Yale’s Safety Advisor Model for Supporting and Integrating Safety into Research

Peter A. Reinhardt, Director
Department of Environmental Health & Safety
What EHS Does at Research Universities

About 70% of the work involves supporting research laboratories and the hazardous materials they use (e.g., biologicals, chemicals, radioactive materials)

Managing hazardous waste (much of it generated by laboratories) and other environmental compliance activities

Other safety programs: investigating accidents, fall protection, electrical safety, hazard communication, industrial hygiene, bloodborne pathogens, etc.
### EHS Service Models at Research Universities

| Typical Specialty Groups | • **Radiation safety** staff do wipe tests, calibrate meters, exposure monitoring, etc.  
|                          | • **Biosafety** staff register rDNA research, validate BSLs, work practice observations, investigate needlesticks, biosafety PPE, etc.  
|                          | • **Chemical safety** staff review chemical storage, inventory, labeling, signage, chemical PPE, etc.  
|                          | • **Fire safety** staff inspect flammable loads, separations, etc.  
|                          | • **Occupational health** staff do ergonomic assessments, investigate accidents, etc. |

| Yale Safety Advisor Program | Safety Advisors are generalists. Each Safety Advisor performs all of the above tasks. |
Many Benefits to Safety Advisor Model

**Efficiency**: One inspection and one meeting versus many.

**Customer service**: EHS is not seen as “the safety police.” Helping relationships are developed from the opening welcome.

**SA job satisfaction**: Variety, responsibilities, intellectually challenging, interacting with people, always something new.

**No more “not my job”**: SAs are responsible for all EHS issues in their assigned department or building.

**EHS Agility**: EHS can change priorities and reallocate resources on a dime. Time allocated to safety issues naturally adjust to their demands.
To paraphrase BASF:

We don’t make scientific discoveries.
We make scientific discovery safer.
The Key to All Relationships: Understanding

The researcher's career at Yale

Understanding their “world” as a research scientists

Learning about their research goals, accomplishments, future plans...

Listening to the PI and their staff

Attending groups meetings

Attending departmental seminars
Yale Environmental Health & Safety

Understanding Their Research

Title: Genetic Loss of Tmprss6 Uncouples Hepcidin Expression from Erythroferrone Signaling

Introduction:

Although iron is essential for many biological processes, maintaining iron homeostasis is crucial to prevent iron deficiency anemia and iron overload-related diseases. Hepcidin, a 25-amino-acid peptide, is the key regulator of iron homeostasis by controlling iron uptake by enterocytes and iron release from macrophages.

Materials and Methods:

1. Establishment of hematopoietic cell lines
2. Generation of bone marrow chimeras
3. Analysis of gene expression

Results:

Genetic loss of Tmprss6 in mice induces severe anemia and iron deficiency anemia with a marked decrease in iron stores. The results are shown in the table below:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Control</th>
<th>Tmprss6 KO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>10 mg</td>
<td>2 mg</td>
</tr>
<tr>
<td>Hb</td>
<td>15 g/dL</td>
<td>8 g/dL</td>
</tr>
</tbody>
</table>

Discussion:

Tmprss6 acts locally in the liver to suppress hepcidin. The uncoiling of hepcidin expression from Erythroferrone signaling in Tmprss6 KO mice raises these intriguing possibilities:

1. Tmprss6 may be required for Erfe signaling in the liver to suppress hepcidin.
2. Upregulation of hepcidin by the loss of Tmprss6 may override Erfe's suppressive signal.

References:

Not Just the PI
Getting Off to a Great Start

• **Making it personal:** “I’m your Safety Advisor. I’m here to help you.” Lab staff have a single point of contact.

• **Cutting red tape.** We are all on the same team.

