



Laboratory Personal Protective Equipment (PPE) – Lessons Learned

EHS Exchange
October 25, 2016
CSU East Bay, Hayward CA

Ken Smith, CIH CHP RRPT
Executive Director for EH&S
Office of the President Risk Services



UCDAVIS



UCMERCED

UCRIVERSIDE

UCSF



INFLUENTIAL SCALE¹

Campuses	10
Medical Centers	5
National Laboratories ²	3
FTE Students	252,000
Full-time Faculty and Staff ³	146,000
Living Alumni	1,700,000

HONORS & AWARDS

Nobel Prizes – <i>most of any public university</i>	61
National Medals of Science	67
MacArthur Fellows	85
Fulbright Award Recipients	264
Pulitzer Prize Winners	16

5 ACADEMIC MEDICAL CENTERS⁴

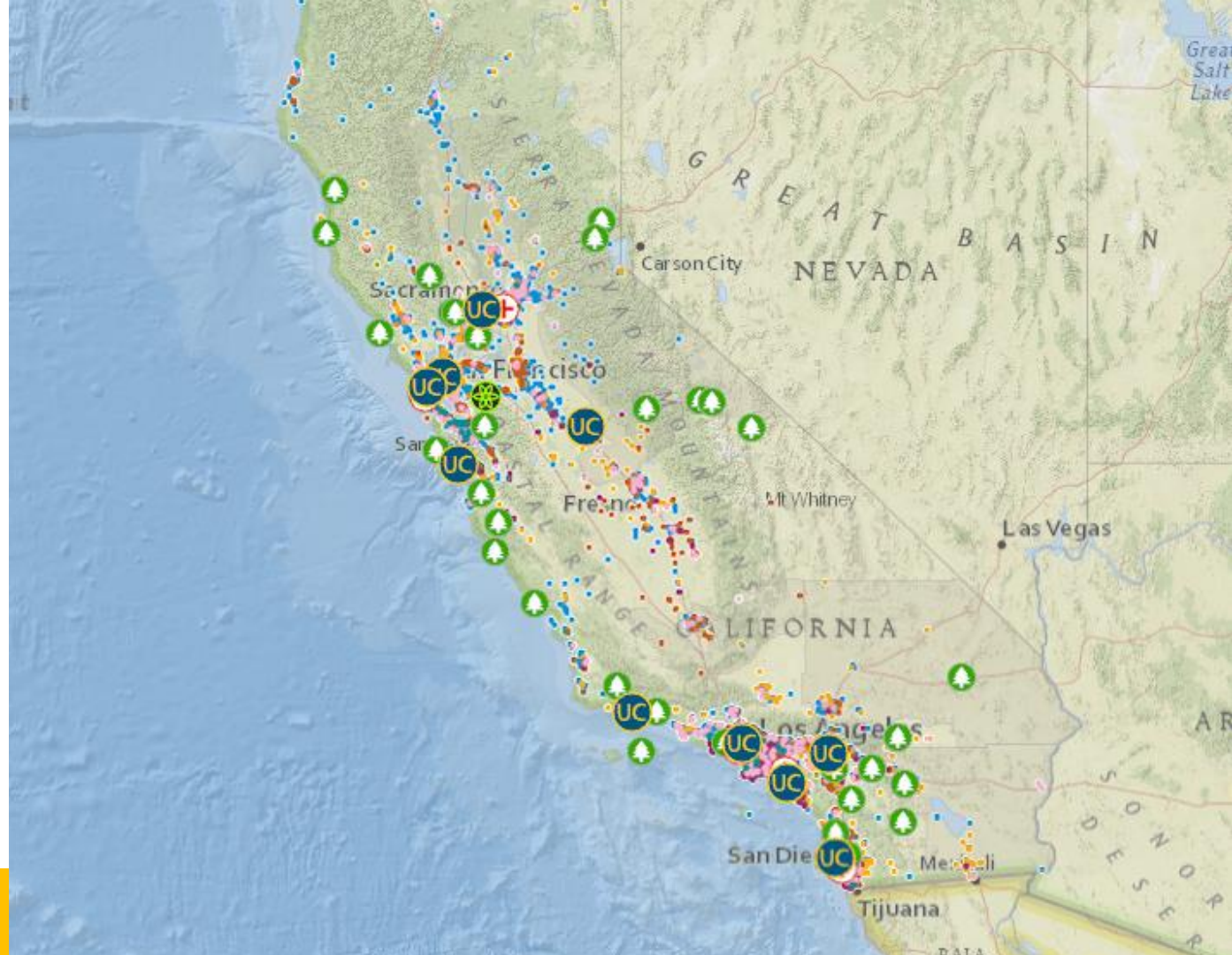
Licensed Beds	3,666
Outpatient Clinic Visits Annually	4,500,000
Inpatient Days Annually	972,000
Major trauma centers	5

