White List

Banned Organisms/Parts

Some of the most dangerous organisms and parts are not allowed in iGEM, even with a Check-In:

- Human and primate cell lines that may contain pathogens
- Whole organisms from Risk Group 3
- Whole organisms from Risk Group 4
- Parts from Risk Group 4 organisms

If you find that you want to use a banned organism/part, you should redesign your project to use a safer substitute. Consult your advisor or contact us at to get advice on choosing a substitute.

	White List (no Check-In required)	Check-In Required (examples only!)
Whole Organisms (including viral genomes)	■ Risk Group 1 microorganisms (For example: *E. coli* K-12, *S. cerevisiae*, *B. subtilis*, *Lactobacillus* spp.)	■ Risk Group 2 microorganisms (For example: *Pseudomonas* spp.)
	■ Bacteriophages T2, T4, T7, M13, P1, ΦX174 (Phi X 174), and λ (Lambda), unless containing a virulence factor (see below) ■ Phagemids	■ Other viruses and bacteriophages

	■ Human and primate cell lines that have been tested and certified free of known pathogens (consult your vendor; see **FAQ**), including for example HEK293 cell lines. ■ Cell lines from plants, fungi, or animals that are not primates (such as **CHO cells** or plant cells)	■ All primary isolated cells (that is, cells taken directly from the body of a multicellular organism)
	■ *C. elegans* (nematodes) ■ *Physcomitrella patens*, *Arabidopsis* spp., *Nicotiana* spp.	■ Other multicellular organisms (animals, plants, insects, etc.). In addition, permission is required from the Safety Committee for the use of animals in iGEM projects – see the **Safety Policy** page for more details.
		■ ...and anything not explicitly listed
Parts	All Registry parts, except those with a Red Flag	Registry parts that have a Red Flag, which looks like

placed by the Safety Committee	**this**. A complete list of parts with Red Flags can be found **here**.
	Any part from a Risk Group 3 organism, regardless of its function
Non-protein-coding parts in the following categories: ■ Promoters, RBSes, Terminators ■ Binding sites for transcriptional regulators, endonucleases, and other proteins that bind to DNA ■ Aptamers and catalytic RNAs ■ CRISPR guide RNAs, microRNAs, small interfering RNAs, and short hairpin RNAs that **do not** target human genes	■ CRISPR guide RNAs, microRNAs, small interfering RNAs, and short hairpin RNAs that target human genes ■ Other non-protein-coding genes
Cas9 (and other CRISPR-associated nucleases such as dCas9 and Cpf1), **EXCEPT** when it is integrated into the genome of a sexually reproducing eukaryotic organism	Cas9 (and other endonucleases, such as dCas9 and Cpf1) integrated into the genome (including through the use of gRNA) of a sexually reproducing organism (including organisms that reproduce both sexually and asexually, such as yeast). ANY team contemplating

		using Gene Drives needs permission from the Safety Committee – see the **Safety Policy** page for more details.
	Prions from non-mammalian organisms, such as yeast	Prions from mammals, such as human PrP
	Proteins or protein-coding genes from animals, plants, or Risk Group 1 / Risk Group 2 microorganisms, EXCEPT those in the list of "dangerous categories" on the right	Proteins or protein-coding genes in the following dangerous categories: ▪ Virulence factors **(see FAQ)** ▪ Factors that help pathogens evade or shut down the immune system ▪ Factors that help pathogens halt the host's DNA/RNA replication, transcription, or translation ▪ Factors that regulate the immune system, such as cytokines and interferons ▪ Proteins that are toxic to humans ▪ Enzymes that produce a molecule that is toxic to humans
	Anti-microbial resistance factors and associated sequences in common	Other anti-microbial resistance factors, in particular any sequence

	use as a research tool. For example, ampicillin resistance commonly used as a **selectable marker**.	associated to resistance against commonly used anti-microbial therapies – see the **Safety Policy** page for more details. For example see the **2016 UIOslo team** worked with a **B carbapenemase resistance factor**, the spread of which is an increasing public **health challenge**.
	...and anything not explicitly listed	

FAQs

What if I'm not sure whether my organism/part requires a Check-In?