• **Making it easy** to get help, easy to comply, easy to get things done.
EHS’ Welcome to New Investigators

- **Explaining EHS Services:** waste disposal; fume hoods; biosafety cabinets; shipping; emergency water; spill response

- **Registrations:** Radioactive material; rDNA; human pathogens; restricted chemicals; lasers; controlled substances

- **Training assessment**

- **Needs assessment:** For research? Appropriate space? Safety infrastructure?
Chemiexcitation of melanin derivatives induces DNA photoproducts long after UV exposure

Sanjay Premi,1 Silvia Wallisch,1 Camila M. Mano,1,2 Adam B. Weiner,1* Antonella Bacchiocchi,3 Kazumasa Wakamatsu,4 Etelvino J. H. Bechara,2,5† Ruth Halaban,3,6 Thierry Douki,7† Douglas E. Brash1,6‡

Mutations in sunlight-induced melanoma arise from cyclobutane pyrimidine dimers (CPDs), DNA photoproducts that are typically created picoseconds after an ultraviolet (UV) photon is absorbed at thymine or cytosine. We found that in melanocytes, CPDs are generated for >3 hours after exposure to UVA, a major component of the radiation in sunlight and in tanning beds. These “dark CPDs” constitute the majority of CPDs and include the cytosine-containing CPDs that initiate UV-signature C→T mutations. Dark CPDs arise when UV-induced reactive oxygen and nitrogen species combine to excite an
ACKNOWLEDGMENTS

We thank M. Bosenberg and V. Muthusamy for UVA-irradiated mouse skin; the Yale Office of Environmental Health and Safety for the single-photon liquid scintillation counter; A. Bommakanti for photography; and D. Mitchell and A. Mennone for helpful discussions. Supported by Department of Defense CDMRP grants CA093473P1 and CA093473 (D.E.B. and R.H.); NIH grant 2 P50
# RAMP Process

<table>
<thead>
<tr>
<th>Scope</th>
<th>Radmat</th>
<th>Biologicals</th>
<th>Chemicals</th>
</tr>
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<tbody>
<tr>
<td>All</td>
<td>• rDNA</td>
<td>• Restricted chemicals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Human Pathogens</td>
<td>• Certain operations</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Recognize the hazard</th>
<th>PI submits protocol; EHS reviews preliminarily; RSC reviews and approves</th>
<th>PI submits protocol; EHS reviews preliminarily; IBC reviews and approves</th>
<th>PI submits Chemical Hazard Risk Assessment Form; EHS reviews and approves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess the risks</td>
<td>General Radiation Safety Training</td>
<td>General Biosafety Training</td>
<td>General Laboratory Safety Training</td>
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<tr>
<td>Minimize the risks</td>
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<tr>
<td>Prepare for emergencies</td>
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<tr>
<td>Yale Restricted Chemicals</td>
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<tr>
<td>Chlorosulfonic acid</td>
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<td>Chromium (VI)</td>
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<tr>
<td>Cyanogen</td>
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<td>Cyanogen chloride</td>
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<td>DF</td>
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<tr>
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<td>Dichlorosilane</td>
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<td>Diethyleneglycol dinitrate</td>
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<td>Dimethyl sulfate</td>
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<td>Dimethylmercury</td>
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<td>Dingu</td>
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<td>Dinitrogen tetroxide</td>
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<tr>
<td>Dinitroresorcinol</td>
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<td>Dipicryl sulfide</td>
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<td>Ethyl phosphonyldifluoride</td>
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<td>Ethylene dibromide</td>
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<td>Ethylene oxide</td>
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<td>Ethyleneimine</td>
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<td>Ethyleneimino</td>
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<tr>
<td>Ethylphosphonothioic dichloride</td>
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<tr>
<td>2-Methoxyethylacetate</td>
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<td>5-Nitrobenzotriazol</td>
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<tr>
<td>Acetone cyanohydrin, stabilized</td>
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<tr>
<td>Acrolein</td>
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<td>Arsenic</td>
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<tr>
<td>Arsenic trichloride</td>
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<tr>
<td>Arsenic trioxide</td>
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<td>Arsine</td>
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<tr>
<td>Beryllium</td>
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<tr>
<td>Bis(2-chloroethylthio)methane</td>
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<tr>
<td>Bis(2-chloroethylthiomethyl)ether</td>
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<tr>
<td>Boron tribromide</td>
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<td>Boron trichloride</td>
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<td>Boron trifluoride</td>
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<td>Bromine</td>
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<td>Bromine chloride</td>
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<tr>
<td>Bromine pentafluoride</td>
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<tr>
<td>Bromine pentafluoride</td>
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Ongoing Safety Advisor Research Support

- **Providing great customer service**: high quality, prompt, helpful and personal

- **Fixing problems** to support their research and improve safety

- **Acting strategically**—finding and pursuing common goals
EHS-Initiated Reviews

- New hazards
- Renovations
- Accident investigations
- Supplemental Safety Plans
PI-Initiated Reviews

• Reviews of lab inspection results—how to make improvements

• Training: Asking EHS to provide (or arrange) refresher or specialized safety training
Other Ways That Safety Advisors Help Researchers

- Decommissioning (equipment, facilities)
- Laboratory clearances prior to renovation or new occupancies
- Compressed gas safety assessments
- Pre-inspections prior to USDA and CT DPH inspections
Other Faculty Support and Engagement

Advocating on behalf of our researchers to regulatory agencies; expediting licensing; etc.