STRONG GOVERNANCE AND INDEPENDENCE FROM THE STATE

President Janet Napolitano directly oversees the [10 campus chancellors](#) and the director of the Lawrence Berkeley National Lab

UC remains constitutionally autonomous and is governed by a [26-member Board of Regents](#)

Undergraduate Applicants (2015)	193,870
Freshman Applicants	158,150
Students (2014)	252,260
Undergraduates	195,080
Veterans	1,610
Employees in CA	186,960
Federally Sponsored	54,900
Veterans	1,270
Alumni	1,721,820
Retirees	64,120
Technology Licensees	1,650
Medical Center Outpatients	3,908,000
Payroll in CA	\$10,549,263,616
State and Federal Funding for Student Aid	
Cal Grant Recipients	66,900
Cal Grants Amount	\$810,353,000
Pell Recipients	77,030
Pell Amount	\$356,725,000
Federal Loan Recipients	74,020
Federal Loan Amount	\$425,432,000
Federal Funding for UC Research	\$3,335,299,000
National Inst of Health	\$1,960,427,000
National Science Found	\$518,416,000
Dept of Defense	\$271,540,000
Dept of Energy	\$110,162,000
USDA	\$50,355,000
NASA	\$198,033,000
Other Agencies	\$226,366,000





*Yale student dies in
chemistry lab accident*

CBS News, Apr 2011

**CBS
NEWS**

A photograph of a laboratory aisle. On the left and right are tall wooden shelves filled with various boxes and supplies. In the center, a large window looks out onto a landscape with mountains under a blue sky with light clouds. A long fluorescent light fixture hangs from the ceiling. In the foreground, a blue-tinted semi-transparent banner is overlaid on the image. The banner contains white text. The floor is a light-colored, reflective surface. A rolling office chair is visible in the middle ground.

*Employee Killed in Magnetic Lab Accident
at FSU*

WGJH Oct 21 2015



SHARE



33



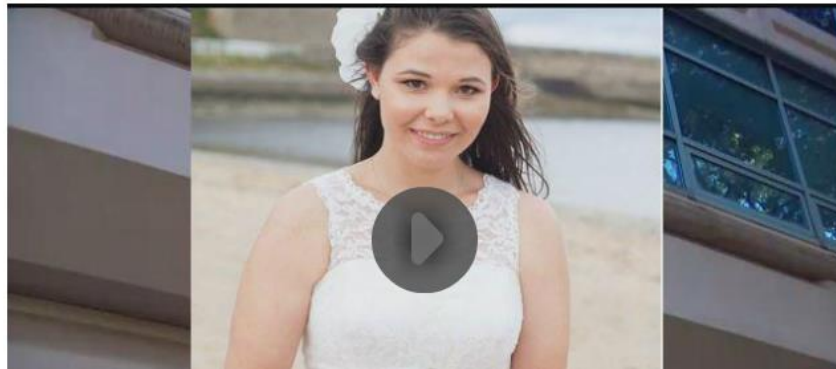
Credit: A.McAvoy/ASSOCIATED PRESS

Report on UH lab explosion reveals deep, systemic safety failures

By [Beryl Lief Benderly](#) | Jul. 7, 2016, 10:15 AM

The 16 March **explosion** at the University of Hawaii (UH), Manoa, that maimed postdoc Thea Ekins-Coward resulted from a static electricity charge that ignited a tank containing a highly flammable, pressurized mixture of hydrogen, oxygen, and carbon dioxide, finds an **investigation** by the **University of California Center for Laboratory Safety (UCCLS)**. This conclusion contrasts with that of a **previous investigation** by the Honolulu Fire Department (HFD), which

