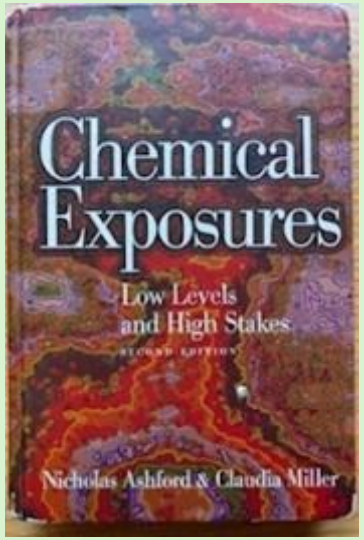
Informasjon til Sikkerhetsforum. Møte 10. 09.2025

Sammendrag

«***Toxicant Induced Loss of Tolerance (TILT)*** bør inngå som en del av yrkessykdomsutredninger.
Dette kan redusere risikoen for at arbeidstakere med kjemisk betingede helseplager feilaktig henvises til psykologisk utredning og «behandling».



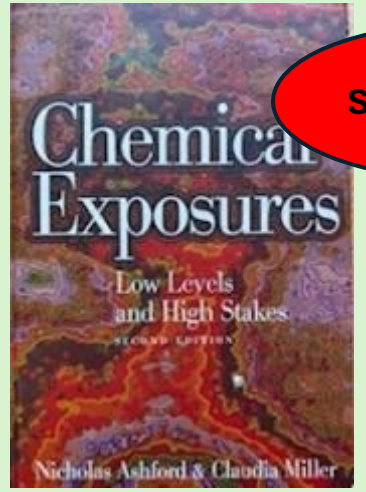
Halvor Erikstein
organisasjonssekretær/
yrkeshygieniker SYH
www.safe.no

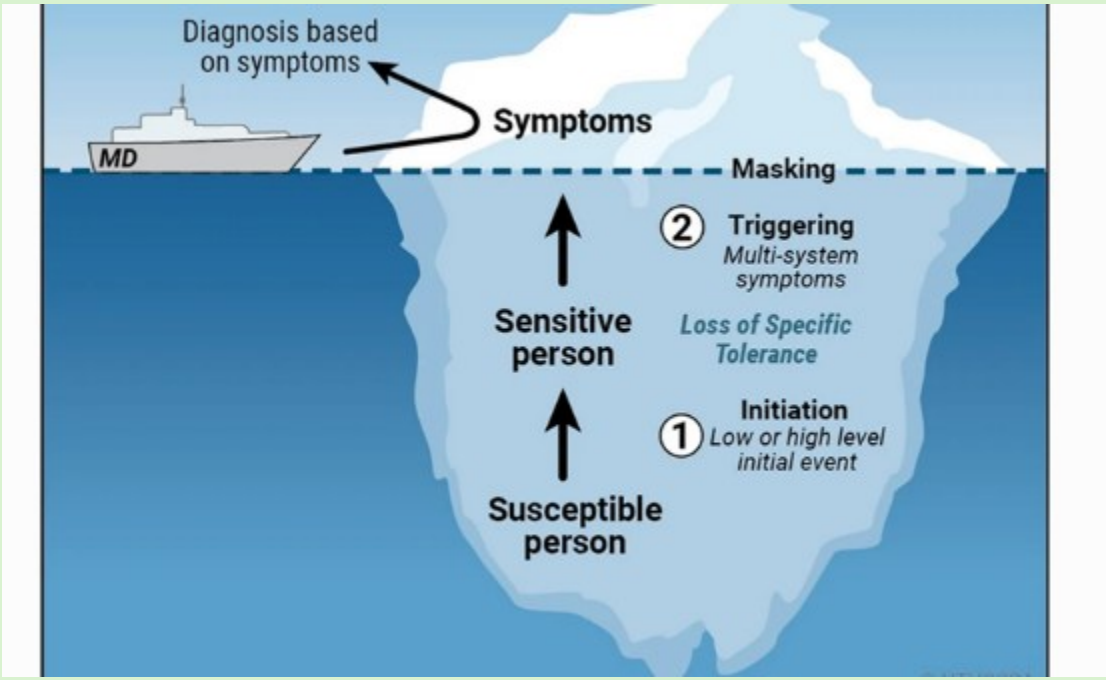
https://tiltresearch.org /

Toxicant Induced Loss of Tolerance (TILT)

Sammendrag

- «Toxicant-Induced Loss of Tolerance (TILT), er en to-stegs sykdomsprosess der en enkelt kraftig kjemisk eksponering eller langvarig lavnivåeksponering («initiering») fører til tap av kroppens naturlige toleranse.
- Følgelig kan senere, svært lave mengder av hverdagsstoffer – som midler vi tidligere tålte – utløse vedvarende reaksjoner i flere organsystemer hos angrepne individer.»





https://tiltresearch.org/

Toxicant Induced Loss of Tolerance (TILT) versus
Multiple Chemical Sensitivity - (MCS) og Idiopatic Environmental Intolerance – IEI.

Sammendrag

- Arbeidstakere som er blitt «kjemisk overfølsomme» (ofte betegnet **Multiple Chemical Sensitivity – MCS** eller **Idiopathic Environmental Intolerance – IEI**) etter yrkeseksponering, får ikke sin yrkessykdom godkjent som yrkesbetinget.
- Toxicant Induced Loss of Tolerance (TILT) kan forklare hvorfor arbeidstakere etter arbeidsmiljøeksponering kan reagere spesielt (pådrar seg «kjemisk intoleranse»).
- Yrkessyke arbeidstakere må ikke bli møtt med psykolog og behandlet med «konverteringsterapi».

Masri et al. Environ Sci Eur (2021) 33:65
https://doi.org/10.1186/s12302-021-00504-z

Environmental Sciences Europe

Sammendrag

DISCUSSION Open Access

Toxicant-induced loss of tolerance for chemicals, foods, and drugs: assessing patterns of exposure behind a global phenomenon

Shahir Masri[1†], Claudia S. Miller[2†], Raymond F. Palmer[2*] and Nicholas Ashford[3]

Abstract

Background: Despite 15–36% of the U.S. population reporting Chemical Intolerances (CI) or sensitivity, the condition has been overlooked in medicine and public health. CI is characterized by multisystem symptoms and new-onset intolerances that develop in a subset of individuals following a major chemical exposure event or repeated low-level exposures. While Toxicant-Induced Loss of Tolerance (TILT) is a two-stage disease mechanism proposed to explain CI, less is known about the exposures that initiate the disease, than about the intolerances that have been documented.

Methods: We reviewed eight major exposure events that preceded onset of chemical intolerance in groups of individuals sharing the same exposure. Our goal was to identify the chemicals and/or groups of chemicals that were most pervasive during each exposure event as well as identify the concentrations of key chemicals involved in each exposure event and the proportions of exposed individuals who ultimately developed TILT following exposure. Case studies we selected for review included (1) workers at U.S. Environmental Protection Agency (EPA) headquarters during renovations; (2) Gulf War veterans; (3) pesticide exposure among casino workers; (4) exposure to aircraft oil fumes; (5) the World Trade Center tragedy; (6) surgical implants; (7) moldy environments; and (8) tunnel workers exposed to solvents.

Results: Mixed volatile and semi-volatile organic compounds (VOCs and SVOCs), followed by pesticides and combustion products were most prevalent across TILT initiation events. As a broader category, synthetic organic chemicals and their combustion products were the primary exposures associated with chemical intolerance. Such chemicals included pesticides, peroxides, nerve agents, anti-nerve agent drugs, lubricants and additives, xylene, benzene, and acetone.

Conclusion: A select group of exposures were predominant in several major initiating events, suggesting their potential role in TILT initiation. Such insights are useful to public health scientists, physicians, and policymakers seeking to minimize harmful exposures and prevent future disease.

Keywords: Chemical intolerance, Multiple chemical sensitivity, TILT, Environment, Exposure

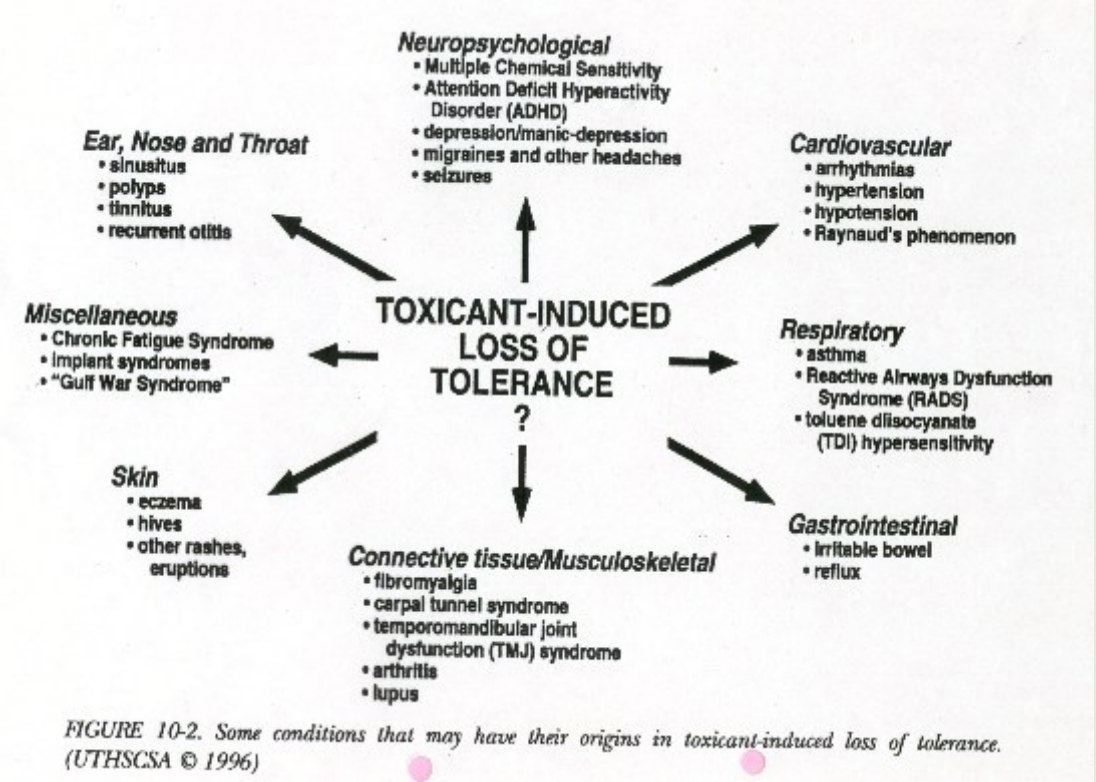


FIGURE 10-2. Some conditions that may have their origins in toxicant-induced loss of tolerance. (UTHSCSA © 1996)

Oversettelse

https://enveurope.springeropen.com/articles/10.1186/s12302-021-00504-z

Abstrakt

Sammendrag

Til tross for at 15–36 % av den amerikanske befolkningen rapporterer kjemisk intoleranse (CI) eller sensitivitet, har tilstanden i liten grad fått oppmerksomhet innen medisin og folkehelse. CI kjennetegnes av multisystemiske symptomer og nyoppståtte intoleranser som utvikles hos en undergruppe individer etter en større kjemisk eksponeringshendelse eller gjentatte lavnivåeksponeringer.

Mekanismen: Toxicant-Induced Loss of Tolerance (TILT) er foreslått som en to-trinns sykdomsmodell for å forklare CI, men det er mindre kunnskap om eksponeringene som initierer sykdommen enn om intoleransene som senere dokumenteres.

Metode: Vi gjennomgikk åtte større eksponeringshendelser som gikk forut for utvikling av kjemisk intoleranse hos grupper av individer som delte samme eksponering. Målet var å identifisere de kjemikaliene og/eller kjemikaliegruppene som var mest utbredt ved hver hendelse, samt å kartlegge konsentrasjoner av nøkkelkjemikalier og andelen eksponerte individer som senere utviklet TILT.

Kasusstudiene vi vurderte omfattet:

(1) ansatte ved U.S. Environmental Protection Agency (EPA) under renovering av hovedkontoret;

(2) (2) Gulfkrigsveteraner;

(3) (3) pesticid-eksponering blant kasinomedarbeidere;

(4) (4) eksponering for oljedamp i flykabiner;

(5) (5) terrorangrepet på World Trade Center;

(6) (6) kirurgiske implantater;

(7) (7) muggbelastede miljøer; og

(8) (8) tunnelarbeidere eksponert for løsemidler.

Resultater: Blandingseksponeringer med flyktige og semiflyktige organiske forbindelser (VOC og SVOC), etterfulgt av pesticider og forbrenningsprodukter, var mest utbredt i forbindelse med TILT-initierende hendelser.

Som bredere kategori var syntetiske organiske kjemikalier og deres forbrenningsprodukter de primære eksponeringene assosiert med kjemisk intoleranse. Slike kjemikalier inkluderte pesticider, peroksider, nervegasser, anti-nervegassmedikamenter, smøremidler og tilsetningsstoffer, xylen, benzen og aceton.

Konklusjon: Et utvalg av eksponeringer var fremtredende i flere større initierende hendelser, noe som antyder deres mulige rolle i å utløse TILT. Denne innsikten er verdifull for folkehelseforskere, leger og beslutningstakere som søker å minimere skadelige eksponeringer og forebygge fremtidig sykdom.

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DISCUSSION Open Access

Toxicant-induced loss of tolerance for chemicals, foods, and drugs: assessing patterns of exposure behind a global phenomenon

Table 1 List of abbreviations in alphabetical order

Abbreviation	Meaning
4-PCH	4-Phenylcyclohexene
AChE	Acetylcholinesterase
BFR	Brominated fire retardants
BII	Breast implant illness
CI	Chemical intolerance
CYP	Cytochrome P450
EI	Environmental illness
EMU	Environmental medical unit
ENT	Ear, nose, and throat
EPA	Environmental Protection Agency
IEI	Idiopathic environmental intolerance
IgE	Immunoglobulin-E
MCS	Multiple chemical sensitivity
mVOCs	Mold VOCs
OP	Organophosphate
OSHA	Occupational Safety and Health Administration
PAHs	Polycyclic aromatic hydrocarbons
PB	Pyridostigmine bromide
PCBs	Polychlorinated biphenyls
QEESI	Quick Environmental Exposure and Sensitivity Inventory
SVOC	Semi-volatile organic compounds
TILT	Toxicant-induced loss of tolerance
TMJ	Temporomandibular jaw-joint
VOC	Volatile organic compounds
WTC	World Trade Center

Sammendrag

popular press to describe the myriad sy
internationally.

In 1906, von Pirquet coined the term "allergy," defining it as "altered reactivity." In 1925, European allergists redefined allergy in terms of antibodies and antigens. However, other forms of heightened reactivity did not fit this new definition, and in 1967, the discovery of the key biomarker immunoglobulin-E (IgE) solidified the field of allergy in medicine and its focus on antibody-mediated responses. Meanwhile, for the many patients showing no biomarkers of exposure, doctors largely dismissed their problems as psychosomatic.

The situation is similar today as a growing number of patients fit this category yet remain unaided by physicians, in some cases being referred to psychiatrists or psychologists for treatment for alleged psychosomatic disorders. In effect, the field of allergy defined chemically intolerant patients as being out of its sphere of study, despite the fact that these patients have "altered reactivity" per von Pirquet's original definition of "allergy" and fit diagnostic criteria for chemical intolerance.

Dismissal and disease unfamiliarity by physicians often leave chemically intolerant patients having to consult ten or more physicians in search of relief. Furthermore, persistence of symptoms in the face of dismissal by doctors leads to skepticism by family, friends, and employers, ultimately leaving patients destitute without emotional support, employment, or medical insurance.

Oversettelse

https://enveurope.springeropen.com/articles/10.1186/s12302-021-00504-z

Introduksjon

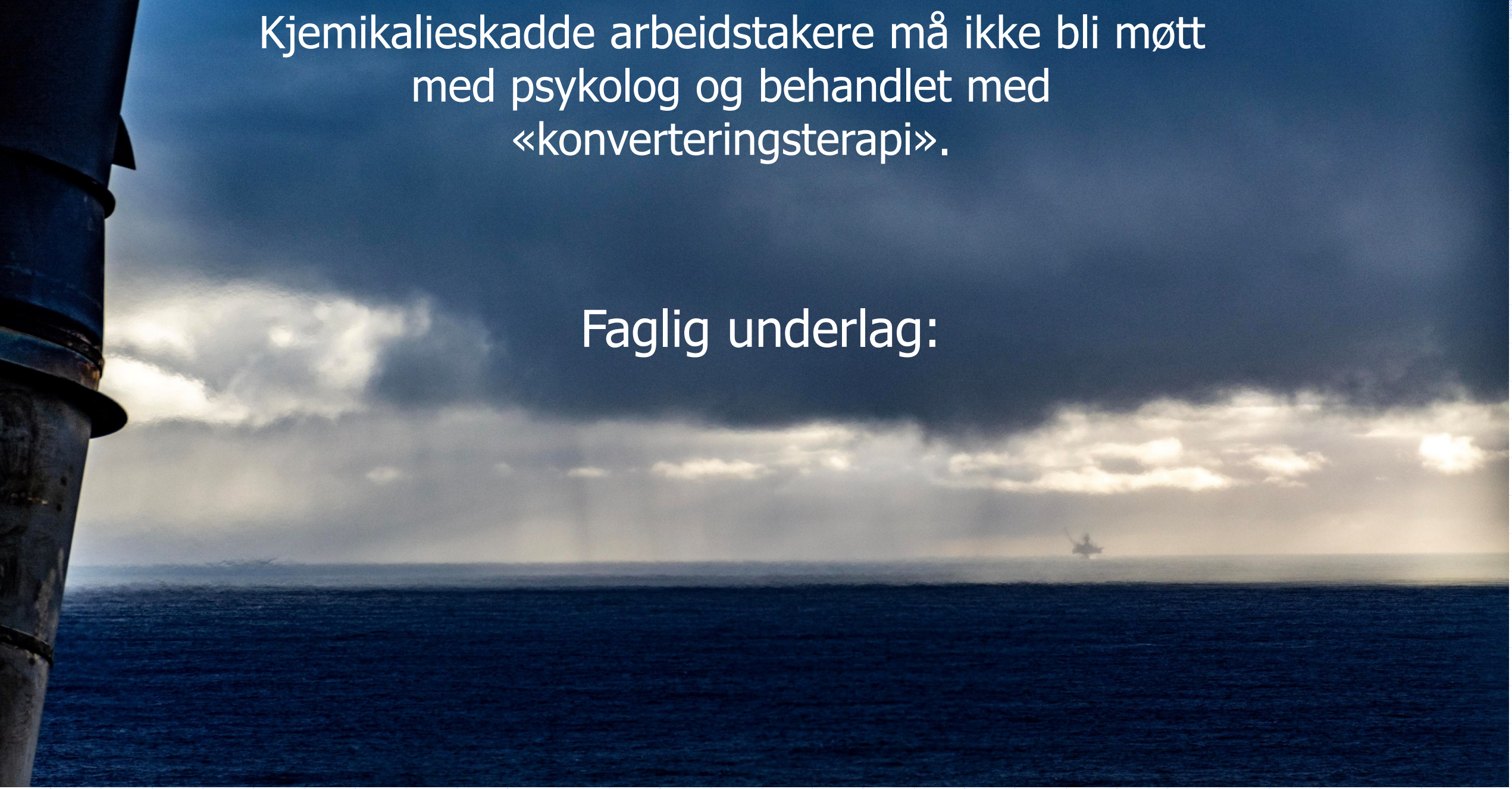
- I 1906 introduserte von Pirquet begrepet «allergi», som han definerte som «endret reaktivitet». I 1925 redefinerte europeiske allergologer allergi i lys av antistoffer og antigener.
- Andre former for økt reaktivitet passet imidlertid ikke inn i denne nye definisjonen, og i 1967 førte oppdagelsen av den sentrale biomarkøren immunglobulin-E (IgE) til at allergifeltet i medisinen ble konsolidert, med hovedvekt på antistoff-medierte responser.
- I mellomtiden ble mange pasienter uten biomarkører for eksponering i stor grad avvist av legene, som anså problemene som psykosomatiske.
- Situasjonen er lik i dag, ettersom et økende antall pasienter faller inn i denne kategorien, men likevel ikke får hjelp av leger. I enkelte tilfeller blir de henvist til psykiatere eller psykologer for behandling av angivelige psykosomatiske lidelser.
- I praksis har allergifeltet definert kjemisk intolerante pasienter som liggende utenfor sitt fagområde – til tross for at disse pasientene har «endret reaktivitet» i tråd med von Pirquets opprinnelige definisjon av «allergi» og oppfyller diagnostiske kriterier for kjemisk intoleranse.
- Legers avvisning og manglende kjennskap til sykdommen gjør ofte at kjemisk intolerante pasienter må oppsøke ti eller flere leger i jakten på lindring.
- Videre fører vedvarende symptomer, kombinert med legenes avvisning, til skepsis fra familie, venner og arbeidsgivere. Til slutt står pasientene ofte igjen uten emosjonell støtte, uten arbeid og uten helseforsikring.