EHS information system

Enterprise-wide chemical inventory system

Safety Committees (mostly faculty)
- Radiation Safety Committee
- Institutional Biosafety Committee
- Laboratory Safety Committee
- University Safety Committee
EHS Integrator is an Environmental, Health and Safety web portal designed for use by EHS’s partners in promoting safety across the institution.

Please use the menu at the top of the page to navigate. If you are unable to find an item related to your needs, please contact your lab manager or Principal Investigator to request access. For further assistance please contact Yale Environmental Health & Safety directly.

**Your Pending Items**

Please review the pending items below. These are items associated with you, which typically require an action on your part. However, there are cases where others may be responsible for a pending item that you have access to. Click on a pending item to be brought to the associated area. Hover over the number to view more information about the item.

**Registration**
- 1 Registrations Requiring Your Approval
- 2 Registrations Expiring/Renewing
- 1 Lab Safety (Inmers/Visitors) In Progress

**Surveys & Decommissions**
- 2 Surveys Requiring a Response or Resolution

**Principal Profile Training**
- 20 Training Compliance Issues

**Inventory**
- 1 Incomplete Radiation Inventories
- 1 Incomplete Clean Air Device Chargebacks

**Waste**
- 1 Unsubmitted Biomedical Waste Requests
Welcome to EHS Registration

To create a new registration, a Principal must be selected.

### Registrations Requiring Your Approval
| Type           | Version | Appl. Type | Name                                           | Status   |
|----------------|---------|------------|                                                |----------|
| Radiation Isotope | 3       | Renewal    | Anderson, Karen/Rad IsotC-14I3                 | Pending  |

### Registrations Expiring/Renewing
| Type           | Version | Appl. Type | Name                                           | Status   | Expiration |
|----------------|---------|------------|                                                |----------|------------|
| Radiation General | 1       | New        | EHS, Test/Rad Gen1                            | Authorized | 8/21/2018  |
| Radiation Isotope | 1       | New        | EHS, Test/Rad IsotAc-225 (SS)/1               | Authorized | 8/21/2018  |

### Lab Safety (Minors/Visitors) In Progress
| Type       | Version | Appl. Type | Name                                           | Status   |
|------------|---------|------------|                                                |----------|
| Lab Minor  | 1       | New        | EHS, Test/MinorTEST/Diubac Minor, James2019-08-24/1 | Pending  |

### Authorized Registrations

### EHS Approval or Close Pending
Researchers can find their valuable chemicals.

Labs can share chemical stocks.

Encourages safe chemical management.
Also...

• Because we develop close relationships with laboratory staff, the lab’s Safety Advisor is often the first to hear of a pregnancy. We refer the people to Employee Health for counseling and accommodation.

• The Chemistry Department’s Safety Advisor supports and closely partners with their Joint Safety Team.

• Several EHS Safety Advisors participate in the annual Chemistry Department “Safety Day.”
Chemistry Joint Safety Team

People

Alumni

Benjamin Rudshueyn
Webmaster Emeritus
benjamin.rudshueyn@yale.edu
Website

Ben was a graduate student in the Batista Lab studying computational chemistry. Specifically, he applied it to problems in alternative energy, specifically carbon dioxide mitigation and water splitting using the tools of DFT, EHT, and simulated vibrational spectroscopy. Despite not doing experiments, he was passionate about lab safety, especially ergonomics safety. He acted as both the liaison for SCL as well as the webmaster. He received his B.S. in Chemistry from Brooklyn College/CUNY/Macaulay Honors College in 2013 and graduated in 2018 with a Ph.D. He acknowledged the financial support of the NSF/GRFP program. Ben served as webmaster from 2015-2018 and served as SCL Liaison from 2015-2017.

