

Measuring Particulate Matter



FIREFIGHTER PHYSIOLOGICAL MONITORING
TECHNOLOGY
SUMMIT
March 28-30, 2018
Washington, DC



Occupational Exposure to Fireground Chemicals

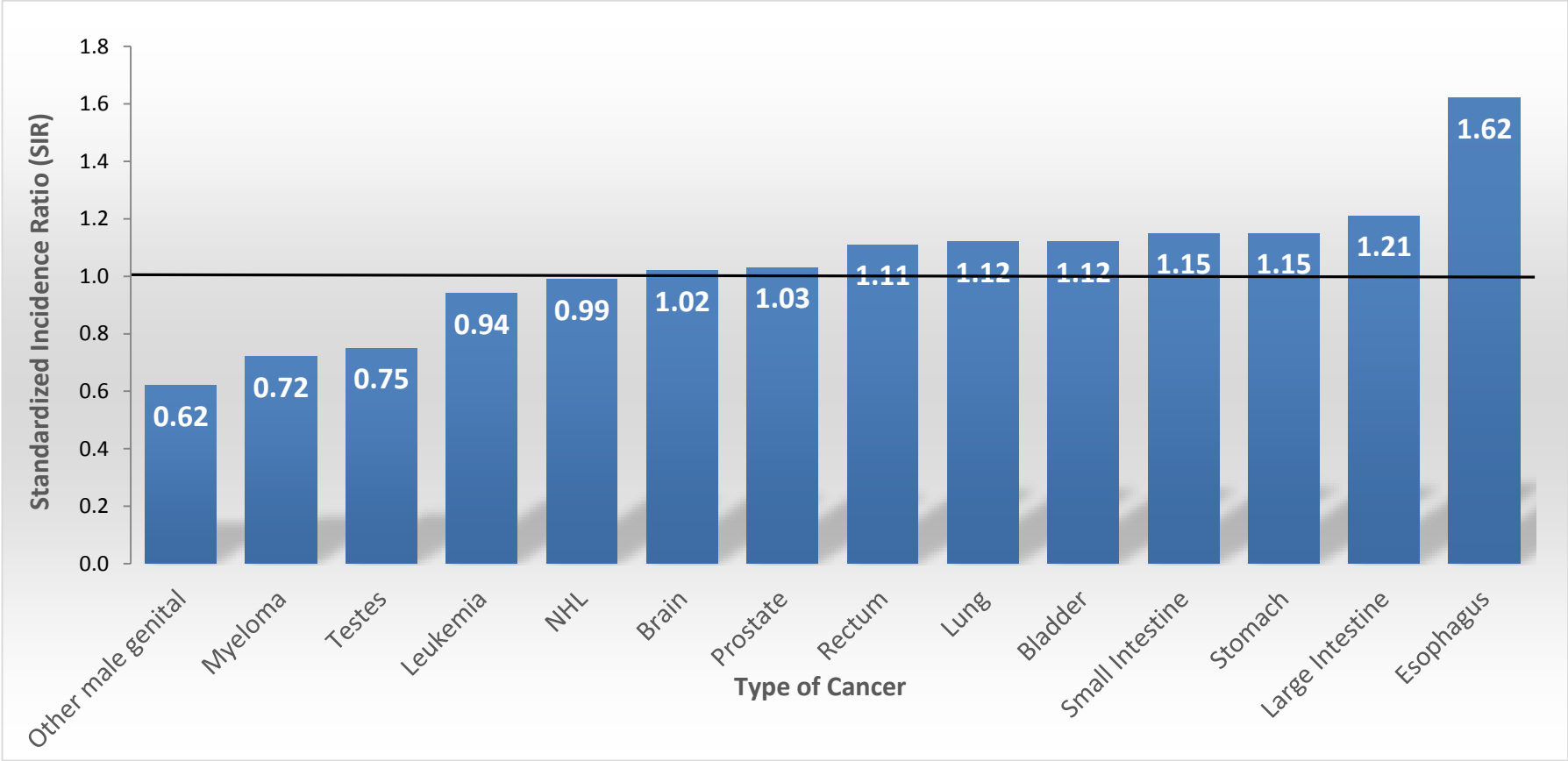
- The number of firefighters who have died from cancer, or are battling this disease, is alarming
 - IAFF LODD database - 864 members between 2005-15
 - Mounting epidemiological evidence we characterize our 'workplace'?