Side 3: Masri et al. Environ Sci Eur (2021) 33:65 https://doi.org/10.1186/s12302-021-00504-z

Før «psykologbehandling»: Hva vet psykologen om kjemisk arbeidsmiljø og hva er kjent om den kjemiske eksponeringen pasienten har vært utsatt for?

- Er det avklart om pasienten er;
- Anosmisk
- Hyposmisk
- Hyperosmisk
- Hyposmisk og hyperosmisk?

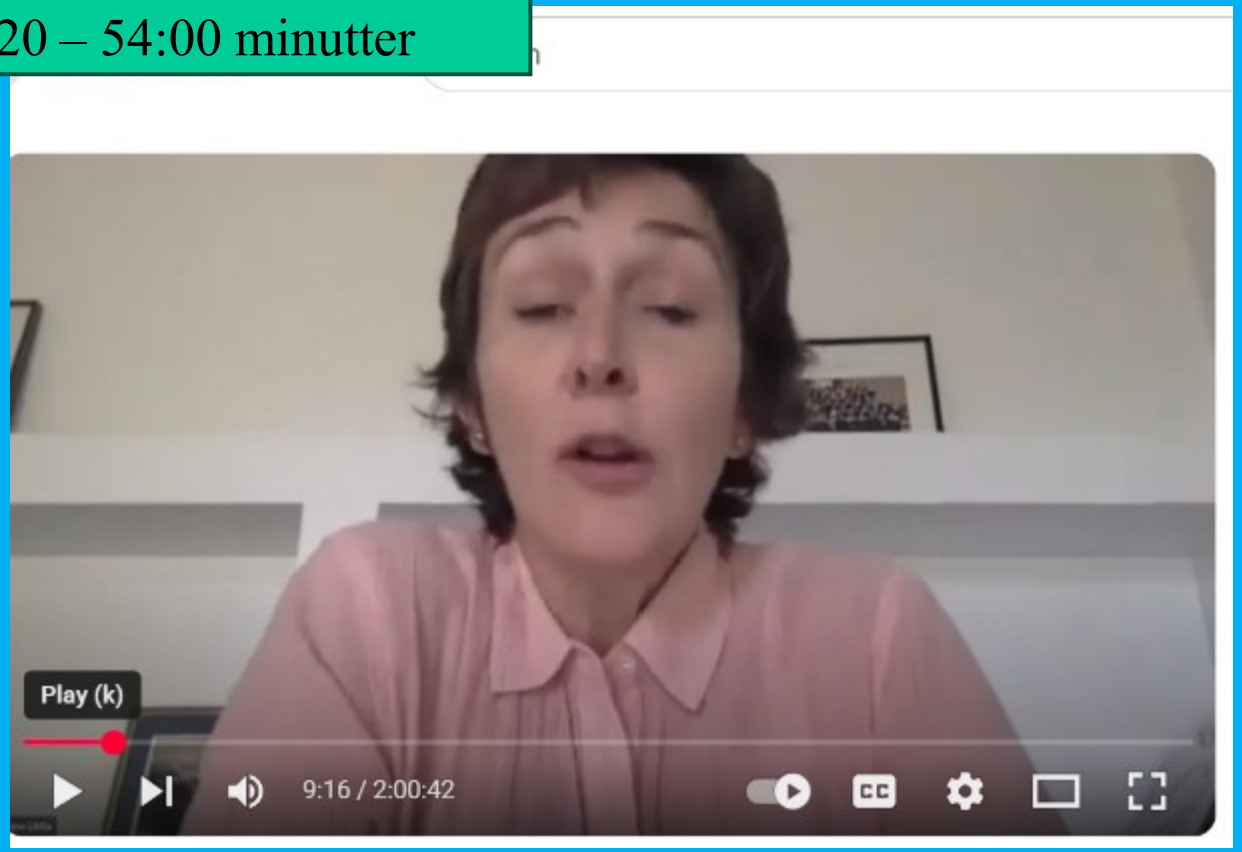
Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association, 1995. ISBN 0-932627-34-X



Kjemikalieskadde arbeidstakere må ikke bli møtt med psykolog og behandlet med «konverteringsterapi».

Faglig underlag:

Seminar om TILT.
Youtube-presentasjon holdt av professor Claudia Miller
Introduksjon 00:00-09:20 minutter
Claudia Miller 09:20 – 54:00 minutter



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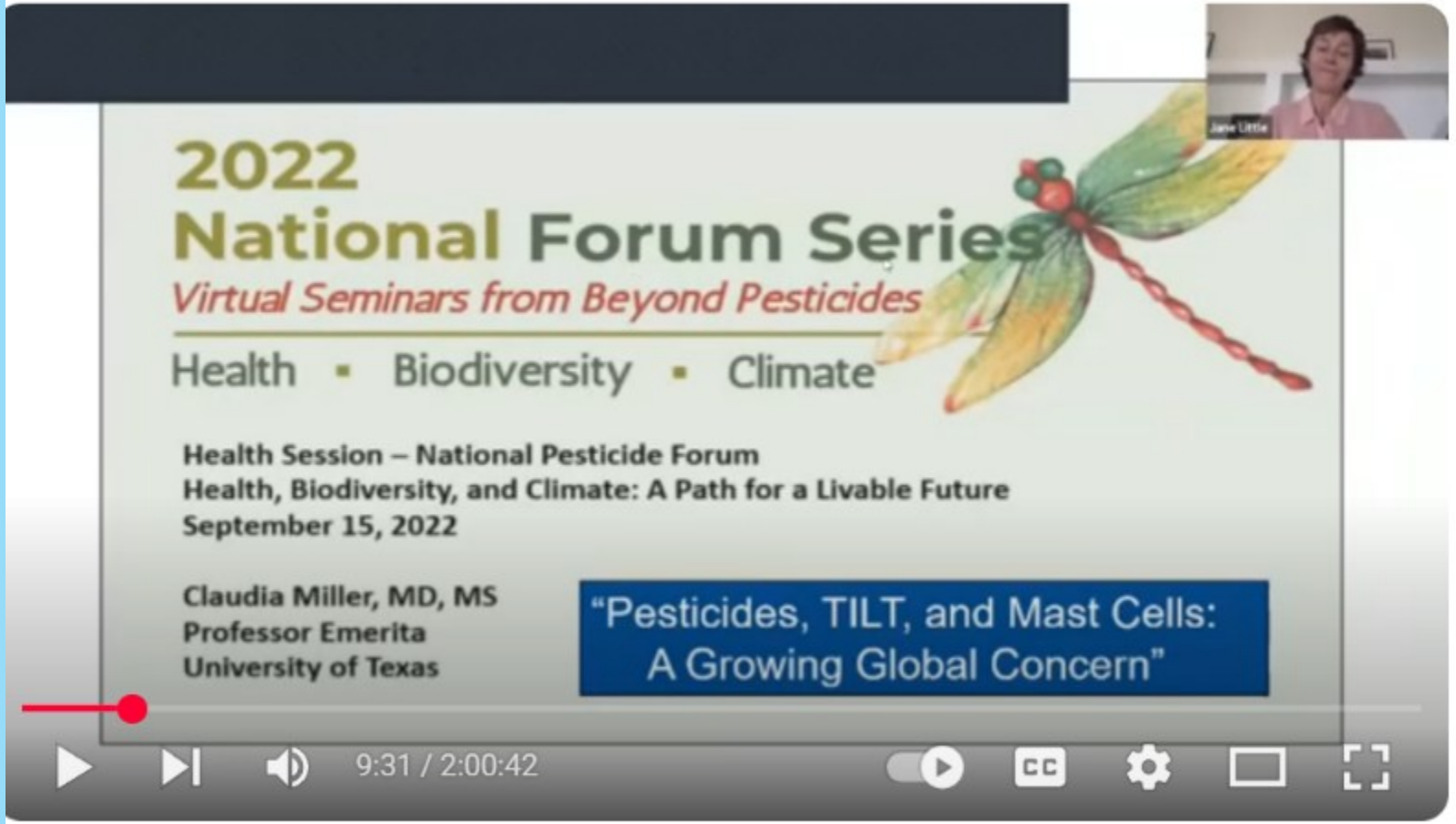
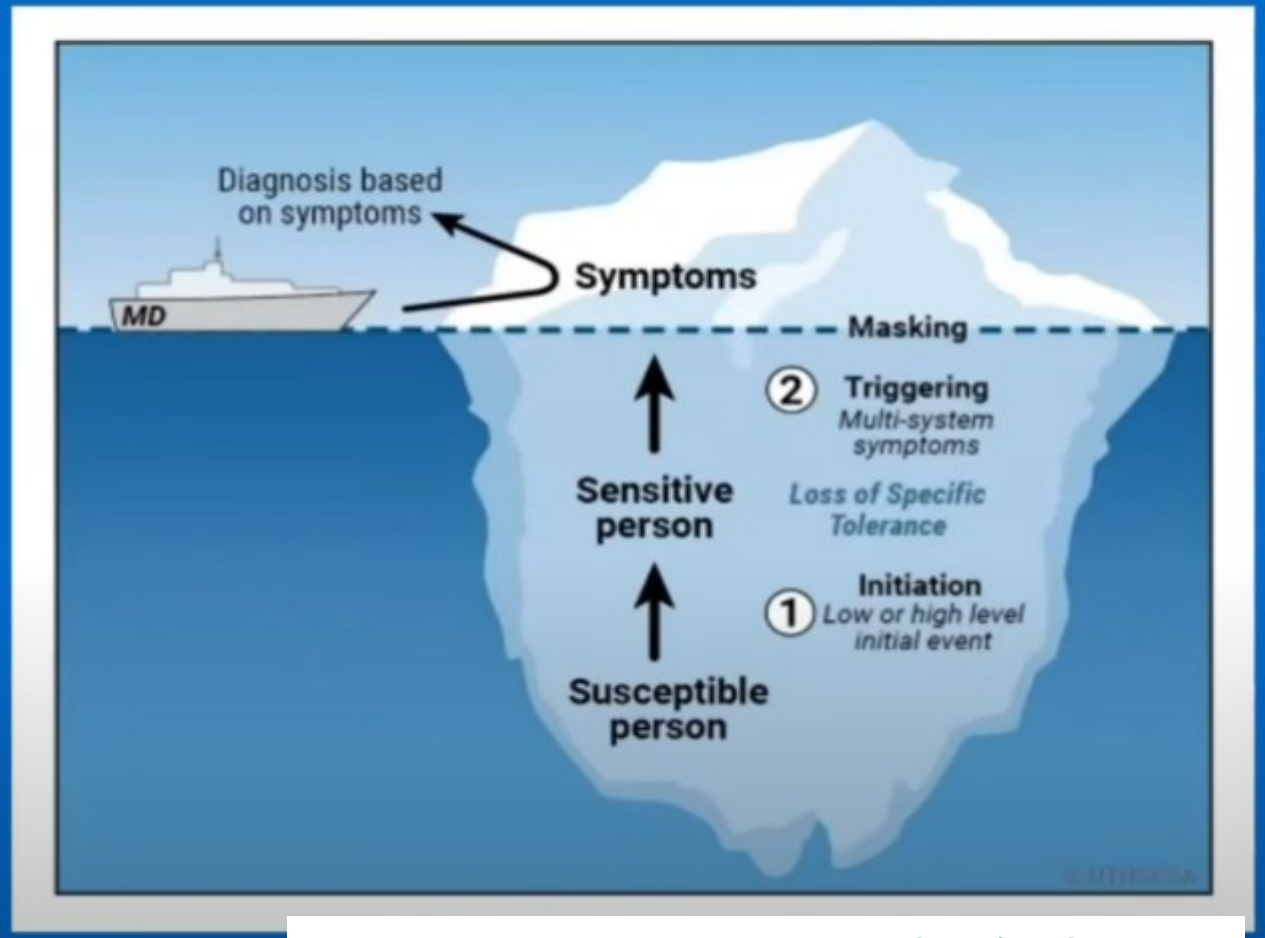


2022 Forum Series - Seminar 1 - Health - with Claudia Miller, MD, MS, and Kaipo Kekona

2022 Forum Series - Seminar 1 - Health - with Claudia Miller, MD, MS, and Kaipo Kek...

TILT = Toxicant-Induced Loss of Tolerar



TILT has two stages:

1. Initiation by acute exposure or repeated lower-level exposures
2. Triggering by previously tolerated chemicals, food, or drugs

"Masking" hides the relationship between exposures and symptoms

https://www.youtube.com/watch?v=ojXRC9b-vaM

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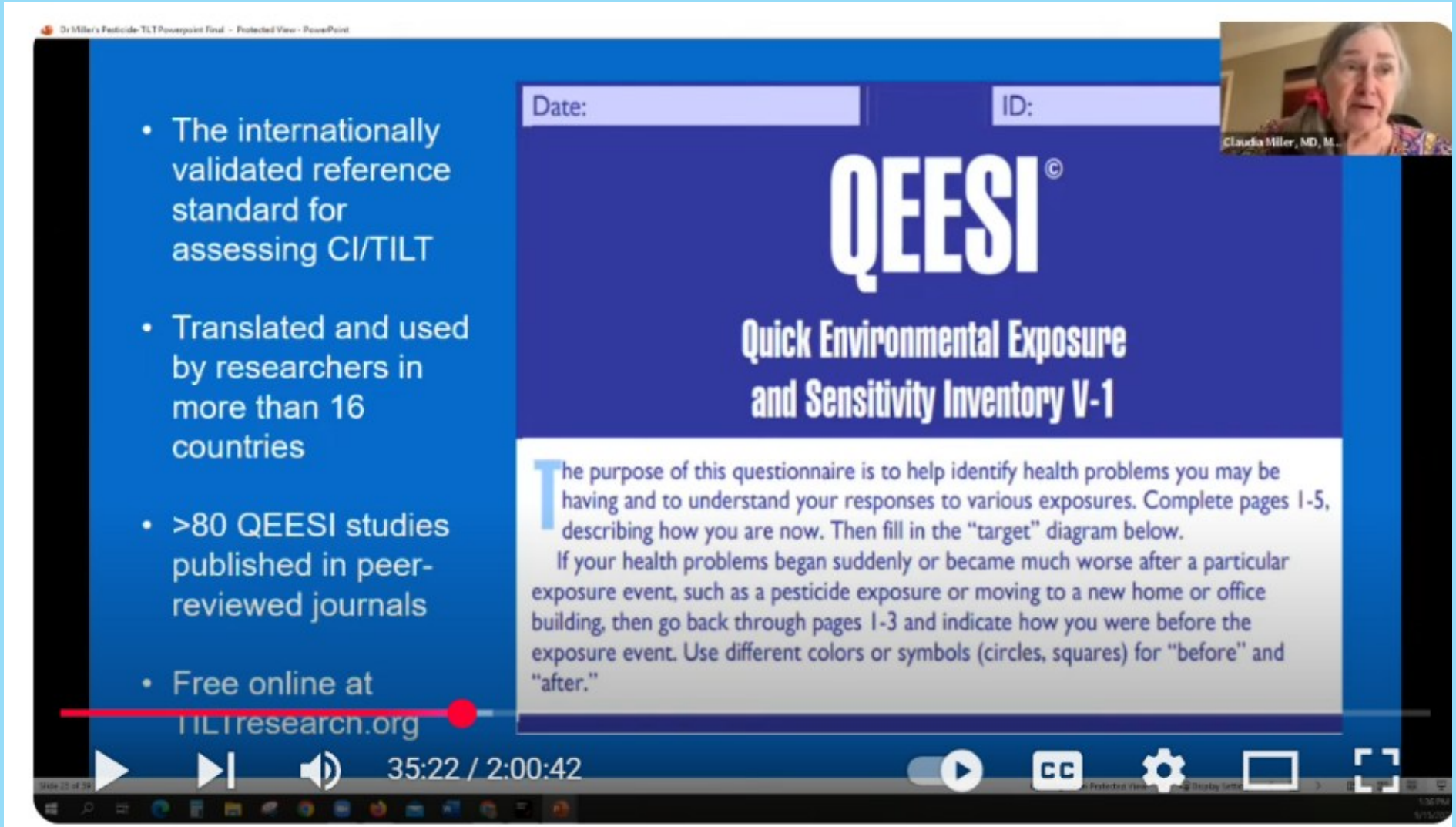
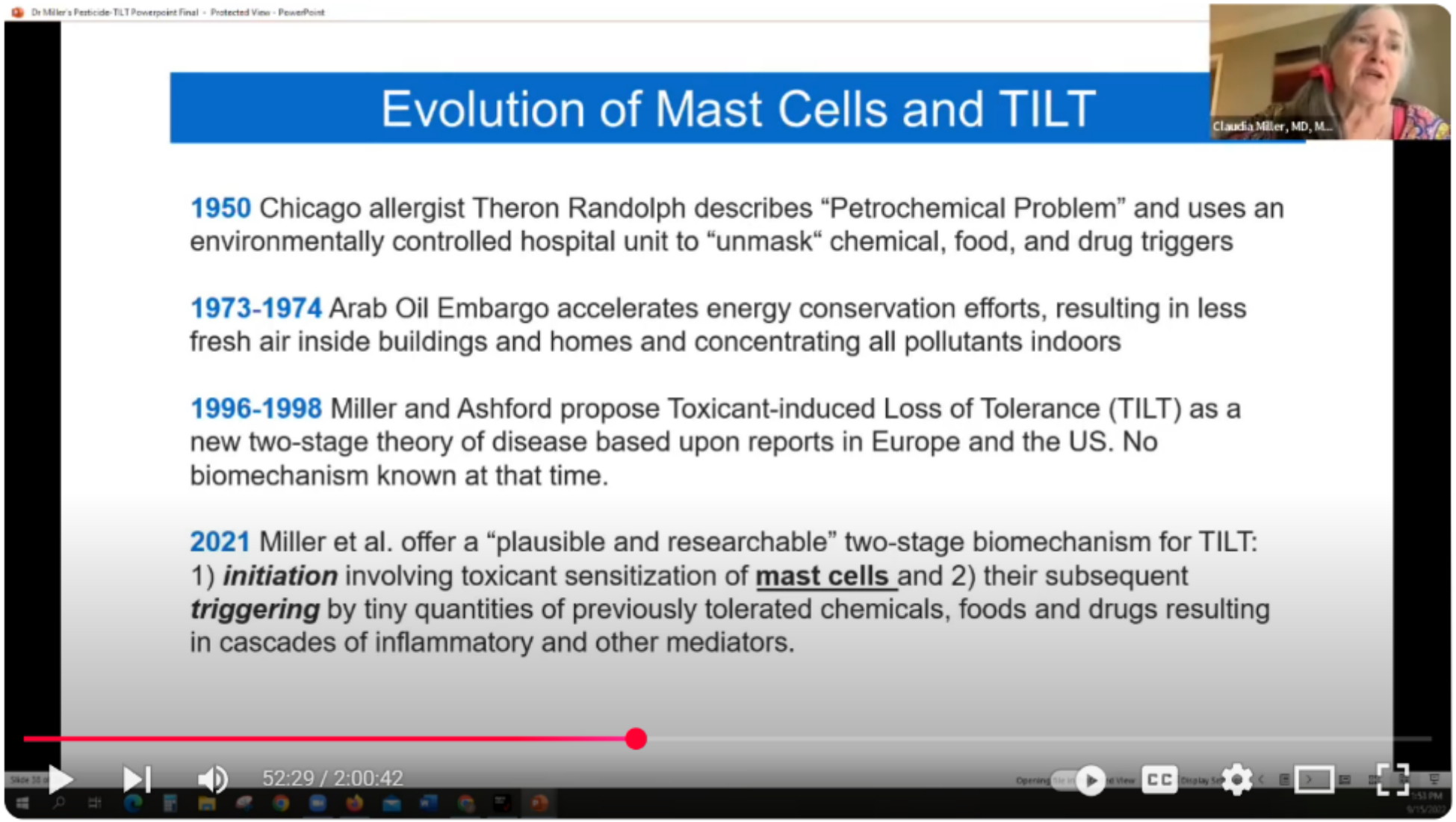


