# INSTITUTIONAL BIOSAFETY COMMITTEE

# SAN JOSÉ STATE UNIVERSITY

# BIOLOGICAL USE AUTHORIZATION APPLICATION

# Attachment A. Recombinant Nucleic Acids, Synthetic Nucleic Acids, and Viral Vectors

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| Check all of the following that you propose to do in your research: | |
|  | Insertion of foreign nucleic acids into a vector or organism for the purpose of cloning. The nucleic acid to be cloned will:  be from a Risk Group 3 or 4 agent  represents more than two-thirds of the genome of a Risk Group 1 or 2 agent  encode a known oncogene  encode molecules known to be toxic  encode components that impart pharmaceutical resistance  integrate into DNA |
|  | Use of more than two-thirds of a viral genome |
|  | Construction and/or use of synthetic DNA/RNA (e.g., probes, DNA or RNA oligonucleotides, base-pair analogs) |
|  | Creation of cDNA libraries or genomic libraries |
|  | Transgenes are expected to alter virulence or infectivity, change resistance or susceptibility to drug therapy, or change host range |
|  | Recombinants or synthetics are deliberately created for the biosynthesis of toxin molecules with an LD50 of less than 100 ng/kg body weight |
|  | The host into which foreign DNA is introduced is a cell or organism other than *E. coli* K12 or its derivatives, *Saccharomyces cerevisiae*, *S. uvarum*, *Bacillus subtilis* or *B. licheniformis*. |
|  | Use of recombinant or synthetic nucleic acids in animals (somatic cells or germ-line transgenics) including insects, nematodes, and mammals (vertebrates and invertebrates).  Creation of a transgenic organism via introduction of recombinant or synthetic nucleic acid molecules or breeding. |
|  | Use of recombinant or synthetic DNA/RNA in plants (somatic cells or germ-line transgenics) |
|  | Potential for infectious agents to be produced/released from recombinant cells, animals (vertebrates and invertebrates), or plants. |
|  | Environmental release or field testing of genetically engineered organisms. |

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| A Standard Operating Procedure (SOP) must be attached that describes your methods for transforming the vector and host. A detailed step-by-step protocol is not necessary, but provide sufficient information on your procedures so that the committee can identify the steps that involve the greatest likelihood of worker or environmental exposure to biohazardous materials. Include the steps that will be conducted in a biological safety cabinet (including reagent and construct preparation). Consult the SOP template and the sample recombinant DNA SOP for other required components. |

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| N/A | 1. **Vectors.** |

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| Vector Name  (e.g., pET28b) | Vector Description  (e.g., bacterial expression plasmid) | Risk Group | Replication Incompetent  (Y/N) | Amphotropic  (Y/N) | Used in Animals (vertebrates and invertebrates)?  (Y/N) | Used in Plants?  (Y/N) |
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Complete a below table with additional details for each **viral** vector listed above. Copy and paste additional tables as needed.

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| Viral vector name: |  |
| Causes human disease: (Y/N) |  |
| Used in animals (vertebrates and invertebrates) or plants: (Y/N) |  |
| Replication incompetent: (Y/N) |  |
| If you derive a new vector from wild-type virus, or similarly use an early generation vector (for example, first generation), please describe the method by which you will verify replication incompetence. Specify the frequency of testing. | |
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| Provide an explanation of the hazards to humans and describe the possible modes of transmission: | |
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| Provide a detailed description of this vector and safety features of its design (such as which generation of viral vector, gene deletions, etc.): | |
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| N/A | 1. **Genes** |

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| Gene (Family) Name  (e.g., fluorescent proteins) | DNA Source(s)  (e.g., *Aequorea victoria, Discosoma coral*) | Immunogenic  (Y/N) | (Proto)oncogenic  (Y/N) | Toxigenic  (Y/N) | Pathogenic  (Y/N) | Teratogenic (Y/N) |
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Due to enhanced potential risk to personnel, additional details for each gene/gene family listed above that are **immunogenic, (proto)oncogenic, toxigenic** and/or **pathogenic** are required. Fill out one table per gene/gene family. Copy and paste additional tables as needed.

