iGEM 2013 Basic Safety Form

Team name: TU-Munich

Deadline: 30th of August 2013

Submission method: email form to the correct email list for your region:
safety_forms_asia@igem.org
safety_forms_europe@igem.org
safety_forms_north_america@igem.org
safety_forms_latin_america@igem.org

Students can complete this safety form, but it must be read and signed (electronic or hard copy) by your team's faculty advisor. Your advisor must verify the information contained in this form and sign it.

The iGEM Safety Committee must be able to easily reach the advisor with questions or other follow-up communication. If you have made changes to your project (new coding regions or organisms) you must resubmit your safety form before wiki freeze (date TBD).

Key points to remember as you complete the safety assessment process:

- For help in completing questions 1 and 2, you may find it useful to consult the Risk Groups section of the Safety Resources List [2013.igem.org/Safety].
- he iGEM Safety Committee will be reviewing your project. To avoid temporary suspensions, answer these questions completely and accurately.
- The Safety Committee needs to be able to communicate with your faculty advisor about any safety concerns. If we cannot reach your advisor in a reasonable amount of time, you may be subject to restrictions at the Jamboree.
- Your safety page, wiki project page and poster should be consistent with each other. If you change your project, submit an updated Basic Safety Page to the iGEM Safety Committee before the wiki freeze. (Your faculty advisor must also read and sign the updated page.)
- We understand that projects may still be changing at a late date. However, large discrepancies between
- what you submit on the Basic Safety Page and what you present at the Jamborees may result in restrictions at the Jamboree.

Basic Safety Questions for iGEM 2013

a. Please describe the chassis organism(s) you will be using for this project. If you will be using more than one chassis organism, provide information on each of them:

Species	strain no/name	Risk group	Risk group source link	Disease risk to humans? If so, which disease?
E. coli (K 12)	NEB 10 Beta	1	www.absa.org/riskgroups/bacteriasearch.php?genus=&species=coli	Yes. May cause irritation to skin, eyes, and respiratory tract, may affect kidneys.
E. coli (K 12)	XL-1 Blue	1	http://www.epa.ie/pubs/advice/gmo/gmms/Exampleriskassessmentclass1gmm.pdf	Yes. May cause irritation to skin, eyes, and respiratory tract, may affect kidneys.
Physcomitrella patens	Wild type	1	-	No
Physcomitrella patens	40447 ΔSiR1 (1-6)	1	-	No

2. Highest Risk Group Listed: 1

3. List and describe *all* new or modified coding regions you will be using in your project. (If you use parts from the 2013 iGEM Distribution without modifying them, you do not need to list those parts.)
Please see attached spreadsheet

4. Do the biological materials used in your lab work pose any of the following risks? Please describe.
a. Risks to the safety and health of team members or others working in the lab?

- *Physcomitrella patens* does not pose any risk to the researcher.
- *E.coli* may cause the disease risks listed above, however if handled with the necessary precaution this risk is minimal

b. Risks to the safety and health of the general public, if released by design or by accident?

- *Physcomitrella* itself does not pose any risks to the health of the general public
- The enzymes secreted by our moss for biodegradation (laccase (used in food industry), EreB, Catecholdioxygenase) are not harmful
- degradation products of hormones, antibiotics etc. could be potentially harmful but are also formed in natural environments in higher concentrations. Reaction products will be treated under the precaution principle and be disposed in the chemical waste
- the substances used in bioaccumulation (Glutathioon-S-transferase, Proteinphosphatase 1) are not harmful, but moss that has bound toxic substances (e.g. microcystin) in high concentrations is potentially toxic and has to be disposed of
- a potential problem is the horizontal gene transfer of the antibiotic resistance gene for EreB to bacteria (however, this possibility is very low: http://www.bvl.bund.de/SharedDocs/Downloads/06_Gentechnik/ZKBS/02_Allgemeine_Stellungnahmen_englisch/05_plants/zkbs_plants_Antibiotic_resistence_genes_in_the_genome_of_plants_2008.pdf?__blob=publicationFile&v=1)

c. Risks to the environment, if released by design or by accident?

- *Physcomitrella patens* itself is endemic to many parts of the world and therefore does not pose a threat to the environment
- None of the transgenes introduced into the moss will increase the vitality of the moss in nature
- Due to our red-light inducible kill switch, our genetically moss is not able to survive in the environment
- Since we are using a knockout-strain, our moss is not able to germinate

d. Risks to security through malicious misuse by individuals, groups, or countries?