2022 Forum Series - Seminar 1 - Health - with Claudia Miller, MD, MS,



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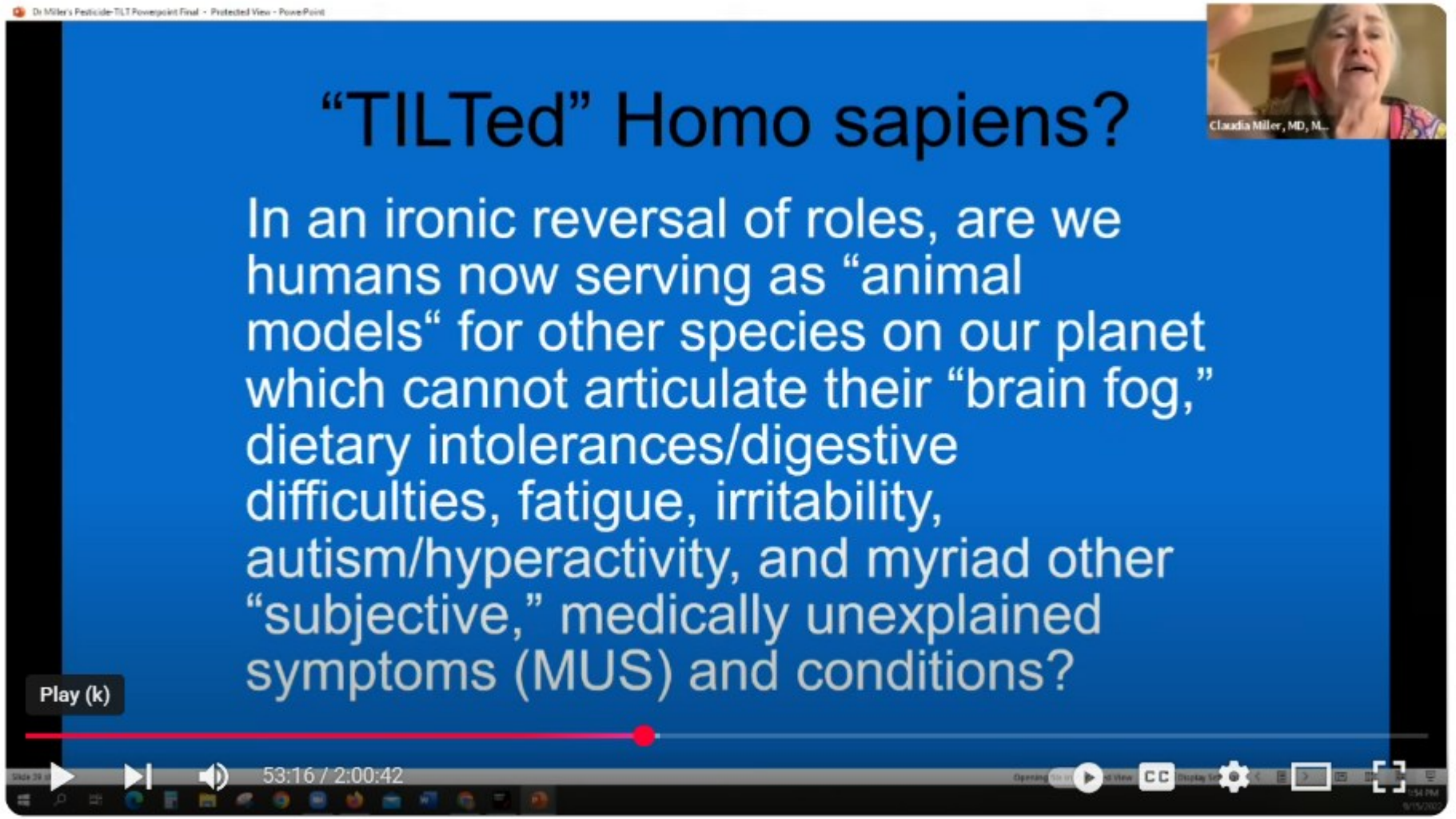

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https://www.youtube.com/watch?v=ojXRC9b-vaM

International Journal of
Environmental Research and Public Health

MDPI

Article

Validation of a Brief Screening Instrument for Chemical Intolerance in a Large U.S. National Sample

Raymond F. Palmer [1,*], Tatjana Walker [1], David Kattari [2], Rudy Rincon [1], Roger B. Perales [1], Carlos R. Jaén [1], Carl Grimes [2], Dana R. Sundblad [2] and Claudia S. Miller [1]

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[2] Hayward Score, Carmel, CA 93921, USA; dkattari13@gmail.com (D.K.); grimes@haywardscore.com (C.G.); dana.r.sundblad@gmail.com (D.R.S.)
* Correspondence: palmerr@uthscsa.edu; Tel.: +1-210-827-7681

Abstract: Background: Chemical intolerance (CI) is characterized by multisystem symptoms triggered by low levels of exposure to xenobiotics including chemicals, foods/food additives, and drugs/medications. Prior prevalence estimates vary from 8–33% worldwide. Clinicians and researchers need a brief, practical screening tool for identifying possible chemical intolerance. This large, population-based study describes the validation of a three-item screening questionnaire, the Brief Environmental Exposure and Sensitivity Inventory (BREESI), against the international reference standard used for assessing chemical intolerance, the Quick Environmental Exposure and Sensitivity Inventory (QEESI). Methods: More than 10,000 people in the U.S. responded to the BREESI and the QEESI in a population-based survey. We calculated the overall prevalence of CI in this sample, as well as by gender, age, and income. Common statistical metrics were used to evaluate the BREESI as a screener for CI against the QEESI. Results: The prevalence estimate for QEESI-defined chemical intolerance in the U.S. was 20.39% (95% CI 19.63–21.15%). The BREESI had 91.26% sensitivity (95% CI: 89.20–93.04%) and 92.89% specificity (95% CI: 91.77–93.90%). The positive likelihood ratio was 12.83 (95% CI: 11.07–14.88), and the negative likelihood ratio was 0.09 (95% CI: 0.08–0.12). Logistic regression demonstrates that the predicted probability of CI increased sharply with each increase in the number of BREESI items endorsed (Odds Ratio: 5.3, 95% CI: 4.90–5.75). Conclusions: Chemical intolerance may affect one in five people in the U.S. The BREESI is a new, practical instrument for researchers, clinicians, and epidemiologists. As a screening tool, the BREESI offers a high degree of confidence in case ascertainment. We recommend: screen with the BREESI, confirm with the QEESI.

Keywords: chemical intolerance; drug intolerance; food intolerance; QEESI; BREESI; multiple chemical sensitivity; toxicant-induced loss of tolerance; prevalence

check for updates

Citation: Palmer, R.F.; Walker, T.; Kattari, D.; Rincon, R.; Perales, R.B.; Jaén, C.R.; Grimes, C.; Sundblad, D.R.; Miller, C.S. Validation of a Brief Screening Instrument for Chemical Intolerance in a Large U.S. National Sample. *Int. J. Environ. Res. Public Health* **2021**, *18*, 8714. https://doi.org/10.3390/ijerph18168714

Academic Editors: Paul B. Tchounwou and Dudley E. Shallcross

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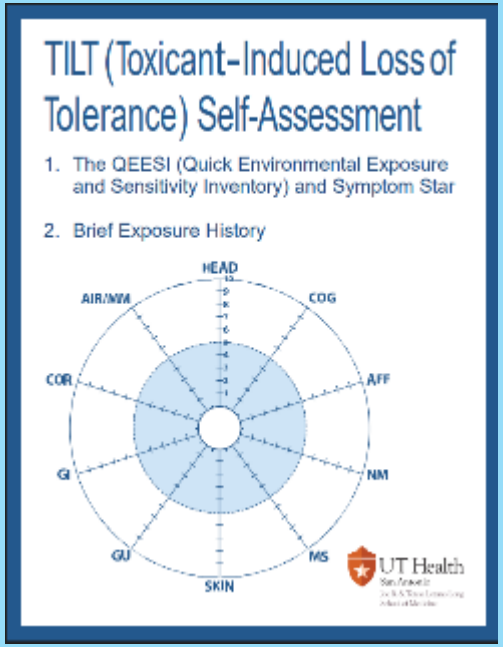
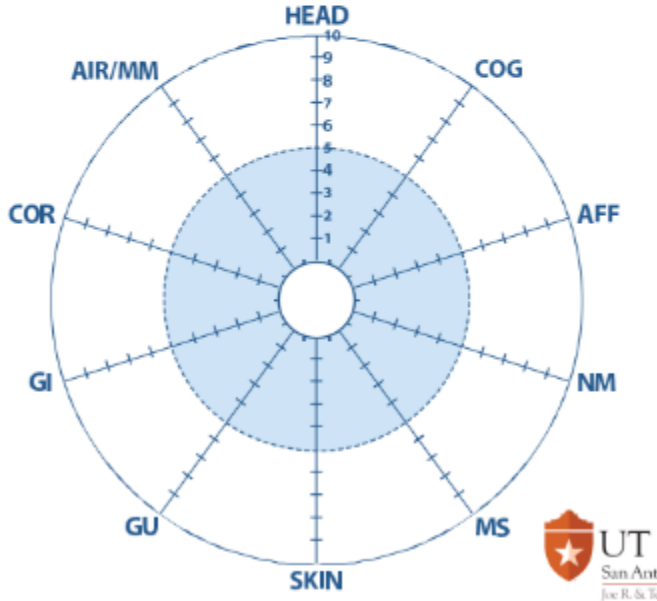


https://pmc.ncbi.nlm.nih.gov/articles/PMC8391803/pdf/ijerph-18-08714.pdf

https://tiltresearch.org/self-assessment/

TILT (Toxicant-Induced Loss of Tolerance) Self-Assessment

1. The QEESI (Quick Environmental Exposure and Sensitivity Inventory) and Symptom Star
2. Brief Exposure History



UT Health San Antonio
Joe R. & Teresa Lozano Long School of Medicine

https://tiltresearch.org/wp-content/uploads/sites/231/2025/07/TILT-Self-Assessment-12-4-2024.pdf

Chemical, Food, and Drug Intolerances: Self-Assessment

Over the last decade, peer-reviewed research has linked a wide variety of medically unexplained symptoms and syndromes with exposures to chemicals, foods, and drugs. Identifying and understanding potential connections between symptoms and exposures are crucial for diagnosis, prevention, and treatment. We encourage you to print and complete this Self-Assessment, share it with your doctors, and ask that it be placed in your medical record.

- The **QEESI** (Quick Environmental Exposure and Sensitivity Inventory) is an internationally validated questionnaire with 50 questions to identify specific chemical, food, and drug intolerances as well as symptoms and life impact. The purpose of this questionnaire is to help identify health problems you may be having and to understand your responses to various exposures.
- The **QEESI Symptom Star** is a useful visual diagram that shows how your symptoms may have changed over time.
- The **Brief Exposure History** includes 7 questions to help document specific exposures that may have initiated or may trigger your symptoms.

Instructions:

- First, fill out the QEESI. This may take you 10 to 20 minutes.
- Next, plot your symptom severity scores on the QEESI Symptom Star. Instructions will be provided.
- Complete the Brief Exposure History.

https://tiltresearch.org/self-assessment/

Kliniske miljøer som bruker TILT-verktøy

1. **UT Health San Antonio (USA)** – *TILT Research Program & Family Medicine-klinikk*
    1. Har utviklet og driver **QEESI online** for pasienter og klinikere, og **BREESI** som hurtigscreening. https://news.uthscsa.edu/symptom-checking-test-for-environmental-intolerances-now-online/?utm_source=chatgpt.com
    2. I en universitetsbasert allmennlegeklinikk ble pasienter **screenet med BREESI og deretter QEESI** før intervensjon; programmet implementeres klinisk og personal opplæres («Environmental House Calls»). https://pmc.ncbi.nlm.nih.gov/articles/PMC11569860/
    3. Universitetet kommuniserer aktivt at verktøyene er standard for måling av kjemisk intoleranse. https://news.uthscsa.edu/think-you-have-chemical-intolerance-answer-3-questions/?utm_source=chatgpt.com

University of Texas Health Science Center at San Antonio. [UT Health San Antonio](),

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The University of Texas at San Antonio

Masri et al. Environ Sci Eur (2021) 33:65
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Environmental Sciences Europe

DISCUSSION Open Access

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Methods: We reviewed eight major exposure events that preceded onset of chemical intolerance in groups of individuals sharing the same exposure. Our goal was to identify the chemicals and/or groups of chemicals that were most pervasive during each exposure event as well as identify the concentrations of key chemicals involved in each exposure event and the proportions of exposed individuals who ultimately developed TILT following exposure. Case studies we selected for review included (1) workers at U.S. Environmental Protection Agency (EPA) headquarters during renovations; (2) Gulf War veterans; (3) pesticide exposure among casino workers; (4) exposure to aircraft oil fumes; (5) the World Trade Center tragedy; (6) surgical implants; (7) moldy environments; and (8) tunnel workers exposed to solvents.

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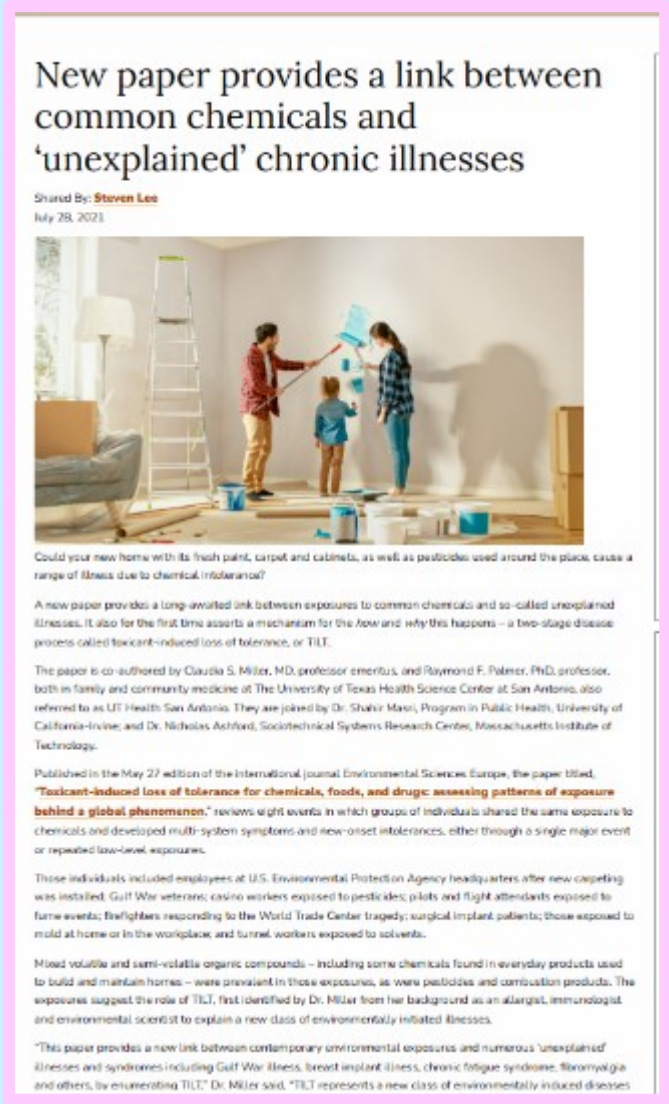

New paper provides a link between common chemicals and 'unexplained' chronic illnesses

Shared By: Steven Lee
July 28, 2021

Could your new home with its fresh paint, carpet and cabinets, as well as pesticides used around the place, cause a range of illness due to chemical intolerance?

A new paper provides a long-awaited link between exposures to common chemicals and so-called unexplained illnesses. It also for the first time asserts a mechanism for the how and why this happens – a two-stage disease process called toxicant-induced loss of tolerance, or TILT.

The paper is co-authored by Claudia S. Miller, MD, professor emeritus, and Raymond F. Palmer, PhD, professor, both in family and community medicine at The University of Texas Health Science Center at San Antonio, also referred to as UT Health San Antonio. They are joined by Dr. Shahir Masri, Program in Public Health, University of California-Irvine; and Dr. Nicholas Ashford, Sociotechnical Systems Research Center, Massachusetts Institute of Technology.

Published in the May 27 edition of the international journal Environmental Sciences Europe, the paper titled, **"Toxicant-induced loss of tolerance for chemicals, foods, and drugs: assessing patterns of exposure behind a global phenomenon,"** reviews eight events in which groups of individuals shared the same exposure to chemicals and developed multi-system symptoms and new-onset intolerances, either through a single major event or repeated low-level exposures.

Those individuals included employees at U.S. Environmental Protection Agency headquarters after new carpeting was installed; Gulf War veterans; casino workers exposed to pesticides; pilots and flight attendants exposed to fume events; firefighters responding to the World Trade Center tragedy; surgical implant patients; those exposed to mold at home or in the workplace; and tunnel workers exposed to solvents.

Mixed volatile and semi-volatile organic compounds – including some chemicals found in everyday products used to build and maintain homes – were prevalent in those exposures, as were pesticides and combustion products. The exposures suggest the role of TILT, first identified by Dr. Miller from her background as an allergist, immunologist and environmental scientist to explain a new class of environmentally initiated illnesses.

"This paper provides a new link between contemporary environmental exposures and numerous 'unexplained' illnesses and syndromes including Gulf War illness, breast implant illness, chronic fatigue syndrome, fibromyalgia and others, by enumerating TILT," Dr. Miller said. "TILT represents a new class of environmentally induced diseases

https://news.uthscsa.edu/new-paper-provides-a-link-between-common-chemicals-and-unexplained-chronic-illnesses-2/

Oversettelse

Kan ditt nye hjem med frisk maling, tepper og skap, samt bruk av sprøytemidler rundt huset, forårsake sykdommer som følge av kjemisk intoleranse?

- En ny vitenskapelig artikkel viser en etterlengtet sammenheng mellom eksponering for vanlige kjemikalier og såkalte uforklarlige sykdommer. Den presenterer også for første gang en forklaringsmodell for hvordan og hvorfor dette skjer – en totrinns sykdomsprosess kalt **toxicant-induced loss of tolerance (TILT)**, eller toksikant-indusert tap av toleranse.
- Artikkelen er skrevet av **Claudia S. Miller, MD**, professor emeritus, og **Raymond F. Palmer, PhD**, professor – begge ved Family and Community Medicine, UT Health San Antonio.
- De har medforfatterne **Dr. Shahir Masri**, Program in Public Health, University of California-Irvine, og **Dr. Nicholas Ashford**, Sociotechnical Systems Research Center, Massachusetts Institute of Technology.

Environmental Sciences Europe under tittelen ***"Toxicant-induced loss of tolerance for chemicals, foods, and drugs: assessing patterns of exposure behind a global phenomenon."***

- Den ble publisert 27. mai 2021 i tidsskriftet. Artikkelen gjennomgår åtte hendelser hvor grupper av mennesker ble utsatt for de samme kjemikaliene og utviklet multisystem-symptomer og nyoppstått intoleranse – enten gjennom én stor hendelse eller gjentatte lavdose-eksponeringer.
- Blant de berørte var:
- ansatte ved US Environmental Protection Agency etter installasjon av nytt teppe,
- Gulfkrigsveteraner,
- kasinomedarbeidere eksponert for sprøytemidler,
- piloter og kabinansatte utsatt for «fume events»,
- brannmenn som rykket ut ved World Trade Center-katastrofen,
- pasienter med kirurgiske implantater,
- personer utsatt for mugg i hjem eller på jobb,
- tunnelarbeidere eksponert for løsemidler.

Eksponering

- Blandinger av flyktige og halvflyktige organiske forbindelser – inkludert kjemikalier som finnes i vanlige bygg- og vedlikeholdsprodukter – gikk igjen i disse tilfellene, sammen med sprøytemidler og forbrenningsprodukter. Eksponeringene peker mot rollen til TILT, først identifisert av Dr. Miller, som har bakgrunn som allergolog, immunolog og miljøforsker. Hun beskrev TILT som en ny klasse miljøutløste sykdommer.
- «Denne artikkelen gir en ny kobling mellom dagens miljøeksponeringer og en rekke 'uforklarlige' sykdommer og syndromer, inkludert Gulfkrigssyndrom, brystimplantatsykdom, kronisk utmattelsessyndrom, fibromyalgi og andre, ved å beskrive TILT,» sa Dr. Miller. «TILT representerer en ny klasse miljøinduserte sykdommer med samme underliggende biokjemiske mekanisme.»