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| Gene or gene family name: |  |
| NCBI Gene ID: |  |
| Gene DNA sources: |  |
| Highest risk group of sources: |  |
| Expressed as RNA/protein: (Y/N); If yes, indicate RNA or protein |  |
| Immunogenic: (Y/N) |  |
| (Proto)oncogenic: (Y/N) |  |
| Toxigenic: (Y/N) |  |
| Enhances pathogenicity: (Y/N) |  |
| Pathogenic to humans: (Y/N) |  |
| Teratogenic: (Y/N) |  |
| Gene function is uncharacterized: (Y/N) |  |
| Associated vectors: |  |
| Describe the nature of cellular activity that will result if this gene is expressed or knocked down. | |
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| Provide an assessment of the hazardous potential of cloning, expressing or inhibiting the target of these DNA/RNA segments that encode substances that are immunogenic, (proto)oncogenic, teratogenic, toxigenic or enhance pathogenicity: | |
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| Will these genes be expressed in a host organism? If yes, please provide a brief description and any relevant hazards. | |
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| N/A | 1. **Hosts** |

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| Host Name  (e.g., *E. coli*) | Infectious Agent  (Y/N) | Bloodborne Pathogen  (Y/N) |
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For **each host** listed above, fill out a table with additional details.

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| Host name: |  |
| Risk group: |  |
| Infectious agent: (Y/N) |  |
| Bloodborne pathogen: (Y/N) |  |
| Host details (if applicable): |  |
| Vectors (from section 1 above): |  |
| Genes (from section 2 above): |  |