Ana Newton, Ph.D.
President Emeritus
ana.newton@yale.edu
Website

Ana S. Newton, Ph.D. is a postdoctoral researcher at the Jorgensen Lab in the Department of Chemistry at Yale University. Dr. Newton helps develop small inhibitors to treat cancer and HIV using both computational and synthetic skills. She is currently leading two collaborative research projects to design potent small molecule inhibitors of Dnmt3b, a protein whose inhibition has been shown to reduce or eliminate cancer growth, and Cxcr4, a G-protein-coupled receptor associated with HIV. Dr. Newton holds a Ph.D. in Medicinal Chemistry and a B.S. in Chemistry from the University of Lisbon.

Xiaoshen Ma
Safety Officer Liaison for CRB
Emeritus
xiaoshen.ma@yale.edu

Born and raised in Beijing, China, Xiaoshen received his undergraduate education at Peking University where he studied transition metal carbene chemistry under the mentorship of Professor Junbo Wang. After graduating, Xiaoshen decided to pursue his PhD in chemistry at Yale. Xiaoshen currently serves as an LSO liaison for the CRB building in the JST team. Aside from chemistry, Xiaoshen enjoys cooking, reading, and classical music.

Herman Nikolayevskiy
herman.nikolayevskiy@yale.edu

BE, 2011, The Cooper Union for the Advancement of Science and Art

Herman was born in Tashkent, Uzbekistan during the collapse of the Soviet regime. Escaping with his family to America allowed him to pursue his passion for science and math at the Bronx High School of Science. At the Cooper Union for the Advancement of Science and Art, Herman studied chemical engineering. As an escape from the mathematics of his degree, Herman took interest in Organic Chemistry, working under Professor Ruben Savitsky on benzyl guanidine analogs as inhibitors of the Tat-TAR interaction in HIV-1. Upon graduation, Herman decided to pursue total synthesis under Professor Seth B. Herzon at Yale University. Besides chemistry, Herman enjoys traveling, foreign foods and soccer. He is currently a postdoctoral fellow at NIDDK/NIDDK.
Chemistry Joint Safety Team

4th Annual Safety Day

August 9, 2018

The 4th Annual Safety Day will be held in the 3rd Floor Lounge of SCL Tuesday August 28th 9AM - 1PM. All first-year students and safety officers are required to attend and visit all stations. Slots for training in the morning are reserved for attendees who work at West Campus. Trainings and demonstrations include:

- Pyrophoric Materials (JST demonstration)
- Bench and hood maintenance (JST demonstration)
- Emergency Response (JST demonstration)
- Chemical Hygiene (JST demonstration)
- Fire Extinguisher Training with Yale Fire Marshals
- Chemical Inventory System
- Near Miss Reporting
- Hazardous Waste
- Safety Glasses Fitting
- Lab Coat Fitting
- Gas Cylinders with TechAir
- PPE
- E-Ship Global

There will be a light breakfast at 9AM as well as a lunch at noon. To receive a lunch voucher, attendees must visit and get stamped at the Waste Management Station, Near Miss Report Station, and at least 1 JST demonstration. Go to all of the stations and trainings for a chance to win $80 in Amazon gift cards!

The JST and EHS would also like to remind everyone to complete the required online safety training for Laboratory Chemical Safety (https://ehs.yale.edu/node/259) and Fire Extinguishers (https://bmsweb.med.yale.edu/tms/tms_enrollments.offerings?p_crs_id=20746&p_std_id=) by August 27th. Please sign up for the interactive fire extinguisher training using the attached spreadsheet to get the opportunity to put out a real fire!

*The online trainings are required for everyone in Chemistry whether you attend the Safety Day or not.
Safety Advisor Career Progression

- **Safety Advisor Technician**: support activities for Safety Advisor Program—radmat package deliveries, fume hood testing, environmental sampling, etc.

- **Safety Advisor-1**: True generalist—assigned departments and buildings. (All Safety Advisors have responsibilities for laboratory and non-laboratory space.)

- **Safety Advisor**: In addition to SA-1 duties, we add responsibilities in an area of specialty (e.g., laser safety, research material exports, clinical safety, etc.)
“The collateral damage of unsafe research is all research”

—James M. Welch
Ex-Executive Director, Elizabeth R Griffin Research Foundation