sponsor.
- The Adult Sponsor should keep all the forms on file for liability purposes. *Copies* of both completed forms (**Forms 1A and 2A**) and **copies** of any state or federal permits (if required) must be available for review by the judges and the NJAS Regional Director (or his/her representative) at the Regional Science Fair competition. It is recommended these be kept in a notebook or folder on the display table.

Part E: Sources of Information on Chemicals

Safety in Academic Chemistry Laboratories, 1995.

Washington, DC: American Chemical Society.

Order from (first copy free of charge):

American Chemical Society
Office of Society Services
1155 16th Street, NW
Washington, DC 20036
phone: (202) 872-4615 or 1-800-227-5558

Material Safety Data Sheets (MSDS)

MSDS should be collected by your laboratory or available from the manufacturer. The internet also has a range of free resources: <http://www.ilpi.com/msds/index.html>

Part F: Sources of Information on Lasers and Radiation/Radioactive Substances

U.S. Department of Labor

Occupational Safety and Health Administration (OSHA)

Publications Office

200 Constitution Avenue, N.W.

Washington, DC 20210

phone: (202) 693-1999

<http://www.osha.gov>

PUB 8-1.7 - Guidelines for Laser Safety and Hazard Assessment

STD 1-4.1 - OSHA Coverage of Ionizing Radiation Sources Not Covered by Atomic Energy Act of 1954

Part G: Sources of Information on Radioisotopes and Radioactive Substances

John Hickey

U.S. Nuclear Regulatory Commission

Material Safety and Inspection Branch

11555 Rockville Pike

Rockville, MD 20852

phone: (301) 415-7000

<http://www.nrc.gov>

Part H: Sources of Information on Firearms

Local Police Department or State Police

The Bureau of Alcohol, Tobacco and Firearms

650 Massachusetts Ave., NW

Washington, DC 20226

Firearms & Explosives Division:

phone: (202) 927-8300 and website: <http://www.atf.treas.gov>

Chapter 8: Adults Involved in a Science Project--Roles and Responsibilities

The purpose of this section is to explain the roles and responsibilities of different adults that may be involved in a student's research project. ALL projects require the Adult Sponsor. Projects that pose risk to the students and/or to the research organisms as outlined in Chapters 2-7 involve other adults.

Part A: The Adult Sponsor

- Adult Sponsor may be a teacher, parent, university professor, or scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project.
- Adult Sponsor is ultimately responsible not only for the health and safety of the student conducting the research, but also for the humans or animals used as subjects.
- Adult Sponsor must review the student's Student Research Plan Form (Form 1A) to make sure that: a) experimentation is done within local, state, and federal laws and the NJAS Rules; b) that forms are completed by other adults involved in approving or supervising any part of the experiment; and c) that criteria for the qualified scientist adhere to those set forth in the NJAS Guidelines.
- Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to a specific student project. These may include chemical and equipment usage, experimental techniques, research involving human or nonhuman animals, and cell cultures, microorganisms, or animal tissues. The issues must be discussed with the student when completing the Student Research Plan Form (Form 1A). Some experiments involve procedures or materials that are regulated by state and federal laws. If not thoroughly familiar with the regulations, the Adult Sponsor should help the student enlist the aid of a Qualified Scientist and/or Designated Supervisor.
- Adult Sponsor is responsible for ensuring the student's research is eligible for entry in the Nebraska Junior Academy Science Fair.

Part B: The Qualified Scientist

- Qualified Scientist, depending on the special supervision required for the project, might be a medical doctor, veterinarian, medical technologist, chemistry or physics teacher, or police officer.
- Qualified Scientist must be thoroughly familiar with the local, state, and federal regulations that govern the student's area of research.
- Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as outlined above.
- A student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor who has been trained in the techniques the student will use.

