



Sustainable Laboratory Certification Program

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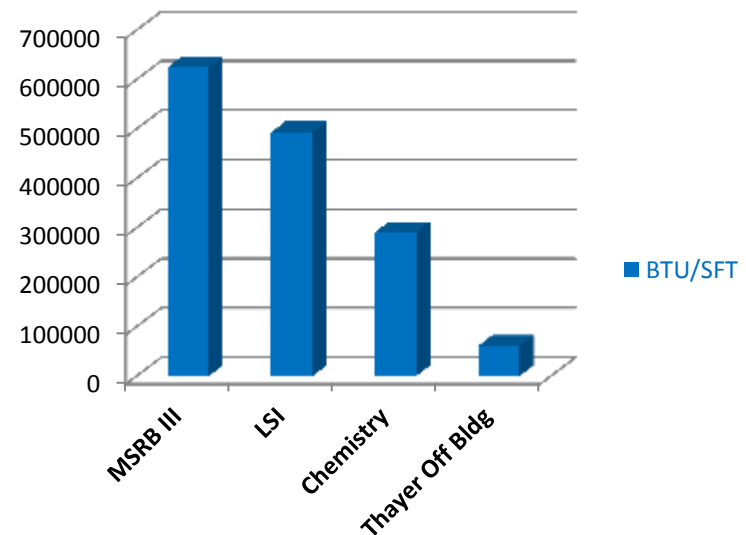




Background

- According to EPA estimates laboratories consume 4-10 more energy when compared with a class room environment
- It is true in case of our campus
- *Reasons:* HVAC, Hoods, Utilities, Equipment, research and teaching activities
- **What does this mean us?**
- Providing rich opportunities to save on energy, utilities and achieve waste reduction through green initiatives
- A Sustainable Laboratory not only establishes best lab practices but also improves safety in the lab

Sample Comparison of Energy Consumption on UM campus 2012 (BTU/SFT)





What is a Sustainable Lab?

An ideal Sustainable Lab would actively engage in the following:

- P2 & WM
- Green Purchasing
- Green Chemistry
- Green Computing
- Energy and utilities
- Reduce, Recycle & Reuse
- Disposal and Treatment
- Safety

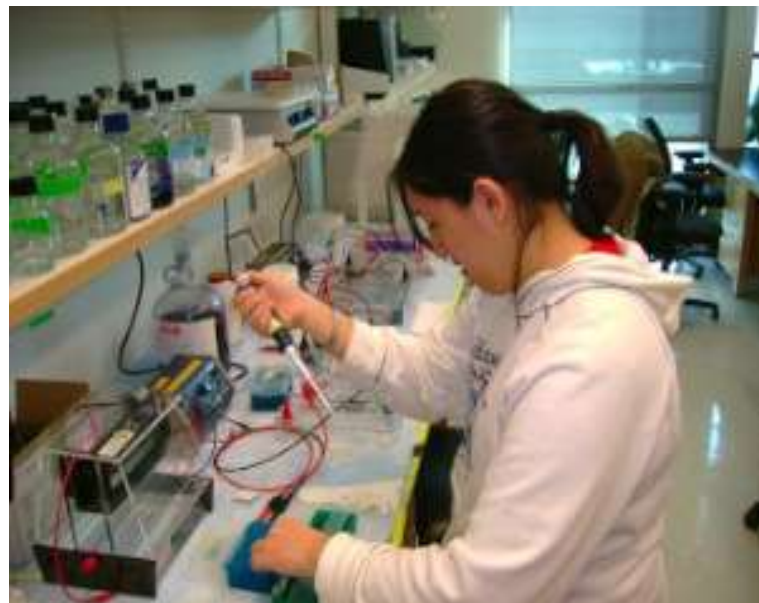




Goals & Objectives of the Program

Through Sustainable Lab Certification program we intended to achieve:

- Standardized operations to establish best lab practices
- Reduction in use and generation of hazardous materials including mercury
- Increase in Reuse and Recycling
- Green initiatives/Substitution
- Behavioral change to save \$\$\$
- Improved safety





How it started?