Cellemediert immunitet

- Mekanismen innebærer aktivering av **mastceller**, «førstelinjeforsvaret» mot fremmede stoffer som kjemikalier og virus.
- Mens immunforsvarets del som omfatter antistoffer (immunoglobuliner) er godt studert, er den cellemedierte immuniteten mindre kjent. Dette er en eldgammel del av immunsystemet hvor mastceller, som dannes i benmargen, migrerer til områder mellom vev og ytre miljø og blir værende der.
- De kan sensibiliseres av én kraftig eksponering (for eksempel sprøytemidler), eller av gjentatte lavnivå-eksponeringer (som inhalering av flyktige organiske forbindelser fra oppussing eller nybygg). Etter dette kan selv lave nivåer av disse og andre kjemikalier utløse frigjøring av hundrevis av betennelsesfremkallende stoffer fra mastcellene – noe som gir allergilignende reaksjoner, ofte svært alvorlige.
- Dr. Miller påpeker at disse invalidiserende tilstandene har eksplodert etter andre verdenskrig, parallelt med økt produksjon og innendørs bruk av syntetiske kjemikalier. Problemene ble forsterket etter 1970-tallets energisparetiltak, da bygg ble mer lufttette og fikk lite eller ingen frisklufttilførsel.
- Resultatet er at mennesker i dag utsettes for hittil usette nivåer av nye kjemikalier fra byggematerialer, møbler og produkter som bevisst tilsettes inneluften eller påføres overflater – inkludert rengjøringsmidler, parfymer, tobakksrøyk, møllkuler, desinfeksjonsmidler samt avgasser fra gassovner og varmeapparater. Mugg i vannskadede bygg kan også frigjøre giftige stoffer til inneluften.
- Konsekvensene er økende antall kjemisk eksponerte og funksjonshemmede personer, særlig barn. (En tidligere studie fra Dr. Miller viste at barn av mødre med kjemisk intoleranse har nesten tredoblet risiko for å utvikle ADHD eller autisme.)

Bruk av studien

- De nye funnene er ventet å bli tatt i bruk av folkehelseforskere, leger og beslutningstakere for å begrense skadelig eksponering og forebygge sykdom.
- «Vi håper funnene vil være nyttige for klinikere, slik at de kan hjelpe det stadig voksende antallet mennesker som får livene sine ødelagt av TILT,» sa **Carlos Roberto Jaén, MD, PhD, FAAFP**, leder for Family and Community Medicine ved UT Health San Antonio og medlem av National Academy of Medicine.
- Behandling krever først **unngåelse eller eliminering** av utløsende eksponering, deretter reduksjon av triggere. Nøye utvalgte medisiner kan være til hjelp, men mange vanlige eller tidligere godt tolererte legemidler kan utløse symptomer hos disse pasientene.
- Artikkelen viser også til et validert spørreskjema utviklet av Dr. Miller kalt **QEESI (Quick Environmental Exposure and Sensitivity Inventory)**, som nå er den internasjonale referansestandarden for forskning og diagnostikk av kjemisk intoleranse. Senere utviklet hun og Dr. Palmer en kortversjon med tre spørsmål, **BREESI (Brief Environmental Exposure and Sensitivity Inventory)**, som kan brukes av leger til å identifisere pasienter med kjemisk intoleranse og av epidemiologer til å screene store befolkningsgrupper.
- Mer informasjon og gratis nedlasting av BREESI og QEESI finnes på: https://TILTresearch.org.

Do no harm: Multiple chemical sensitivity is not psychological

spaces, an issue not just for MCS, but for all vulnerable populations, and one further compounded by climate change. Ongoing toxicologic research continues to underscore the complex genetic interactions chemicals have, and to discover the implications of nonmonotonic dose–response curves.[1] Growing evidence complicates long-standing assumptions regarding dose–response toxicity and that low doses are less harmful.

Finally, Binkley's[1] characterization of MCS perpetuates ableism in medical practice. It does not address patients' accessibility needs, which may encourage identity-based bias.[7] It does not address the responsibility to provide patient support for the disabling aspects of illness, including impacts to functional status and activities of daily living. Scent-free policies are commonplace. Moreover, it is discriminatory and harmful language to imply that access needs such as unscented spaces are phobic avoidance.

Rather than continuing to engage in the debate regarding MCS etiology, a patient-led perspective demands clinicians focus on disability and accessibility which, as Binkley[1] points out, is by necessity complex, "challenging and time-consuming." This is, at minimum, clinicians' duty to care, and it is their ethical responsibility to cause no harm.

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REFERENCES
1. Binkley KE. Multiple chemical sensitivity/idiopathic environmental intolerance: a practical approach to diagnosis and management. J Allergy Clin Immunol Pract 2023;11:3645-9.
2. Mazet S, Miller CS, Palmer RF, Ashford N. Toxicant-induced loss of tolerance for chemicals, foods, and drugs: assessing patterns of exposure behind a global phenomenon. Environ Sci Eur 2021;33:1-9.
3. Molot J, Sears M, Anisman H. Multiple chemical sensitivity: it's time to catch up to the science. Neurosci Biobehav Rev 2023;151:105227.
4. Damiani G, Alessandrini M, Caccamo D, Cormano A, Gazzi G, Mazzatenta A, et al. Italian expert consensus on clinical and therapeutic management of multiple chemical sensitivity (MCS). Int J Environ Res Public Health 2021;18:11294.
5. Perales RB, Palmer RF, Rincon R, Viramontes JN, Walker T, Jain CR, et al. Does improving indoor air quality lessen symptoms associated with chemical intolerance? Prim Health Care Res Dev 2022;23:e3.
6. Palmer RF, Almeida M, Perales RB, Rincon R. A genome-wide SNP investigation of chemical intolerance. Environ Adv 2023;12:100380.
7. Peña-Guzmán DM, Reynolds JM. The harm of ableism: medical error and epistemic injustice. Kennedy Inst Ethics J 2019;29:369-92.

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Do no harm: Multiple chemical sensitivity is not psychological

To the Editor:

Binkley[1] presents her definition and approach to "idiopathic environmental intolerance" (IEI)—we prefer multiple chemical sensitivity (MCS)—as if these were settled science and well-established clinical protocols. However, any competent scan of MCS studies starkly demonstrates that this field is composed of two opposing schools of thought.[2,3] Binkley classifies MCS (IEI) as a phobia,[1] which belongs squarely in the psychological school, in which even chemicals demonstrated to be toxic at extremely low levels in authoritative environmental health studies[3,4] have nothing to do with MCS (IEI).

We stand with the biophysical-toxicologic school that understands MCS to be a serious, complex, multisystem, recurrent, environmental disorder and disease process displaying neurologic, immunologic, cutaneous, allergic, gastrointestinal, rheumatologic, cardiologic, and endocrinologic signs and symptoms.[4-7] A staggering number (3% to 14% of the population; 70% women) have received the diagnosis in Canada, the United Kingdom, Sweden, the United States, Australia, Japan, and Korea.[5]

Symptoms of anxiety and depression, which MCS patients may develop, are often part of a broader constellation of neuroimmune symptoms that can be triggered by exposure to chemicals, even in trace amounts,[4-7] and after onset, from great levels of stress caused by isolation, poverty, stigmatization, a lack of health care, and physician gaslighting.[7]

An extensive aggregation and discussion of recent research on MCS is presented by Bornstyn and MacQuarrie.[2] It summarizes, with references, critiques of and alternatives to the psychological school[2]; presents research on the prevalence of and multiple pathways to sensitization and major hypothesized physiologic mechanisms[4]; discusses recent research and clinical practice regarding underlying disease factors and diagnostic and treatment approaches[5]; and presents extensive relevant findings in environmental health studies,[6] addressing relationships between chemical exposures and other stressors.[3]

The psychiatric approach is a dangerous pathway to iatrogenesis. Multiple chemical sensitivity is not a phobia. Recommended stress management and relaxation training[1] mitigate all illnesses, but certainly do not rid MCS patients of the condition. Pharmacotherapy[1] may reduce depression and anxiety, but many with MCS cannot metabolize typical drugs that may make them sick. "Psychological desensitization with graded exposure"[1] goes against the basic principle of MCS treatment (avoidance of triggers) so may cause serious short-term and long-term setbacks.[1] Telling patients with MCS as well as physicians and family members that those with MCS have a phobia instead of a complex disease process is gaslighting that actively contributes to deteriorating social support and mental health.[7]

There is great danger to people experiencing MCS if their hard-won disability accommodation involving accessibility and safety, especially in hospitals and long-term care facilities as well as in schools and workplaces is actively undermined by Binkley's approach.[1]

We urge the editors to frame the article by Binkley[1] as an expression of one competing approach and to include an article that expresses the views of the widely adopted biophysical-toxicologic approach in this issue or a soon-to-be forthcoming edition.

Adrianna Tetley, BA[a]
(on behalf of the CureNow Ontario Board of Directors and the Ontario Environmental Health Advocates)

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https://www.jaci-inpractice.org/article/S2213-2198%2823%2901263-1/pdf?utm_source=chatgpt.com

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REFERENCES
1. Binkley KE. Multiple chemical sensitivity/idiopathic environmental intolerance: a practical approach to diagnosis and management. J Allergy Clin Immunol Pract 2023;11:3645-9.
2. Zucco GM, Doty RL. Multiple chemical sensitivity. Brain Sci 2022;12:46.
3. Bornstyn V, MacQuarrie M. Putting the chemicals back in "multiple chemical sensitivity." Accessed October 30, 2023. https://recognitionofscientificevidence.org/wp-content/uploads/2015/12/INSPQ-MCS-CRITIQUEcomplete.pdf
4. Mazet S, Miller CS, Palmer RF, Ashford N. Toxicant-induced loss of tolerance for chemicals, foods, and drugs: assessing patterns of exposure behind a global phenomenon. Environ Sci Eur 2021;33:65.
5. Damiani G, Alessandrini M, Caccamo D, Cormano A, Gazzi G, Mazzatenta A, et al. Italian expert consensus on clinical and therapeutic management of multiple chemical sensitivity (MCS). Int J Environ Res Public Health 2021;18:11294.
6. Molot J, Sears M, Marshall L, Bray RI. Neurological susceptibility to environmental exposures: pathophysiological mechanisms in neurodegeneration and multiple chemical sensitivity. Rev Environ Health 2021;37:509-30.
7. Miller CS, Palmer RF, Dempsey TT, Ashford NA, Afrin LB. Mast cell activation may explain many cases of chemical intolerance. Environ Sci Eur 2021;33:129.

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Patient expert perspectives on multiple chemical sensitivities and the validity of access needs

To the Editor:

As disability advocates and members of the disability community, we would like to bring our expertise and lived experiences with multiple chemical sensitivities (MCS) to the forefront. We write to express our deep concerns regarding a recent publication by Binkley on MCS,[1] particularly the reference to patient advocates as so-called advocates.

It is paramount to underscore the critical role of patient-centered and patient-led perspectives in shaping best practices for the care of MCS. "Reassurance" is inappropriate and does not address the disabling aspects of this illness. Rather, medical care must adopt the social model of disability, which underscores the structural and relational aspects of accessibility required by patients contending with the disabling aspects of MCS.

Binkley's article[1] risks pathologizing accessibility needs rather than supporting it. Given the medical community's responsibility to do no harm, we suggest that practitioners center on the environmental access needs of individuals with MCS and deem them valid, rather than dismissing them. Accessibility interventions must by necessity include those that improve air quality and avoid chemicals, because the prevention of exposures is the single most important form of management for the safety and well-being of individuals with MCS. Because these needs are the most effective way to improve disability status, they should absolutely not be belittled as mere phobic avoidance.

Clear connections are established in the literature between disability status and unequal exposures to pollution.[2] Attributing functionally disabling exposure symptoms to anxiety is not only misleading but also detrimental from an epistemic justice perspective, which emphasizes that patient knowledge about disability matters, especially given the known inequities in environmental health.[3] Binkley[1] thus risks perpetuating the social exclusion and stigmatization of individuals with MCS and invisible disabilities.[4] The article's characterization may misguide medical practitioners, especially those who have little familiarity with MCS, because there is a lack of medical education on this condition, and in turn may perpetuate gendered, racialized, and class-based discrimination within the health care system. The consequences of such discrimination are significant, including a lack of housing security, social support, and medical care.[5] It also dismisses a wealth of existing scientific evidence supporting mechanisms of MCS, and especially emergent genetic research.[6,7]

Overall, Binkley's article[1] may foster a dismissive attitude among care providers regarding the environmental influences on symptom presentation, potentially resulting in incomplete and misguided clinical assessment practices. Although psychopharmacologic treatment can be beneficial in specific cases, as patient experts, we assert that on the whole, it is an inadequate and misguided approach to patient care for this population. Over 1.1 million Canadians received the diagnose of MCS as of 2020 (Statistics Canada, email communication, August 19, 2022).

It is crucial that we reevaluate Binkley's[1] proposed approach to MCS care, recognizing that lived experiences and patient-led perspectives are invaluable sources of knowledge to guide best practices in the field, and acknowledging the unique disability-centered needs of patients with MCS.

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REFERENCES
1. Binkley KE. Multiple chemical sensitivity/idiopathic environmental intolerance: a practical approach to diagnosis and management. J Allergy Clin Immunol Pract 2023;11:3645-9.
2. Chakraborty J. Unequal proximity to environmental pollution: an intersectional analysis of people with disabilities in Harris County, Texas. Prof Geogr 2023;72:521-34.
3. Ottinger G. Careful knowing as an aspect of environmental justice. Env Polit. Published online March 16, 2023. https://doi.org/10.1080/09644016.2023.2185971.
4. Kattari SK, Olzman M, Hanna MD. "You look fine!" Ableist experiences by people with invisible disabilities. Affilia 2018;33:477-92.
5. Molot J, Sears M, Anisman H. Multiple chemical sensitivity: it's time to catch up to the science. Neurosci Biobehav Rev 2023;151:105227.
6. Molot J, Sears M, Marshall LM, Bray RI. Neurological susceptibility to environmental exposures: pathophysiological mechanisms in neurodegeneration and multiple chemical sensitivity. Rev Environ Health 2021;37:509-30.

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Reply to correspondence on "Multiple chemical sensitivity/idiopathic environmental intolerance: A practical approach to diagnosis and management"

To the Editor:

As a recognized expert in the psychological aspects of idiopathic environmental intolerance/multiple chemical sensitivity (IEI/MCS), Herman Staudenmayer has been invited to

https://www.jaci-inpractice.org/article/S2213-2198(23)01263-1/fulltext

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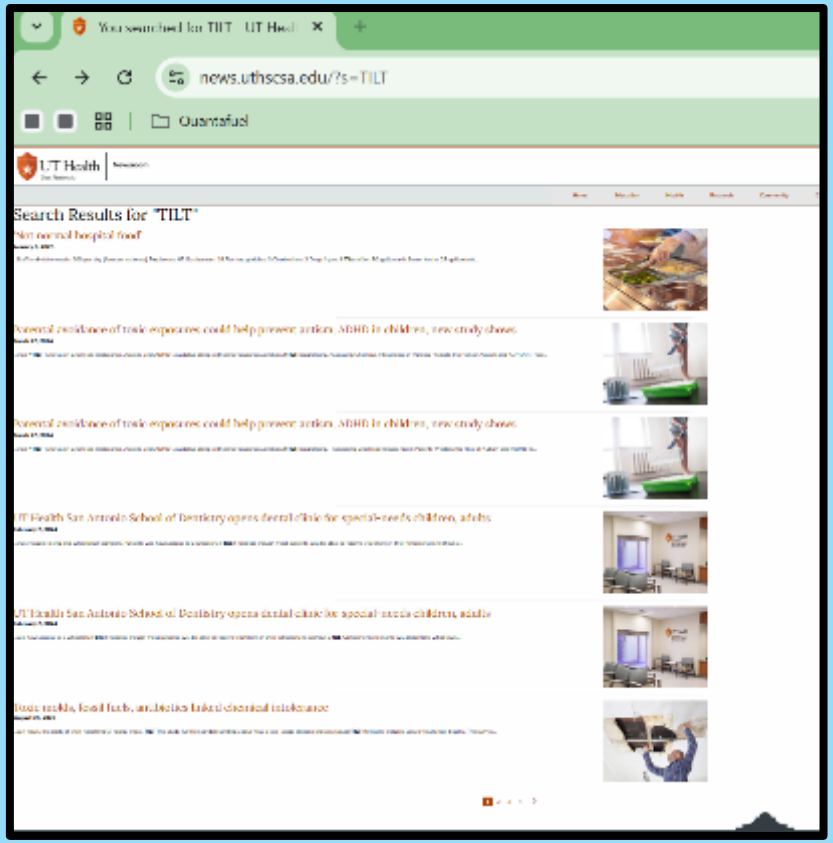

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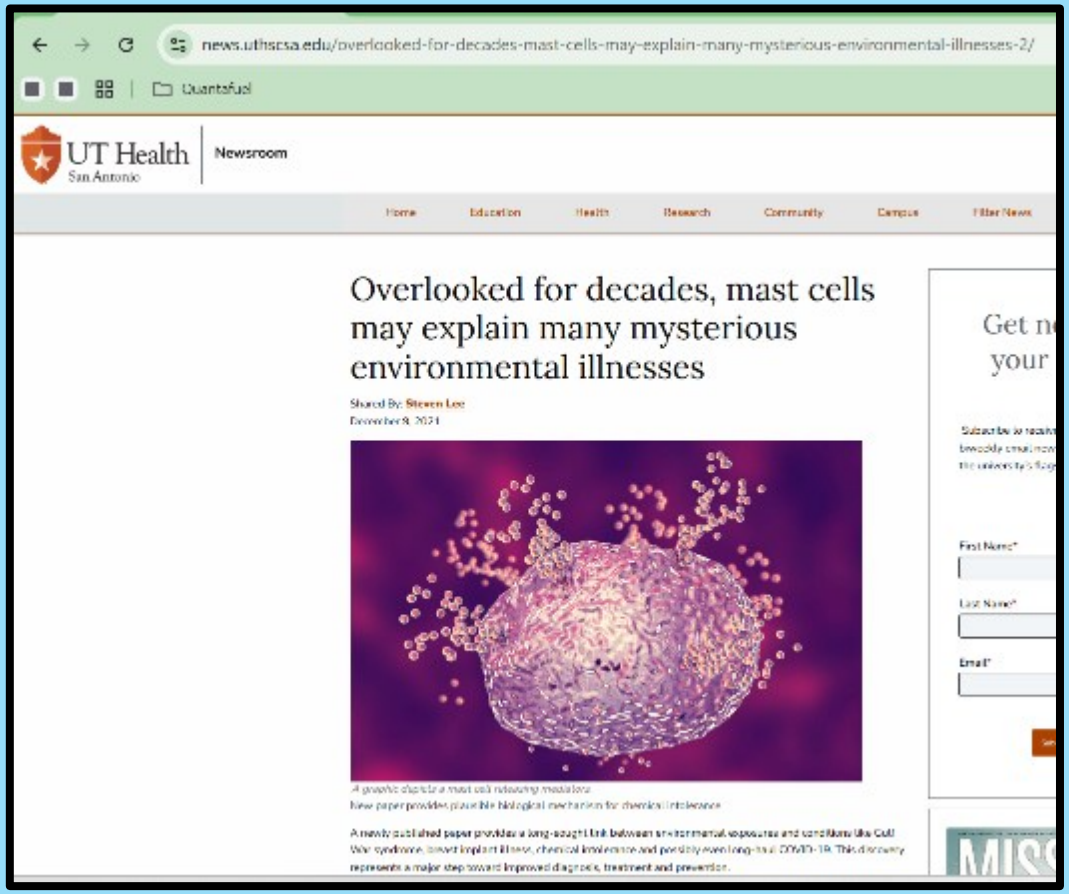
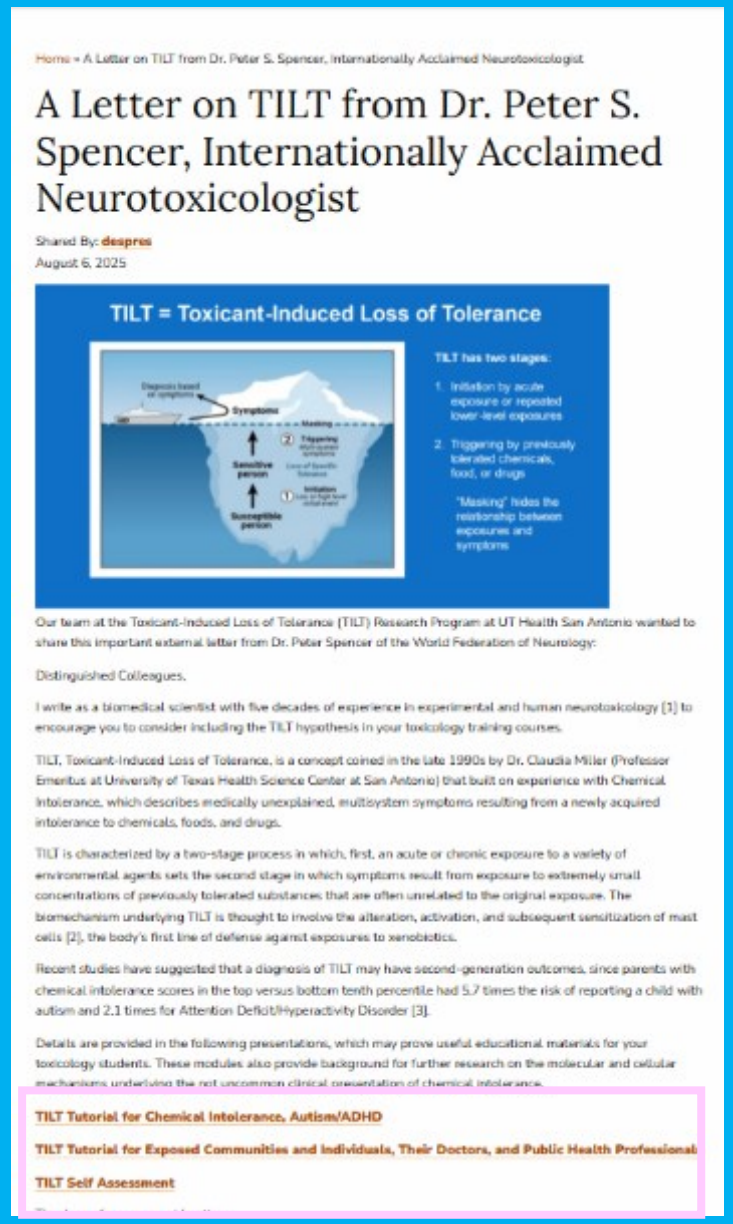


https://news.uthscsa.edu/overlooked-for-decades-mast-cells-may-explain-many-mysterious-environmental-illnesses-2/



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A Letter on TILT from Dr. Peter S. Spencer, Internationally Acclaimed Neurotoxicologist

Shared By: despres
August 6, 2025

Our team at the Toxicant-Induced Loss of Tolerance (TILT) Research Program at UT Health San Antonio wanted to share this important external letter from Dr. Peter Spencer of the World Federation of Neurology:

Distinguished Colleagues,

I write as a biomedical scientist with five decades of experience in experimental and human neurotoxicology [1] to encourage you to consider including the TILT hypothesis in your toxicology training courses.