Researcher loses arm in UH lab explosion; blast cause not yet known

*Published: Thursday, March 17th 2016, 1:36 am EDT**Updated: Friday, March 18th 2016, 7:07 pm EDT*By [Allyson Blair, Reporter](#) [CONNECT](#)



Local

San Francisco VA Lab Faces Sanctions For Researcher's Death

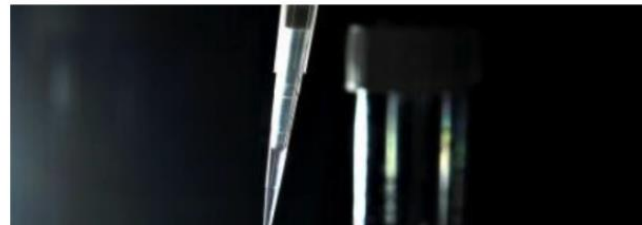
February 20, 2013 9:30 PM

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Share 4

View C



U. of C. researcher dies after exposure to plague bacteria

Chicago Tribune, Sept 2009

Chicago Tribune

A photograph of a school laboratory. The room is filled with shelves of supplies, including boxes and bottles. A window in the background shows a view of mountains under a blue sky. A blue overlay covers the bottom half of the image, containing text.

*Danger in School Labs: Accidents
Haunt Experimental Science*

Scientific American, Aug 2010

**SCIENTIFIC
AMERICAN**



*Texas A&M to pay \$1 million fine to end
ban on biodefense research*

Dallas Morning Star, Feb 2009

The Dallas Morning News



*HIGH-CONTAINMENT LABORATORIES: National Strategy
for Oversight Is Needed*

GAO Congressional Testimony Report, Sept 2009

COMMENT

BIOETHICS Four questions face delegates of gene-editing summit **p.159**

CANCER A stirring memoir of crude therapies and internecine politics **p.162**

HISTORY Kepler cast women as knowledge-makers to save his mother **p.164**

EMISSIONS Russia's coast holds rich potential for renewable-energy generation **p.165**



DOUGLAS C. FITZ/IC/AF/PI/IMAGES





Biosafety-level-3 protection at the US Army's Dugway Proving Ground, Utah.

Rethink biosafety

Tim Trevan calls on those working with organisms that are hazardous, or could be so, to take lessons from the nuclear industries, hospitals and other sectors that have established a safety culture.

Two months ago, the US Department of Defense froze operations at nine biodefence laboratories where work is done on dangerous pathogens. Inspectors had discovered live anthrax outside a containment area at the US Army's Dugway Proving Ground — a facility in Utah that tests defence systems against biological and chemical weapons.

The discovery at Dugway is the latest of several concerning finds. In June 2014,

workers at a US Centers for Disease Control and Prevention (CDC) biosafety-level-3 laboratory in Atlanta, Georgia, sent anthrax samples to three other laboratories on the same campus. The samples were meant to have been sterilized but several

factors meant that 41 people were potentially exposed to live bacteria¹. Then in May this year, an investigation revealed that for several years, staff at Dugway had been improperly sterilizing anthrax samples, and that live spores may have been sent to 52 laboratories in the United States, Canada, Australia and South Korea.

These mishaps — which are by no means unique to anthrax — are worrying on two levels. First, the handling of ▶





UCLA Ebola Kits
UCLA HEALTH SYSTEM

TRT=1:38

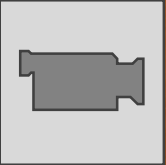
Split audio - Narration L, Nat R

Connect 8 Media



New CDC Guidance for Ebola PPE Calls for No Skin in the Game





2008 UCLA Case

- PARADIGM SHIFT: Completely reframed university expectations and concerns regarding campus safety
- FOR THE FIRST TIME: Both faculty member and a university held accountability under criminal legal proceedings
- CRIMINAL CHARGES: Charges of criminal liability in Sheri Sangji's death
- SETTLEMENT: Agreement reached with Professor Harran after 4 years of criminal court proceedings, charges to be dropped if settlement terms met
- REPUTATIONAL IMPACT: Both to Professor Harran and to UCLA
- COSTS: In excess of \$9M paid out by university
- CIVIL CHARGES: Possible civil charges?
- SANGJI FAMILY ADVOCACY: ACS meeting in Boston, Fall 2015

Why PPE?