- **2008-09** – Green Chemistry Task Force (GCTF) was formed:
 - Sudhakar & Anya from OCS
 - Ingrid and Greg from Hazmat
- Researched on happenings at:
 - Peer Institutions
 - Government (EPA)/GCI
 - Conferences on Green Chemistry/Sustainability
- **2010/11** – OCS and Planet Blue Operations sponsored a project for ENV 391 class on “Sustainable Labs”





Program launched Summer of 2011

- Two Labs Piloted by ENV 391 Student group:
 - Lurie Nanofabrication Lab
(Research lab)
 - USB Teaching Lab
(Teaching lab)
- The work was presented at the 2011 Michigan Green Chemistry & Engineering conference on Oct. 27, 2011
- To date, 54 labs have been evaluated and number is growing





Team Behind this Program

UM Campus

- GCTF Team
 - Sudhakar & Anya: OCS
 - Mark & Greg: Hazmat
- Mark Sedmak: Med School
- Dan Rife: L S & A
- John Keedy: CoE
- Cathew Andrews, LSI

UM Health System

- Chris Victory: Engineer
- Michelle Eleby: Mgr, COO

Team Thanks...

- Terrance Alexander, Director
- Deans and Facility Directors
- OSEH Managers
- Mike Shriberg and his students, Graham Institute
- Chris Kolevar and his team, Planet Blue Operations
- Tracy Artley and her team, Ground/Waste Management



How does it work?

- Program is run in phased manner
- Steps involved:
 - Initial contact with OCS by Lab manager/Safety Liaison or PI
 - Receive and respond to a comprehensive questionnaire
 - Lab visit and assessment of questionnaire by OCS
 - Recommendations provided by OCS
 - Recommendations implemented by Lab
 - Evaluation report by OCS
- The certificate of recognition is awarded to the lab typically at their group meeting following final report





Questionnaire

It is very comprehensive and covers:

- Lab activity and waste streams generated
- Pollution prevention activities
- Green purchasing
- Green Chemistry & Engineering
- Chemical Substitution
- Reuse/reduce/recycle
- Energy and utilities
- Treatment and disposal



GREEN LABORATORY OPERATIONS FOR SUSTAINABILITY

Lab:		PI:	
Building:	Room#:	Number of Employees:	
Lab Coordinator:	Phone:	Email:	
Evaluation by:		Date:	

LAB COMMITMENT:

We, the members of above mentioned lab are applying for Green Lab Operations for Sustainability (GLOS) certification and affirm that, to the best of our knowledge, provide the following information for your consideration. We are aware of the significant environmental impact of research on our campus, recognize the benefits of this program from sustainability point of view and willing to commit to reduce carbon footprint.

LAB ACTIVITY:

Description of research, operations, equipment, techniques, etc.: _____

Waste Streams Generated (type, amount, frequency, costs): _____



Lab visit/Recommendations

- **Lab Visit**

- Nature of work done
- Waste streams generated
- Equipment
- Techniques
- Recycling efforts
- Safety

- **Recommendations**

- Implementations
- Corrective actions

Each lab is evaluated on **point system:**

96% and above: **Platinum**

90-95%: **Gold**

80-89%: **Silver**

70-79%: **Bronze**

Labs scoring less than 70% need to work with OCS closely to improve their operations to get recognized under this program



Awarding certification of recognition

Sustainable Laboratory Certification



M | planetblue
UNIVERSITY OF MICHIGAN
sustainable laboratory

School : Med. School
Room : MSRB I #A500
Rating : Gold

This certificate is awarded to:

