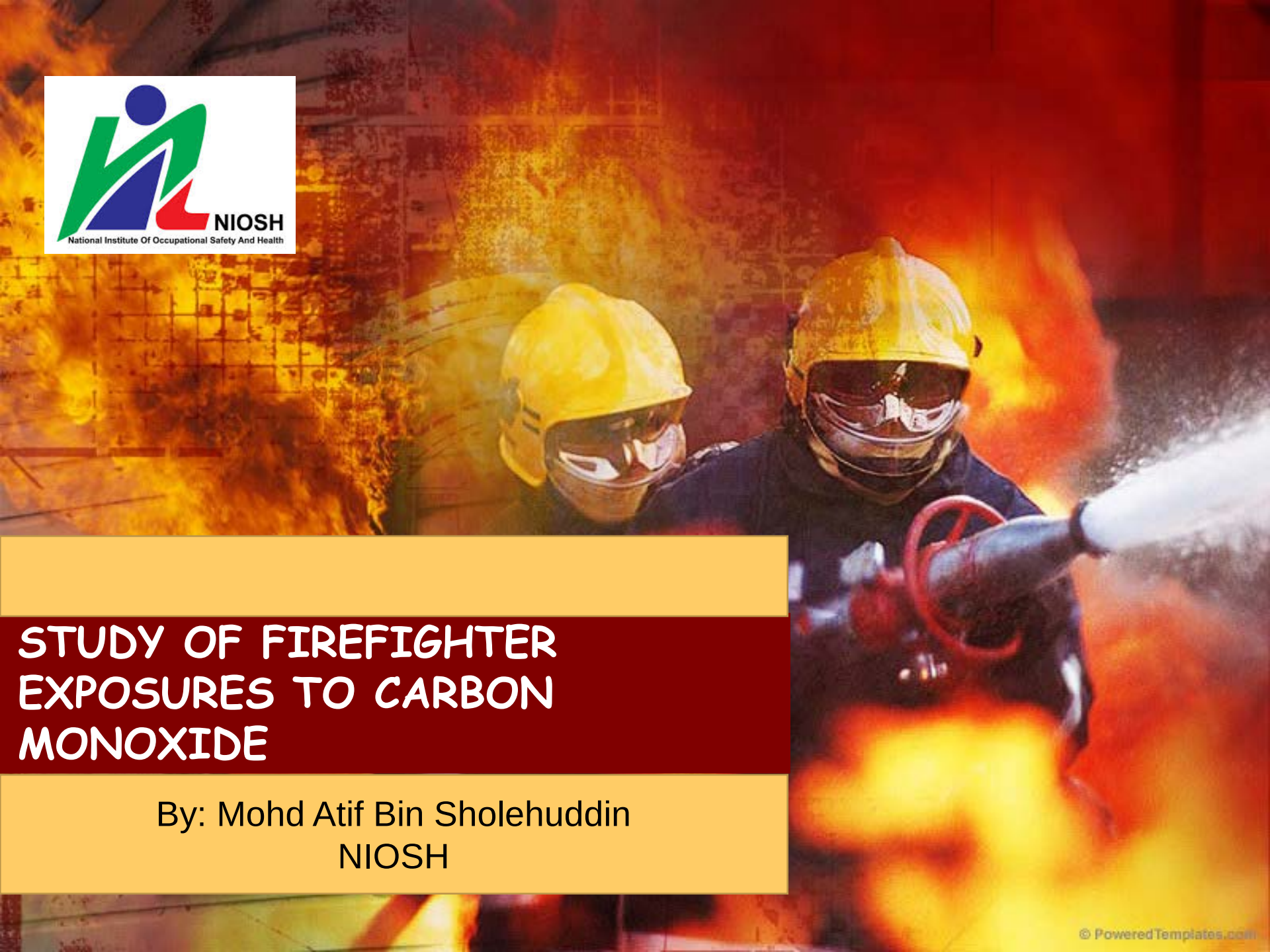

STUDY OF FIREFIGHTER EXPOSURES TO CARBON MONOXIDE

By: Mohd Atif Bin Sholehuddin
NIOSH

INTRODUCTION

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INTRODUCTION

- Carbon monoxide – product of incomplete combustion
- Also known as “silent killer’ among OSH Practitioner
- Because the gas occur during fire, firefighter have high potential to have carbon monoxide poisoning
- The purpose of this study is to study firefighter exposure to carbon monoxide during firefighting