TILT, Toxicant-Induced Loss of Tolerance, is a concept coined in the late 1990s by Dr. Claudia Miller (Professor Emeritus at University of Texas Health Science Center at San Antonio) that built on experience with Chemical Intolerance, which describes medically unexplained, multisystem symptoms resulting from a newly acquired intolerance to chemicals, foods, and drugs.

TILT is characterized by a two-stage process in which, first, an acute or chronic exposure to a variety of environmental agents sets the second stage in which symptoms result from exposure to extremely small concentrations of previously tolerated substances that are often unrelated to the original exposure. The biomechanism underlying TILT is thought to involve the alteration, activation, and subsequent sensitization of mast cells [2], the body's first line of defense against exposures to xenobiotics.

Recent studies have suggested that a diagnosis of TILT may have second-generation outcomes, since parents with chemical intolerance scores in the top versus bottom tenth percentile had 5.7 times the risk of reporting a child with autism and 2.1 times for Attention Deficit/Hyperactivity Disorder [3].

Details are provided in the following presentations, which may prove useful educational materials for your toxicology students. These modules also provide background for further research on the molecular and cellular mechanisms underlying the not uncommon clinical presentation of chemical intolerance.

TILT Tutorial for Chemical Intolerance, Autism/ADHD

TILT Tutorial for Exposed Communities and Individuals, Their Doctors, and Public Health Professionals

TILT Self Assessment

TILT Tutorial for Chemical Intolerance, Autism/ADHD
https://tiltresearch.org/2024/05/06/tilt-tutorial-explores-link-between-chemical-intolerance-autism/

TILT Tutorial for Exposed Communities and Individuals, Their Doctors, and Public Health Professionals
https://tiltresearch.org/2025/07/10/tilt-tutorial-explores-chemical-intolerance-in-exposed-communities-and-individuals-their-doctors-and-public-health-professionals/

TILT Self Assessment
https://tiltresearch.org/self-assessment/

Thank you for your consideration.
Sincerely,
Peter S. Spencer, PhD, FANA, FRCPath
Chair World Federation of Neurology

https://tiltresearch.org/2025/08/06/a-letter-on-tilt-from-dr-peter-s-spencer-internationally-acclaimed-neurotoxicologist/

Kjemisk eksponering

- Skiftarbeid 14 dager sammenhengende
- Ekstrem arbeidstid + overtid
- Eksos
- Kortvarig høy eksponering
- Ototoksiske kjemikalier
- Boreslam, benzen, cocktail fra formasjon
- Produksjonskjemikalier, syrer, baser
- Biocider, kathoner
- Maling; epoxy, isocyanater, løsningsmidler
- Passiv brannbeskyttelse (epoxy)
- Avfettingsmidler,
- Kjemikalier som gir hudopptak
- Støv fra sandblåsing; kvarts, malingsstøv, (blykromat, zink etc.)
- Kvarts (boreslam)
- Boreslamskjemikalier i pulverform
- Avluftingspunkter (venter) med benzen ukjente kjemiske forbindelser
- Termisk dekomponert maling; sveiserøyk/sliping/nålepikking
- Kvikksølv (Utfelling i prosessystem, binding til stål)
- Hormohermere, BPA, term. dekomp. epoxy
- Støv/Ultrafine partikler/asbest
- Kreftremkallende stoffer
- Immunotoksiske kjemikalier
- Cocktaileffekter
- Rengjøring /vaskekjemikalier
- Hydrokarboner fra formasjon (benzen)
- Avlufting fra smøresystem
- Turbinoljer med organofosfater
- Hydraulikkoljer
- Brukt motorolje
- Inneklima Steikeos
- Vaskeri; Kontaminert arbeidstøy
- Renhold I områder med kjemisk eksponering og forurensning

Kompleks eksponering uansett yrke

Yrkesgrupper

- Prosessoperatør
- Mekanikere
- Forpleining. Renholder, kokk
- Sveisere
- Teknisk rengjørere (Cleanere)
- Borepersonell
- Maler/stillasbygger/isolatør
- Arbeidsledelse
- Dekksarbeid/logistikk
- Elektriker/automatiker
- Kranførere
- Retningsborer
- Ledelse
- Borevæskeingeniør
- Sementer
- Mudlogger
- Med flere
- *Reisemekaniker*
- …….

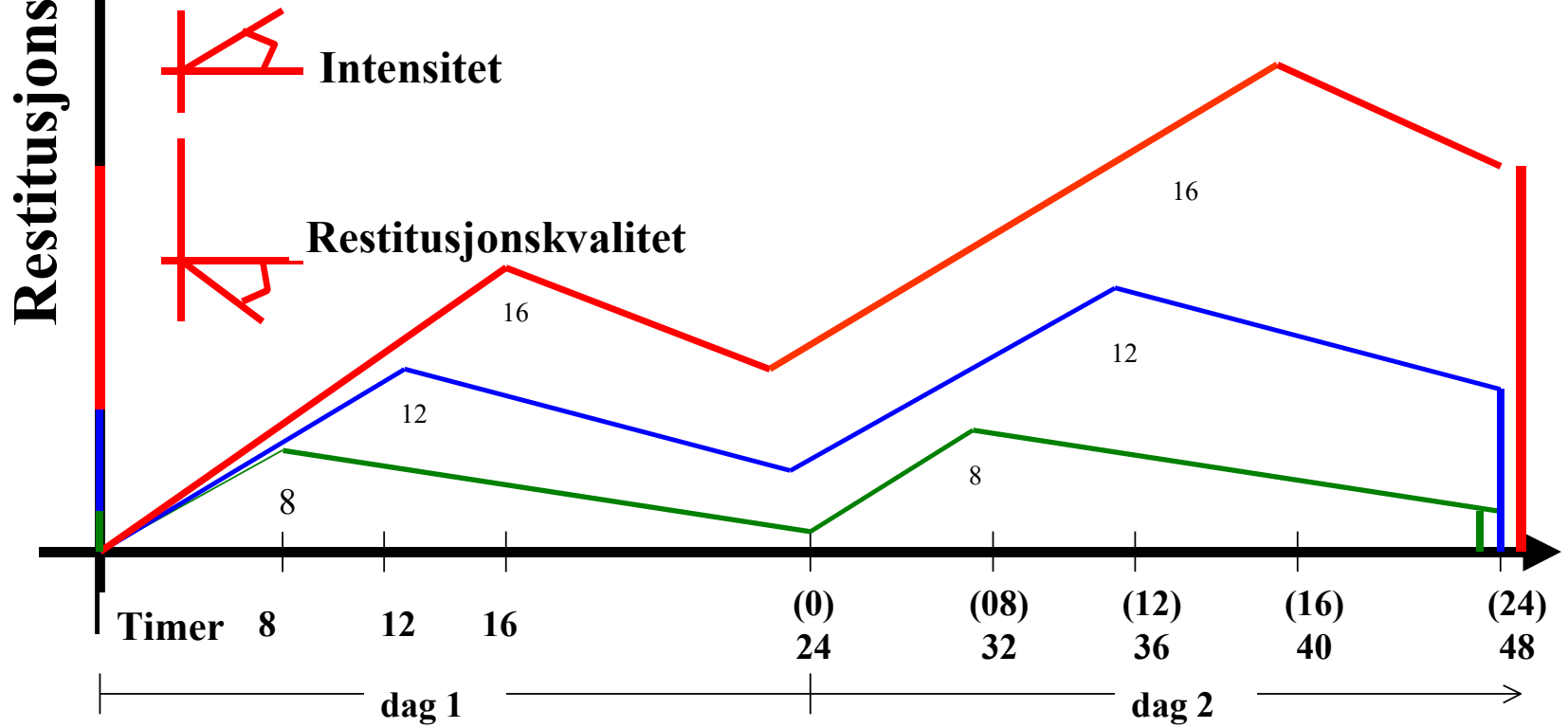
Helseskader (helseutfall)

- Hjerte- og karlidelser
- Kreft
- Diabetes
- Lungelidelser
- Sensibilisering – kilde ikke kartlagt
- Ødelagt hørsel, tinnitus
- Astma og allergi
- **Toxicant Loss of Tolerance (TILT)**
- Nevrologiske effekter
- Hjerneskader
- Nevrologiske sykdommer
- MS-liknende sykdommer (organofosfater)
- Toksisk encefalopati
- Smertehelvete
- Kombinasjon av sykdommer
- KOLS
- RADS (Reactive airway dysfunction syndrome)
- *Sarcoidose*
- …….
- Død

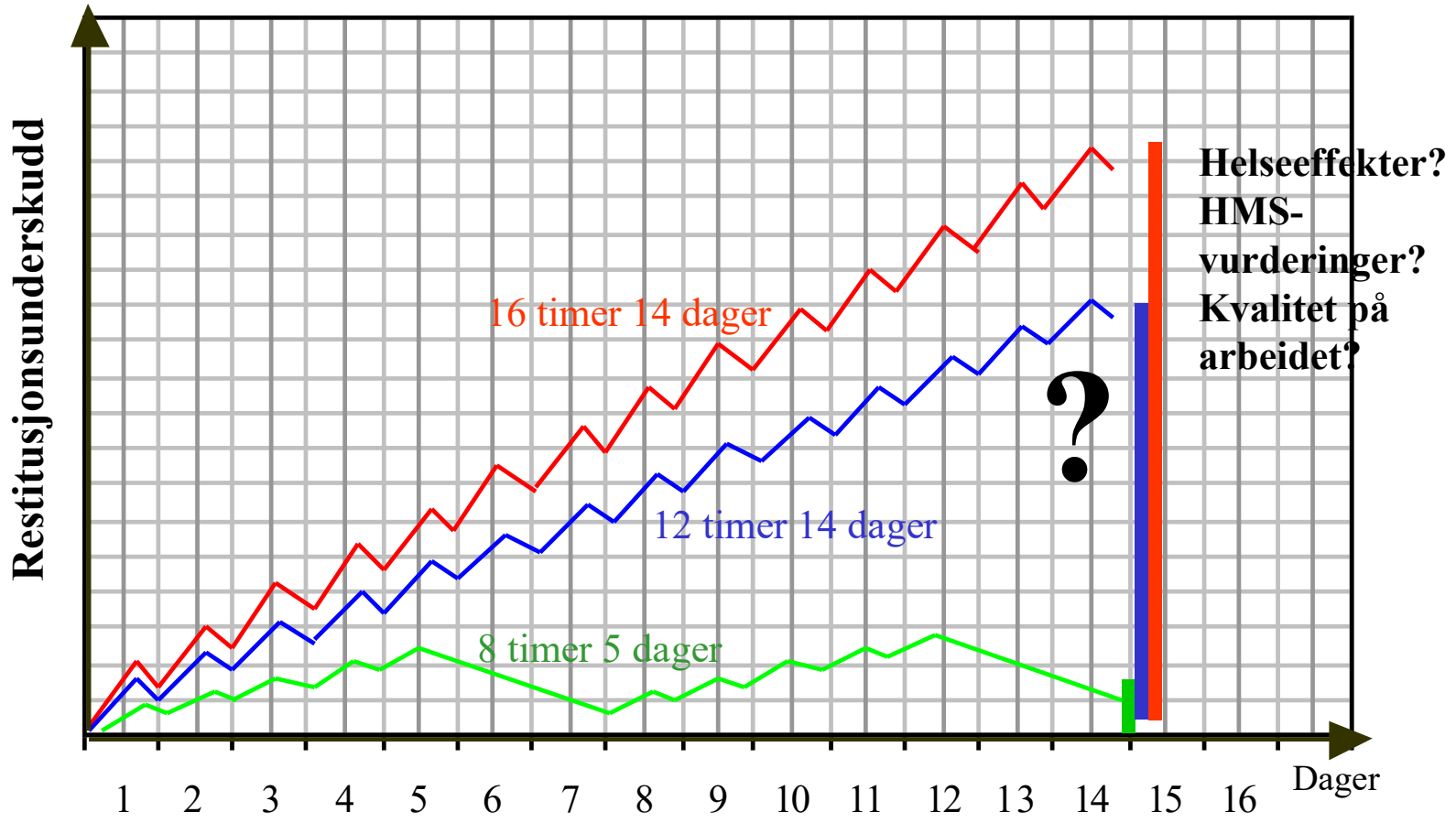
Naturlov; Naturen er slett ikke så enkel som vi kunne ønske

VURDERING AV BELASTNING:
YTEGRENSE OG TÅLEGRENSER

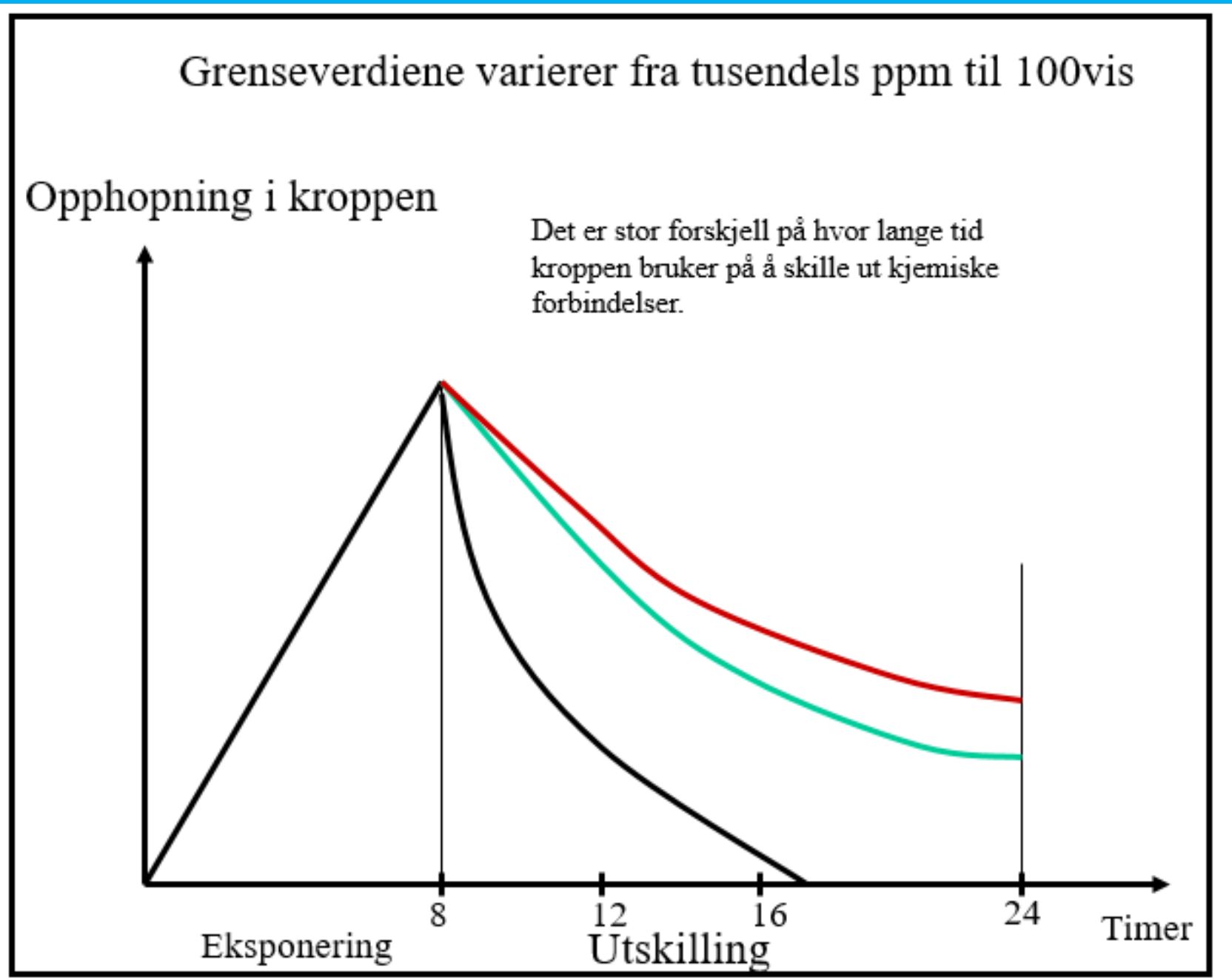
Restitusjonsunderskudd: Funksjon av (arbeidstid, arbeidsbelastning, arbeidsintensitet, kjemisk eksponering, støy eksponering, restitusjonskvalitet……) → Gir ulike helseeffekter og påvirker HMS



Vurdering av belastning; Hvilken effekt har mange dagers belastning på helse og sikkerhet?



Grenseverdiene varierer fra tusendels ppm til 100vis



Grenseverdier for forurensning i arbeidsatmosfæren anvendt på offshore arbeidstid

- **Offshorenormen for 12 timers arbeidsdag er justert slik at normene offshore er 0,6 av 8 timers normen.**
- **Det er ikke tatt hensyn til offshorerotasjon med 14 dagers sammenhengende arbeid (eksponering).**

OLF's industriseminar

Varmt arbeid og åndedrettsvern

Petroleumstilsynet 12. mars 2009

Eksponering ved varmt arbeid – risikovurdering med mange ukjente

Halvor Erikstein

Sertifisert yrkeshygieniker/ org. sekr Sammenslutningen av fagorganiserte i energisektoren.

SAFE

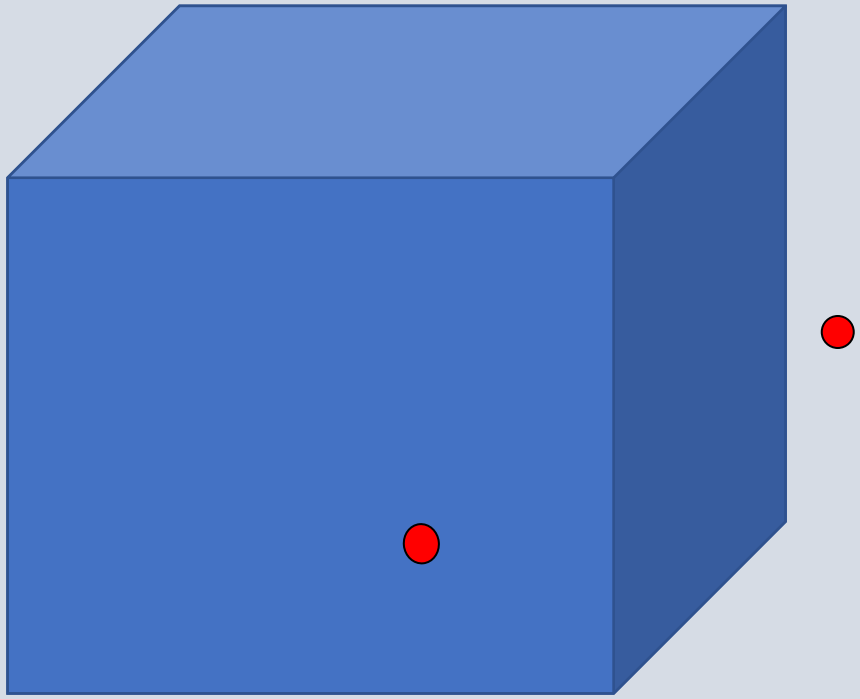
www.safe.no

halvor@safe.no

https://www.offshorenorge.no/globalassets/dokumenter/drift/arbeidsmiljo/kjemisk-arbeidsmiljo/konferanser/2008-varmt-arbeid-og-andedrettsvern/02-risikovurdering-med-mange-ukjente---halvor-erikstein.pdf

Konsentrasjonsangivelser av kjemisk eksponering

1 kubikkmeter (m^3) = 1000 liter



Grenseverdier oppgis i parts pr million (ppm) eller i milligram pr. kubikkmeter (mg/m^3)

1 ppm er en gassboble på 1 cm^3 (1 milliliter) tynnet ut i 1m^3.

