

# Combatting Firemen's Cancer risk



## Cancer risks in firefighting work

1. Hygio Oy – Background of the company
2. Health impacts of PAH (Polycyclic aromatic hydrocarbon)
3. Approach in Finland and in Sweden
4. Hygio approach: HOW TO GET RID OF PAH's ?



# Hygio Oy

Salo, Finland  
Specialized in ozone hygiene solutions

Timo Jaatinen

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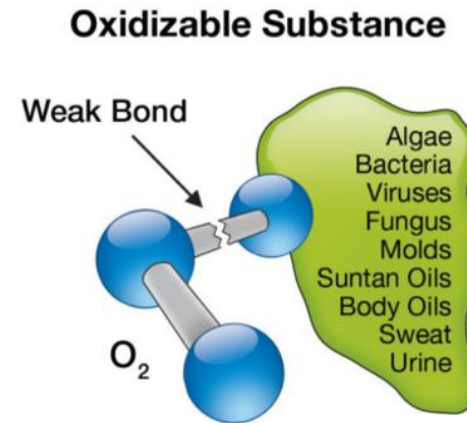


**HYGIO®**



# Hygio Ozone Cleaning

- Removes odours
- Disinfects bacteria and viruses
- Neutralizes VOC (PAH's included in VOC)
- Fast and effective, 1-6 hour programs
- Has no impact on material (excl. natural rubber)
- Does not cause microbial immunity



# Ozone Microbial Disinfection with Hygio

Type	Test microbe	Test result correlates with these microbes, for example	Reduction of growth / log cfu/pcs	Disinfection result, killed %
Sporicidal bacteria	<i>Bacillus</i> spores	<i>Clostridium difficile</i> <i>Bacillus cereus</i> <i>Clostridium botulinum</i>	1,4	<b>96%</b>
Gram-positive	<i>Staphylococcus epidermidis</i>	MRSA Listeria, MRSP Streptococcus	>5,2	<b>99,999%</b>
Gram-negative	<i>Escherichia coli</i>	Salmonella Norovirus ESBL, EHEC All other viruses	3,9	<b>99,99%</b>
Yeasts	<i>Candida albicans</i>	Cryptococcus	1,6	<b>97%</b>
Molds	<i>Cladosporium sphaerospermum</i>	Aspergillus Fusarium	1,8	<b>98%</b>

# Health care, first response, fire department, kindergarden, care home and veterinary, police and sports.



**HYGIO®**



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**HYGIO®**

**Hygio a40**

High quality hygiene care.

Disinfection of care is challenging, high temperatures are often required.

Hygio ozone processing device makes disinfection easy, fast and more often as hygiene.

Textiles and as they are, cleaning, the higher also challenge molds.

Hygio is suitable for fire fighting gear, accessories, handling equipment, even electronic devices, computers and disinfecting with Hygio remove odours and disease transmitters.

**Hygio a40 Medi**

Cleaning of soot, smoke and fuel smells from fire fighting gear is challenging. The residual smells represent a health hazard for the whole personnel.

Hygio ozone processing device makes disinfection easy, fast and effective. A single Hygio device can contribute savings of tens of thousands of euro as the to-be-removed gear can be returned to active use.

Protective suits and equipment can be disinfected with Hygio as they are, without disassembly of parts. After cleaning, the items are ready for use immediately.

The higher power of a40 Medi programs removes hydrocarbon residuals by a single program run. Also challenging sporicidal bacteria and molds are disinfected.

Hygio is suitable for disinfecting all clothes, gear and foot wear, fire fighting suits, breathing masks and helmets, for example.

Even electronic devices, such as mobile phones, computers and electronic medical instruments can be disinfected with the Sensitive programs.

Hygio removes odours and disease transmitters.



**Hygio a40**

Preventing the spread of germs is a vital part of personnel hygiene.

Toys and other objects used by children daily and infections. There are many goods not withstanding disinfection.

Hygio ozone processing device makes disinfection easy, fast and effective. Cleaning can now be done more often and this contributes as high quality hygiene.

