# Chemical Safety in an Organic Chemistry Lab

Integrating Safety Practices into Complex Processes Presented by Zackary Herbst (they/them)



- Chemical Management
  - Storage
  - Usage



- Chemical Management
  - Storage
  - Usage
- Unattended/Overnight reactions



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- New processes are common





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- Managing Accumulation







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#### Addressing Chemical Storage & Accumulation



• Storage of volatile chemicals: "Cancer Fridge"



- Storage of volatile chemicals: "Cancer Fridge"
- Some >30 years old and duplicates









- Storage of volatile chemicals: "Cancer Fridge"
- Some >30 years old and duplicates
- Difficult to find materials













• Reduce the Number of Chemicals Stored

	A	В	C	D	E	F	G H	1
274	KEEP FOR SURE	38078-09-0	Diethylaminosulfur trifluoride	5G	2013	Never opened??	CHB418A Freeze Big Bin (gene	ral] A00301499
275	KEEP FOR SURE	38078-09-0	Diethylaminosulfur trifluoride	25G	2018		CHB413 Fridge Bin 14 (C4)	A00357602
276	hamid said throw out	38078-09-0	(Diethylamino)sulfur trifluoride	25G	2019	Date wrong - bottle is VERY OLD	CHB413 Fridge Unmarked (T	nro A00367846
277	KEEP FOR SURE	38078-09-0	(Diethylamino)sulfur trifluoride	25G	2019		CHB413 Freezer	A00367846
278	KEEP FOR SURE	38222-83-2	2,6-Di-tert-butyl-4-methylpyridine	10G	2015		CHB418A Refrige Door 2nd Top	Riį A00330871
279	KEEP FOR SURE	38899-05-07	D-Glucosamine 2-sulfate sodium	1G			CHB413 Fridge Bin 1 (C1 & C	<u>/</u> )
280	KEEP FOR SURE	391-82-2	4-Chloro-7-fluoroquinoline	1G	2017		CHB418A Refrige Door Top Left	A00345303
281	KEEP FOR SURE	39539-66-7	4-Methyl-1-piperazinecarbonyl chloride	1G	2012	(spec date 2010)	CHB413 Fridge Bin 18	A00285428
282	KEEP FOR SURE	39637-74-6	(1S)-(-)-Camphanic chloride	1G	2014		CHB418A Refrige 2nd from top	C9 A00316117
283	Throw out	39684-80-5	2-(Boc-amino)ethyl bromide	500MG	2003	Marked as discarded 2009? we have 1G from 2007 and 2011	CHB418A Refrige Top Shelf	A00179923
284	KEEP FOR SURE	39684-80-5	2-(BOC-amino)ethyl bromide	1G	2007	Disposed of in 2014?	CHB418A Freeze Big Bin (gene	ral] A00227364
285	KEEP FOR SURE	39684-80-5	2-(Boc-amino)ethyl bromide	1G	2011	NOT IN INVENTORY	CHB413 Freezer	A00254115
286	>20 years old	39718-32-6	2,5-Difluorophenyl isocyanate	1G?	1997?		CHB418A Freeze Isocyanates	ох
287	>20 years old	39920-37-1	2,6-Dichlorophenyl isocyanate	1G	1997	Disposed in 2007?	CHB418A Freeze Isocyanates	ox A00106655
288	KEEP FOR SURE	39968-33-7	1-Hydroxy-7-azabenzotriazole	1G	2003		CHB413 Fridge Bin 15 (C5)	A00174361
289	KEEP FOR SURE	3999-38-0	2-Methylpyridine borane complex solution	5G	2017		CHB413 Fridge Bin 18	A00348720
290	KEEP FOR SURE	40054-01-01	6-Bromomethyl-2-pyridinemethanol	1G	2003		CHB418A Refrige Top Shelf	A00180589
291	KEEP FOR SURE	40377-41-1	N-(4-Aminophenyl)acetamide	250MG		Chemical looks brown??	CHB413 Fridge Bin 18	
292	KEEP FOR SURE	40397-95-3	2-Chloro-4-nitrophenyl isocyanate	25G	2018		CHB418A Refrige Door Top Left	A00357603
293	>20 years old	40398-01-04	2-Chloro-6-methylphenyl isocyanate	1G	1997	Disposed in 2007?	CHB418A Freeze Isocyanates	ox A00106672
294	>20 years old	404-71-7	3-Fluorophenyl isocyanate	5G	1997	older than labelled	CHB418A Freeze Isocyanates F	ox A00364968
295	>20 years old	404-71-7	3-Fluorophenyl isocyanate		1997?	MISSING ORIGINAL LABEL (1997?)	CHB418A Freeze Isocyanates R	ох
296	>20 years old	4111-54-0	Lithium diisopropylamide	100ML	1992		CHB418A Refrige 2nd from top	C9 B0000022620
297	KEEP FOR SURE	4111-54-0	Lithium diisoproplamide solution	100ML	2011		CHB418A Refrige Door 2nd Top	Riį A00256604
298		4111-54-0	Lithium diisopropylamide 2.0M heptane/THF	100ML	2011	Discarded 2011??	CHB418A Refrige Very Bottom	hε A00275594
299	>20 years old	41195-90-8	2,3-Dichlorophenyl isocyanate	1G	1997		CHB418A Freeze Isocyanates F	ox A00106652
300	KEEP FOR SURE	4163-60-4	B-D-Galactose-pentaacetate	25G	2010	Discarded in 2012??	CHB418A Refrige 2nd from bot	on A00265043
301	>20 years old	41840-28-2	tert-Butyl S-(4,6-dimethylpyrimidin-2-yl)thiocarbonate	10G	1992	Discarded in 2012??	CHB418A Refrige 2nd from top	C9 B0000022870
302	KEEP FOR SURE	41840-28-2	O-Tert-Butyl S-(4,6-dimethylpyrimidin-2-yl)thiocarbonate	10G	2011	THIS LOOKS OLDER	CHB418A Refrige 2nd from top	C9 A00259797
303	KEEP FOR SURE	420-04-02	Cyanamide	25G	2014		CHB413 Fridge Bin 2 (C1 & C	2) A00316063
304	Throw out	420-37-1	Trimethyloxonium tetrafluoroborate	10G	2006	We have 8 bottles	CHB413 Fridge In a bottle with	h c A00209297
305	Throw out	420-37-1	Trimethyloxonium	10G	2006	Disposed of in 2007?	CHB418A Freeze Big Bin (gene	al] A00210805
306	Throw out	420-37-1	Trimethyloxonium tetrafluoroborate	10G	2008		CHB418A Freeze Big Bin (gene	al] A00237326
307	Throw out	420-37-1	Trimethyloxonium tetrafluoroborate	10G	2010	We have 8 bottles	CHB413 Fridge Bin 9 (C3)	A00280529
308	Throw out	420-37-1	Trimethyloxonium tetrafluoroborate	10G	2010	We have 8 bottles	CHB413 Fridge Bin 9 (C3)	A00280528

