

**NO HEALTH EFFECTS  
FOLLOWING EXPOSURE  
TO ULTRAFINE  
PARTICLES AT A  
SHOOTING RANGE**

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# COLLABORATING INSTITUTIONS

1. MEDICAL UNIVERSITY OF VIENNA

[www.meduniwien.ac.at](http://www.meduniwien.ac.at)

2. AUSTRIAN WORKER'S COMPENSATION  
BOARD

[www.auva.at](http://www.auva.at)

3. AUSTRIAN DUST-SILICOSIS CONTROL  
CENTER

[www.auva.at](http://www.auva.at)

# HYPOTHESIS

Occupational exposure to UFP is higher than the environmental, thus will cause exaggerated effects at the level of:

1. Airways due to:

**inflammation** - release of chemical mediators and cytokines ubiquitous

2. systemic effects due to:

**inflammatory reactions**; fibrotic, and thrombotic activity

# POLICE SHOOTING RANGE



**OCCUPATIONALLY EXPOSED: 30 healthy policemen**  
**OCCUP. NON-EXPOSED CONTROLS: 30 healthy subjects**

# DEMOGRAPHIC DATA

	<b>Exposed (n=30)</b>	<b>Control (n=30)</b>
<b>Age, years (mean)</b>	<b>34</b>	<b>42</b>
<b>Male/female</b>	<b>30/0</b>	<b>30/0</b>
<b>Exposure in y (mean)</b>	<b>4,7</b>	<b>0</b>
<b>Current smokers %</b>	<b>30</b>	<b>33</b>
<b>Ex-smokers %</b>	<b>30</b>	<b>30</b>
<b>Packyears</b>	<b>5,53</b>	<b>14,4</b>
<b>Body height in cm</b>	<b>179</b>	<b>182</b>
<b>Body weight in kg</b>	<b>79</b>	<b>85</b>
<b>BP in mm Hg</b>	<b>128/82</b>	<b>129/83</b>

# METHODS

- ❖ **Questionnaire – history (exposure, personal and past history, allergies, smoking)**
- ❖ **Physical check-up**
- ❖ **Lung function**
- ❖ **Systemic parameters**
  - Red and white blood count**
  - Coagulation parameters**
  - Blood chemistry**
  - Blood**
  - Blood metals and CO content**

# STUDY DESIGN



## **EXPOSED SUBJECTS:**



**time point 0 = before exposure,**



**time point 1 = day of exposure,**



**time point 2 = 24 hours after exposure**



## **CONTROL SUBJECTS:**



**time point 0, time point 1 = equal conditions, no occup. exposure**

# UFPs AT DIFFERENT LOCATIONS

Location	Exposure	No. Mean	SD
A1	3.5 h	$3.57 \times 10^5$	$7.49 \times 10^6$
A2	3.5 h	$5.31 \times 10^5$	$1.12 \times 10^6$
B1	3.5 h	$4.66 \times 10^5$	$0.79 \times 10^6$
B2	3.5 h	$5.66 \times 10^5$	$1.33 \times 10^6$
B3	4.0 h	$5.39 \times 10^5$	$1.02 \times 10^6$
C	3.5 h	$4.28 \times 10^5$	$0.75 \times 10^6$
D	3.5 h	$7.58 \times 10^5$	$1.01 \times 10^6$
E	2.0 h	$3.34 \times 10^5$	$0.31 \times 10^6$



# INHALABLE DUST

## ❖ Exposed subjects:

- $< 0.26$  and  $0.41 \text{ mg/m}^3$  ,  
in 2 instructors  $0.52$  and  $0.53 \text{ mg/m}^3$   
( $<0.26$  amount below detection limit)