Textiles and equipment can be disinfected with Hygio as they are, without disassembly of parts. After cleaning, the items are ready for use immediately.

Hygio disinfects MRSP, Brucella Melitensis, EHV, Camelopard, plus challenging sporicidal bacteria, yeasts and molds.

Hygio is suitable for disinfecting all clothes and foot wear, accessories, x-ray protective shields, carry bags, splints and patient handling equipment, for example.

Even electronic devices, such as mobile phones, computers and electronic medical instruments can be disinfected with the Sensitive programs.

Hygio removes odours and disease transmitters.



**Hygio a40**

Managing work place safety and health hazards is a vital part of every day police work.

Clearing and disinfection of gear and equipment is challenging as many of the items are complicated in structure, don't tolerate high temperatures, infecting washing with water.

Disinfecting chamber makes disinfection easy, fast and effective. Odours and dangerous germs can be disinfected fast. Cleaning can often and this contributes as high quality hygiene.

Textiles, equipment and personal items, such as radio telephones, and electronic instruments can be disinfected without having to dismantle them. Hygio is suitable for use immediately after.

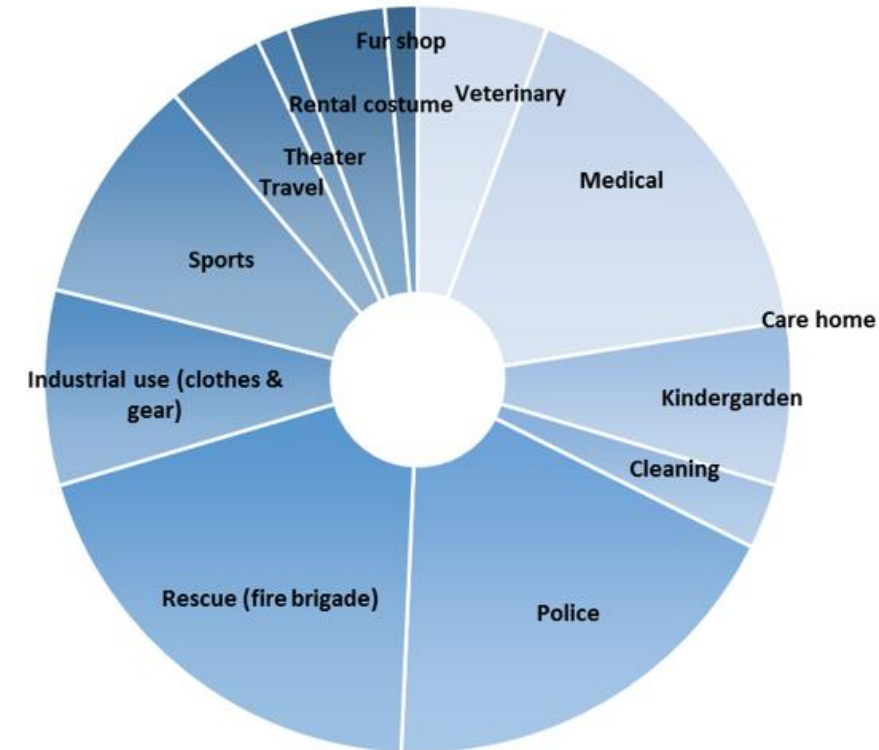
Disinfecting all clothes and foot wear, shields, breathing masks and helmets.

Hygio is suitable for disinfecting all clothes and foot wear, accessories, x-ray protective shields, carry bags, splints and patient handling equipment, for example.