- Reduce the Number of Chemicals Stored
- Use Sealed 2º Containers to Reduce Exposure Risk



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- Reduce the Number of Chemicals Stored
- Use Sealed 2º Containers to Reduce Exposure Risk
- Create a System for Organization



# Project: Flam

- Reduce the Numbe
- Use Sealed 2º Con
- Create a System fc

C9-1			
ADD269850 C9 C9H8N207 74124-79-1 DSC IN N' D			
A00274050 C12 C12/N207 84-58-2 2.3-Diffuse of Carbonatal			
C17 holt-TAA00274108 C0 Nu2 223-68-5 2-Biblendrata			
45G-1 - A00275594 C6 C6H14H1 Amonia d5 La Am	25G	201	11
C12/1-A00278060 C12 C12H2R2 t11-54-0 Uthium disopropyl alocohol	10G	201	1
C8-2 - A00280175 C7 C7H1002 132705-51-2 Bromotringroup opyramide 2.0M heptane/Tur	1G SOOAAI	201	1 Discarded in 2012??
G-( -A00281511 C7 C/H108MC 30472-24-9 Methyl 2-property Methyl 2-p	100MI	201	1
CIE/ - A00283183 CII CI14080, 380430-57-9 N-4-methanosula	5G	201	Discarded 201177
C7 1-A00283501 C7 C74587 939-26-4 1-(Bromomesturionamidephenylboronic acid	250	2010	Oiscarded in 2012??
CP-(- A00284789 C9 C9H18A0 3564-57 3-Bromo-4-(trifluoromethalene	16	2012	2
, GT-2 -A00289215 C8 (SH100MC TODAY) TEMPO	5G	2012	2
A00290109 C0 H202 73887-39-5 3-Acetamidobenzeneboronic acid	5G	2012	1
VCISTA00291058 CI4 Clause International Hydrogen Peroxide	5G	2012	
C9-( - A00291221 C9 C9451-40-1 2-Phenylacetophenone	1G	2012	
Cs-1 -A00294306 CS CBIOUZ 637-44-5 Phenylpropioli acid	SOOML	2012	Discarded L. Server
an - A00298982 G GH/G 1073-67-2 4-Chlorostyrene stability	25G	2012	obcarded in 2014??
(9-1 - A00304188 C4 C4H9L 109-72-8 n-Butylithium scholarzed	5G	2012	
ADDITION IN ADDITION GO CHITNO 1074-88-0 Indole 2 cathoon	10G	2012	
City - A00305063 Cit City City Control City Carboxaidehyde	100ML	2013	Colline at
C3 C3H5BrZn 126403-68-7 Content on Spheric Sph	1G	2013	Still in the can
Cyclobutylzinc bromide 0.5M in THF	100G	2012	
4-1 -400308002 C4 C4H9BrZn 126403-67-6	50ML	2012	
20+( - A00308120 C28 C28H36CI3 106255 81 0	SOML	2013	
A00308257 C4 C4H9BrZn 126403-57 C4 C4H9BrZn 126505-57 C4 C4H9BrZn 12650500-57 C4 C4H9BrZn 12650500-57 C4 C4H9BrZn 12650500-57 C4 C4H9BrZn 1265000-57 C4 C4	SOML	2013	Discarded in 2014??
A00308259 C3 C3H7BrZn 77042 7 Sobuty/zinc bromide solution in THE	1G	2013	
A00398266 C3 C3HTRK2 HOM-8/-1 2-Propylzinc bromide	25MI	2014	
- ( -A00311713 C10 C10H22N2 SIGNAGE D. Progylainc bromide 0.5M THE	25MI	2014	Discarded in 2014??
-1 -100312529 C8 C8H785 51644-96-3 N-Boc-1,5-diaminopentane	SOM	2014	Discarded in 2014??
CtoW - A00313271 CD H202 The H	16	2014	
7-( -A00313290 C7 C7U2C84-1 Hydrogen Peroxide solution 30er in the	100	2014	
- A00313291 C7 CPH/CINS 2740-81-0 2-Chlorophenyl isothiocrasov in H2O	10044	2014	Says N-Benzylglycine ethyl exter in immediate
4-1 A00313568 C CHACINS 2392-68-9 3-Chlorophenyl isothiopman.	EC	2014	Old Peroxide Old Peroxide
- A00313569 C10 CASINO25 113504-93-1 1,3-Benzodioxol.5.V leathing	50	2014	
-1 -A00313570 CB Countrillos 89007-45-4 4-Isopropylohendi isothiocyanate	30	2014	
-A00313571 C8 CBHZNK CS163-86-2 4-Chloro-3-(trifluorometholics)	10	2014	
- A00313572 C9 C9H3EAN 222-78-6 Benzyl isothiocyanate	10	2014	
- A00313573 C9 C9H10N3 2315-29-9 3,5-bis(trifluoromethyliphen disent	50	2014	
A00313585 C CH2CTAL 131-64-8 4-(Dimethylaminolohomd licethylaminolohomd licethylaminol	50	2014	
A00313586 C CH3CHNS 137724-66-4 3-Chloro-4-fluorophend isocniocyanate	50	2014	
Roozizses C Chickens 247170-25-8 5-Chloro-2-Biarcoharte Social	56	2014	
A00313752 CO LINE 247170-25-8 Schloro 2 Grandel Microphenylisothiocyanate	56	2014	
A00313950 CO NH3 7664-41-7 Ammonia 21 Contempositio yanate	16	2014	
A00315337 C8 C8H6CINS 3694-58-4 3-Chlorobenet institution	16	2014_	
AUGUST237 C8 C8H7NOS 3125-64-2 3 Mathematical Software	TOOML	2014	
C9 C9H7NOS 3125-71-1 3 Activity premy lisothio cyanate	1G	2014	
Autosissen C9 C9H7NOS 2131-57-9 Antersympenyi isothiocyanate	106	2014	
AUU315298 C8 C8H5NO2S 2131-62-6	SG	2014	
A00315330 C9 C9H9NO25 33904-03-0	SG	2014	
A00315981 C7 C7H3CI2N <sup>5</sup> 6590.95 1 2,4-Dimethoxyphenyl isothiocyanate	5G	2014	
A00315982 C9 C9H9N(2S 330M of a 2,4-Dichlorophenyl isothiocyanate	SG	2014	
A00316054 C11 C11H20841 193040 1,3-Dimethoxyphenyl isothiocyanate	10G	2014	
- A00316112 C18 C18H23CIC 1384U/04-6 4-Bromomethyl-piperdine-1 carbondic acid text be	10G	2014	
A00316113 C12 C12Horson C12 C12Horson Oleoyi chloride	1G	2014	
A00316114 C12 C12076250 688-73-3 Tributyttin hydride	-1G	2014	>10
A00316115 C12 C12HZ850 688-73-3 Tri-N-butyltin hydrida	50G	014	talle out of can
A00310115 C19 C19H15N0 82911-69-1 FM0C-05U	50G	014	dessicant
Tetrakistrinhendeberking	56	in in	dessicant
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(9-7 A001/47/17			
(9-2 A00114747			

