**University of Colorado Colorado Springs**

**IBC BIOSAFETY APPLICATION FORM**

**Attachment II – Section A Recombinant or Synthetic Nucleic Acid Molecules (rsNA)**

**Biosafety Application#  (Office Use Only)**

**Renewal for Application #** (Office Use Only)

**Administrative Information**

Principal Investigator: 

Email Address:

The NIH requires that the IBC review the following information as a pre-requisite of approval of any recombinant or synthetic nucleic acid molecule experiment. Review the following example of a C. elegans experiment and include the appropriate information of your experiment in your application form:

**EXAMPLE:**

**Agent Characteristics:**  *non pathogenic vectors are used*

**Routes of Exposure:** *non pathogenic to humans*

**Host**: *Caenorhabditis elegans, E-coli*

**Vector**: *pUC19*

**Nature of inserted sequences**: marker, gfp cDNA, antibiotic resistance, ampicillin and kanamycin

**Source of inserted sequences**: *bacterial*

**Types of manipulation:** *standard tissue culture, growth of worms occur using E-coli agar gel plates*

**Attempt to express foreign gene:** *yes, AmpR, KanR, bacterial resistance, gfp*

**Protein produced:** *Green Florescent Protein*

**Containment:** *BSL1*

**Section of Guidelines:** *(Section III-D-4-a):* *Experiments Involving Whole Animals*

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**Agent Characteristics:**

**Routes of Exposure:**

**Host**::

**Vector**:

**Nature of inserted sequences**:

**Source of inserted sequences**:

**Types of manipulation:**

**Attempt to express foreign gene:**

**Protein produced:**

**Containment:**

**Section(s) of Guidelines:**

**II-A.1. Description of Gene(s), include but not limited to: genes over-expressed, expressed in transgenic animals and/or silenced by RNA interference**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Gene Sources**  (organism-genus, species, strain, e.g., E-coli, K12) | **Gene Name and Protein Produced**  (acronym & full name, e.g., GFP, green florescent protein) | **Gene category \*** | **Expression of construct in Host** | |
| **In vitro cultured Cells - define** | **In vivo Animals**  **Define species** |
|  |  |  |  |  |
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\*Examples of gene category: structural, enzymatic proteins, metabolic enzymes, cell growth/housekeeping, cell cycle/cell division, DNA replication, membrane proteins, tracking genes (GFP, luciferase), toxins, regulatory genes, oncogenes

**II-A.2. Viral Vectors used - check all that apply**

**Other, please list:**

**Adenovirus, list genes deleted if applicable:**

**Adeno-Associated virus (AAV); helper virus used**  **Yes**  **No**

**Epstein-Barr Virus (EBV)**

**Herpesvirus:** **HSV-1**  **HSV-2**

**Retrovirus:** **ecotropic**  **amphotrophic**

**pseudotype virus, (e.g, VSV Glycoprotein Envelope expressed):**

**MMLV**

**Lentivirus:** **HIV**  **SIV**  **Other:**

**helper virus used**

**genes separated on separate plasmids**

**pseudotype use of VSV-G**

**Poxvirus -Vaccinia Virus**

**Sindbis (alpha) virus**  **helper virus used**

**Baculovirus**

**II-A.3. Vector Description**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Vector backbone**  (organism-genus, species, strain) | **Vector name**  (e.g. PBr322) | **Gene Transfer Method**  (e.g. gene gun, transfection) | **Host to be used**  (e.g. E. coli K-12) | **Expression** | |
| **Stable** | **Transient** |
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Attach a construct map and clearly indicate what viral sequences are being deleted from the wild-type vector, and the description and location of inserted viral or cellular sequences.