Part C: The Designated Supervisor

- Designated Supervisor is an adult who supervises a student's experiment.
- In the case of hazardous substances or devices, a Designated Supervisor is directly responsible for overseeing student experimentation. A Qualified Scientist may or may not be necessary.
- Designated Supervisor need not have an advanced degree, but should be thoroughly familiar with the student's project, and must be trained in the student's area of research.
- The Adult Sponsor may act as the Designated Supervisor.
- If a student is experimenting with live vertebrates and the animals are in a situation where their behavior or habitat is influenced by humans, the Designated Supervisor must be knowledgeable about the humane care and handling of the animals. If the Designated Supervisor is not knowledgeable, the Adult Sponsor must ensure that the student enlists the help of an Animal Care Supervisor.
- If a student is using hazardous substances or devices, the Designated Supervisor must be thoroughly knowledgeable about the project and must be directly responsible for overseeing the student experimentation.

Part D: The Animal Care Supervisor

- Animal Care Supervisor is required for all nonhuman vertebrate animal projects and must be familiar with the proper care and handling of research animals used in the project.
- The Adult Sponsor or Qualified Scientist or Designated Supervisor usually serves as the Animal Care Supervisor.

Chapter 9: NJAS Science Fair Display and Safety Regulations

Part A: Display/Exhibit Size

Exhibit size for a display sitting on a table is limited to 76 cm (30 in.) deep, front to back; 122 cm (48 in.) wide, side to side; and 198 cm (78 in.) high. If the display is on the floor it is limited to 274 cm (108 in.) high from floor to top with the same depth and width as the table display. Any exhibit/display board exceeding these dimensions will be disqualified at the Regional Science Fair.

Part B: Materials NOT Allowed at Project

- Living organisms, including plants, animals and microbes
- Taxidermy specimens or parts
- Preserved vertebrate or invertebrate animals
- Human or animal food
- Human/animal parts or body fluids (for example, blood, urine)
- Plant materials (living, dead or preserved) usually which were part of the scientific experimentation and which are in their raw, unprocessed, or non-manufactured state (Exception: manufactured construction materials used in building the project or display)
- Laboratory/household chemicals including water
- Poisons, drugs, controlled substances, hazardous substances or devices (for example, firearms, weapons, ammunition, reloading devices)
- Dry ice or other sublimating solids
- Sharp items (for example, syringes, needles, pipettes, knives)
- Flames or highly flammable materials
- Batteries with open-top cells
- Photographs or other visual aides depicting vertebrate animals in surgical techniques, dissections, necropsies or other lab procedures, improper housing conditions, etc.
- Lasers, except for the use of laser pointers during presentations

Part C: Allowed at Project, BUT with the Restrictions Indicated

- Any apparatus with unshielded belts, pulleys, chains, or moving parts with tension or pinch points may not be operated.
- Any scientific apparatus or invention may be displayed, but not operated. Apparatus must conform to the other display safety rules, such as no water or flames.

Part D: Electrical Regulations at the NJAS Science Fairs

- Presentation equipment requiring AC electrical circuits must have a UL-listed extension cord appropriate for the equipment. Availability of electrical outlets is **NOT** guaranteed.
- All electrical work must conform to the National Electrical Code or exhibit hall regulations. The guidelines presented here are general ones, and other rules may apply to specific configurations. The on-site electrician may be requested to review electrical work.
- All electrical connectors, wiring, switches, extension cords, fuses, etc. must be UL-listed and must be appropriate for the load and equipment. Connections must be soldered or made with UL-listed connectors. Wiring, switches, and metal parts must have adequate insulation and overcurrent safety devices (such as fuses) and must be inaccessible to anyone but the student with the display. Exposed electrical equipment or metal that is liable to be energized must be

grounded or shielded with a nonconducting material or with a grounded metal box or cage to prevent accidental contact.

- There must be an accessible, clearly visible on/off switch or other means of disconnect from the 120 or 220 Volt power source.
- Wiring which is not part of a commercially available UL-listed appliance or piece of equipment must have a fuse or circuit breaker on the supply side of the power source and prior to any project equipment.

Chapter 10: NJAS Forms Required for Junior High/Middle School Students

The NJAS forms for junior high/middle school projects are on the following three pages. These forms may be duplicated as needed. Forms 1 A and 2 A are required for *all* projects. Form 3 A may be required for projects involving humans (refer to Ch. 2). The forms are: the **Student Research Plan (Form 1A)**, the **Adult Sponsor Safety Assessment and Approval Form (Form 2A)**, and the **Informed Consent Form (Form 3A)**.