## ❖ Controls:

- $0.007 - 0.009 \text{ mg/m}^3$

# BLOOD METALS AND BLOOD CO CONTENT

	<b>Exposed mg/m<sup>3</sup></b>	<b>Controls µg/m<sup>3</sup></b>
<b>Lead</b>	<b>0,01±0,02</b>	<b>0.02</b>
<b>Barium</b>	<b>0,05±0,04</b>	<b>0.02</b>
<b>Cooper, mg/m<sup>3</sup></b>	<b>0,01±0,01</b>	<b>0.5</b>
<b>Antimony, mg/m<sup>3</sup></b>	<b>0,002 ± 0,01</b>	<b>-</b>
<b>CO, mg/m<sup>3</sup></b>	<b>4,86±4,87</b>	<b>-</b>

## LUNG FUNCTION AT 3 TIME POINTS (0 = BEFORE, 1 = IMMEDIATELY THREATER & 3 = 24h AFTER SHOOTING)

<u>Group</u>	<u>TP</u>	<u>N</u>	<u>LUNGFUNCTION</u>	<u>Mean</u>	<u>S.D.</u>	<u>Median</u>
Insltructors	0	30	VC L	5,45	0,98	5,32
			FEV1 L	4,56	0,69	4,52
			FEV1 R%	96,75	13,23	95,55
			MEF 50 R%	95,93	26,56	90,80
			MEF 25 R%	88,14	35,82	86,30
Instructors	1	30	VC L	5,25	0.86	5,22
			FEV1 L	4,48	0,65	4,52
			FEV1 R%	94,96	11,15	92,90
			MEF 50 R%	97,34	26,47	95,90
			MEF 25 R%	85,56	33,49	83,45
Instructors	2	30	VC L	5,40	0,71	5,30
			FEV1 L	4,33	0,64	4,30
			FEV1 R%	92,53	10,45	90,15
			MEF 50 R%	90,28	23,72	87,50
			MEF 25 R%	78,88	27,35	72,30

# LUNG FUNCTION IN CONTROLS AT 2 TIME POINTS; 1 WEEK APART

<u>Group</u>	<u>Time point</u>	<u>N</u>	<u>Variable</u>	<u>Mean</u>	<u>S.D.</u>	<u>Median</u>
Controls	0	30	VC liter	5,01	0,93	4,70
			FEV1 liter	4,21	0,79	4,14
			FEV1 R%	92,80	16,98	90,20
			MEF 50 R%	89,95	32,00	87,15
			MEF 25 R%	72,28	36,83	66,25
Controls	1	30	VC liter	5,16	0,83	5,02
			FEV1 liter	4,14	0,53	4,16
			FEV1 R%	91,15	10,14	91,50
			MEF 50 R%	87,13	29,16	87,95
			MEF 25 R%	69,26	26,79	64,35

# NO DIFFERENCES BETWEEN GROUPS AND BETWEEN TIME POINTS 0 : 1 and 0 : 2 HAVE

- ❖ **Systemic parameters:**
  - Red and white blood cell count
  - Blood metals and CO content
  - Coagulation parameters & blood chemistry
  - Blood parameters IL-2, IL-4, IL-5, IL-6, IL-8, IF $\gamma$  and GM-CSF
- ❖ **Induced sputum:**
  - IL-2, IL-4, IL-5, IL-6, IL-8, IL-13, IF- $\gamma$ , GM-CSF, anti-Myeloperoxidase, and PMN-Elastase (assessed by ELISA)

# SUMMARY 1

**OCCUP. EXPOSURE TO UFP DID NOT CAUSE:**

- ❖ **RESPIRATORY OR SYSTEMIC COMPLAINS**
- ❖ **BRONCHOCONSTRICTION**
- ❖ **AIRWAY INFLAMMATION (IL-6, IL-8, IL-13, PMN-Elastase and Anti-MPO)**
- ❖ **↑ OF SYSTEMIC FIBROTIC OR THROMBOSIS MARKERS**

# SUMMARY 2

**A TREND MAY EVENTUALLY BE SUSPECTED IN:**

- ASYMPTOMATIC DECREASE IN LUNG FUNCTION PARAMETERS 24H POST EXPOSURE IN SUBJECTS OCCUPATIONALLY EXPOSED TO UFP**
- SYSTEMIC INCREASE OF IFN- $\gamma$ , GM-CSF, IL-8, and IL-6**