**II-A.4. Packaging Cell Line(s) for Production of Virus Particles**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name of Cell Line(s) and** **helper plasmids** (co-transfection)  (e.g., HEK 293) | **Source(s)**  (e.g. viral, human) | **Source of envelope glycoprotein**  If retro-or lentivirus (e.g.  vsv-g pseudotype in retroviral system) | **Characterization** **with respect to host range**  (e.g. retro - ecotropic, amphotrophic  or lentivirus) | **Host Cells** |
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Worksheet 1

RECOMBINANT OR SYNTHETIC NUCLEIC ACID (rsNA) MOLECULE EXPERIMENTS QUESTIONNAIRE

**CLASSIFICATION OF EXPERIMENTS THAT REQUIRE NIH REVIEW AND APPROVAL**

Source: ***NIH Recombinant or Synthetic Nucleic Acid Molecules Guidelines,*** dated March 2013

This section **MUST** be completed if you are working with ANY recombinant or synthetic nucleic acid molecules. Please check the appropriate **Yes** box if the NIH category accurately describes your experiment. IBC applications are required for experiments that may be classified as Section III-F.

## SECTION III-A

**Experiments that require IBC approval, Recombinant DNA Advisory Committee (RAC) review, and National Institutes of Health (NIH) Director Approval *before* initiation of the experiment.**

**Yes**

**III-A-1** **Major Actions Under the NIH Guidelines**.

**Experiments considered as Major Actions under the NIH Guidelines require submission to the NIH for NIH / RAC Review. The NIH will determine the level of containment at the time of approval.**

**III-A-1-a** Deliberate transfer of a drug resistance trait to microorganisms that are known to acquire it naturally, if such acquisition could compromise the use of the drug to control disease agents in human or veterinary medicine or agriculture.

## SECTION III-B

**Experiments that require NIH / Office of Biotechnology Affairs (OBA) and IBC approval *before* the initiation of the experiment.**

**Yes**

**III-B-1** Deliberate formation of recombinant or synthetic DNA containing genes for the biosynthesis of toxin molecules lethal at an LD50 of less than 100 nanograms per kilogram body weight (e.g., microbial toxins such as tetanus toxin, botulinum toxin).

***SECTION III-C***

**Experiments that require IBC approval, Institutional Review Board (IRB) approval, and NIH /RAC Approval *before* Research Participant Enrollment**

**Yes**

**III-C-1** Experiments involving the deliberate transfer of recombinant or synthetic nucleic acid molecules or DNA or RNA derived from Recombinant or synthetic nucleic acid molecules into one or more human research participants.

***SECTION III-D***

**Experiments that Require IBC Approval Before Initiation (IBC will determine the containment level on a case by case basis depending on the experimental assessment of risk.)**

**Yes**

## III-D-1 Experiments Using Risk Group 2, Risk Group 3, Risk Group 4, or Restricted Agents as Host-Vector Systems (see [Section II-A](http://oba.od.nih.gov/oba/rac/Guidelines/NIH_Guidelines.htm#_Section_II-A._Risk), Risk Assessment)

**III-D-2** Experiments in Which DNA From Risk Group 2, Risk Group 3, Risk Group 4, or Restricted Agents is Cloned into Nonpathogenic Prokaryotic or Lower Eukaryotic Host-Vector Systems.

**III-D-3** Experiments Involving the Use of Infectious DNA or RNA Viruses or Defective DNA or RNA Viruses in the Presence of Helper Virus in Tissue Culture Systems

**III-D-4** Experiments Involving Whole Animals

This section covers experiments involving whole animals in which the animal's genome has been altered by

stable introduction of recombinant or synthetic nucleic acid molecules, or nucleic acids derived therefrom, into

the germ-line (transgenic animals) and experiments involving viable recombinant or synthetic nucleic acid

molecule-modified microorganisms tested on whole animals. For the latter, other than viruses which are only

vertically transmitted, the experiments may not be conducted at BL1-N containment. A minimum containment of

BL2 or BL2-N is required.