Elimination

Substitution

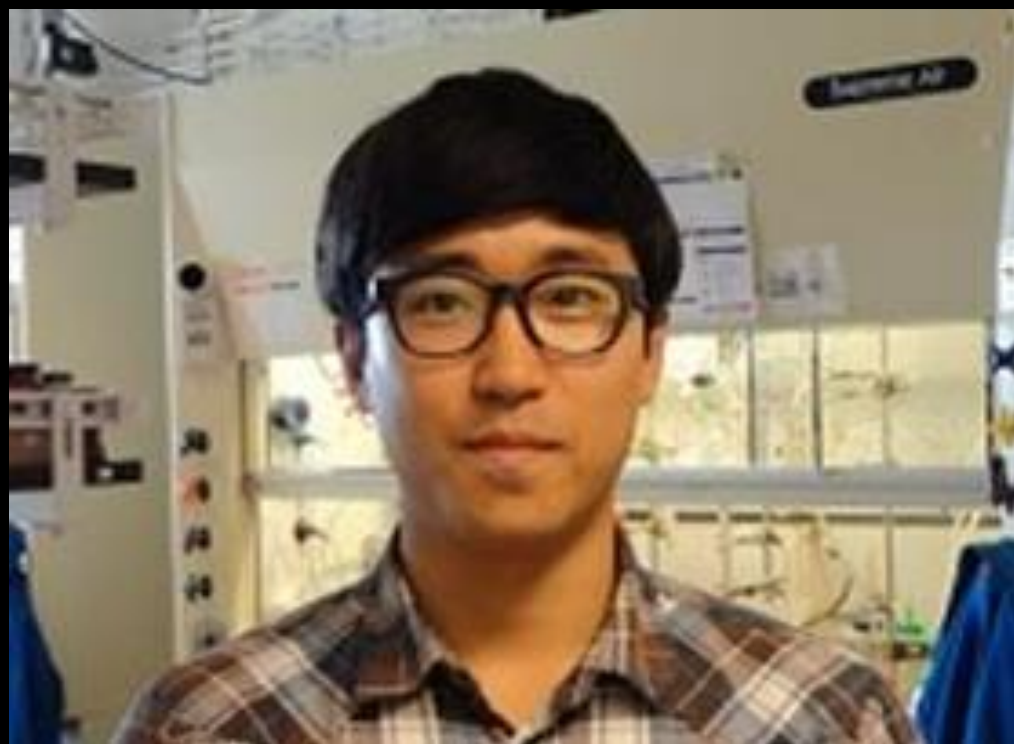
Isolation

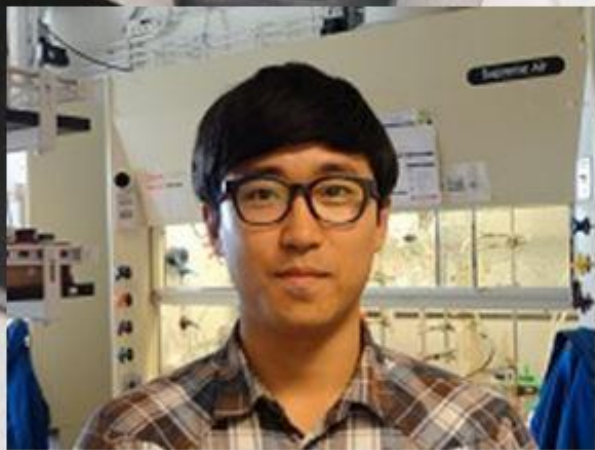
Engineering

Administrative

PPE

UNIVERSITY
OF
CALIFORNIA
*The Smart
About Safety*



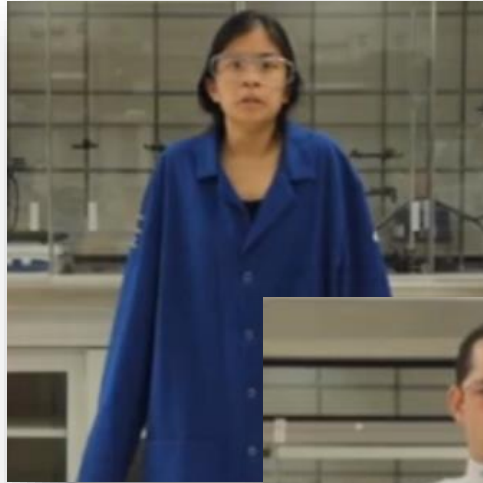




Stay Protected

Success of an PPE program is dependent on three factors:

1. Fit
2. Fit
3. Fit



So what type of Lab Coat Do you Need?



What's the diff?

Optional Campus Embellishment



Campus Logo

Name

Dr. Charles Perrin – Professor of Chemistry
50 years of Teaching, Research and Service



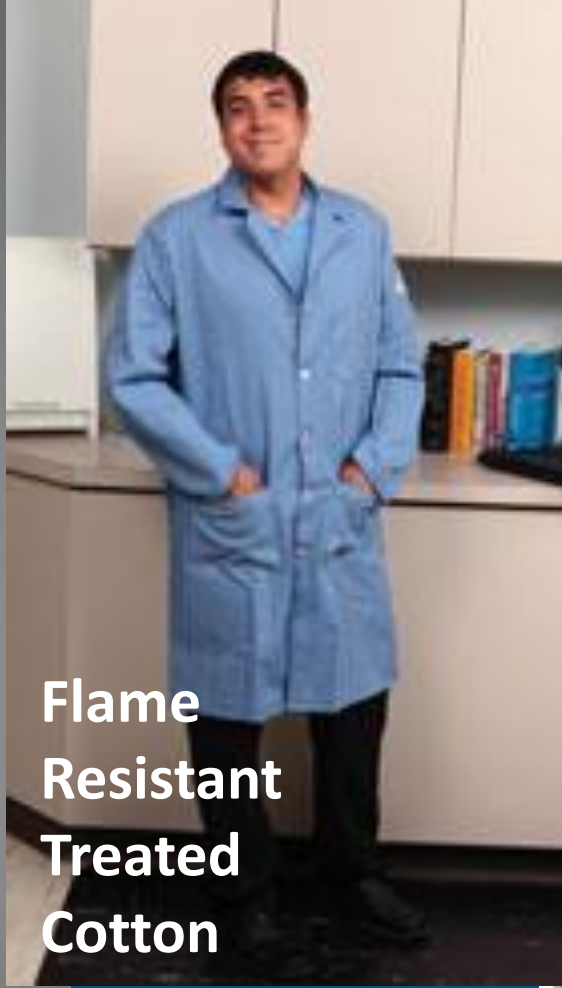
What's the diff?

Reported Laboratory Safety Incidents at UCLA

- ◆ About 100 reported lab accidents per year at UCLA from roughly 10,000 postdoctoral scholars, graduate students, undergraduate students, and staff in research labs.
 - (About 7 from Department of Chemistry & Biochemistry)
- ◆ 17% of lab accidents at UCLA over eight years were **Chemical Exposures**
- ◆ 35% of the **Chemical Exposures** were “splash to body”
- **Do lab coats provide adequate protection?**



**Cotton
Or
Polyester**



**Flame
Resistant
Treated
Cotton**



**Flame
Resistant
Nomex**

What is it we want a lab coat to do.