CHB413 Chemical Refrigerat	or Inventory by CAS#	No.	2142-58-7 Diethyl cyanophosphosala 2142-58-7 Diethyl cyanophosphosala	544, 22% 8-+7/25 A00225481	INS
Last opdated Novemp	er zuly, zmh	1	2142-56-7 Dethyl sysnephespherate (CaA 2015) 356-23-6 Toth assessment land (CaA 2015)	SML DOOR ADDIDUDY	
S # Company Name	Amount Care Bin # UW Barcode	- HE./H	38527-81-4 Indeaserin chierde	250 200 Bin 1 (C1 & C2) A00014/97 250 2004 Bin 1 (C1 & C2) A00014/97	Can ma
2445-78-8 Clamica	10 2004 Bin 10 (C4) A002/3333	1200	26819-29-37 Distrytaminesultar trifugride 26819-29-37 D-Stucesamine 2-authors endum	230 2018 Bit 8 (24) A02217623 10 Bin 1 (21 & C2) A02217623	See ma
044-54-2 EDigny/trimethylaliana	\$6 204 Bir 5 (C3) A00317292		19539-46-7 4-Methyl - piperatinecarbonyl shlarida	19 292 Bin 11 (C4) ADD295428	insert fo
1073-06-09 [ 1-Bromo-3-fluorobensere (Ampule)	100 B= 10 (50)		2019-38-3 2-Mathytypridine barane complex assultan	30 3011 (III- 11 (CA) AND	
198-23-6 Insprept chiereferman selution	10044, 2013 Bin 8 (54) A00303964	8 1 H H H	40317-41-1 N-(a-Amingshary)acctanida 420-06-02 Cranamize	250%5 Bit 10(24) 250 20% Bit 2 (214 CD) A0024003	storage 1
108-66-3 Resorcinel 109-61-5 Propyl chloraformale	250 200 6m 8 (C4) A00APS30	- 1181 ·	A22-27-1 Trimethylasanium tetraturnitipotes	00 201 Bo 1 (C) ADD1673	
109-43-7 Baran trifluoride diethyl etherate	100ML 2017 Bix 8 (C4) A00347000 100ML 2018 Bix 8 (C4) A0034856	1.181	420-31-1 Trendhylasseque lan alluer ber vice bergla 420-31-1 Trendhylasseque lan alluer bergla	100 201 Bin 5 (22) Add(19087)	of causic
129-12-8 N-Burglithium solution	5044, 2014 Bin 8 (C4) A00373837		421-83-8 Trifuerometryindary chierde	230 227 Bin 1 (2) & CD (ARGANATS 230 2211 Bin 1 (2) & CD (ARGANATS	acidic ma
199-74-2 13-Diaminopropaka	250 2002 Bin 2 (21 & C2) A00/552/8	12.111	12153-38-4 J-Chiery 5-shrangelink and	10 201 Bin 9 (52) A00073788 100 2007 Bin 8 (54) A00173788	
TIRA-78-7 Trevelbylamine N-Seide	10 2008 Bin 5 (C2) ADDE33840 16 2011 Bin 8 (C4) ADD234638		414/12/-14-2 2-Discoggridine 4-benatic ADM	92 94 8-1211 ANDONE	
122-28-4 Propionalitetyde	25656, Bin & A02218055		442-77-8 Thighnegers	190 2014 dec 1 (C) 4002 0211	1
123-54-6 2.4.Participations	1000 2014 Bin 9 (CS) A0027(\$120	1	Lasa da a Apiden inetity allane	10 200 Be 1 CE ANYACEM	
123-18-2 Carcoline More allored childred	10046, 1304 Bin 2 (CL & CD) A00214832	100	1865 42-3 An Dickerstrattal methol etter	2000 T Bis 2 (21.6 (2) AND 194252 30 2010 Fin 4 (25) AND 1942521	
135418-75-5 3- (Resements (2)-5-methylasteetee	10 101 Bin 11 (CA) ADDITUDAT	1 2 1	19.12.1 N interactionals	10 700 Bin 8 (51) A003(1911 1000 2001 Bin 9 (53) A003(1911	B
14/03-0-3 3. Method 3. furned chierde	70 200 Bin 12 (CA) A0027004		SAL-01-3 Ency chiereductions SAL-01-81 12-Appendications and	153 207 85120 AM15700 100 201 85120 AM15700	ET A
Velage-62-5 Barane /wrated-staran complex 144 in Ted	10544, 2009 Ein 8 (C4) A0024813 10546, 2009 Ein 8 (C4) A00248054		1429-14-1 2-Antamotemylic stid	1000 1014 Bin 2 67 8 CD ADDA400	1
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1409-47-8 Owithy synakarbanate	VG 2004 811 9 1078 ADDITION		und all 0 2 Thanking and	250 1000 000 1000 assortate	
1419-59-7 Acers antiptride Ch.	10 10% 80 0.54 000000000000000000000000000000000	E E	415-35-4 Confuences 425-35-7 Virginitic Acid	700 1001 8-8 100 ADD 1000	NO
11209-19-5 5-000000000002-6-00000000000000000000000	155040 Bin 10 (54) 105440 Bin 10 (54)		AD-38-5 D-Brance (Accessed	ZPPES ZEPE BELT COLL ADDIALD	FOOD O
117185-10-5 4-20 sense of party of the sense	1000 1000 Rev Y (CA) APPOINT		Alle-TC-B 2-Designmentation	200 2001 Biolificial AMERICA	DRINK
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CHB413 Chemical Refrigerator Inventory by CAS# Last updated November 2019, ZMH	No. 82 - Devid demonstrationerses Mrs. 201 (8-1-20) Antitioner 101-0-2 - Devid demonstrationerses Mrs. 201 (8-1-20) Antitionerses Mrs. 20		
COS.8         Company have         Amount         Des         Bit #         Vet Recent           1950-27-4         Permit - systexceletele         30         1964. Sex 1, Six March 1         40000000           1984-15-2         Reserve         9         2064. Sex 1, Six March 1         40000000           1984-15-2         Reserve         190         2064. Sex 1, Six March 1         400000000           1984-15-2         Reserve         190         2064. Sex 1, Six March 1         400000000           1984-15-2         Reserve         190         190. Six March 1         4000000000	Internal control         Internal control<	Bn 6 C3	
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Data 5: 1-1         Difference of the A subject to the A su	10.4.4.5         Monitoria         10         102.4.8.6.4         Annotation           10.4.6.5         Advantaciona         10         10.4.8.6.4         Annotation           10.4.6.6         Advantaciona         10         10.4.8.6.4         Annotation           10.4.6.7         Advantaciona         10         10.4.8.6.4         Annotation           10.4.6.8         Advantaciona         10         10.4.8.6.4         Annotation           10.4.6.8         Advantaciona         10         10.4.8.6.4         Annotation           10.4.6.8         Advantaciona         10         10.4.8.6.4         Advantaciona           10.4.6.6         Advantaciona         10         10.4.8.6.4         Advantaciona		
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See manufactur insert for safe storage requirem of caustic and