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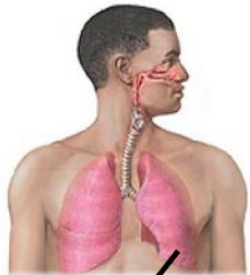
# PAH Firemen Cancer risk

(Polycyclic aromatic hydrocarbons)

- Increased risk for testicular and prostate cancers and for Non-Hodgkins syndrome (IARC 2010)
- Increased risk for prostate cancer, melanoma, lung cancer etc. (Puhakka et. 2014)
- Increased mesothelioma risk (Daniels et. 2014)

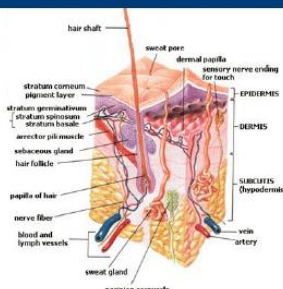
## 3. Palomiesten altistumisreitit

### Hengitystiealtistuminen

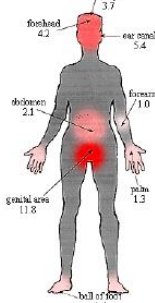


Otettu lähteestä: <http://www.nytimes.com/health/guides/disease/sickle-cell-anemia/print.html>

### Iho altistuminen




Otettu lähteestä: The Internet Encyclopedia of Science, 2010




Relative absorption rates, as compared to the forearm (1.0)

Otettu lähteestä: [http://www.agf.gov.bc.ca/pesticides/b\\_2.htm](http://www.agf.gov.bc.ca/pesticides/b_2.htm)

### Altistuminen rs-kanavan kautta



Kuva: Juha Laitinen



Otettu lähteestä: Panu Oksa (Työterveyslaitos)

# Wearing the suit can be as dangerous as fire fighting!

**Taulukko 20.** Altistumiseen vaikuttavat tekijät

Altistumiseen vaikuttava tekijä		korrelaatiokerroin	p-arvo
<u>Naftaleenialtistuminen</u>			
Smoke diving work	Savusukelluksen kesto	0,63727	0,0033**
	Savusukelluksen ja raivauksen kesto	0,59465	0,0072**
	Koko tehtävän kesto palopaikalla	0,46892	0,0428*
Suit wearing	Savusukellusasun pitoaika	0,48516	0,0352*
	<u>Pyreenialtistuminen</u>		
Gear cleaning	Savusukelluksen kesto	0,81724	<0,0001***
	Savusukelluksen ja raivauksen kesto	0,82660	<0,0001***
	Savusukellusasun pitoaika	0,52995	0,0287*
	Varusteiden huolto (ei 0, kyllä 1)	0,70159	0,0008***
<u>Bentseenialtistuminen</u>			
	Koko tehtävän kesto palopaikalla	0,45030	0,0530



How can the PAH exposure be minimized ?



# THE SKELLEFTEA MODEL

LINK:

<https://www.youtube.com/watch?v=IV2ZsZ6WJMc>

## Progress in Finland

Puhdas Paloasema / “Clean Fire Station” program since 2010.

### *In a nutshell:*

1. Intensive use of protective masks and gear
2. Minimize any and every exposure time to PAH-compounds
3. Efficient cleaning always after a smoke or chemical exposure.
  - WASH + HYGIO OZONE CLEANING



“Fireman of the Year 2014”:  
Officer Jarkke Lahti

### Other new findings in Finland:

- Microbial exposure (due to possible structural moisture damages at the fire station building) makes PAH exposure to staff more severe.
- Proposal to list all fire fighters in ASA register (ASA: National register for people working in cancer risky conditions)

# HYGIO OZONE CLEANING

## RECOMMENDED PROCESS STEPS:





# PAH Cleaning Test for Hygio (Hygio a40 Medi with 2h program)

Substances tested: (AfPS-GS-2014-01 + REACH Regulation 1907/2006)