Ask us! Contact safety AT igem DOT org. Alternatively, because the Check-In form is short, you could choose to send a Check-In even if you are unsure.

Where can I submit a Check-In?

Submit a Check-In here.

How do I find out the Risk Group of an organism?

Consult the **Risk Group Guide**.

What if the White List changes during the summer?

We are going to use a lot of parts. May we combine them on a single Check-In?

If the parts all come from the same parent organism, you may combine them on a single Check-In, but make sure you give complete information about each part. If the parts come from different parent organisms, please send separate Check-Ins, or contact safety (at) igem (dot) org to ask about combining several Check-Ins into a spreadsheet.

What about experiments with human subjects, such as surveys or software user-testing?

If you conduct any experiments with human subjects, you must follow

As we learn more, we might **add** things to the White List, but we will not **remove** things from the White List until after the Jamboree each year. So, if something is on the White List now, it will stay on the White List for the whole 2017 season.

Our project is to detect a dangerous organism. In order to test our project, we want to handle the dangerous organism (or parts of it), but it will not be part of what we build.
Do we still have to send a Check-In?

Yes. The Check-In requirement applies to all organisms and all parts that you will handle in the lab, even if they will not be part of your final project.

What exactly counts as a "whole organism"?

For the purposes of this White List, a "whole organism" is an entire cell or multicellular organism, whether alive or dead. Intact, isolated viral genomes are also considered "whole organism", because many viral genomes can be pathogenic if they enter a host cell, even without the viral capsule.
(Isolated non-viral genomes are considered parts. Individual nucleic acids and proteins are also parts.)

your country's laws and your university's rules. You must get approval from the appropriate authorities, even for non-invasive experiments like surveys.

We are going to handle an organism in lab, but we will only extract some DNA from it using PCR -- we won't use it as our chassis.
Do we still have to send a Check-In?

Yes. The Check-In requirement applies to all organisms and all parts that you will handle in the lab, even if they will not be part of your final project.

We are going to use a lot of parts. May we combine them on a single Check-In?

If the parts all come from the same parent organism, you may combine them on a single Check-In, but make sure you give complete information about each part. If the parts come from different parent organisms, please send separate Check-Ins, or contact safety (at) igem (dot) org to ask about combining several Check-Ins into a spreadsheet.

How can I find out if my cell line is free of pathogens? What pathogens should I be

What is a virulence factor?

Virulence Factors of Pathogenic Bacteria is a good resource where you can look up virulence factors in some well-studied pathogens. It gives this definition: "Virulence factors refer to the properties (i.e., gene products) that enable a microorganism to establish itself on or within a host of a particular species and enhance its potential to cause disease. Virulence factors include bacterial toxins, cell surface proteins that mediate bacterial attachment, cell surface carbohydrates and proteins that protect a bacterium, and hydrolytic enzymes that may contribute to the pathogenicity of the bacterium."

concerned about?

If you bought the cells from a vendor or a culture collection, then you can consult their catalog. Many catalogs will list safety and pathogen information -- if you cannot find it, contact the vendor. If you received the cells from another lab, you should find out where they originally came from.
Cell lines can contain harmful viruses. Sometimes, the viral genome is integrated into the cell's genome. Most viruses have a limited "host range", which means that they can only infect closely related species. Therefore, viruses living in a human or monkey cell line are likely to be dangerous to humans, but viruses living in an insect cell line probably cannot infect humans. If you work with a cell line from humans or other **primates**, you should check whether it contains viruses or viral genomic DNA. Viruses have Risk Group numbers, so if your cell line contains any viruses, you must handle it at the laboratory Safety Level that is appropriate for the highest Risk group virus it contains.
Some dangerous viruses that infect human cell lines: **HBV (hepatitis B virus)**, **HCV (hepatitis C virus)**, **HIV (human immunodeficiency virus) 1 & 2**, **HTLV**

(human T-lymphotropic virus) 1 & 2, CMV (cytomegalovirus).