FOOD OR DRINK

#### CHB413 Chemical Refrigerator Inventory by CAS# Last updated November 2019, ZMH

	Competer	d Name		Am		Cara	Bin #		W Barcote
1-29-4	Pyrrsia	2-carboxaldehyde		50		2004	Din T.		ADDIVIDAT
45-78-8	Clamica			10		2004	\$in 12		
14-54-2	Eltym	trimativialiana		150		2014	Die 9		A00311292
6-15-6	Abith	omide		105	6	2001	Din 5		A00144431
173-06-09	1-Bros	na-3-Ruorobanzana (Amoula)					(Ein 15	000	
00.33.4	hanne	and chievelocenets and the		110	DAL.	2013	Din 8		A01202944
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109-63-7	Bar	on trifluoride diellivyl etherate			0000		in the second	1100	A00324837
109-72-9	N-	burglithium solution						5.0730	A10218051
109.74-3		Diaminophopana		-	110			7.073 6.070	A20161218
VIS-10-1	6. M	chul ather					100	A. (7.75)	ANDYSBAD
184-75		weathylamine N-Dalda		-	50				A00754435
118994	-90-4 0	wassin-S-carbonylic sold					1,00		AAATIADES
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126-	43-9	Mathaness (forgt chooride					-		
	128-75-5	3-(Repnamathy)-5-mathylates	((2))					a to tit at	A00171347
	25.79.8	4-Nitrepresion add			12	-		- T. (T.O.)	
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		5-Metholfuran-Z-Larborol ship	rite		124	1	in la	- 8 (C4)	
	1244-42-6	Borana-Inicabulrafurat come	lax IM in Did.					Em 8 (C42	A00248054
		Barane terrahydrafaran comp	Lock IM				ana lu		D A00347650
	492-13-6	Treusrenethanew/fenic acid					2004	Bin 10.0542	A00254292
	1429-47-8	Charlows available that all a						Bin 9 (123)	ADDIFCES
	1419-58-9	Ethyl virgh katana					2016	tin & ICAL	A3122435
	10449-69	Acetic antiotrida /06						Both 1590	AROSHER
	1111419-10	-) 5-Methologrides-3-bernets	and the second			STATE .		80.11.07.62	
	17575-77	4 2-Bremanethy2-6-printe				the -		Bin 12 (53)	
	111785-1	1.1 4-30 sense of the sense				105	1004	En 13(4).	
	1885-16	9 Pharpi chisroliti				<u>110</u>	3117.	Box 32 (2.5)	
	2035-2	L-1 Manufacture to service and				M#5	1.000	0000	A90703
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lodeacetyi chipride			255		2224	Bis 1		0 4	0021625
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4-Methyl-1-piperazinecarbonyl shloride			13			En 11	0.0	A	11111111
1-Hydraxy-7-anabampoiriansia			10		1000	Sec. 9.2	c10	1 40	otheser
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- Reduce the Number of Chemicals Stored
- Use Sealed 2º Containers to Reduce Exposure Risk
- Create a System for Organization



## Projec

#### ces

ENVIRONMENTAL HEALTH & SAFETY

UNIVERSITY of WASHINGTON

#### Criteria for designating Particularly Hazardous Substances

EH&S classifies chemicals in MyChem based on the Fire Code, the Globally Harmonized System for Classification and Labeling (GHS), the National Institutes of Health List of Antineoplastic and Other Hazardous Drug in a Healthcare Setting and the EH&S Reproductive and Developmental

Chemical List.

nemicul List.		CHS (Class Hazard Category, Route)
e travie	Fire Code	GITS (Class, Hazara and Control 18
Criteria	Nettrocked	Carcinogenicity, Category TA of TB
Carcinogen	Not tracked	
		Reproductive Toxicity, Category 1A or 1B
Peproductive toxin	Not Tracked	
Reproductive		f is served to r 2. Inhalation or Dermal
	Highly Toxic	Acute toxicity, Category 1 of 2, initial definition
High acute toxicity	Highly Toxic	Specific Target Organ Toxicity - Single Exposure, Category 1
		Skin Sensitizer, Category 1A
		Respiratory Sensitization, Category 170
		Oxidizing Liquids, Category 1
Reactive	Oxidizer, Class 3 or 4	Oxidizing Solids, Category
	water Reactive, class o	Substances, which in contact with water, entering Category 1 or 2
		Explosives Divisions 1.1, 1.2 or 1.3
- I dive (unstable	Explosive Division 1.1, 1.2, or 1.3	Unstable explosive
Explosive/unstable	Water Reactive, Class 3	Reacts violently with water
	Flammable Solid, Pyrophoric	In contact with water liberates toxic gas
	Linstable (Reactive), Class 3 and 4	Explosive with or without air contact
	Organic Peroxides, Class UD or Class I	Self-reactive substances, Type A-F
		Self-reactive substances and mixtures, Type A-F
		Organic Peroxides Type A or B
		Self-heating substances, category