1. Comfortable material to wear



2. Breathable



3. Flame resistant



4. Non-porous for liquids



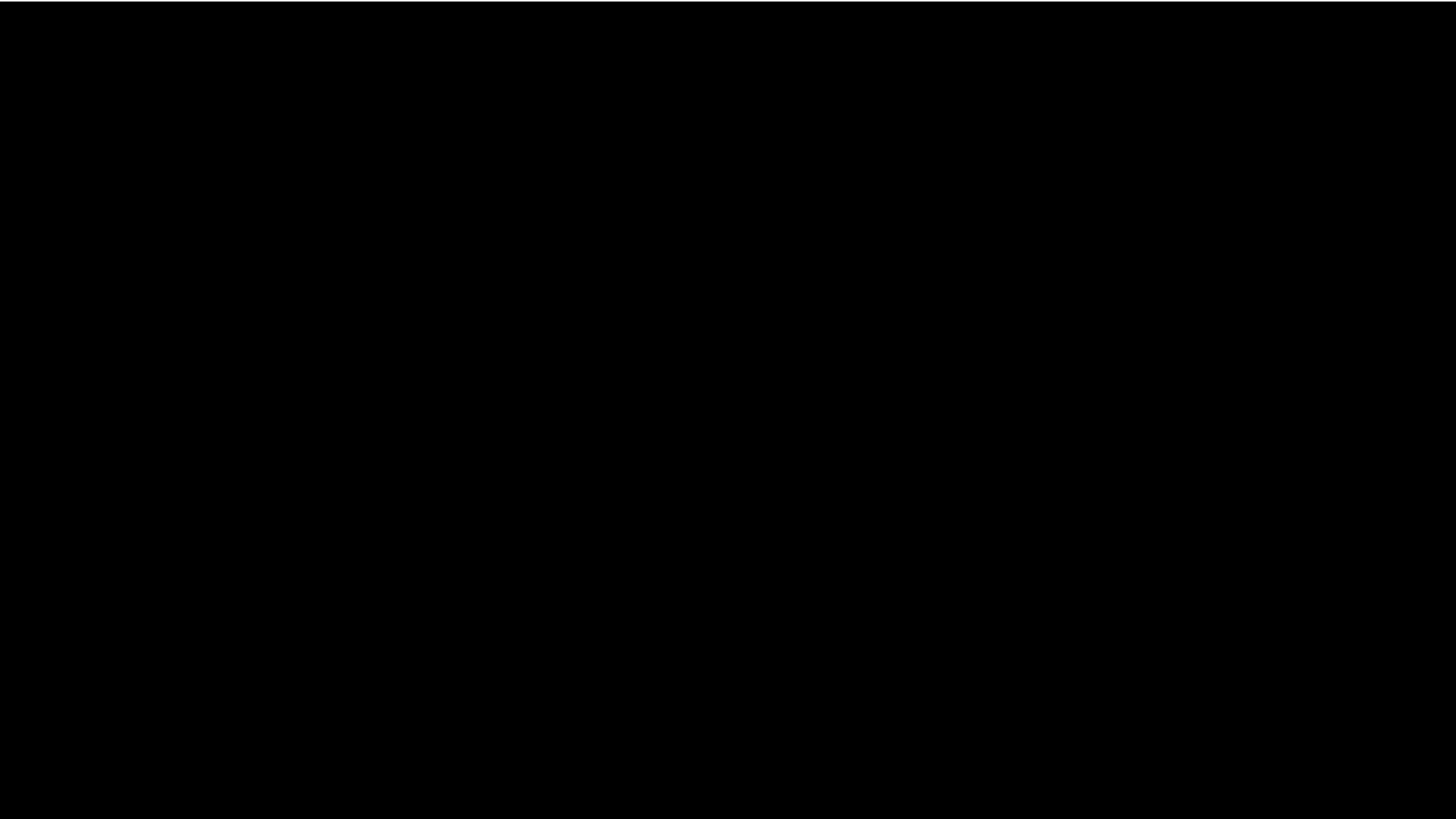
5. Non-wicking for liquids



6. Chemically resistant

But, more than 100 years after the invention of lab coats, they FAIL criteria 4, 5 and 6!