Brann- og eksplosjonsgrenser angis i **100 deler** (% - prosent)

Helserisiko angis i **1000000 deler** (ppm)

1 volum% = 10000 ppm

Risikotrappen

Konsentrasjon		Forbindelse
parts pr. **million** (ppm)	**Volum%**	
1.000.000	100	**LEL. (Nedre eks. nivå) %**
100.000	10	**Metanol (6,0 LEL)**
10.000	1	**Metan (5,0)**
1.000	0,1	**Etan (3,0)**
100	0,01	**Propan (2,1 LEL)**
10	0,001	**Butan (1,9)**
1	0,0001	**Pentan (1,4)**
0,1	0,00001	**Benzen (1,3 LEL)**
0,01	0,000001	**N-heksan (1,1)**
0,001	0,0000001	**GRENSEVERDIER ppm**
		Propan (500)
		n-Butan (250)
		N-Pentan (250)
		Heptan (200)
		Metanol (100 ppm) HE
		Karbonmonoksid (25 ppm)
		N-Heksan (20)
		H_2S (5,0 ppm) E
		Blåsyre (0,9 ppm) HE
		Benzen (1,0 ppm) HKG (gammel)
		Nitrogendioksid (0,5 ppm) E[13]
		Benzen (0,2) Ny grenseverdi HKMG
		Ozon (0,1 ppm)
		Diisocyanater (0,005 ppm) A[4]

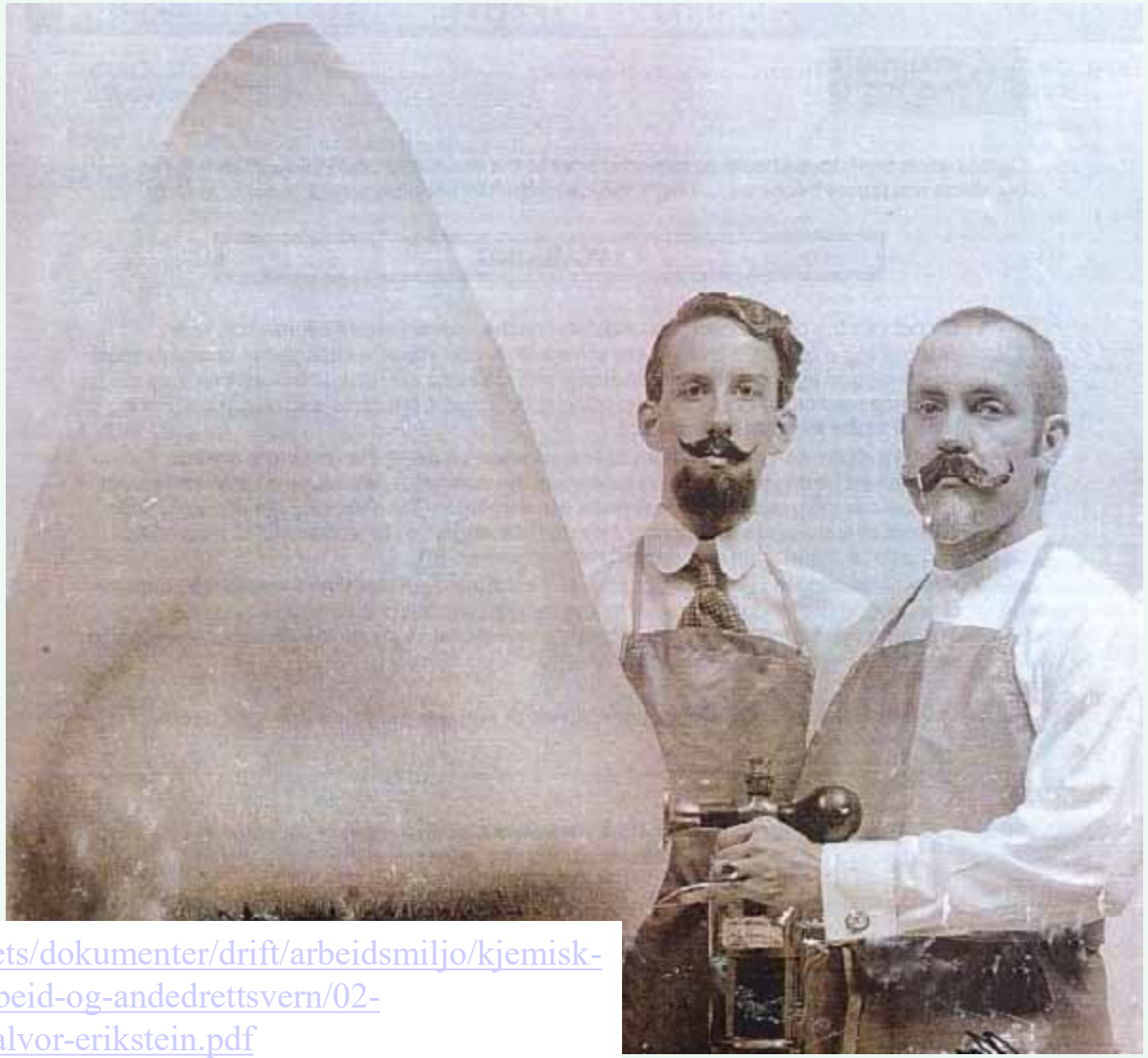
1 volum% = 10000 ppm

NB!

Måler du 20,0% oksygen (O_2) har du 0,9% (9000 ppm) av noe annet.

Ref; "Forskrift om endring i forskrift om tiltaks og grenseverdier. Eksplosjonsgrenser hentet fra "NIOSH Pocket Guide to Chemical Hazards (1990) og "Sources of Ingition" (J.Bond 1991)

Luktesansen



https://www.offshorenorge.no/globalassets/dokumenter/drift/arbeidsmiljo/kjemisk-arbeidsmiljo/konferanser/2008-varmt-arbeid-og-andedrettsvern/02-risikovurdering-med-mange-ukjente---halvor-erikstein.pdf

Før «psykologbehandling»: Hva vet psykologen om kjemisk arbeidsmiljø og hva er kjent om den kjemiske eksponeringen pasienten har vært utsatt for?

- Er det avklart om pasienten er;
- Anosmisk
- Hyposmisk
- Hyperosmisk
- Hyposmisk og hyperosmisk?

Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association, 1995. ISBN 0-932627-34-X

Forskjell på folk

- I gruppen av ufølsomme for lukt inkluderes mennesker som er ANOSMISKE (ute av stand til å kjenne lukt) og HYPOSMISK (delvis ute av stand til å kjenne lukt).

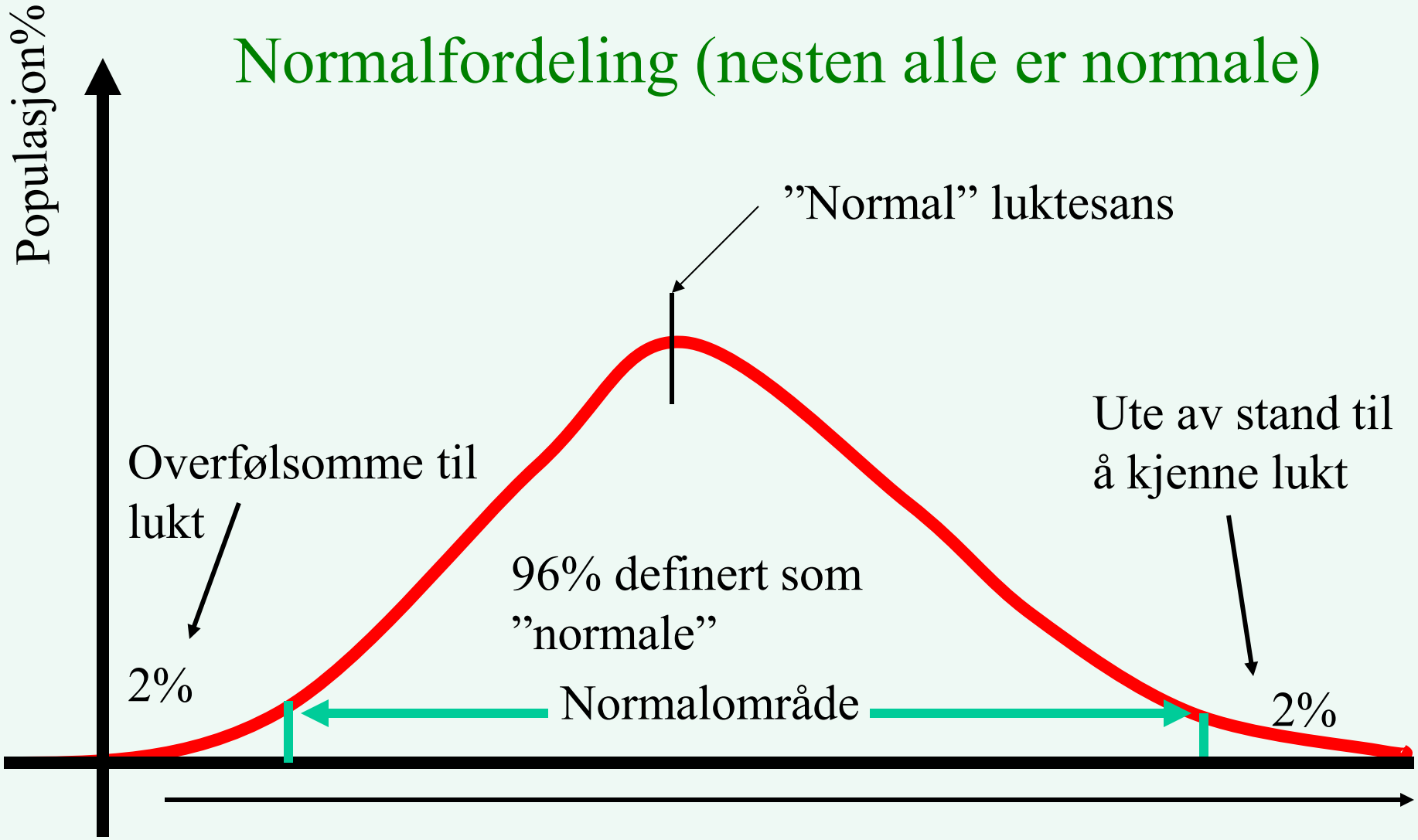
Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association, 1995. ISBN 0-932627-34-X

Forskjell på folk

- I den sensitive gruppen hører folk som er HYPEROSMISKE (veldig følsomme) og folk som er blitt sensibilisert til spesielle lukter gjennom gjentatte eksponeringer.
- En person kan være hyposmisk til en lukt, og hyperosmisk til en annen lukt.

Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association, 1995. ISBN 0-932627-34-X

Normalfordeling (nesten alle er normale)



Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association, 1995. ISBN 0-932627-34-X

Eksempler på luktdata

Kjemikalie (Adm.norm ppm)	Nedre grense	Øvre grense	Geometrisk middelverdi
Diklormetan (15)	1,2	440	160 d
Styren (25)	0,017	1,9	0,14 d
Hydrogensulfid (H_2S) 10	0,001	0,13	0,0094 d
Xylen (25)	0,06	40	20d
Saltsyre (5)	0,256	10,1	Ikke godkjent
Maursyre (5)	1,6	340	Ikke godkjent
Toluen (25)	**0,16**	**37**	**1,6**
Ammoniakk (25)	0,04	53	17 d
Aceton (125)	3,6	653	62 d
Toluendiisocyanat TDI (0,005ppm)			0,2-0,4*
Benzen (1)	34	119	61 d

Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association, 1995. ISBN 0-932627-34-X

*http://www.basf.com/businesses/polymers/urethanes/pdfs/chemicals/Other/2000tdihandbook.pdf

Lukttrøtthet (odor fatigue)

3 minutter i lukten fører til at en persons oppfatning av lukt redusere med omkring 75%

Varmt arbeid som sveising, sliping, brenning, skjæring og kutting utføres over alt, og kan medføre stor helsefare. Pust aldri inn røyken fra maling

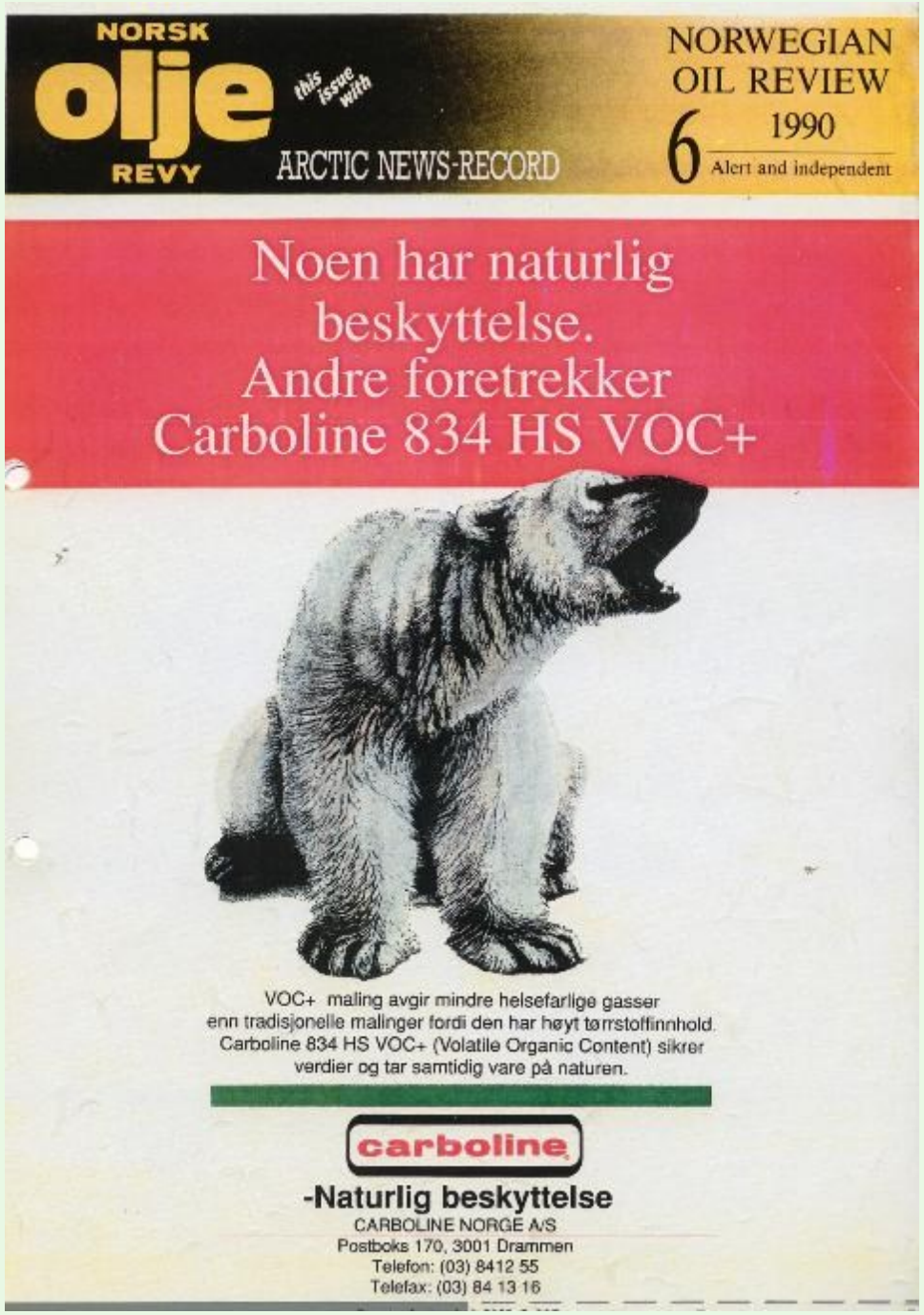
Les mer; Info fra Arbeidstilsynet;
Arbeidstilsynets faktaside om isocyanater
http://www.arbeidstilsynet.no/sok/index.html?q=sveising+%2B+isocyanat%3F&cmd=S%F8k%21

Veiledning om sveising, termisk skjæring, termisk sprøyting, kullbuemeisling, lodding og sliping (varmt arbeid)
http://www.arbeidstilsynet.no/c26981/forskrift/vis.html?tid=28009

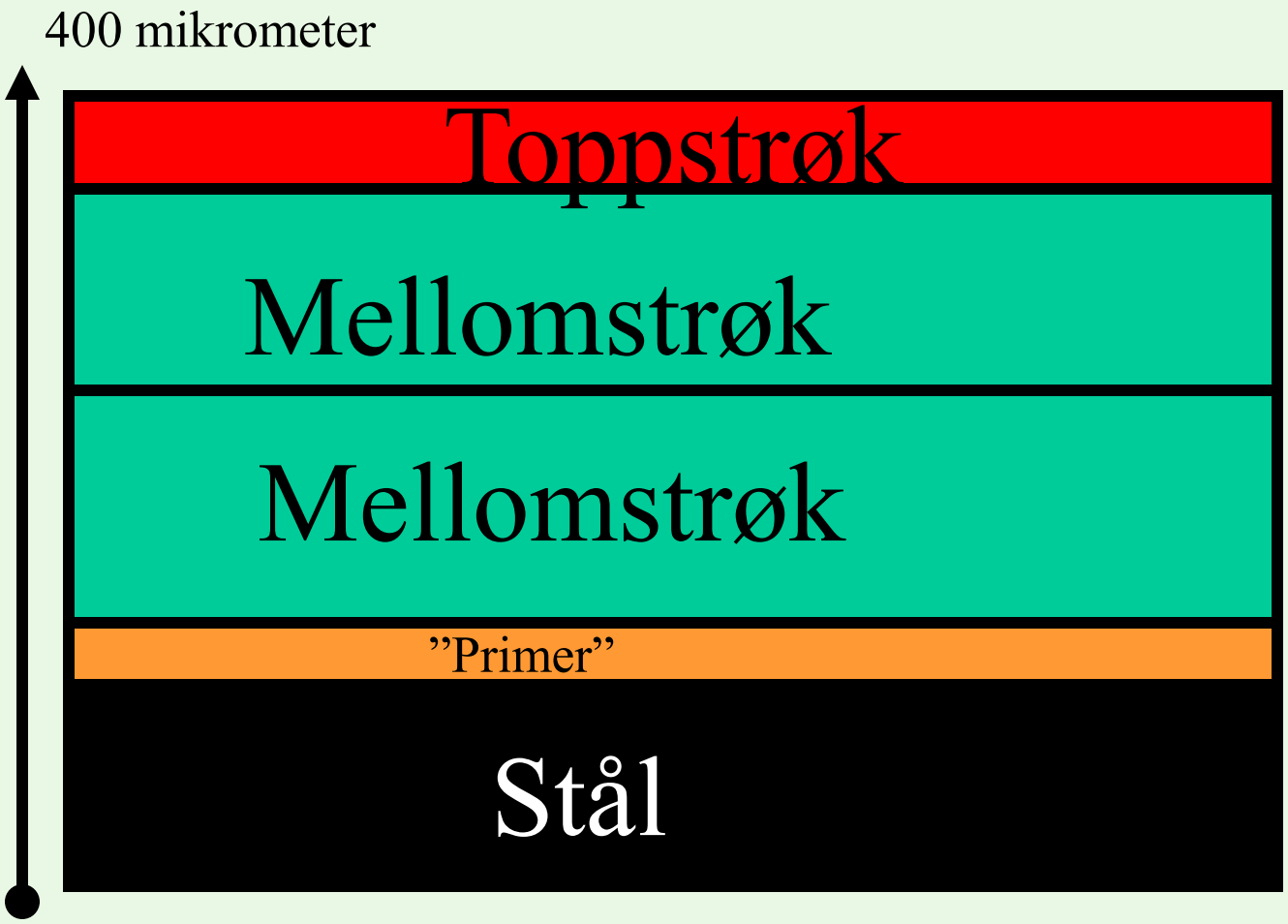
Foto: Halvor Erikstein

Eksempel på farlig og forfeilet substitusjon:

Isocyanatbasert maling ble lenge markedsført som ”miljøvennlig” pga lavt innhold av VOC. Isocyanater ble derimot ikke nevnt…….