August 2018 | EH&S Environmental Programs | www.ehs.washington.edu | Tel: 206.616.4046 | mychem@uw.edu

• Large number of PHS (>600)

#### • Large number (

				CAS Number	Catalog Homest		10 G			NO
	Cham ID		Supplier Name	4602-86-9	M1279	1	100 M		1000	No
Product Name	Chem to	SIGM	A-ALDRICH/SIGMA	919-30-2	A3648	1	100 1		100	No
Product Native	83550	CIGM	A.AL DRICH/SIAL	06798-33-4	755346	1	10			No
RHMENTHYL CHLOROFORMATE	1864046	SIGM	A ALDRICHIALDRICH	10000.326	226084	1	5 G			No
AMINOPROPYLITRIETHOXYSILANE	2303861	SIGM	AVALUMINI DRICH	50002-30-0	226084	1	5 G			No
NUTROBENTYL IMERCAPTAN	SPHATE 604719	SIGN	A-ALDRICHIALDRICH	56602-33-6	000001	1	5 G		Ρ	N.
INITHOBERE TO ANY OXY TRIS(DIMETHYLAMINO)PHOSPHONIUM HEXAPLOOPOTHO	SPHATE 604719	SIGN	A-ALDRICH/ALDHICH	56602-33-6	220004	1	25 G		P	NO
SENZOTHIAZUCI TO CONVERSIONETHYLAMINO PHOSPHONIUM HEXAFLUOROPHU	604719	SIGN	MA-ALDRICH/ALDRICH	56602-33-6	226084		25 G		P	No
BENZOTRIAZOL-1-YLUXT)THIS(CHIEFHYLAMINO)PHOSPHONIUM HEXAFLUOROPHO	SPHATE 604719	SIG	MA-ALDRICH/ALDRICH	56602-33-6	226084	1	5.0		P	io
BENZOTRIAZOL-1-YLOXY) I HIS(DINCTITUS AMINO)PHOSPHONIUM HEXAFLUOROPHO	OSPHATE 604719	SIG	MA-ALDRICH/ALDRICH	2783-17-7	D16401	1	5.0		P	P
BENZOTRIAZOL-1-YLOXY)THIS(DIMETHY DAMINO(PHOSPHONIUM HEXAFLUOROPHO	OSPHATE 007734	SIG	MA-ALDRICH/ALDRICH	635-46-1	T15504	1			P	
(BENZOTRIAZOL-1-YLOXY)TRIS(DIMETHYLAMINO)PHOLOUTRIAZOL-1	23/24	010	MA_ALDRICH/ALDRICH	106-93-4	D6887	1	11	-	P	- 11
1.12-DIAMINODODECANE	35485	010	ALL DRICH/SIGMA	+02.62.1	248487	1	25	G		
1 2 3 4-TETRAHYDROQUINOLINE	142390	SIG	MARCHINI DRICH	122-00-1	02390	1	1	G	-	1
1 A DIBROMOETHANE SOLUTION	761493	s sic	MA-ALUNACIAL	540-63-6	21260	1	2	3	P	
1,2-DID TOTAL PHENOXYPROPANE	819608	B SK	3MA-ALDRICH/SIAL	109-76-2	33200	1	2	3	Р	N
1.2-EPUATOTIC:	36740	1 SK	GMA-ALDRICH/FLUKA	109-76-2	33260		5	G	P	N
1,2-ETHANEDITHIOL	36740	1 5	GMA-ALDRICH/FLUKA	7226-23-5	D7398		2	G	Р	N
1,3-DIAMINOPROPANE	64330	a SI	GMA-ALDRICH/SIGMA	1120-71-4	P50706	1	-		P	
1,3-DIAMINOPROPANE	04510		IGMA-ALDRICH/ALDRICH	1120-71-4	81815	1	-		P	,
1.3-DIMETHYL-3.4.5.6-TETRAHYDRO-2(1H)-P-THIMIDINO.12	3/180		ICMA-AL DRICH/FLUKA	110-60-1	D13208	1	1	G	P	1
13-PROPANESULTONE	67040	06 5	AND A DRICHALDRICH	110 00 1	D13208	1	2	-		-
A A PROPANESULTONE	2332	3 5	IGMA-ALDRICH DRICH	110-60-1	02522	1	2	1	P	
T, SPINISTORI ITANE	2332	3 5	IGMA-ALDHICHIALDHICH	280-57-9	DESEE	1	2		Ρ	
1,4-DIAMINOSOFINE	1405	515 5	SIGMA-ALDRICH/SIGMA	280-57-9	DZSZZ		5		P	
1,4-DIAMINOBUTANE	1405	515	SIGMA-ALDRICH/SIGMA	140-31-8	A55209			G	Р	
1,4-DIAZABICYCLO[222]00 INCC	1860	93	SIGMA-ALDRICH/ALDRICH	2008-75-5	C42602				Ρ	
1,4-DIAZABICYCLO[2.2.2]OCTANE		46	SIGMA-ALDRICH/ALDRICH	25503-90	6 A15606	1			P	
1-(2-AMINOETHYL)PIPERAZINE	210		ALEA AFSAR (THERMO FISHER SCIENTIFIC)	54698-60	1 MO07407DA	1			P	
1-(2-CHLOROETHYL)PIPERIDINE HYDROCHLORIDE	119	0030	HAVE PLC	144657-8	L9 696811	1		10		
1.ACETYLPIPERIDINE-4-CARBOXYLIC ACID	179	33784	MATCHIOGE F BE	144007 5	878106	1		5 N	-	
S THE ACTION & METHYL-1H-[1,2,3-]TRIAZOLE-4-CARBOXYLIC ACID	214	44011	SIGMA-ALDRICHALDRICH	106-94-5	070106	1		500	P	_
IS I-BENZ TO ME TO ME SCARBOXALDEHYDE	20	793	SIGMA-ALDRICH/ALDHICH	106-94-5	Bielde	1		100	P	
S 1-BOC/-ACAMONAL & COMPANY	20	793	SIGMA-ALDRICH/ALDRICH	97-00-7	33105	0 1		100	P	
1-BROMOPHUPANE	18	14139	SIGMA-ALDRICH/RIEDEL	100-00-	AC10963000			25 G	P	
1-BROMOPROPANE	11	109149	ACROS ORGANICS (FISHER SCIENTIFIC)	123333	53-9 157260	1		25.6	P	
DS 1-CHLORO-2,4-DINITROBENZENE	14	0542	SIGMA-ALDRICH/ALDRICH	123333	53-9 157260	1		25.0	P	
DS 1-CHLORO-4-NITROBENZENE, 99%	54	0.042	SIGMA-ALDRICHIALDRICH			1		250	P	
1-HYDROXYBENZOTRIAZOLE HYDRATE	5	054Z	DISCORE BIOTECHNOLOGY INC (LIFE TECH/THERMO SCIENTIFIC)	872.50	4 M6762	1		100 M	0	
1 HYDROXYBENZOTRIAZOLE HYDRATE	1	213203	MENUE BIO REVENSIONA	8/2-50	4 328634	1		100 ML	P	
A HADBOXYBENZOTRIAZOLE MONOHYDRATE 25 GM **DWSG 05/02/95	1	58093	SIGMA-ALUMACHISTORY	872-50	622560	1		16	P	
SOS I-ITITUTION TO PYRROLIDINONE		181384	SIGMA-ALDRICHISIAL	39021	62-0 633009	1		16	P	
SOS 1-METHTL-CF INNOVEMENT		172971	8 SIGMA-ALDRICH/ALDRICH	39021	62-0 633569			250 G	P	
SOS 1-METHYL-2-PYTHHOLIDING		172971	8 SIGMA-ALDRICH/ALDRICH	134-3	-7 N9005	1		25 G	F	
I-METHYL-S-IMIDAZOLECARBOALDCH TO D		100201	6 SIGMA-ALDRICH/ALDRICH	134-3	2-7 N9005	1		6.0	10	1
1-METHYL-5-IMIDAZOLECARBOXALDEHTUE		100201	6 SIGMA-ALDRICH/ALDRICH	4023	02-3 402516	1		100 10		P
INDS I-NAPHTHYLAMINE		190291	SIGMA ALDRICHIALDRICH	020.0	9-9 385506	1	1	100 ML		
1-NAPHTHYLAMINE		18206	SIGNA AL DRICH/ALDRICH	70.0				200		
1H-PYRAZOLE-1-CARBOXAMIDINE HYDROCHLORIDE		41465	0 SIGNALDINA POOL							