- Although there is the theoretical possibility to use *Physcomitrella* to cause harm, other organisms seem to be more appropriate for such dual-use applications.
- None of our transgenic plants (listed: http://2013.igem.org/Team:TU-Munich/Results/GM-Moss#Transgenic_Physcomitrella_patnes_plants) could be used to cause harm

5. If your project moved from a small-scale lab study to become widely used as a commercial/industrial product, what new risks might arise? (Consider the different categories of risks that are listed in parts a-d of the previous question.) Also, what risks might arise if the knowledge you generate or the methods you develop became widely available? (Note: This is meant to be a somewhat open-ended discussion question.)

- problems that could arise from widely using our moss filter could be vertical and horizontal gene transfer, however this possibility is very low
- other general risks that might arise are discussed in this article: http://onlinelibrary.wiley.com/doi/10.1002/3527603638.ch16/summary
- the knowledge we generate (e.g. immobilization of proteins on the membrane) could possibly be used for other purposes, but the likelidhood for misuse is very low
- The methods we have used (e.g. transformation of moss) are already established and widely available

6. Does your project include any design features to address safety risks? (For example: kill switches, auxotrophic chassis, etc.) Note that including such features is not mandatory to participate in iGEM, but many groups choose to include them.

- Killswitch: when exposed to red-light, a nuclease system is activated which destroys all genetic material, killing the moss and preventing the spread of genetic material of the moss. With this genetic circuit it would be possible to create an ecological ninch for the transgenic moss by just covering an area with an appropriate filter foil. Other ecological ninches can't be occupied by transgenic moss equipped with our kill switch
- we are using a sulfite reductase 1 knockout mutant, which is not able to germinate thus preventing the spread of our moss in the environment
- Gene transfer of our transgenes to plants used by mankind is most unlikely because Bryophytes are of the lowest economical importance

7. What safety training have you received (or plan to receive in the future)? Provide a brief description, and a link to your institution's safety training requirements, if available.

- A regular safety briefing and a lecture about the legal basics concerning biotechnology and genetic engineering are basic elements of our education at the TU Munich
- the handling of biological material and safety aspects of chemicals are explained
- Additionally a special safety briefing was held for all iGEM students by Dr. Martin Schlapschy who is the responsible person for lab safety

8. Under what biosafety provisions will / do you work?

a. Please provide a link to your institution biosafety guidelines

- The lab we work in is classified as BSL 1 (biosafety level 1), according to the European Union Directive 2000/54/EG and the German "Gesetz zur Regelung der Gentechnik (GenTG)" (law for the regulation of genetic engineering, text in German only)
- Work inside a BSL 1 lab, such as ours, involves no devices that are potentially harmful to the researchers if they act according to the general precautionary measures. Especially, no pathogenic organisms are used.
- Safety guidelines: http://www.mikro.biologie.tu-muenchen.de/pdfdocs/Betranl090312.pdf

b. Does your institution have an Institutional Biosafety Committee, or an equivalent group? If yes, have you discussed your project with them? Describe any concerns they raised with your project, and any changes you made to your project plan based on their review.

- Every department at the TU Munich needs a safety delegate, in our case Dr. Martin Schlapschy.
- We discussed all planed transgenic moss plants and all genetic construcs with Dr. Schlapschy. He could ensure us and approve our finding that none of our experiments could cause harm to our students or other people.
- We do not have an Institutional Biosafety Committee. All checks concerning safety in laboratories are taken care of by state officials. In general, working with genetically modified organisms in Germany is regulated by the "Gesetz zur Regelung der Gentechnik (GenTG)" (law for the regulation of gentetic engineering,). In this context we will inactivate all transgenic organisms after our project and will prohibit transgenic organisms by any means from leaving the lab.

c. Does your country have national biosafety regulations or guidelines? If so, please provide a link to these regulations or guidelines if possible.

- The Federal office of consumer protection and safety is the institution responsible for biosafety at universities, institutions etc. All laws, regulations and guidelines can be found here: http://www.bvl.bund.de/DE/06_Gentechnik/gentechnik_node.html .
- The Federal office of consumer protection and safety appoints a team of experts (ZKBS, Zentrale Kommission für die Biologische Sicherheit) who determine the risks of GMOs for humans, animals and the environment. Based on their results they can suggest rules and regulations for handling GMOs (http://www.bvl.bund.de/DE/06_Gentechnik/03_Antragsteller/06_Institutionen_fuer_biologische_Sicherheit/01_ZKBS/gentechnik_zkbs_node.html

d. According to the WHO Biosafety Manual, what is the BioSafety Level rating of your lab?

- The lab we work in is classified as BSL 1 (biosafety level 1)

e. What is the Risk Group of your chassis organism(s), as you stated in question 1? If it does not match the BSL rating of your laboratory, please explain what additional safety measures you are taking.

- Risk Group 1

Faculty Advisor Name: Prof. Dr. Arne Skerra

Signature: