IV. Recombinant and Synthetic Nucleic Acids, Gene Transfer and Transgenic Organisms

IV.1. Introduction

Recombinant and synthetic nucleic acids are defined as (1) molecules that a) are constructed by joining nucleic acid molecules and b) that can replicate in a living cell, i.e., recombinant nucleic acids, (2) nucleic acid molecules that are chemically or by other means synthesized or amplified, including those that are chemically or otherwise modified but can base pair with naturally occurring nucleic acid molecules, i.e., synthetic nucleic acids, or (3) molecules that result from the replication of those described in (1) or (2) above.

All work with recombinant and synthetic nucleic acid molecules must be registered with the ORRP and, if the research is not exempt from full committee review under the *NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules* (*NIH Guidelines*), also approved by the IBC. Investigators must understand that the poor wording used in the *NIH Guidelines i.e., “exempt from the NIH Guidelines”*, means only that the work need not be approved by the IBC. Good laboratory practices and containment procedures are to be followed by all individuals using recombinant and synthetic nucleic acids at The Ohio State University. Exempted research is also subject to inspection by the Institutional Biosafety Officer or other OEHS personnel.

All Principal Investigators intending to use recombinant and synthetic nucleic acid molecules shall notify the IBC by submitting an electronic research protocol (e-Protocol) according to the nature of the research. All recombinant and synthetic nucleic acid research falls into the six classes below:

- Experiments that require IBC approval, RAC review, and NIH director approval before initiation
- Experiments that require NIH/OBA and IBC approval before initiation
- Experiments that require IBC and IRB and RAC review before research participant enrollment
Experiments that require IBC approval before initiation
Experiments that require IBC notice simultaneous with initiation
Exempt experiments.

Experiments involving the generation of recombinant and synthetic nucleic acids require, at a minimum, registration with the Institutional Biosafety Committee (IBC). Some experiments also require approval of the IBC. The NIH Guidelines are applicable to all research conducted at or sponsored by an institution that receives funds from the National Institutes of Health for recombinant and synthetic nucleic acid research. The University is required to monitor all recombinant and synthetic nucleic acid research. Compliance is required to protect employees, the community, and the environment from the creation and release of any novel organisms that might be pathogenic to man, animals, and plants or harmful to the environment.

The NIH Guidelines deal primarily with laboratory research and human gene-therapy protocols. A few types of experiments are prohibited by the Guidelines and several others require prior approval by NIH. The rest come under the jurisdiction of the OSU IBC, which reviews the research and sets the level of biosafety and containment necessary to safely conduct the experiments. In recent years, the Guidelines have been relaxed considerably and much of the recombinant and synthetic nucleic acid research at the University is exempt from full committee review. But even the research that is exempted from full committee review must be registered and carried out using prudent laboratory practices.

Most regulated experiments involve hosts and/or genes that are derived from etiologic agents or have a known biohazard associated with them. The release of genetically-engineered organisms into the environment, their use as drugs or food products, and human gene-therapy protocols may be regulated by the USDA, EPA and FDA. The IBC may not have the sole authority to approve research in these areas and researchers may need to obtain permission from the federal agencies in addition to the IBC.

All protocols involving the generation of recombinant and synthetic nucleic acid molecules for human gene transfer must be approved by
the IBC prior to the enrollment of the first human subject.

Investigators who use transgenic plants or animals must submit a recombinant and synthetic nucleic acid protocol and submit it via e-Protocol to the IBC. The IBC will review the form to determine if IBC approval of the experiments is necessary.

**IV.2. Institutional Biosafety Committee (IBC)**

An Institutional Biosafety Committee (IBC) is required at all institutions that receive funding from the National Institutes of Health (NIH). The IBC is composed of researchers, administrators, OSU staff, and community members. The committee meets as needed to review research protocols and advise the University on matters of recombinant and synthetic nucleic acid safety or biosafety matters. Different subcommittees of the IBC review recombinant and synthetic nucleic acid experimentation, biohazard research, and gene transfer experiments. All recombinant and synthetic nucleic acid and gene transfer protocols are approved by the full committee. All recombinant and synthetic nucleic acid research at The Ohio State University (OSU), regardless of funding source, must be conducted in accordance with the [NIH Guidelines for Research Involving Recombinant and Synthetic Nucleic Acid Molecules](#) and must be registered with the OSU IBC.

The OSU IBC is further charged with reviewing and approving research conducted with human, plant, or animal pathogens. This review is conducted pursuant to the Centers for Disease Control and Prevention (CDC)/NIH publication, *Biosafety in Microbiological and Biomedical Laboratories* (currently in 5th edition, February 2007).

The OSU IBC in conjunction with the Office of Environmental Health and Safety also provides guidance to the OSU research community regarding proper acquisition, handling, transfer, and disposal of potentially hazardous or regulated biological materials. The Office of Responsible Research Practices (ORRP) will also provide assistance with IBC registrations and applications.
Additional information is provided at the ORRP Biosafety web page (http://orrp.osu.edu/ibc/about/) under the Investigator Guidance link. This site provides detailed descriptions of IBC registration requirements and the IBC review process.

IV.3. Principal Investigator’s Responsibilities

Under the NIH Guidelines a PI has the responsibility to:

1. Evaluate the proposed research and establish appropriate containment conditions for that research;
2. Inform all laboratory personnel of the potential hazards associated with the work;
3. Develop an appropriate safety plan and procedures to minimize potential personnel exposure to hazardous materials;
4. Insure that the host/vector systems used in all research projects are safe.
5. Ensure that all recombinant and synthetic nucleic acid waste is appropriately decontaminated prior to disposal.