Improvements

- Lab coats made from Milliken ShieldTEC have the comfort and breathability of cotton coats.
- They have flame resistance due to the core Nomex fiber.
- They are non-wicking and non-porous for polar liquids such as aqueous solutions and organic solvents such as ethanol, DMF, and DMSO.
- They exhibit remarkable chemical resistance due to a proprietary fabric treatment that also enables the non-wicking and non-porous properties.

Reusable Liner and Single Use Gloves Tested

REUSABLE LINERS

SINGLE USE GLOVES

70-200 Liner
available today



- Main body yarn : 100% Kevlar [inherently Flame Resistant material]
- Cuff elastic, colored size indicator, label: all flammable

80-813 Liner
not yet available



- Main Body yarn: Patented Ansell Kevlar Blend
- Cuff elastic, colored size indicator, label: all inherently FR

92-675 Nitrile Glove



25-201 NeoTouch



- Polychloroprene glove

Nitrile Glove FR Test

Sample	Burn time after flame (sec)	Melting/drips	Burn/Char length	Pass / Fail
92-675	>45	none	consumed	Fail
92-675 over 70-200	45	none	consumed	Fail
92-675 over 80-813	>45	none	consumed	Fail
92-675	>45	none	consumed	Fail



Exposed to flame, nitrile gloves make good torches, and the flames don't go out until all material is consumed



92-675 over 80-813



92-675 over 70-200

25-101 NeoTouch FR Test

Sample	Burn time after flame (sec)	Melting/drips	Burn/Char length	Pass / Fail
25-101 solo	19.2*	None	4	Fail
80-813 fingers	0.34	Yes	3	Fail
80-813 folded	0.56	None	2	Pass
70-200 fingers	<10**	Yes	3	Fail
70-200 folded	0.56	None	2	Pass

* It did self extinguish after 19 seconds

** 2 samples went out in less than 2 seconds, one that self extinguished after 16 seconds



Exposed to flame, This glove usually self extinguishes, but the time varied a bit, and small flaming pieces would drop off, a definite concern



80-813 Liner FR Test

Sample	Burn time after flame (sec)	Melting/drips	Burn/Char length	Pass / Fail
Fingers down	0.94	None	< 1 inch	Pass
Overedge down	0.45	None	< 1 inch	Pass
Side cuff down	0.64	None	< 1 inch	Pass
Folded edge	0.55	None	< 1 inch	Pass



SU Gloves Underneath FR Liners

Sample	Burn time after flame (sec)	Melting / drips	Burn/ Char length	Pass / Fail
25-101 under 80-813 fingers	0.88	None	<1 inch	Pass
25-101 under 80-813 folded	0.72	None	<1	Pass
25-101 under 70-200 fingers	0.57	None	<1	Pass
25-101 under 70-200 folded	0.49	None	<1	Pass
92-675 under 80-813 fingers	0.72	None	<1	Pass
92-675 under 70-200 fingers	0.77	none	<1	pass



Picture of 25-101 underglove & 80-813 overglove after folded glove flame test – visual marks only, no burn holes