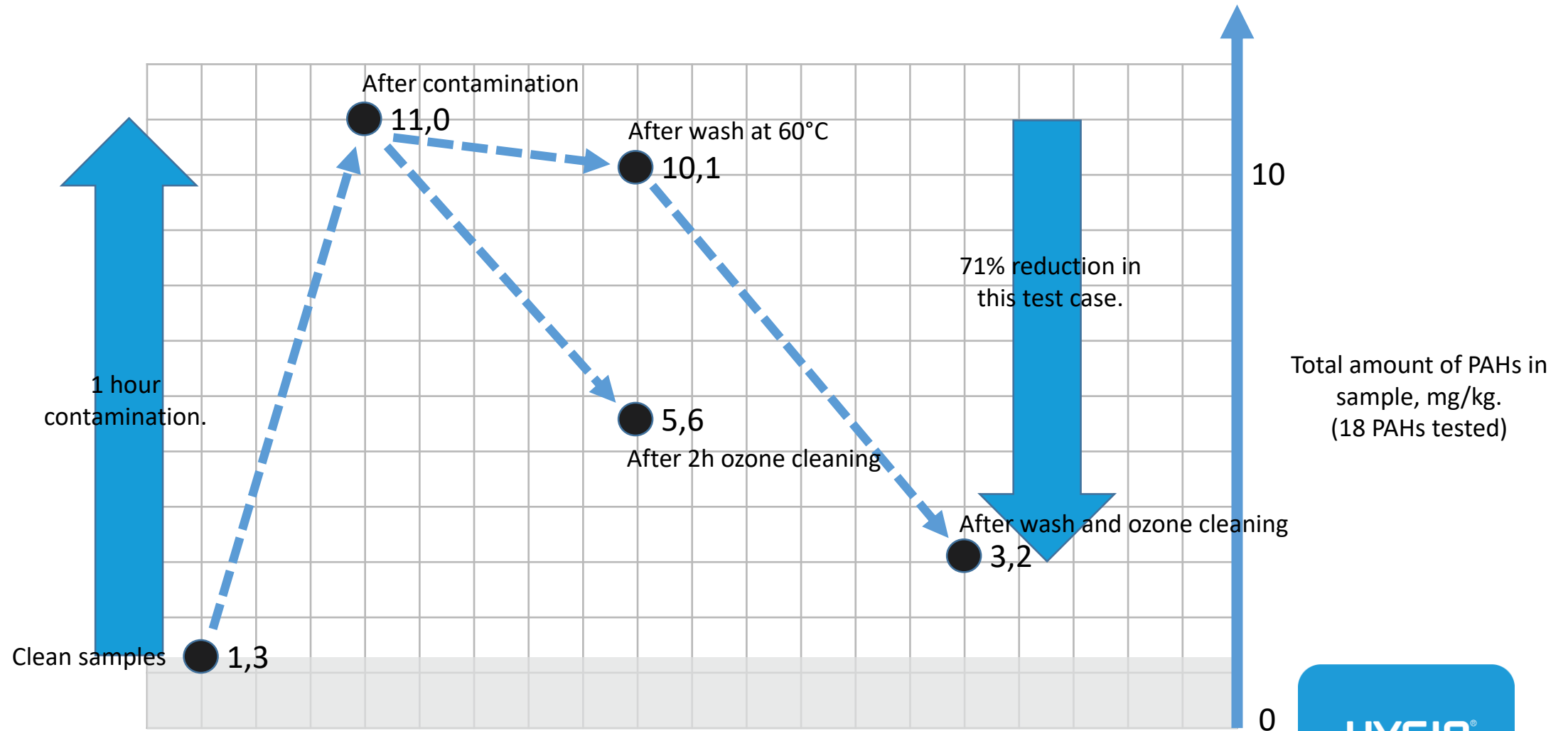
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(e)pyrene
- Benzo(ghi)perylene
- Benzo-(j)-fluoranthene
- Benzo-(k)-fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Phenanthrene
- Pyrene

# PAH test arrangement



# Total amount of PAH substances in different phases of the test

Average of all samples in each phase



# TEST RESULTS

VTT Technical Research Centre of Finland Ltd, Espoo, Finland &  
Eurofins Consumer Product Testing, Hamburg, Germany, 2017

REACH Regulation 1907/2006 (EU)  
AfPS-GS-2014-01 (Germany)

The Hygio a40 Medi 2h program significantly enhances cleaning of contaminated firefighter gear

1. When used as the only cleaning method
2. When used together with washing
3. The best cleaning results can be achieved by combination of washing and ozone cleaning.

Hygio recommends all fire departments to follow known best practices for both protective gear use and for cleaning of all material.



# Combatting Firemen's Cancer risk



# Thank You!