- Large number of PHS (>600)
- Each require customized SOPs and training

#### Project: Particu

- Large number of PHS
- Each require custom



						No. of Concession, Name		1								TT							
CAS	Chemical Name	Flammable Liquid	Flammable Solid	Flammable Gas	Pyrophoric	Oxidizing	Acute Oral Toxicity	Acute Inhalation Toxicity	Acute Dermal Toxicity	Corrosive	Skin Irritation	Eye Irritation	Serious Eye Damage	Respiratory Sensitisation	Skin Sensitisation	Germ Cell Mutagenicity	Carcinogen	Reproductive	Specific target organ toxicity - single exposure	Specific target organ toxicity - multiple exposures	Risk of Aspiration	Gas Under Pressure	Special Notes
100-00-5	1-CHLORO-4-NITROBENZENE, 99%						3	3	3							2	2			2			
100-01-6	4-NITROANILINE						3	3	3											2			
100-16-3	4-NITROPHENYLHYDRAZINE		2				4		4		2	2a			1				3				
10022-31-8	BARIUM NITRATE					2	4	4				2a					1b						
10025-65-7	PLATINUM(II) CHLORIDE													1	1								
10025-69-1	TIN (II) CHLORIDE DIHYDRATE									1b			1		1	2		2	3	2			
10025-87-3	PHOSPHORUS OXYCHLORIDE						2	2		1a			1							1			
10026-13-8	PHOSPHORUS PENTACHLORIDE						4	2		1b			1							2			
10026-24-1	COBALT SULFATE HYDRATE						4							1	1		1b	1b					
100-28-7	4-NITROPHENYL ISOCYANATE						4	4			2	2a		1					3				
1003-03-8	CYCLOPENTYLAMINE	2					2	4			2				1								
1003-32-3	5-THIAZOLECARBOXALDEHYDE						4					2a			1								
10034-93-2	HYDRAZINE SULFATE						3	3	3	1a			1		1		1b						
100-42-5	STYRENE	3						4			2	2a					2	2		1			
10043-35-3	BORIC ACID																	1b					
10043-35-3	BORIC ACID SOLUTION (3 G/100 ML) FOR THE DETERMINATION OF TVB IN FISH AND FISH PRODUCTS ACC. TO 95/149/EC (TITRATION METHOD)																	1b					
	•							-		OP-HAN	S		TZYZ	AJTER	M								

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CEIRIAR SOPS BY CAS No.

SOP: MILLIQ

1 of 18 COLIVERIT DRIED GELB LAB (MAR'19)

:40S





Standard Operating Procedures for Cyclopentylamine (CAS: 1003-03-8)