70-200 over 25-101



80-813 over 25-101



80-813 over 92-675

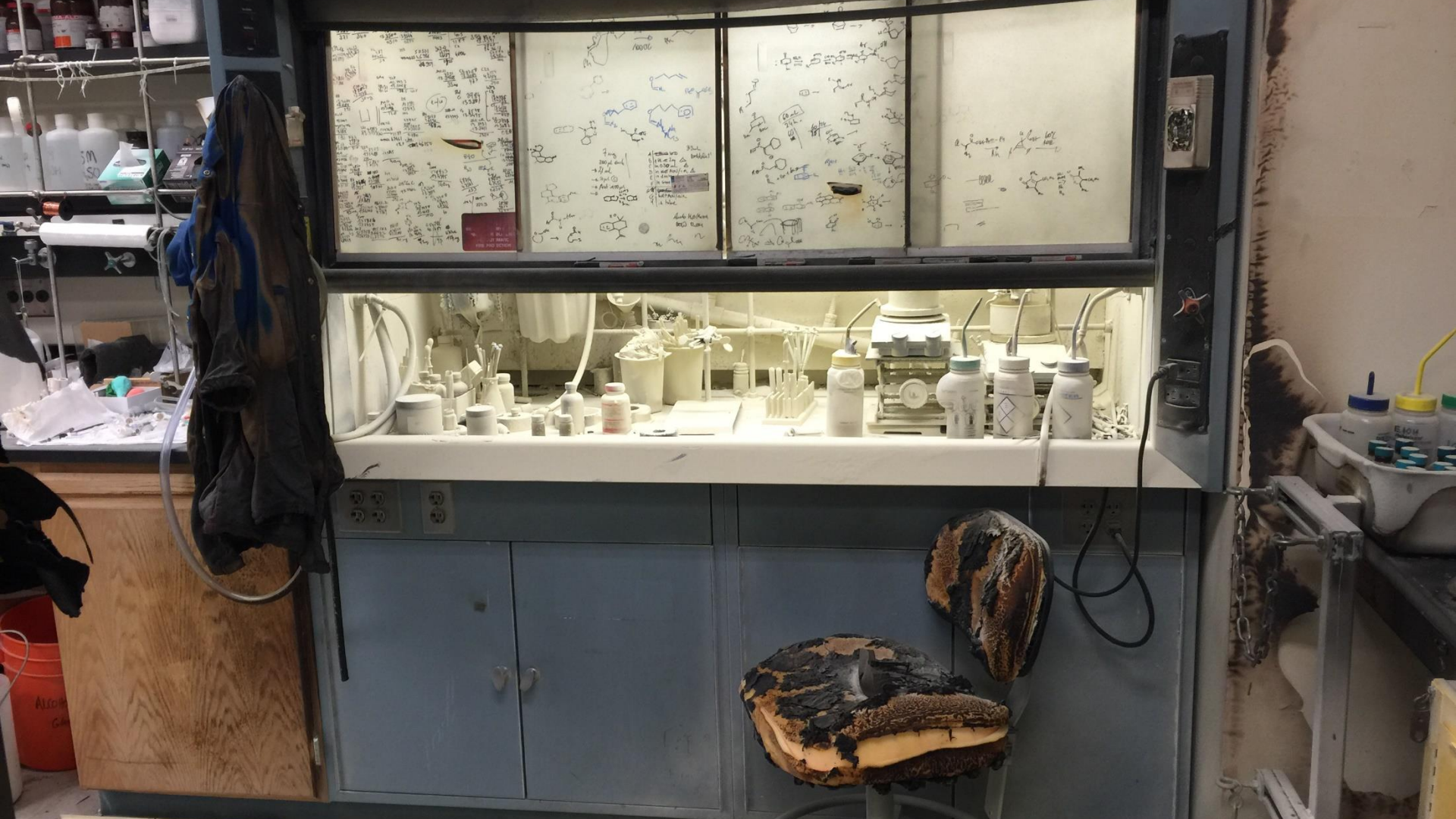




UN1265,
PENTANES, 3, PG II









The graduate student involved was wearing goggles, gloves, and a flame-resistant Nomex lab coat and did not sustain any injuries





Implementation Guide

20 recommendations for a safety culture drawn from top resources

Tools and resources for implementation (+ values, roles, responsibilities resources).

Suggested Core Institutional Values

Safety is everyone's responsibility.

Good science is safe science.

Safety training & education is critical to research and education.

Safety culture is necessary to implement true risk reduction.

Diversity and flexibility of approaches and methods.

Acknowledgements

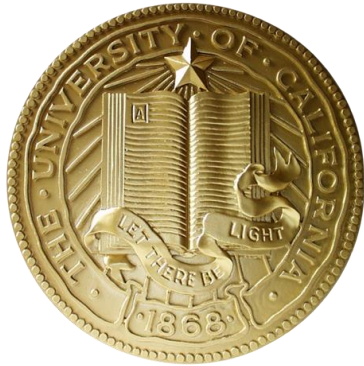
- Dr. Jason Spruell, Milliken & Company
- Ansell
- DuPont
- Milliken & Company
- Workrite

UCLA

UC | Center for
Laboratory Safety



SAFETY TRAINING
CONSORTIUM



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