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| 4. Potential Environmental Impact Describe aspects of the protocol which could have potential or deliberate environmental impact. Discuss the possible consequences of an accidental release into local agricultural areas or natural ecosystems and how you will minimize that risk. If you plan to conduct a field trial, include the location and size of environmental release. |
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| **5. Section III of NIH Guidelines**  Check all of the registration categories that best describe your experiments involving recombinant/synthetic nucleic acids. You may need to check more than one category. For more detailed information about the types of recombinant/synthetic nucleic acid experiments covered under the Office of Science Policy (OSP) NIH Guidelines, refer to <https://osp.od.nih.gov/biotechnology/nih-guidelines/>.  **Note: While certain recombinant/synthetic nucleic acid experiments are considered by the** [***NIH Guidelines***](http://osp.od.nih.gov/office-biotechnology-activities/biosafety/nih-guidelines) **to be exempt (Section III-F and Appendix C), research of this nature is not exempt from review and oversight from the SJSU IBC.** | |
|  | **III-A. Experiments that require IBC Approval, RAC (Recombinant DNA Advisory Committee) Review, and NIH Director Approval Before Initiation**  1. The deliberate transfer of a drug resistance trait to microorganisms that are not known to acquire the trait naturally, if such acquisition could compromise the ability to control disease agents in humans, veterinary medicine, or agriculture. |
|  | **III-B. Experiments that require NIH OSP and IBC Approval Before Initiation**  Experiments involving the cloning of toxin molecules with LD50 of less than 100 ng per kg body weight (e.g., **microbial toxins** such as the botulinum toxins, tetanus toxin, diphtheria toxin, and *Shigella dysenteriae* neurotoxin). |
|  | **III-C. Experiments that require IBC, IRB, and RAC review registration before research participant enrollment**  Experiments involving the transfer of recombinant/synthetic nucleic acids into human subjects (**human gene transfer**) |
|  | **III-D. Experiments that require IBC approval before initiation**   * Experiments using Risk Group 2, Risk Group 3, Risk Group 4 or [restricted agents](http://www.selectagents.gov/SelectAgentsandToxinsList.html) as host-vector systems, including **adenoviral and lentiviral vectors** * Experiments in which DNA from Risk Group 2, 3, 4, or [restricted agents](http://www.selectagents.gov/SelectAgentsandToxinsList.html) is cloned into nonpathogenic bacteria or lower eukaryotic host-vector systems * Experiments involving the use of DNA or RNA viruses (infectious or defective) **in the presence of a helper virus** in tissue culture systems (This includes **AAV production** with adenovirus or HSV) * Experiments involving **any transgenic animal** (vertebrate or invertebrate) or the transfer of rDNA to any whole animal (vertebrate or invertebrate), at any biosafety level, **excluding** the generation or purchase of transgenic **rodents** under BSL-1/ABSL-1 containment.[**Click here**](https://osp.od.nih.gov/wp-content/uploads/Animal_Activities_Table.pdf)for examples of animal experiments covered under the *NIH Guidelines* * Experiments to genetically engineer plants by recombinant or synthetic nucleic acid molecule methods, to use such plants for other experimental purposes (e.g., response to stress), to propagate such plants, or to use plants together with microorganisms or insects containing recombinant or synthetic nucleic acid molecules. * Experiments involving more than **10 liters of culture** * Experiments involving influenza viruses generated by recombinant or synthetic methods. |
|  | **III-E. Experiments that require IBC approval before initiation**   * Experiments not classified in III-A, III-B, III-C, III-D, or III-F and involving the formation of recombinant or synthetic nucleic acid molecules. This includes non-exempt (section III-F) host-vector systems (e.g., *E. coli* B strains like BL21; [click here](https://blink.ucsd.edu/safety/research-lab/biosafety/nih/e-coli.html) for resource on *E. coli* strain derivatives). This also includes experiments containing no more than 2/3 of the genome of a eukaryotic virus (in tissue culture only, no helper virus). * Experiments not classified in III-A, III-B, III-D, or III-F and involving recombinant/synthetic nucleic acid molecule associated with whole plants * Experiments involving the generation of rodents in which the animal’s genome has been altered by a stable introduction of recombinant/synthetic nucleic acid molecules into the germ-line (**transgenic rodents**) with **BSL-1/ABSL-1** containment **excluding** breeding |
|  | **III-F. Experiments that require IBC approval before initiation**   * Synthetic nucleic acids that (1) can neither replicate nor generate nucleic acids that can replicate in any living cell (no origin of replication), and (2) are not designed to integrate into DNA, and (3) do not produce a toxin * Experiments not in organisms, cells, or viruses and that have not been modified or manipulated (e.g., encapsulated into synthetic or natural vehicles) to render them capable of penetrating cellular membranes * Experiments that consist solely of the exact recombinant or synthetic nucleic acid sequence from a single source that exists contemporaneously in nature * Experiments that consist entirely of nucleic acids from a prokaryotic host, including its indigenous plasmids or viruses when propagated only in that host (or a closely related strain of the same species), or when transferred to another host by well-established physiological means * Experiments that consist entirely of nucleic acids from a eukaryotic host including its chloroplasts, mitochondria, or plasmids (but excluding viruses) when propagated only in that host (or closely related strain of the same species) * Experiments that consist entirely of DNA segments from different species that exchange DNA by known physiological processes, though one or more of the segments may be a synthetic equivalent (See Appendices A-I through A-VI, *Exemptions under Section III-F-6--Sublists of Natural Exchangers*, for a list of natural exchangers that are exempt from the *NIH Guidelines*). * Genomic DNA molecules that have acquired a transposable element, provided the transposable element does not contain any recombinant and/or synthetic DNA * Experiments that do not present a significant risk to health or the environment not described above and as listed in Appendix C of the *NIH Guidelines*   + Certain recombinant or synthetic nucleic acid molecules that contain less than one half of any eukaryotic viral genome when propagated and maintained in cells in tissue culture   + Experiments using the following host-vector systems: *E. coli K-12, Saccharomyces cerevisiae, Saccharomyces uvarium, Kluyveromyces lactis, Bacillus subtilis, Bacillus licheniformis*, or extrachromosomal elements of gram positive organisms. [Click here](https://blink.ucsd.edu/safety/research-lab/biosafety/nih/e-coli.html) for resource on *E. coli* strain derivatives.   + Purchase, transfer, and breeding (with exceptions) of transgenic rodents under BSL-1/ABSL-1 containment |