1 - dear obemical

1 Process if applicable)	Cyclopentylan reactions.	tine is a reagent used in	Factor if swallowed.							
2 Chemicals and Hazards	Cyclopentyla Harmful if inh Causes seriou	mine. Highly flammab aaled. Causes skin irrita as eye damage.	le liquid and vapour. Fata it smallowing tion. May cause an allergic skin reaction.							
#3 Personal Protective Equipment (PPE)	Use tightly fit protecting ag or when appr	Use tightly fitting safety goggles, an 8-inch minimum and used outside of hood protecting against chemicals and fire retardant clothing. When used outside of hood or when appropriate, use full-face respirator with multi-purpose combination respirator cartridges. Use nitrile rubber gloves. Eyewash fountains and showers should be provided in proximity required by EH&S. Handling of chemical substance should be done in an operating fume hood. In case chemical retent yentilation, wear suitable respiratory equipment.								
#4 Environmental/ Ventilation Controls	Eyewash fou Handling of									
#5 Special Handling Procedures & Storage Requirements	Store tightly	closed in a dry and we	Il-ventilated place. STORE LOCKED OF.							
#6 Spill and Accident Procedures	If spilled, co cleaner or b NOT FLUS	If spilled, contain spillage and then concern when container for waste disposal. DO cleaner or by wet-brushing and place in labelled container for waste disposal. DO NOT FLUSH WITH WATER.								
#7 Waste Disposal	Label with Chemical C website.	hazardous waste label, Collection Request or R	accumulate according to requirements outine Pickup request, both available on the EH&S							
#8 Special Precautions for Animal Use	n/a		111 are Mandatory							
(if applicable)	rardous	X YES:	Blocks #9 to #11 are Mandatory							
Particularly na.	alved?	NO:	Blocks #9 to #11 are Optional.							
#9 Approval Required	Users must receive specific physical and health hazard information and save laboratory work practices training from their supervisor. Representative breathin zone air sampling shall be taken to ensure that exposures do not exceed regulate lawle. (Contact EH&S for additional information.)									
#10 Decontamination	If swallor remove of to fresh a Immedia	If swallowed, immediately call a POISON CENTERCORCO. If while the second provided in the second provided provid								
#11 Designated Area	Rooms	417A, 413, 413A, 411A	·							
	1.4		Title: Research Scientist/Engineer 2							
Name: Zackary M H	erost		Date:							
Signature:										

W ENVIRONMENTAL HEALTH & SAFETY



- Chemical Management
  - Storage

Joage

- Unattended/Overnight reactions
- New processes are common

Managing Accumulation







#### Unattended Reactions and Safety Assessments

Photo Credit: noblediagnostics.com

• Hazard Signs

• Hazard Signs



UNATTENDED REACTION

Intended Conditions.

Other:

Stirring (Y/N), Dark (Y/N)

HEALTH HAZARD

Deadly 4 Extreme Danger 3

Hazardous 2 Slightly Hazardous 1

FIRE HAZARD Flash points

4 <73°F (Boiling pt <100°F) 3 Between 73°F-100°F (Boiling pt

0 Will not burn

2 Violent chemical change

1 Unstable if heated O Stable

INSTABILITY 4 May detonate 3 Shock and heat may detonate

2 100°F - 200°F 1 ≥200°F

- Hazard Signs
- Risk Assessments



# In Progress: Upattended Reactions LABORATORY RISK ASSESSMENT TOOL (Lab R.A.T.)

The Laboratory Risk Assessment Tool (Lab RAT) provides a framework

The Laboratory KISK ASSESSMENC 1001 (Lab 1041) provides a Hamework for risk assessment complimenting the process researchers already use

This tool provides a format for researchers to systematically identify and control hazards to reduce risk of injuries and incidents. Conduct a

and control hazards to reduce risk of injuries and incidents, conduction risk assessment prior to conducting an experiment for the first time

and review the Lab R.A.T. Guidelines document for further details. The risk assessment process involves rating the risk of the experiment

free risk assessment process involves rating the risk of the experiment from "low" to "unacceptable" risk. Consult with your Pl/supervisor and

you trying to measure or learn? what is your hypothesis? \ answer your question? Are there alternative approaches?

Building / Location:

Identify your research question and approach. What question are you trying to answer? What are Identify your research question and approach. What question are you trying to answer? What are you trying to measure or learn? What is your hypothesis? What approach or method will you use to

Approach(s) or Method

Start Date:

itorn tow to unacceptable risk, consult with your Pursupervisor a EH&S if your risk rating is "high" or "unacceptable" to redesign the enes if your risk rating is "right or "unacceptable" to reduce risk. experiment and/or implement additional controls to reduce risk.

to answer scientific questions.

Procedure:

PI / Lab Group: Department:

Form Completed By:

PHASE 1: EXPLORE

Outline the Procedure. List the steps or tasks for your procedure and the hazard/potential consequences of each. Include set-up and clean-up steps or tasks. Define the hazard controls to minimize the risk of each step using the hierarchy of controls starting with the most effective (i.e., elimination, substitution, engineering controls, administrative controls, and personal protective equipment). List the hazard control measure you would use for each step or task (e.g., run at a micro scale, work in a fume hood, wear face shield and goggles).

Steps or Tasks	Hazard	Hazard Control Measure(s)

#### RARCHY OF CONTROLS







Journal of Hazardous Materials 115 (2004) 63-70

*Journal of* Hazardous Materials

www.elsevier.com/locate/jhazmat

#### Chemical reactivity assessments in R&D

David Leggett\*

Baker Engineering and Risk Consultants, Senior Principal Scientist, San Antonio and Houston, 4339 Alla Road, Suite 3, Marina del Rey, CA 90292-6443 USA

Available online 1 July 2004

#### In Progress: Unattended

Table 2

Concern

Stability/reactivity

Toxicity/exposure

NFPA/HMIS ratings

Chemical properties and their role in preliminary hazard evaluation

MSDS Section

3, 4, 8, 11, 15

Many classes of organic and

Bretherick [7] and CCPS [8]

which are often impact sensiti

groupings.

10

3

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10

10

6, 13, 15

- Hazard Signs
- Risk Assessments

		Incompatibilities	7
		Spill clean-up	6,
Table 3 Reactions having a high hazar	rd potential Example of concern	Personal protective equipment	•
Reaction	Use of acyl azides, nitrous acid or hydrazine.	(PPE) required	0
Curtius rearrangements Decarboxylation Diazotizations	Removal –COOH with CO <sub>2</sub> evolution per- Especially if followed by reduction to the hy NH <sub>2</sub> with –H	Specific hazard Oxidizer/reducer	10
Diazota	Uses oxalyl chloride to displace -OR. (CO2	Pyrophoric	10
Displacements Epoxidations	Epoxides are high energy out When using oxalyl chloride	Polymerizes	10
Esterification Friedel Crafts (AlCl <sub>3</sub> )	Friedel Crafts reactions and their question Reactions require an activation period and	Reacts explosively	10
Grignard reactions Hydrolysis	Hydrolysis of a cyano to an amute oxidat Hydrolysis of a cyano to an amute oxidat Uses n-BuLi, t-BuLi, LDA, NaHMDS Uses n-BuLi, t-BuLi, terng acids like sulf	Inhibitor required Impact/friction sensitive	7, 1 10
Metallations	Uses nitric acid and strong action exothermic. The potential for thermal run exothermic K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> /H <sub>2</sub> SO <sub>4</sub> ],	Temperature control needed	7, 1
Oxidations	Use of Jones reagent (N2012 and Sodium periodate	Sensitive to heat High hazard reaction or functional group	7, 10 10
Peptide formations	When PC1 <sub>5</sub> or POC1 <sub>3</sub> have been used	Water reactive	10
Quenches Reductions	Any nitro compound of high $=$ in causti HCl or acetic acid, hydrazine in causti CH <sub>3</sub> OH or C <sub>6</sub> H <sub>12</sub> Sulfonation of an amine to form sulfo	Peroxide former	10
Sulfonation	Guitella		_