**III-D-5** Experiments Involving Whole Transgenic Plants

**III-D-6** Experiments Involving More Than 10 Liters of Culture

**III-D-7** Experiments Involving Highly Pathogenic Influenza Viruses

***Section III-E***

**Experiments that Require Institutional Biosafety Committee Notice Simultaneous with Initiation (The recommended containment level is BL1; recombinant or synthetic nucleic acid molecules experiments of higher risk and subsequently higher containment, are categorized in Section III-D)**

**Yes**

**III-E-1** Experiments Involving the Formation of Recombinant or synthetic nucleic acid molecules Containing No More than Two-Thirds of the Genome of any Eukaryotic Virus Using Risk Group 2, Risk Group 3, Risk Group 4, or Restricted Agents as Host-Vector Systems.

Recombinant or synthetic nucleic acid molecules containing no more than two-thirds of the genome of any

eukaryotic virus (all viruses from a single Family being considered identical [see Section V-J, Footnotes and

References of Sections I-IV]) may be propagated and maintained in cells in tissue culture using BL1

containment. For such experiments, it must be demonstrated that the cells lack helper virus for the specific

Families of defective viruses being used. If helper virus is present, procedures specified under Section III-D-3,

Experiments Involving the Use of Infectious Animal or Plant DNA or RNA Viruses or Defective Animal or Plant

DNA or RNA Viruses in the Presence of Helper Virus in Tissue Culture Systems, should be used. The DNA

may contain fragments of the genome of viruses from more than one Family but each fragment shall be less

than two-thirds of a genome.

**III-E-2** Experiments Involving Whole Plants

**III-E-3** Experiments Involving Transgenic Rodents

This section covers experiments involving the generation of rodents in which the animal's genome has been

altered by stable introduction of recombinant or synthetic nucleic acid molecules, or nucleic acids derived

therefrom, into the germ-line (transgenic rodents). Only experiments that require BL1 containment are covered

under this section; experiments that require BL2, BL3, or BL4 containment are covered under Section III-D-4,

Experiments Involving Whole Animals.

Section III-E-3-a. Experiments involving the breeding of certain BL1 transgenic rodents are exempt under

Section III-F, Exempt Experiments (See Appendix C-VIII, Generation of BL1 Transgenic Rodents via Breeding).

***Section III-F***

**The following experiments are exempt from the *NIH Guidelines* but require submission to IBC. The Biosafety Officer will verify that the experiment is exempt from the Guidelines; those that meet the requirements of Section III-A through III-E-3 of the Guidelines will be reviewed at a convened IBC meeting:**

**Yes**

**III-F-1** Those synthetic nucleic acids that: (1) can neither replicate nor generate nucleic acids that can replicate in any living cell (e.g., oligonucleotides or other synthetic nucleic acids that do not contain an origin of replication or contain elements known to interact with either DNA or RNA polymerase), and (2) are not designed to integrate into DNA, and (3) do not produce a toxin that is lethal for vertebrates at an LD50 of less than 100 nanograms per kilogram body weight. If a synthetic nucleic acid is deliberately transferred into one or more human research participants and meets the criteria of Section III-C, it is not exempt under this Section.

**III-F-2** Those that are 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.

**III-F-3** Those that consist solely of the exact recombinant or synthetic nucleic acid sequence from a single source that exists contemporaneously in nature..

**III-F-4** Those 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.

**III-F-5** Those 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 a closely related strain of the same species). Page 24 - NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules (November 2013.

**III-F-6** Those 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. A list of such exchangers will be prepared and periodically revised by the NIH Director with advice of the RAC after appropriate notice and opportunity for public comment (see Section IV-C-1-b-(1)-(c), Major Actions). 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.

**III-F-7** Those genomic DNA molecules that have acquired a transposable element, provided the transposable element does not contain any recombinant and/or synthetic DNA..

**III-F-8** Those that do not present a significant risk to health or the environment (see Section IV-C-1-b-(1)-(c), Major Actions), as determined by the NIH Director, with the advice of the RAC, and following appropriate notice and opportunity for public comment. See Appendix C, Exemptions under Section III-F-8 for other classes of experiments which are exempt from the NIH Guidelines.