

Policy 320: Transgenic Plants

I. PURPOSE

To prevent the accidental release or dissemination of transgenic or genetically altered plants, pollen, and/or seeds into natural ecosystems.

II. REGULATORY BACKGROUND

- i. All institutions that receive NIH funding for any research involving recombinant or synthetic nucleic acids (r/sNA) must comply with the *NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules (NIH Guidelines)*.
- ii. Experiments involving transgenic plants are subject to *NIH Guidelines* Section III-D-5, III-E-2, and Appendix L. All transgenic organisms must be rendered biologically inactive by appropriate methods before disposal outside the facility.
- iii. It is the policy of the Dartmouth Institutional Biosafety Committee (IBC) that all research involving transgenic plants and seeds must receive approval from the IBC prior to commencement.

III. DEFINITIONS

Transgenic plants: Plants in which the genome has been altered by either the introduction of recombinant or synthetic nucleic acid molecules into or the knockout of sequences from the germ line. Though nucleic acid molecules from another species can be integrated into a plant's genome via natural processes, the term "transgenic plants" refers to plants created in a laboratory using recombinant technology.

IV. RESPONSIBILITIES

- i. All Dartmouth College/Geisel School of Medicine Principal Investigators (PIs) must comply with the *NIH Guidelines* regardless of funding source. Failure to follow the *NIH Guidelines* can result in the suspension, limitation, or termination of NIH funds for all recombinant or synthetic DNA research at the College.
- ii. The PI is responsible for reporting the inadvertent release of transgenic plants, improper disposal of transgenic plants or other incidents in the laboratory or greenhouse or plant containment area to the Biosafety Officer, who shall report them to the IBC, EHS Director, and to the NIH, if deemed necessary. Please see below for reporting procedures.
- iii. The PI is responsible for training students, teaching assistants, and lab staff about the policies and procedures for transgenic plants and appropriate plant disposal.



V. PROCEDURES

A. Approvals

- i. Research (internal and extramural funding) activities that are conducted with the goal of producing transgenic plants by use of recombinant DNA technologies, as described in the *NIH Guidelines*, must be reviewed and approved by the Institutional Biosafety Committee (IBC).
- ii. Projects involving the use of transgenic plants or seeds that have already been created do not need to be registered with IBC, but these plants still need to be disposed of by the procedures outlined below.
- iii. Although some projects will qualify as exempt from the *NIH Guidelines*, all projects that involve the creation of transgenic plants must be registered with the IBC via BioRAFT. In very rare cases, the project may need to be referred to the NIH Office of Biotechnology Activity for federal review.

B. Containment of Transgenic Plants

- i. Appendix L of the *NIH Guidelines* specifies methods to prevent dissemination of plants. Researchers may also find it helpful to review [A Practical Guide to Containment: Plant Biosafety in Research Greenhouses](#) from Virginia Tech.
- ii. Principal Investigators and researchers must inform greenhouse managers of the presence of transgenic plants and any special handling conditions or permits that apply to the crop or experiment. Researcher, lab name, plant strain, and date should be on each flat of plants.
- iii. Non-transgenic plants that are not segregated from transgenic plants must be treated as transgenic, unless genetic transformation between plant species is known to not take place (i.e., from transgenic *Arabidopsis* to wild-type *Brassica rapa*).
- iv. Surfaces and floors in plant containment and greenhouse areas should be cleaned/mopped regularly with an appropriate disinfectant, such as Greenshield or Zerotel.

C. Maintenance of Transgenic Plants

- i. Transgenic plant growth should not extend beyond the borders of the assigned bench space unless specifically authorized by greenhouse staff.
- ii. Plants should be trimmed and staked regularly as needed to accomplish containment.
- iii. Flowers should be removed to prevent pollen dispersal in open pollinated transgenic plants unless the plants are self-pollinators or housed in containment as a single species. Materials harvested from transgenic plants in the greenhouse must be contained in a sturdy leak-proof container with a lid or other seal.
- iv. Abandoned or forgotten plants will be tagged for disposal if they have gone without care or tending for one month or longer and may be destroyed at the discretion of the greenhouse manager if no further action is taken by the owner.



D. Transport of Transgenic Plants

Transgenic plant material must be contained (i.e., container with lid or bagged in an open container) when being transported outside of the greenhouse, growth chambers or laboratory spaces.

E. Disposal of Transgenic Plants

- i. Transgenic plants and materials from transgenic plants (including seeds, soil, and fruit) must be inactivated prior to disposal to prevent accidental environmental release.
- ii. Render transgenic plants, soil, fruit, and seeds inactive by autoclaving. Place plant materials into an orange autoclave bag, add 250 mL water, loosely fasten the bag with autoclave tape, transport in secondary containment, and autoclave at 121°C for at least 60 minutes. Remove autoclaved waste from the autoclave and put into the large, clear bag waste containers for pickup.
- iii. Pots, trays and other hard plastic horticultural supplies in shared use should be thoroughly cleaned to eliminate and prevent survival of plant material or pathogens.
- iv. If an autoclave bag is being used for collection of plant material it must be removed from the greenhouse or contained within a sturdy container with a lid when work is not taking place. Open autoclave bags containing transgenic plant waste are not to be left on greenhouse floors or in common spaces when not in use.

F. Environmental Release of Transgenic Plants or Seeds

The Dartmouth IBC is authorized to approve research of transgenic plants grown in labs, growth chambers or the greenhouse. Any experiment conducted outside of these environments (i.e. field plots) constitutes a deliberate environmental release; for these experiments the researcher must obtain special Dartmouth IBC approval as well as USDA APHIS Field Test Permit. The IBC requires copies of Field Test Plot information and Permits prior to experiment startup.

USDA-APHIS e-authorization: <http://www.aphis.usda.gov/wps/portal/aphis/resources/permits>

VI. REPORTING A RELEASE

Notify the Biological Safety Officer (BSO) within 24 hours via email (biosafety@dartmouth.edu) or phone (603-646-9790). The BSO will investigate the incident and consult with the IBC Chair. If it is determined that the incident involves r/sNA molecules, the BSO will submit an incident report to the NIH Office of Biotechnology Activities within 30 days.

VII. RESOURCES

- *NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules (NIH Guidelines)*. National Institutes of Health Office of Science Policy, 84 FR 17858, 2019 April <https://osp.od.nih.gov/biotechnology/nih-guidelines/>
- Adair D and Irwin R. *A Practical Guide to Containment: Plant Biosafety in Research Greenhouses*, 2nd ed. Information Systems for Biotechnology at Virginia Tech, 2008. <https://vtechworks.lib.vt.edu/handle/10919/78423>