CARBON MONOXIDE

- Carbon monoxide is a toxic product generated from incomplete combustion (Claire Austin, 1997)

- Incomplete Combustion Reaction

$$2C + O_2 \rightarrow 2CO$$

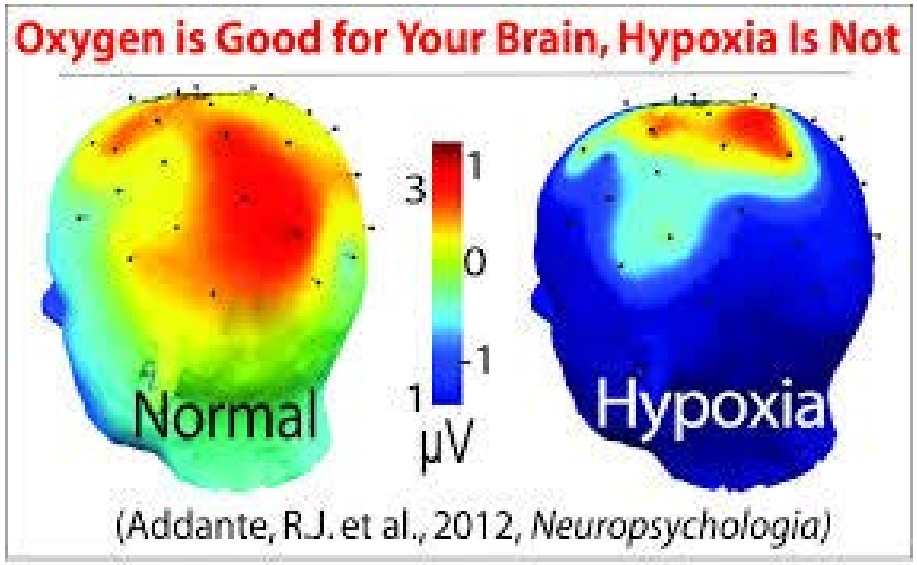
$$1kg\ C + 4/3\ O_2 \rightarrow 7/3\ CO$$

- Carbon monoxide is a radical

CARBON MONOXIDE

- If inhaled, carbon monoxide disrupts the blood's transport of, and intracellular use of, oxygen [Ernst, 1998].

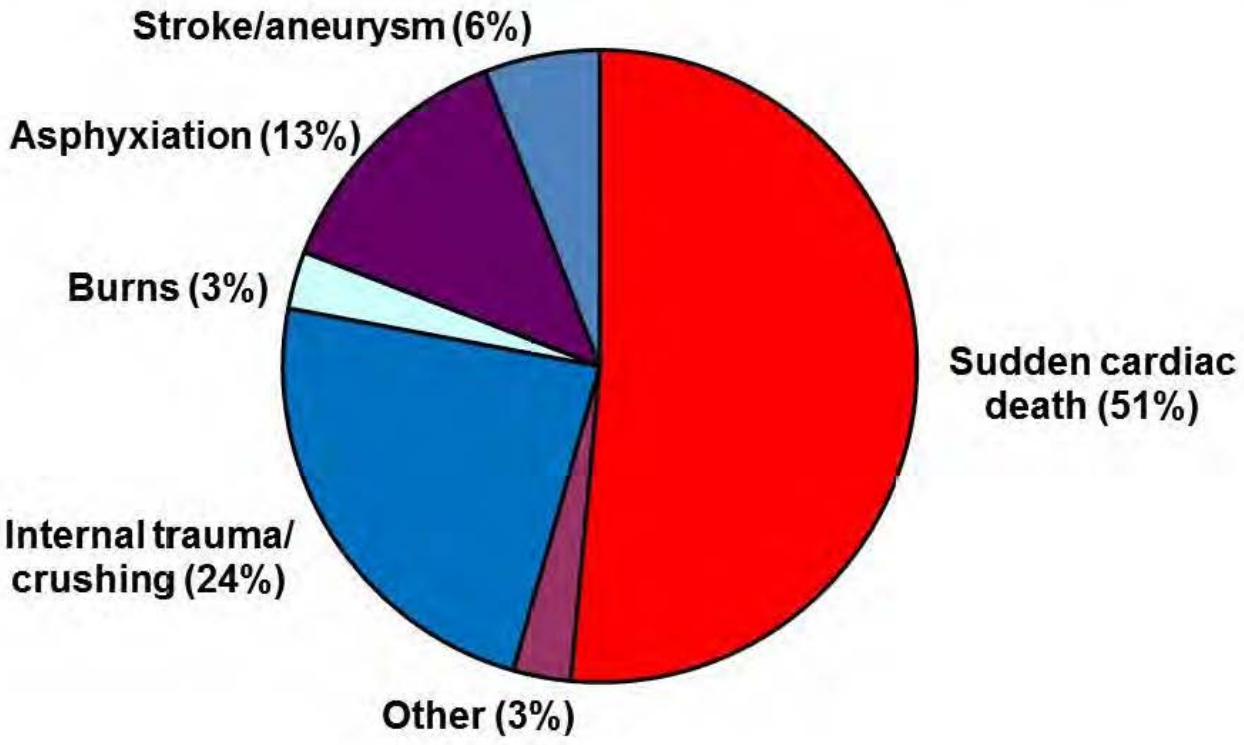
- The resulting hypoxia can cause myocardial injury [Satran, 2005].