ded	1 Run Ref #	_/	2. Synthesis Type:			3. Date		
	4. Description:			5. End Use	e:			
	7. Physical Properties		6. Chemicals to be used – Sample, Reactants, Solvents					
	B Pt / M Pt / VP @ 20 °C		/ /	/	/	/ /		
	Fl Pt / Al / MIE		/ /	/ /		/ /		
	LEL / UEL		/	/		/		
	Dust Explosion Severity							
	8. Chemical Overview							
	Stability/Reactivity							
	Toxicity/Exposure						_	
	NFPA/HMIS Ratings	_					_	
	Incompatibilities	_					_	
	Spill Clean-up Material	_					_	
	PPE Required			_			_	
evaluation	Specific Hazard (Note 1)	_					_	
Significance to chemical Does the particular chem Are there any highly toxi special handling? The NFPA and HMIS rat Specific incompatibilities information about recomn Information about recomn careful if sawdust is plann careful if sawdust is plann many chemicals and supp Specific details are providi 8 with the toxicity and exp to be handled.	9. Function in synthesis						_	
	10. MDS Sheet Reviewed	et Reviewed Signed		i:		Date:		
	11. Classified as a Non-Routine Operation (check relevant categories)							
	High toxicity / Low exposure		Chemical Handled (Air/water sensitive, Corrosive)					
	Flammability (Fl Pt<10 °C; LFL<10%)			Extreme Re	Extreme Reaction Temperature (> 150 °C; < -30 °C			
	Flammability (AI<200 °C; MIE < 0.5mJ)			High Temp	High Temperature Feed (> 50 °C)			
	High Hazard Reaction or Functional Group			High Pressure Reaction (>10 bar)				
Special precautions are nee (e.g. NaBH <sub>4</sub> /MeOH). Solids, liquids or gases that 130 °F. Do any reactants polymeriz inhibitor is removed? Does the particular chemica moderate temperatures? See "Polymerizes". Impact or friction sensitivity.	High/moderate hazard reaction performed $\leq 2$ times			High Pressure Feed (>2 bar)				
	12. Potential Hazard Level	Routi	ne: Y N	: Y N Non-Routi				
	13. Synthesis by	Name	S	Sign:		Date:	1	
	14. Hazard Review by	Name		Sign:		Date:	1	
	15. Non-Routine Hazard Rev	Non-Routine Hazard Review		Schedule Date :		Date Completed :		
Sensitivity							-	

inhibitors and catalysts. The Note 1: Enter as many codes as needed to describe the Special Hazard: RDX - Oxidizer/Reducer; PYR - Pyrophonic; POL - Polymerizes; Material may be liquid only EXP - Reacts explosively: HS - Sensitive to heat: WAT - Water reactive; PER - Peroxide former; INH - Inhibitor required; IMP - Impact/ refrigerator temperature alarr friction sensitive; TCN - Temperature control needed; GRP - Functional group Small temperature changes n

#### See Tables 5, 6 and 7 for exa Instructions for Use of Form

Use this form as a check-list and review of potential hazards involved in the synthesis. Each section requires responses, as detailed below: 1. Reference number 2. Technique 3. Date filled out 4. Describe Synthesis 5. Product end-use 6. List each chemical used in the run - use a new example, acyl chlorides and r form as needed; 7. Physical properties - use MSD sheet, Saxs, Merck Index and "Sources of Ignition" (Bond) 8. Summarize listed properties as extremely rapidly (HCl and H available from reference materials, mostly MSD sheets 9. Function of each chemical in the synthesis, ie reactant, solvent, catalyst, etc. 10. MSDS reviewer, when: 11. What led to a Non-Routine classification? Check all appropriate boxes 12. What is the assessed potential hazard - Routine or Non-Routine 13. Who will perform the synthesis; when? 14. This hazard review; when? 15. If Non-Routine, when is detailed hazard review scheduled; when completed? Non-Routine hazard review notes must accompany this form with risk reduction recommendations activities as needed.

• Automated SDS-Based Chemical Risk Assessments

- Automated SDS-Based Chemical Risk Assessments
- Review chemicals stored at ambient temperature

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- Review chemicals stored at ambient temperature
- Continue to Improve Safety Conditions with EH&S and Gelb Lab

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- Review chemicals stored at ambient temperature
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# Thank You!







Kelsey Abrams & Katie Anderson



# Burke Museum Health and Safety Practices

#### Challenges of a New Building on Display

Kelsie Abrams, Fossil Preparation Laboratory Manager

Dr. Katie Anderson, Geology & Paleontology Collections Manager







## Challenges of a New Building

- Lab spaces visible to the public
- Learning and adapting to new spaces



#### Visible Labs

- Public sees science in action
- Diverse activities and equipment
- Role models to visitors





#### Ambassadors of Safety Culture

- Promoting and demonstrating use of safe practices
- Public awareness of PPE and environmental controls



#### Role Models to Visitors

- Demonstrating that scientists do not follow stereotypes
- Inspiring future generations and increasing awareness





Chambers 1983

#### Adapting to New Spaces

- Communication and Collaboration
- Intradepartmental Training

- Multiple Response Kits
- Signage/communication



#### Hydrofluoric Lab

- Paleontology and Geology Department
  - Hydrofluoric Lab
  - Response planning and training





### **Emergency Shower**

- Water Flow
- Emergency Response





#### Thank You!

- Burke Museum Operations Department
- Dr. Christopher Schiller
- Burke Museum Lab Management Staff (Dr. Sharon Birks!)
- Alex Hagen, UW Environmental Health and Safety



# Supporting a Culture of Safety

#### Stephanie Harrington (she/her)

Associate Dean, Administration, College of the Environment

#### COLLEGE OF THE ENVIRONMENT

UNIVERSITY of WASHINGTON



#### Nags and Nudges

- Catastrophes
- Calendars
- Cages
- Carrots

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