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Firefighter Cancer Risk



Current Understanding of Exposure Pathways During Firefighting



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Chemicals of Concern

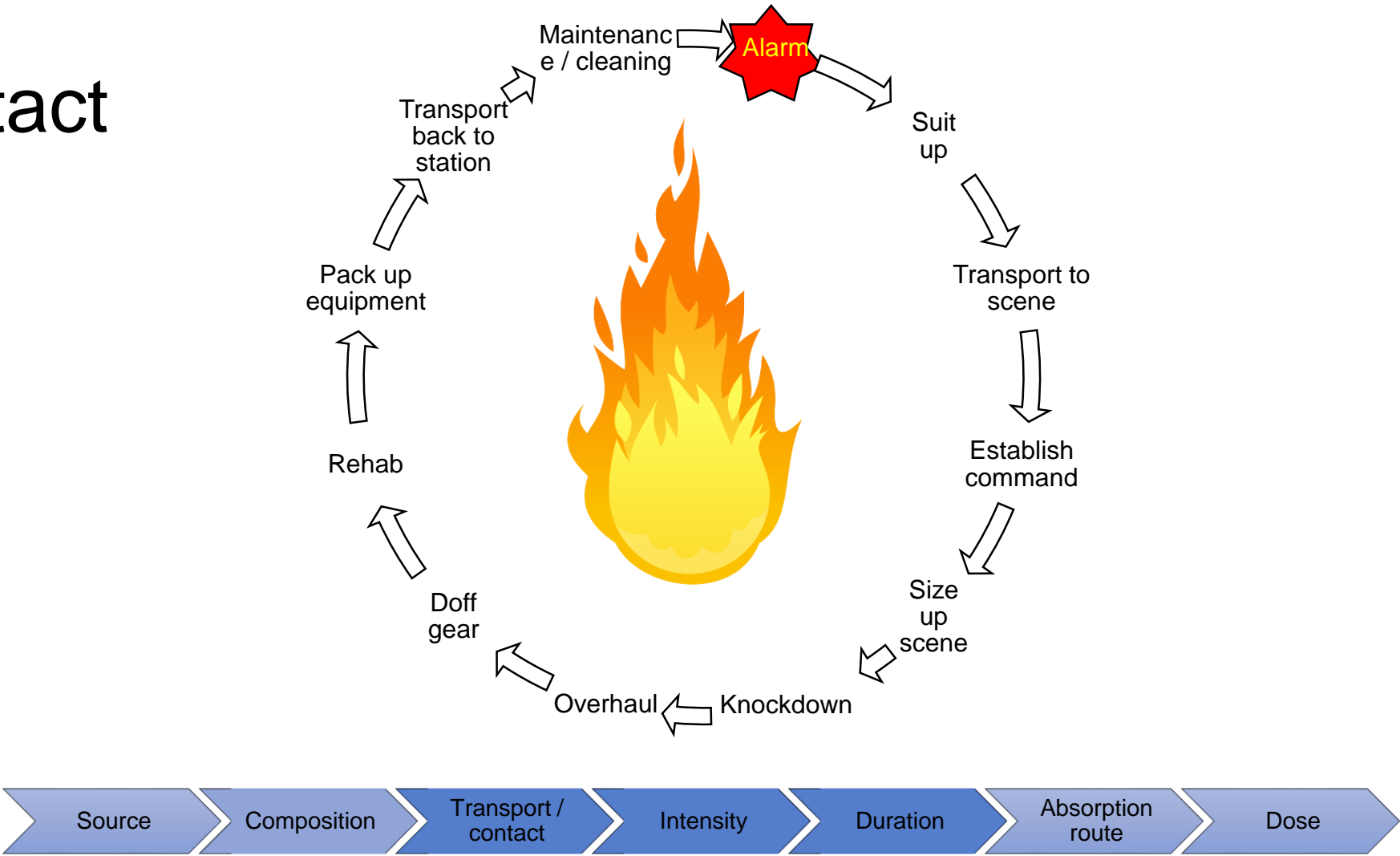
May be produced when organic materials are burned

May be produced when synthetic materials are burned

CHEMICAL CLASS	POTENTIAL HEALTH EFFECTS
Polycyclic aromatic hydrocarbons (PAHs)	Carcinogenic (benzo[a]pyrene)
Volatile organic compounds (VOCs)	Carcinogenic (benzene, 1,3-butadiene), central nervous system effects
Aldehydes	Carcinogenic (formaldehyde), respiratory sensitizer (formaldehyde), pulmonary edema (acrolein)
Acid gases	Respiratory irritation, pulmonary edema, chemical asphyxiation (HCN)
Phthalates	Endocrine disruption, liver tumors in animals (DEHP)
Polybrominated diphenyl ethers (PBDEs)	Accumulates in the body, thyroid, liver, immune system effects, neurodevelopmental effects, liver tumors in animals (deca-BDE)
Dioxins and furans	Accumulates in the body, similar health effects as PBDEs, carcinogenic (TCDD)
Organophosphate flame retardants (OPFRs)	Neurotoxicity, cytotoxicity
Diesel exhaust	Carcinogenic



Potential for Chemical Contact



Routes of Absorption

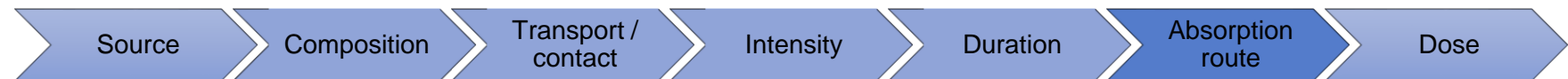
Inhalation

- Exterior operations/overhaul without respiratory protection
- Off-gassing contamination on turnout gear

Dermal

- Permeation/penetration of contaminants
- Direct uptake of gases/vapors
- Cross-transfer of contamination from gear/equipment

Ingestion



Cardiovascular & Chemical Exposure Risks in Today's Fire Service

Denise Smith, Gavin Horn, Steve Kerber, Kenny Fent



<https://vimeo.com/153244392>

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Fire Smoke – Dangers of Particulate Matter



Triggers

Cancer Risks

- Firefighters are at higher risk for many cancers

Pulmonary Risks

- Inflammation/Oxidative stress
- Decreased lung function
- Asthma/COPD
- Increased respiratory symptoms

Cardiovascular Risks

- Increased risk of dysrhythmia
- Increased myocardial ischemia