Eksempel på oppbygging av malingssystemer

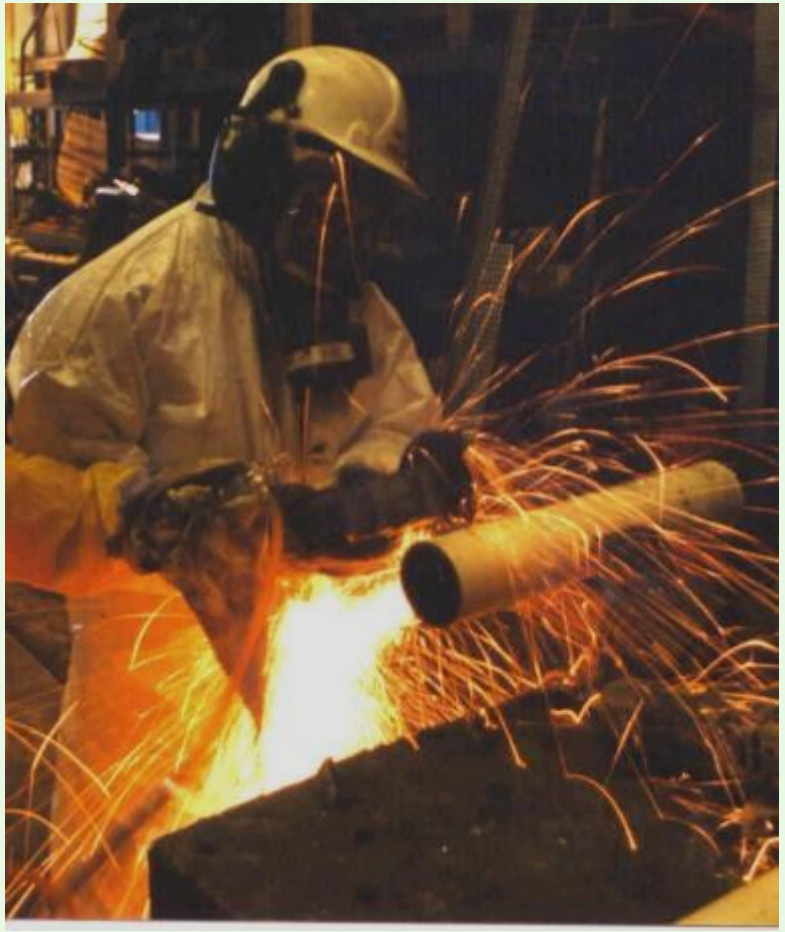


?

Polyuretan,
fluoruretan
epoxy
polyester,
vinyl (pvc),
akryl,
alkyd,……

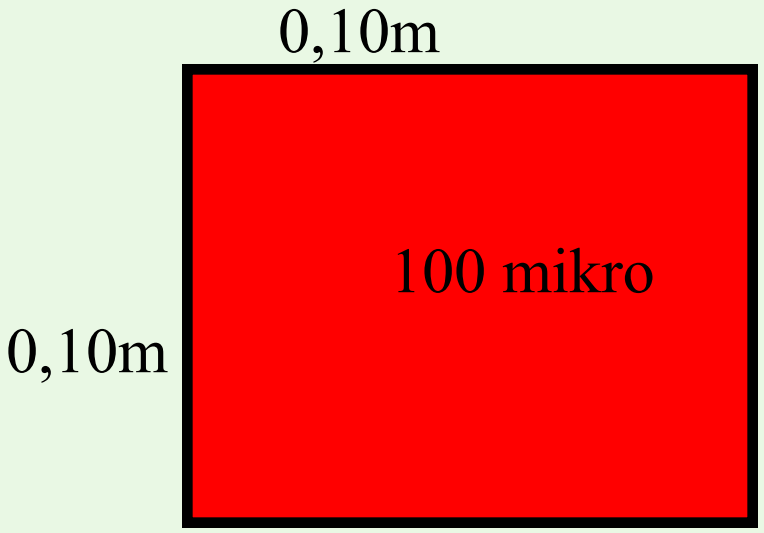
400 mikrometer tilsvarer 0,4 liter på $1m^2$

Termisk dekomponering av maling



Present knowledge regarding exposure and possible health effects of "hot work" in coated metal parts offshore
http://www.ptil.no/getfile.php/PDF/Vedlegg7.pdf

EKSEMPEL PÅ LUFTBEHOV VED TERMISK DEKOMPONERING (BRENNING) PÅ MDI-BASERT POLYURETANMALING;



Tykkelse 100 mikrometer

Tetthet =1 mg/m^3

0,10m x 0,10m x 0,000001m x1mg/m^3

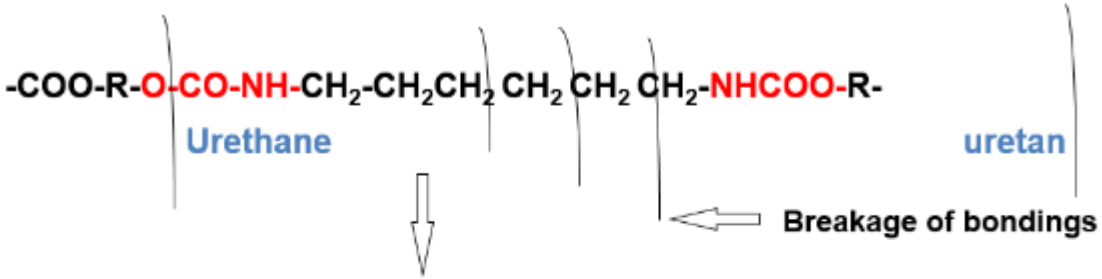
= 1000 mg = 1 gram

Tilbakedanningsgrad 1%. Administrativ norm MDI 0,05mg/m^3.

Ved en tilbakedanningsgrad på 1% fra 1gram blir det dannet (1000mgx1%)=10mg. Luftfortynningsbehov blir 10mg/0,05mg/m^3 =

200 m^3

Termisk dekomponering av HDI-basert polyuretan



CH_3-NCO Methyl isocyanate

CH_3Ch_2-NCO Ethyl isocyanat

$CH_3CH_2CH_2$-NCO Propyl isocyanat

OCN-$(CH_2)_6$-NCO Hexamethylene diisocyanate (HDI)

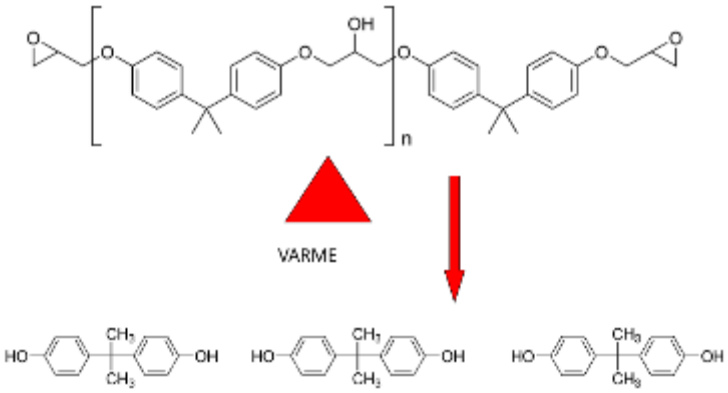
+

Combinations of isocyanates and amins

And other groups. Very complex chemistry

The degradation starts at 150 – 200 C°

Diglycidyleter av bisfenol a tilbakedanner BPA ved termisk dekomponering



EKSEMPEL PÅ LUFTBEHOV VED TERMISK DEKOMPONERING (BRENNING) PÅ MDI-BASERT POLYURETANMALING:

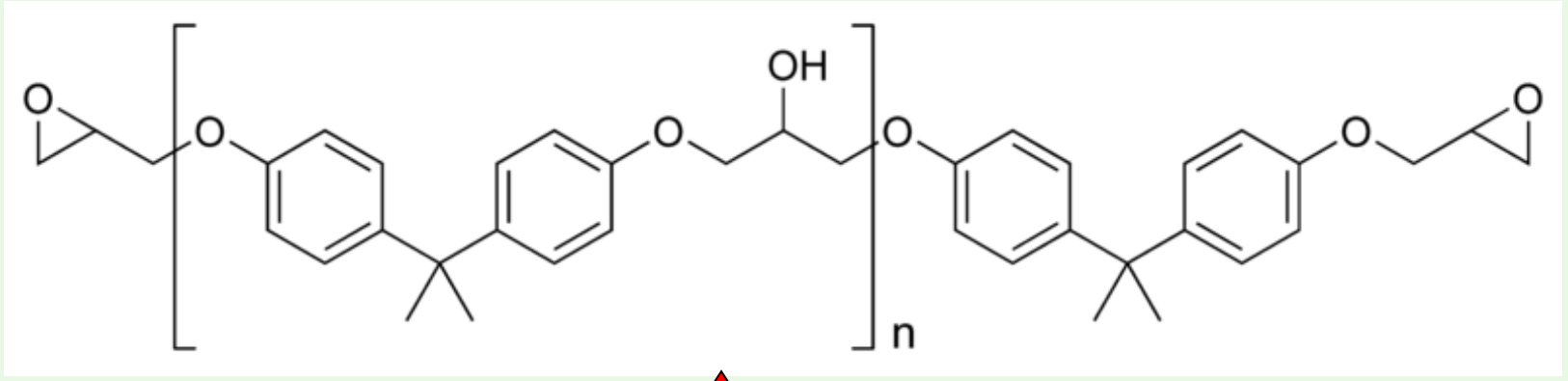
Tetthet =1 mg/m³

= 1000 mg = 1 gram

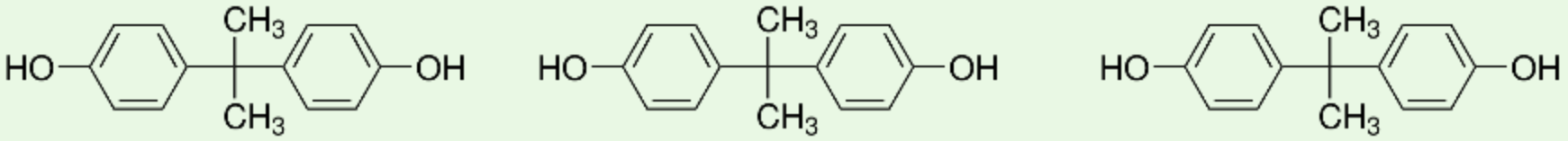
Ved en tilbakedanningsgrad på 1% fra 1gram blir det dannet (1000mgx1%)=10mg. Luftfortynningsbehov blir 10mg/0,05mg/m³ =

200 m³

Diglycidyleter av bisfenol a tilbakedanner BPA ved termisk dekomponering



VARME



Hormonhermeren Bisfenol A, (BPA)

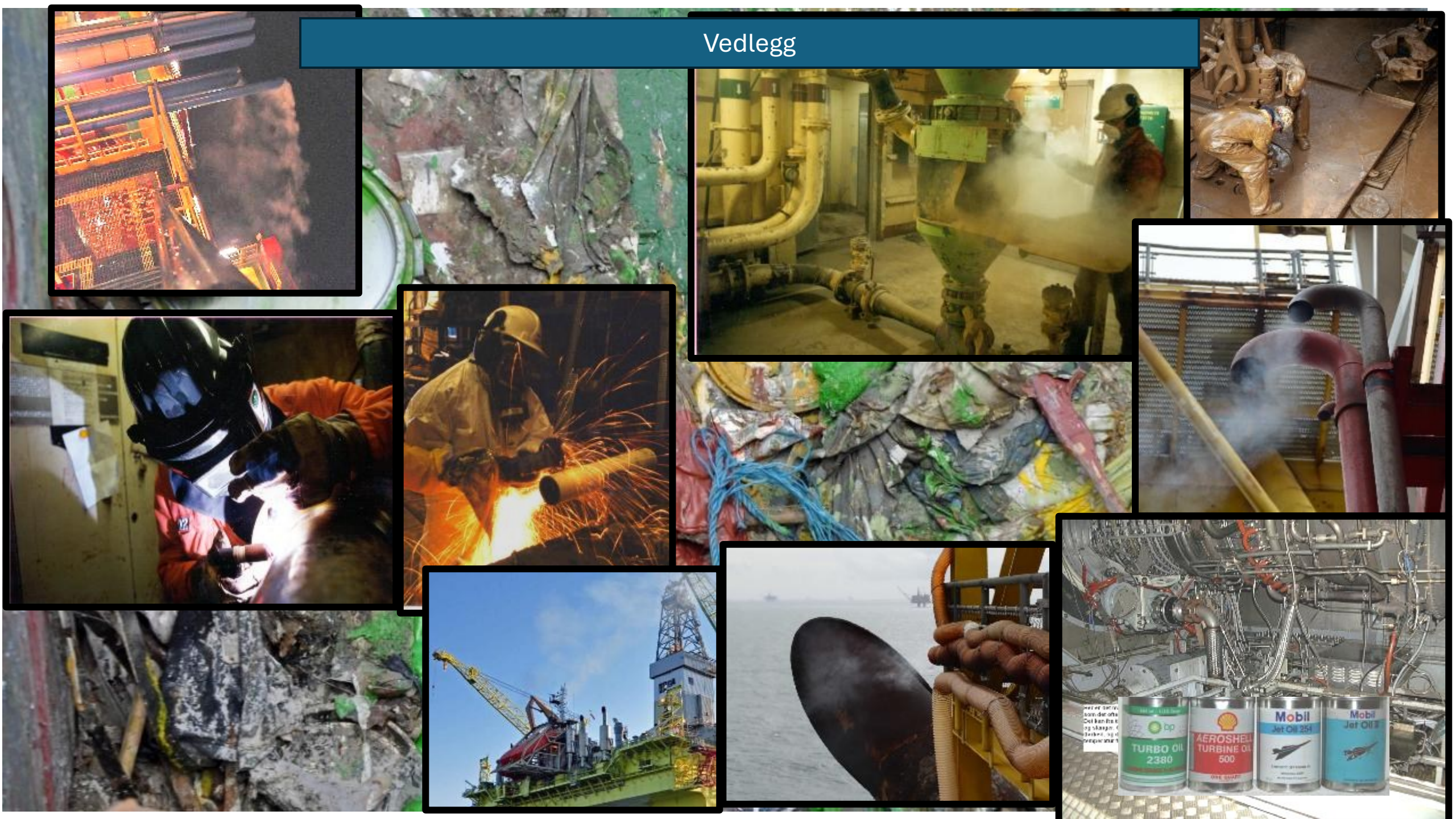
Resolusjon SAFE kongress oktober 2008
Krav til kartlegging av hormonhermere i arbeidsmiljøet

Hormonhermere er kjemiske forbindelser som er så like kroppens hormoner at de lurer kroppens eget hormonsystem. Det er i dag sterk forskning som har påvist sammenheng mellom hormonhermere i matvarer og økning i diabetes og hjerte- og karsykdommer.

Tilsvarende forbindelser finnes i store mengder i det kjemiske arbeidsmiljøet. Vi krever at arbeidsmiljø-myndighetene øyeblikkelig setter i gang et prosjekt for kartlegging av eksponering og forekomst av helseskader. Vi er spesielt opptatt av at det blir foretatt eksponeringsstudier av forbindelsen bisfenol A (BPA) som blant annet er mye benyttet i maling.

http://www.safe.no/news.cfm?id=213439

Vedlegg


TURBO Oil 2380
AEROSHELL TURBINE OIL 500
Mobil Jet Oil 254
Mobil Jet Oil 3

Kan teorien om Toxicant Induced Loss of Tolerance (TILT) hjelpe oss til bedre forståelse av reaksjoner på kjemikalier?

Innlegg på seminar KJEMIKALIER OG HUD
Norsk Yrkeshygienisk Forening, Avd. Rogaland
3. mai 2001

Halvor Erikstein
Yrkeshygieniker / Organisasjonssekretær
Oljearbeidernes Fellessammenslutning OFS

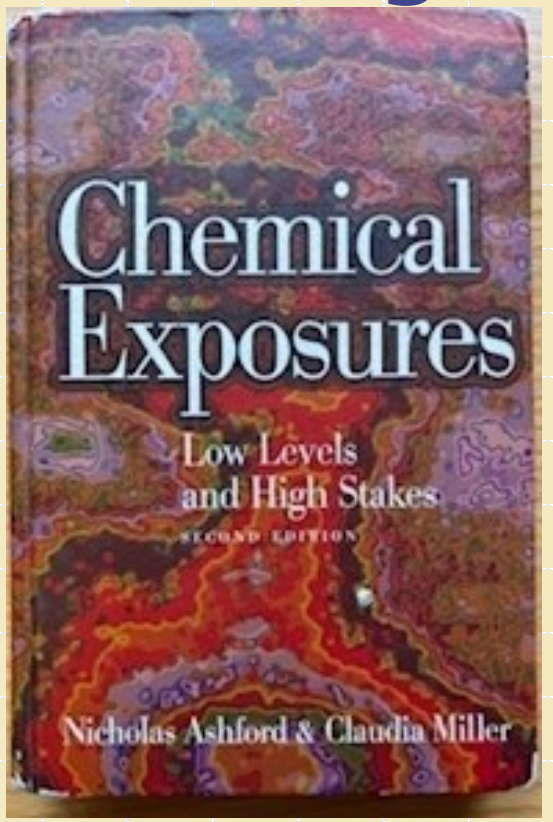
ANBEFALES PÅ DET VARMESTE!!

Chemical Exposures. Low Levels and High Stakes.

Nicholas A. Ashford & Claudia S. Miller

2. utgave 1998, Van Nostrand Reinhold

ISBN 0-442-02524-6



Grupper sensitiv til lav-nivå kjemisk eksponering

1. Industriarbeidere
2. Beboere av ”tette bygninger”, inkludert kontorister og skolebarn
3. Innbyggere i områder hvor luft og vann er forurenset av kjemikalier
4. Individer som har hatt personlig eller unik eksponering til kjemikalier i inneluft, pesticider, medisiner eller forbrukerprodukter

Fra 1.utgaven av Chemical Exposures. Low Levels and High Stakes. Nicholas A. Ashford & Claudia S. Miller 1991

Hva er problemene for ”overfølsomme”?

- De fleste av oss har møtt folk som sier de reagere på ”alt”.
- Det kan være;
  - Malingslukt, parfyme, eksos, innemiljø, nye tekstiler, nye biler, sterke lukter, møbler, madrasser osv. osv. osv.
- Listen kan gjøres svært lang og det er åpenbart at slike ”reaksjoner” fører til store problemer i det moderne samfunn

Slike reaksjoner har hatt mange navn

- Tight Building Syndrome = ”mass psychogenic illness” 1979
- Sick Building Syndrome SBS
- Post traumatisk stress syndrom PTSS
  - Eks. Brannen på Haslestad Brug 1998
- Psykogen reaksjon (”STAMI-ekspert” på yrkesskadesak som var reaksjon på epoxymaling med DETA, 1998)
- Multiple Chemical Sensitivity MCS 1987

Gulf War Veterans

- Sykdom hos Gulfkrig-veteraner, 4000 personer registrert 1994
- De hadde vært utsatt for en sammensatt eksponering av;
  - Diesel i store mengder, pesticider, forringet uran, branngasser, brannrøyk, pyridostigmine (motgift mot kjemiske krigsmidler)

Symptomer hos Gulfkrigveteraner

- Ofrene lider av mange plager som bl.a;
  - Kronisk trøtthet
  - Problemer med hukommelsen
  - Humørsvingninger
  - Kroppssmerter
  - Søvnløshet

  Claudia Miller; ”Symptomene hos en del av veteranene var slående like med sivile pasienter med MCS” 1992

Gulfkrig veteran syndrome

- Samsvarer med fenomenet ”masking”. Symptomer trigges av mange forskjellige faktorer som;
  - Kjemikalier
  - Parfyme
  - Hårspray
  - Bileksos
  - Matvarer
  - Medisiner
- Alle disse faktorene til sammen medfører at de føler seg syke det meste av tiden. Ingen enkeltfaktor kan isoleres fordi det er for mye bakgrunnsstøy, og pasientene ofte underestimerer mengden av påvirkning.

TDI isocyanatastma og provokasjonstest med pepperrot

En liten bit pepperrot førte til anfall med

75% drop i FEV_1 etter 5 minutter.

Etter 26 måneder var personen mer tolerant for isocyanater. Personen ble provosert med 14 gram uten reaksjon.

- Pepperrot innholder allylisotiocyanate og benzylisotiocyanat.