EFFECT OF CARBON MONOXIDE?

- Every 23 seconds a fire in the United States requires the services of a career or volunteer fire department caused by sudden cardiac arrest (Drew Nord et al., 2011).

Cause / Contributing cause



Source: Firefighter Fatalities in the United States, Rita F. Fahy, Paul R. LeBlanc, Joseph L. Molis, NFPA, June 2016

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Duty

Figure 2
Firefighter Deaths by Type of Duty - 2015

Source: Firefighter Fatalities in the United States, Rita F. Fahy, Paul R. LeBlanc, Joseph L. Molis, NFPA, June 2016

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CARBON MONOXIDE

- Thus, a fast technique to detect carbon monoxide poisoning are needed.

- Detection of %COHb in blood using noninvasive measurement technique using MASIMO Rad-57 (CDC, 2011).

THE SOLUTION

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MASIMO Rad-57

- Continuous monitoring in a portable, handheld device
- Rugged and lightweight, ideal for field or hospital settings
- Quick and easy to use

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MASIMO Rad-57

- A medical first – noninvasive measurement of %COHb
- Direct Reading using UV light

RESULT AND DISCUSSION

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RESULT AND DISCUSSION

Carbon Monoxide Monitoring Analysis

Groups	Count	Sum	Average	Variance
start	181	1080	5.966851	9.654451
fire	181	1236	6.828729	10.83161
end	181	1215	6.712707	12.52812

$Ave_{start} < Ave_{fire}$ and $Ave_{fire} > Ave_{end}$

ANOVA was used to further analyse the data

RESULT AND DISCUSSION

Carbon Monoxide Reading Summary

Null Hypothesis:

There is no significant changes between reading taken during duty report (start), after firefighting (fire), and duty end (end).

$H_{start} = H_{fire} = H_{end}$

RESULT AND DISCUSSION

Carbon Monoxide Reading Summary

ANOVA Result

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	79.19	2	39.59	3.60	0.03	3.01
Within Groups	5942.55	540	11.00			
Total	6021.74	542				

RESULT AND DISCUSSION

Carbon Monoxide Reading Summary Result:

$F = 3.60 > F_{crit} = 3.01$

$H_{start} \neq H_{fire} \neq H_{end}$

H null rejected

P-value = 0.03 < 0.05 (significant)

The changes of carbon monoxide reading between time taken is SIGNIFICANT

RESULT AND DISCUSSION

Carbon Monoxide Reading Summary

The changes of carbon monoxide reading between time taken is SIGNIFICANT.

It means the firefighters are EXPOSED to carbon monoxide during firefighting.

CONCLUSION

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CONCLUSION

- There is significant increase of carbon monoxide reading among firefighters after firefighting activity.

- Control measure such as health monitoring and equipment inspection should be implemented.

Thank You

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