Prof. David M. Lubman
LUBMAN LABORATORY

Coordinator, Office of Campus Sustainability Date

Exec. Director, Office of Campus Sustainability Date





Awarding certification of recognition



Lab User Guide



Clock with 12 Green Chemistry Principles



A Lab receiving certification

Chinnaiyan Laboratory		
Room: 5400-5436A	Cancer Center, Medical School	
# of Employees: 117	PI: Dr. Arul Chinnaiyan	Lab ID#: 506
<p>The Michigan Center for Translational Pathology (MCTP) was founded in 2007 under the directorship of Dr. Arul Chinnaiyan, as a collaborative effort between the University of Michigan Department of Pathology, Medical School, and Comprehensive Cancer Center to foster research advances in molecular medicine and apply those advances as quickly as possible to benefit patient care.</p> <p>The discovery in 2005 of TMPRSS2-ETS gene fusion as the causative genetic lesion in a majority of prostate cancers by the Chinnaiyan lab, and subsequently in other solid tumors, was a transformative advance in cancer biology (view article). We utilize multiple, innovative "omics" approaches, cutting-edge high-throughput genomic screening combined with novel bioinformatics and computational analysis as the basis of our studies. Along with powerful next-generation sequencing technology, we have developed novel methodologies to probe cellular mechanisms on a global scale to yield a comprehensive understanding of tumorigenesis. Characterizations of gene fusion sub-types and other cancer genes have led to the identity of "druggable" targets, often with readily available therapeutics. We are also working to develop accurate, non-invasive diagnostic and prognostic tools.</p>		
Sustainable Lab Rating: GOLD		Date Received: 11-22-2011





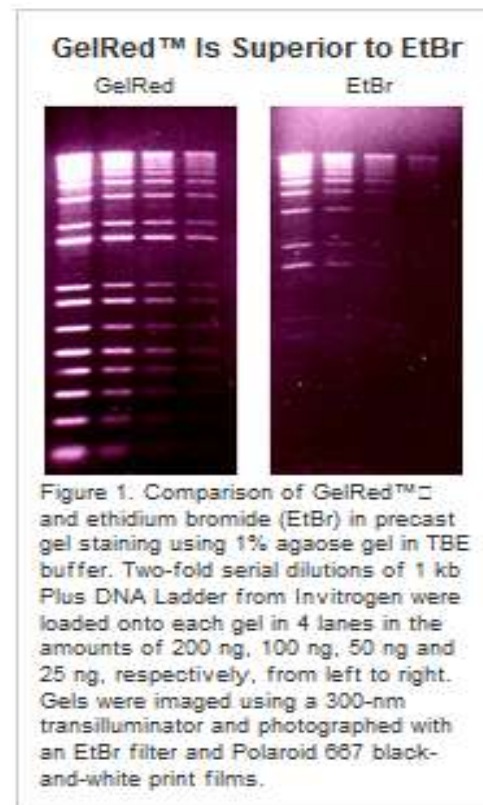
Results – Green Chemistry

- **Safer Alternatives:**

- Toxic ethidium bromide is being substituted with safer alternative, Gel-Red in Life Sciences labs. Nearly 30 labs have switched to Gel-Red in their DNA research
- Cyclopentyl methyl ether and methyl tetrahydrofuran are being used in place of toxic solvents such as dichloromethane and THF
- Micro scale chemistry adapted where applicable

- **Energy Efficient Reactions:**

- Sonication and microwave energy sources are employed as alternative reaction conditions





Results – Reuse and Recycling

- **Recycling**

- Solvents recycled: Acetone, alcohol, xylene and formalin
- Pipette tip boxes, plastic bottles and other uncontaminated plastic
- Electronics, universal waste, paper, glass, pens, pencils, packaging materials etc.

- **ChEM (Chemicals, Equipment and Materials Reuse Program):**

- Surplus chemicals, equipment and materials are being redistributed to those in need
- In excess of 400 lbs/year are redistributed





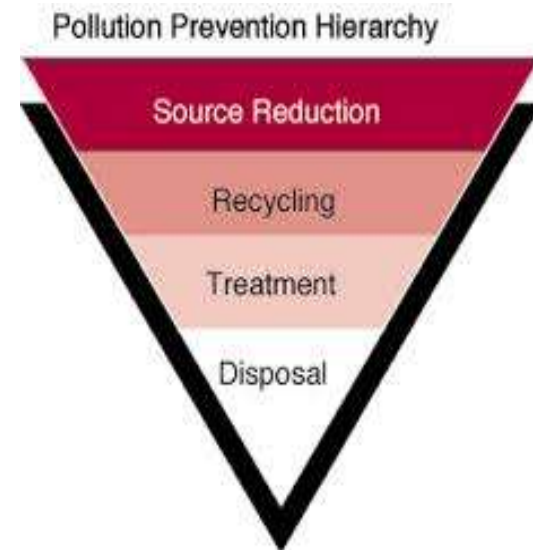
Results - Treatment

- **Treatment:**

- HPLC eluent containing mild buffer can be neutralized and disposed down the drain. >300 gallons/year reduced.
- Ion chromatograph waste is slightly basic with no toxic metals. It can be neutralized to pH 8 and discarded down the drain. 200 gallon a year reduced.
- Dialysate waste generated in Life Sciences labs is slightly basic and contain salts that can be neutralized to pH 8 to release into the sewer. >250 gallons/year reduced.