Hva er Toxicant Induced Loss of Tolerance (TILT)?

- En helt ny mekanisme for sykdom.
- Alle ”toxicanter” i stand til å initiere tilstanden Toxicant Induced Loss of Tolerance (TILT).
- TILT utvikles gjennom en to-trinnsprosess:

To-trinnsprosess i utvikling av TILT

1. En enkelt akutt – eller gjentatte lav-nivå eksponeringer til for eksempel pesticider, løsningsmidler eller andre kjemiske forbindelser. Dette medfører intoleranse til enkelte av de eksponerte.
2. Deretter kan svært lave doser av vanlige forbindelser trigge symptomer. Dette gjelder ikke bare kjemikalier, men forskjellige matvare, medisiner, alkohol- og coffeinholdige drikker.

- Symptomene involvere forskjellige organsystemer. Disse intoleransene er selve (hallmark) ”stempelmerket?” for TILT – på samme måte som feber er ”hallmark”symptomet på en infeksjonssykdom

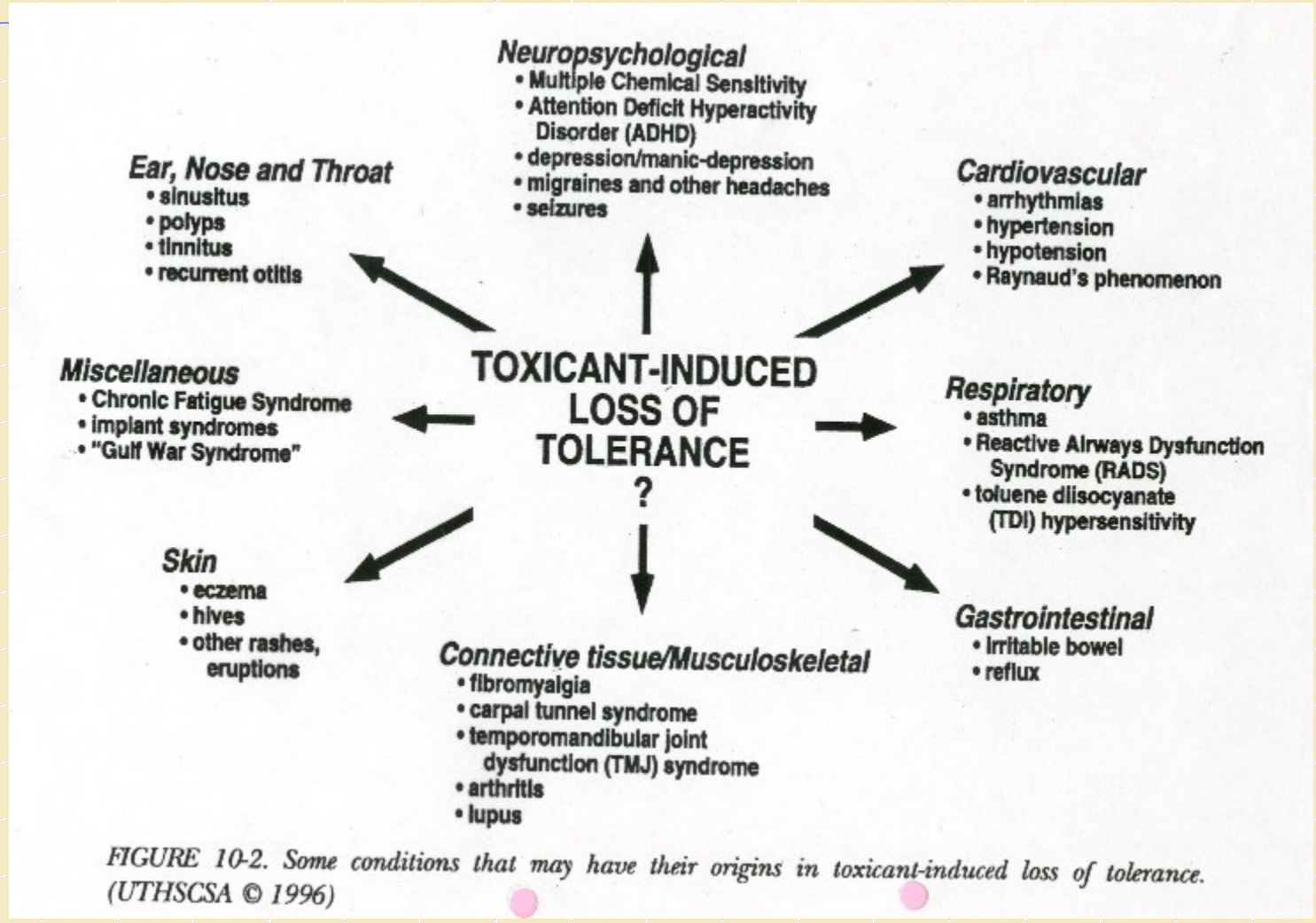


FIGURE 10-2. Some conditions that may have their origins in toxicant-induced loss of tolerance. (UTHSCSA © 1996)

Environmental Medical Unit (EMU)

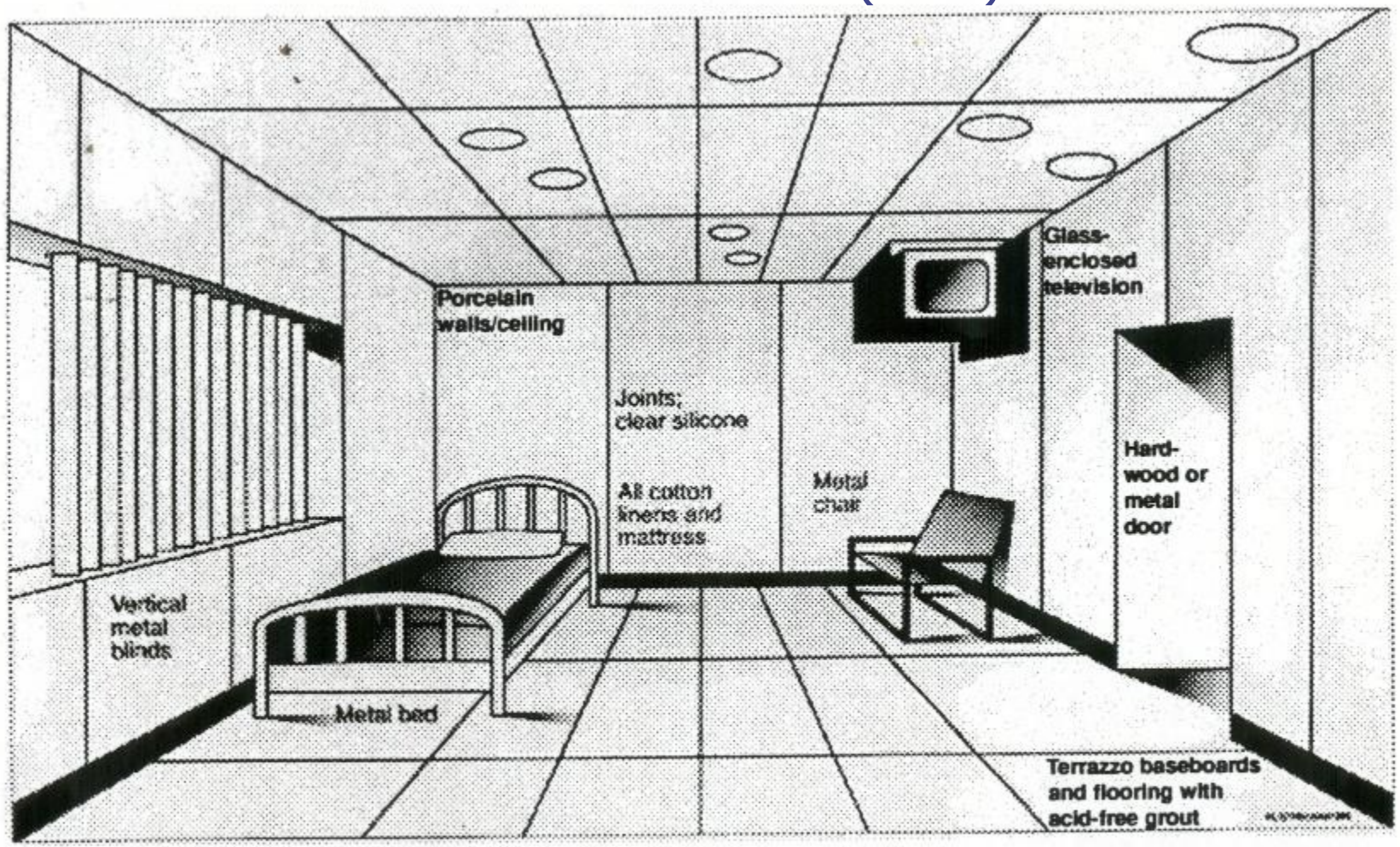


FIGURE 10-8. Preliminary design sketch of a patient room in an environmental medical unit (EMU). Note use of nonoutgassing construction materials and furnishings, and point source control (ventilated television enclosure). (UTHSCSA © 1996)

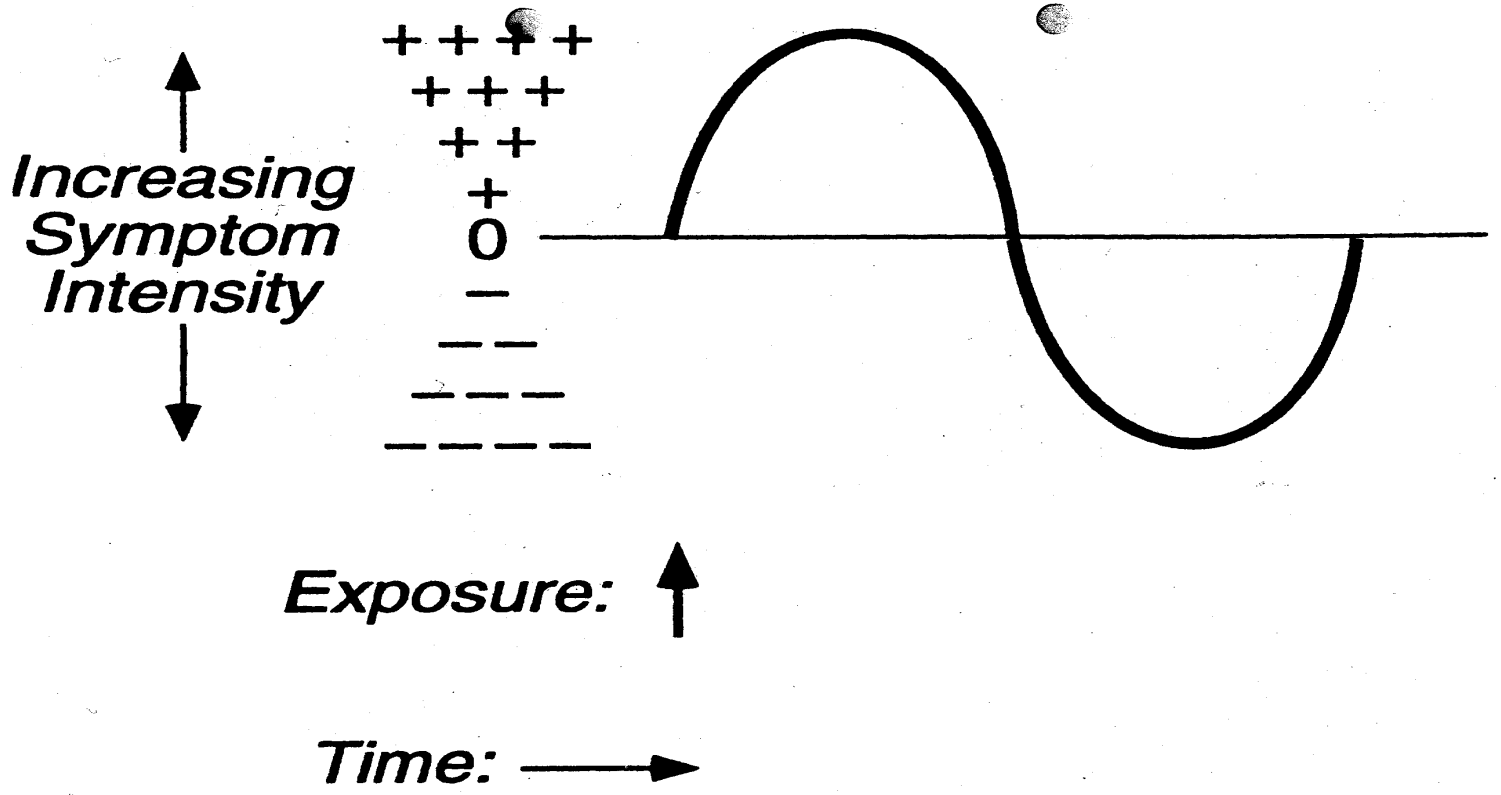


FIGURE 10-3. Graphical representation of symptom progression following exposure to a single substance in a person sensitive to that substance (e.g., caffeine, a solvent, alcohol, nicotine). The portion of the biphasic curve above the line represents symptoms with onset of exposure (stimulatory symptoms) and the portion below, symptoms with offset of exposure (withdrawal symptoms). Amplitude is proportional to symptom severity. The length of the curve (duration of symptoms) may range from minutes to days.
(UTHSCSA © 1996)

Chemical Sensitivity: Postulates

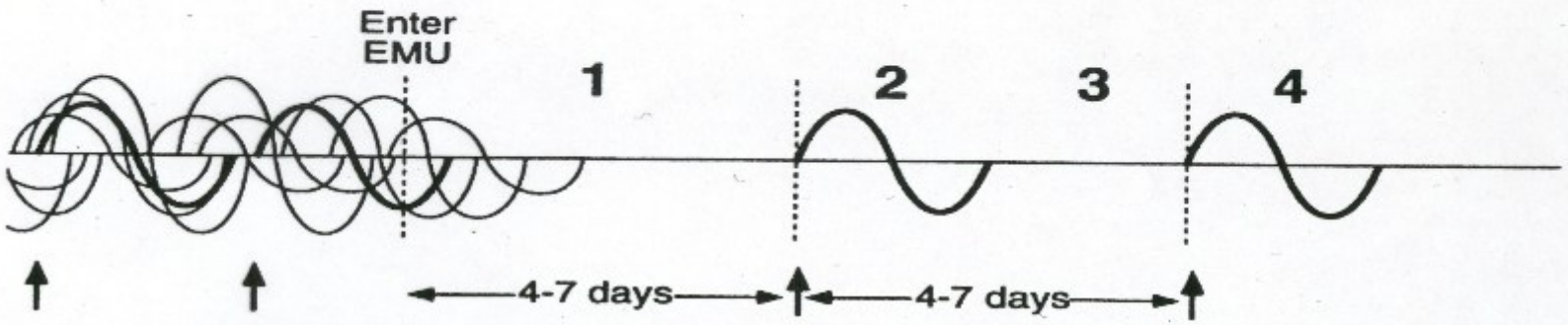


FIGURE 10-7. Testing chemical sensitivity postulates using an environmental medical unit (EMU). In the left-most portion of the figure, before entering the EMU, a chemically sensitive individual is experiencing symptoms in response to multiple exposures (chemicals, foods, drugs). Effects overlap in time. The effect of any particular exposure cannot be distinguished from the effects of other exposures, and the person's symptoms may appear to wax and wane unpredictably over time.

- *Postulate 1. When all chemical, food and drug incitants are avoided concurrently, remission of symptoms occurs. Anecdotally, patients report going through "withdrawal" or "detox" for the first several days and experiencing increased irritability, headaches, depression, etc. Anecdotally, after four to seven days most report feeling well and theoretically are at a clean baseline.*
- *Postulate 2. A specific constellation of symptoms occurs with reintroduction of an incitant.*
- *Postulate 3. Symptoms resolve when the incitant is again avoided.*
- *Postulate 4. Reexposure to the same incitant, within an appropriate window of time (estimat-*

Hva kan vi gjøre?

- **Claudia S. Miller inviteres til Norge (Bergen 2002 eksempelvis)**
- Yrkeshygienikerne må lete etter forhold som utløser plager hos overfølsomme, og forsøke å identifisere faktorer som har betydning
- Bruke av statistiske metoder (kjemometri/infometri) som kan behandle mange parametre samtidig synes velegnet til en større undersøkelser
- Ofrene må motiveres til å identifisere faktorer som de reagere på
- Vi lager en studiegruppe på dette tema i NYF Rogaland?
- Det må igangsettes studier på bruk av rene miljø EMU

Sikkerhetsforums Årskonferanse 11.09.2025

25 år med Sikkerhetsforum.

Arbeidsmiljø

Presentasjoner i perioden 2002 – 2025

Sikkerhetsforum,
HMS informasjon fra SAFE,
Offshore Norge HMS Forum,
Offshore Norge Drilling Managers Forum,
Konferanser
Møter

Halvor Erikstein
organisasjonssekretær/
yrkeshygieniker SYH
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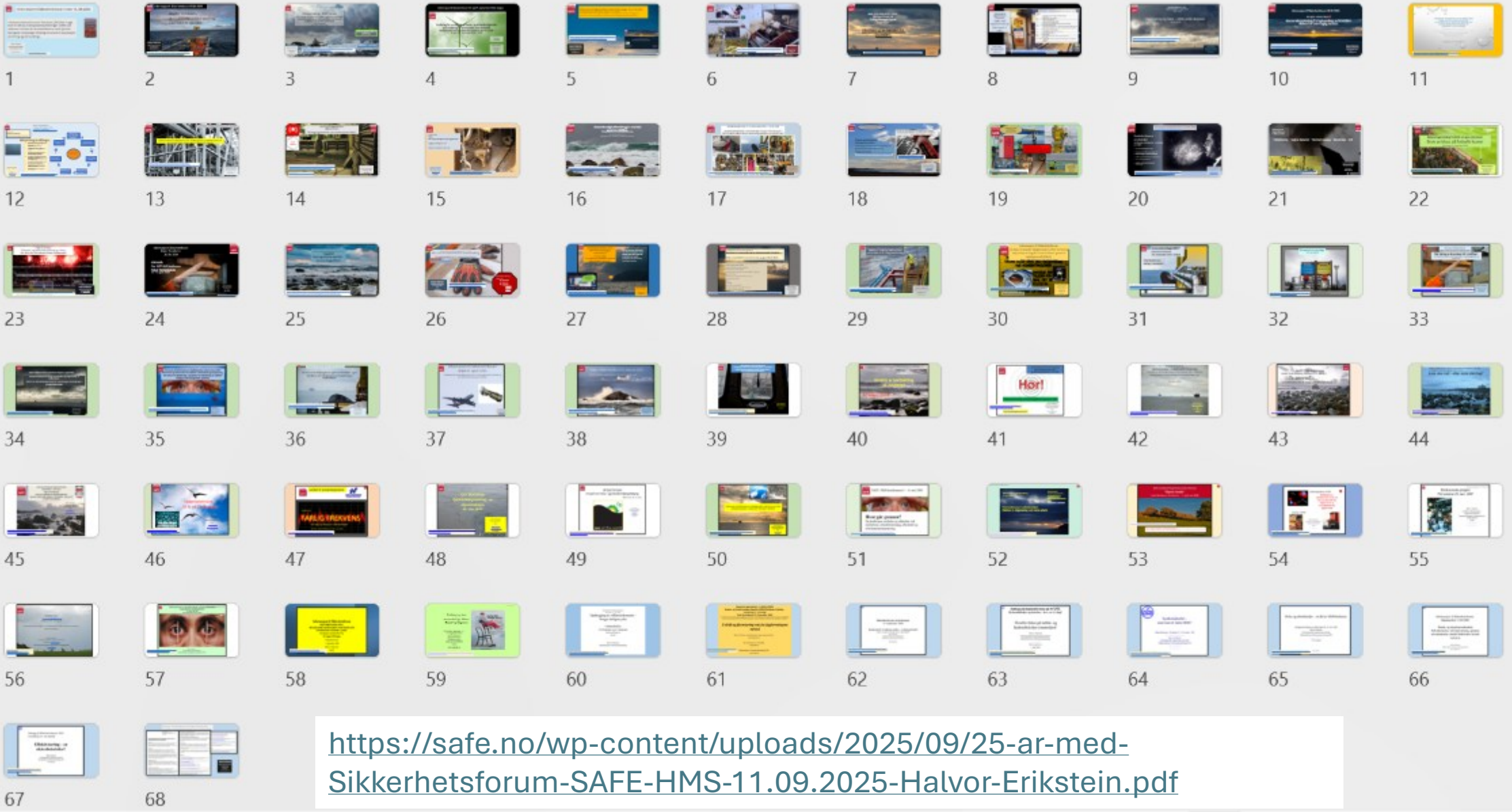

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Vi må strekke oss mot bedre kunnskap

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