- **Elemental Neutralization:**

- Acid (HCl only) or basic waste is neutralized for disposal





Results – Energy conservation

- Turn of lights when leaving lab
- Shut the sash on chemical fume hoods when not in use
- Power down small equipment when no in use to save on vampire power or standby power
- Shut down computers before leaving
- If printing is a must, print on both sides





Results – Utilities conservation

- Avoid water aspirators; they consume 3 gallons/minute water. Install PIAB local vacuum system that run on lab compressed air
- Avoid single pass water usage. Install recirculating chillers
- Check for leaks and drips. Get them fixed
- Run dishwashers when full





Results – Spills and Safety

- **Mercury Spills**

- As a part of mercury removal program we have collected several hundreds of pounds of elemental mercury and 7000 mercury thermometers for proper disposal
- Spills due the breakage of mercury devices were **62** in 2002
- These spills greatly reduced to **8** in the fiscal year 2013

- **Safety**

- Best lab practices ensure safety in the laboratory
- Improved safety in our labs may be seen through less number of accidents/spills in the long run





Program details

For details on the program visit:

<http://www.ocs.umich.edu/labs.shtml>

The screenshot shows a web browser window displaying the website for the Office of Campus Sustainability (OCS) at the University of Michigan. The page features the 'planet blue' logo and the text 'The sustainable difference'. The main heading is 'Office of Campus Sustainability'. Below this, there is a navigation menu with links for Home, About OCS, Sustainability Partners, Campus Initiatives, Education + Outreach, and U-M Sustainability. The main content area is titled 'Sustainable Lab Recognition Program' and contains the following text:

The average laboratory consumes 4 to 5 times more energy and resources as compared to a class room or an office environment. They may generate large volumes of hazardous waste and consume large quantities of water. These impacts provide an opportunity to save energy and resources. The Sustainability Laboratory recognition program is designed by the Office of Campus Sustainability (OCS) to promote and practice sustainable operations in a more standardized way in teaching and research labs across our campus.

The program is run in a phased manner to lessen impact on laboratory staff resources. Once a laboratory manager contacts OCS, our staff will visit the laboratory and evaluate lab practices in terms of pollution prevention, waste minimization, green purchasing, recycling, green chemistry, treatment and disposal. Following the evaluation step recommendations will be provided specific to the laboratory operations and it will be up to the laboratory staff to implement them. Once the recommendations are implemented, the lab will be formally recognized as a UM Sustainable Laboratory and presented with a decal for their door as well as other forms of recognition. Your laboratory will be featured on the OCS website to identify you to your peers as a laboratory with best practices.

Benefits from this program include but not limited to:

- The introduction to Green chemistry practices that our students and industry are expecting
- Reduced consumption of energy and utilities
- Reduction in use and generation of hazardous materials
- Increase in use and recycling
- Increased safety for lab students, faculty and staff

On the right side of the page, there is a 'Quick Links' section with the following links: Metrics + Reporting, Energy, Green Transportation, Green Purchasing, Food, Sustainable Design, Sustainable Labs, Land + Water Use, Planet Blue Operations Team, Pollution Prevention, Recycling, and Sustainable Computing.



What next?

- Revisit the certified labs after one year from certification
- Pay closer attention to their operations
- Capture metrics
- Long term goal of this program is to improve up on the operational changes through green chemistry, pollution prevention, waste reduction and behavioral change



Acknowledgement

- Green Chemistry Task Force Members
 - Anya Dale
 - Gregory Marquis
 - Ingrid Walstad
- Andrew Berki, Manager, OCS
- Terrance Alexander, Director, OSEH and OCS
- Henry Baier, Executive Vice President, Facilities and Operations



Thank you!

