Gli effetti sulla salute di Cromo, Nichel e Cadmio

Massimo Corradi

UNIVERSITÀ DI PARMA

DIPARTIMENTO DI MEDICINA E CHIRURGIA

Reggio E, 20 Ottobre 2017

ORIGINAL ARTICLE

Breath-taking jobs: a case–control study of respiratory work disability by occupation in Norway

AKM Fell,[1] R Abrahamsen,[1,2] PK Henneberger,[3] MV Svendsen,[1] E Andersson,[4] K Torén,[4] J Kongerud[2,5]

Table 3 Risk of job change for occupations with at least 3 cases registered, and by gender

ISCO-88 code and occupation	Cases (n=125)	Controls (n=8352)	OR_{Crude} (95% CI)	OR_{adj}* (95% CI)	Females (n=47) OR_{adj}* (95% CI)	Males (n=78) OR_{adj}* (95% CI)
3230 Nurses (%)	3 (2)	303 (3.6)	0.65 (0.21 to 2.1)	1.2 (0.37 to 3.9)	1.6 (0.46 to 5.3)	–
3229 Health-associated professionals (except nursing) (%)	6 (5)	572 (6.8)	0.69 (0.30 to 1.6)	1.3 (0.53 to 3.0)	1.4 (0.5 to 3.7)	1.7 (0.23 to 13)
5122 Cooks/chefs (%)	7 (6)	196 (2.3)	**2.5 (1.1 to 5.4)**	**3.6 (1.6 to 8.0)**	**5.5 (2.2 to 14)**	1.3 (0.17 to 9.6)
5141 Hairdressers (%)	5 (4)	92 (1.1)	**3.7 (1.5 to 9.4)**	**6.4 (2.4 to 17)**	**8.6 (3.1 to 24)**	–
5220 Shop salespersons (%)	8 (6)	1127 (13.5)	**0.44 (0.21 to 0.90)**	0.75 (0.35 to 1.6)	1.0 (0.37 to 2.7)	0.58 (0.18 to 1.9)
6113 Gardeners (%)	3 (2)	47 (0.6)	**4.3 (1.3 to 14)**	**4.5 (1.3 to 15)**	–	**5.3 (1.5 to 18)**
7124 Carpenters and joiners (%)	6 (5)	176 (2.1)	**2.3 (1.0 to 5.4)**	2.3 (0.98 to 5.5)	–	2.2 (0.92 to 5.2)
7212 Welders (%)	5 (4)	53 (0.6)	**6.5 (2.4 to 17)**	**5.2 (2.0 to 14)**	–	**5.0 (1.9 to 13)**
7213 Sheet metal workers (%)	5 (4)	50 (0.6)	**6.9 (2.7 to 18)**	**5.4 (2.0 to 14)**	–	**5.1 (1.9 to 14)**
7230 Machinery mechanics and fitters (%)	5 (4)	155 (1.9)	2.2 (0.89 to 5.5)	2.0 (0.81 to 5.2)	**22 (2.6 to 191)**	1.6 (0.56 to 4.4)
7231 Motor vehicle fitters (%)	3 (2)	112 (1.3)	1.8 (0.57 to 5.9)	1.7 (0.51 to 5.4)	–	1.6 (0.50 to 5.3)
8332 Earth moving and related plant operators (%)	4 (3)	101 (1.2)	2.7 (0.89 to 7.5)	2.5 (0.88 to 7.1)	–	2.4 (0.84 to 6.8)
9131 and 9132 Cleaners (%)	7 (6)	152 (1.8)	**3.2 (1.5 to 7.0)**	**5.0 (2.2 to 11)**	**5.7 (2.3 to 14)**	3.9 (0.51 to 31)
9211 Agricultural labourers (%)	4 (3)	44 (0.5)	**6.2 (2.2 to 18)**	**7.4 (2.5 to 22)**	**12 (2.6 to 57)**	**5.3 (1.2 to 24)**

Values in bold typeface are statistically significant at $p < 0.05$.
*Adjusted for each other and age, gender and smoking.
–: less than two cases.

Occup Environ Med 2016;73:600–606

- Febbre da fumi metallici
- Polmonite
- Asma
- BPCO
- Fibrosi polmonare
- Tumore del polmone

Journal of the Louisiana State Medical Society

Metal Fume Fever: A Review of the Literature and Cases Reported to the Louisiana Poison Control Center

Syed Atif Ahsan, MPH; Michelle Lackovic, MPH;
Adrienne Katner, MPH; and Christine Palermo, PhD

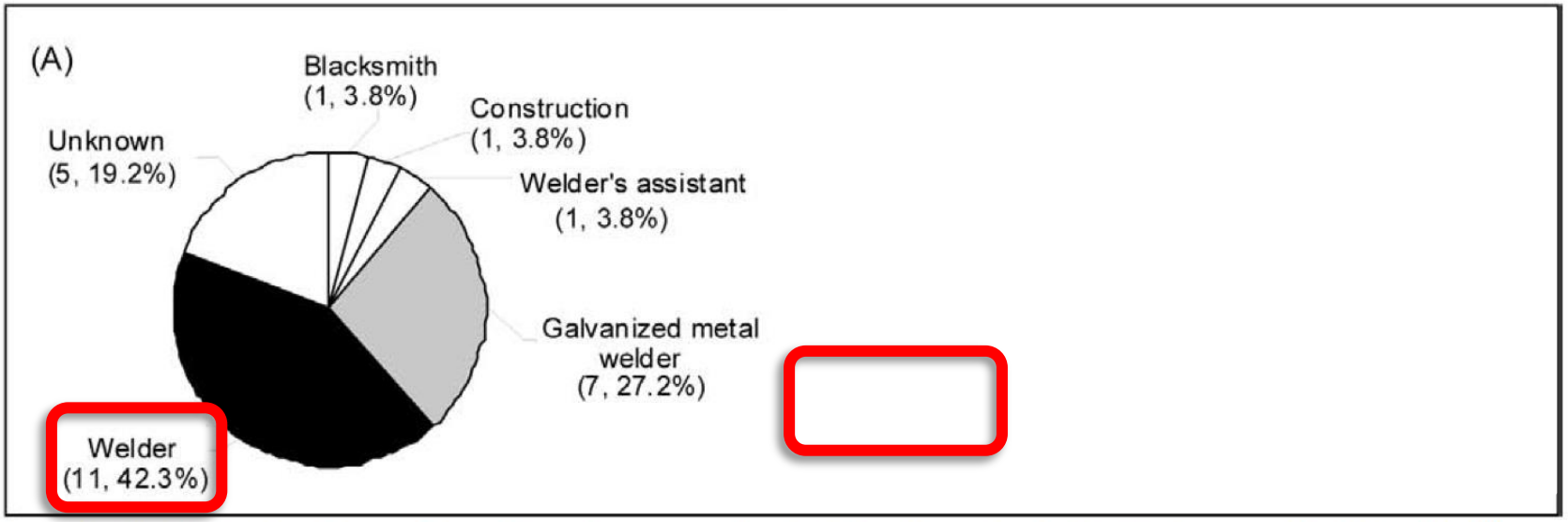

Figure 1. The distribution of cases of metal fume fever reported to Louisiana Poison Control Center by occupation (A) and healthcare management (B) are shown. The number of reported cases and the percent of the total are given.

Reproduced with permission from the *JOURNAL of the Louisiana State Medical Society* [2009;161(6):348-351]

Metal Fume Fever: A Review of the Literature and Cases Reported to the Louisiana Poison Control Center

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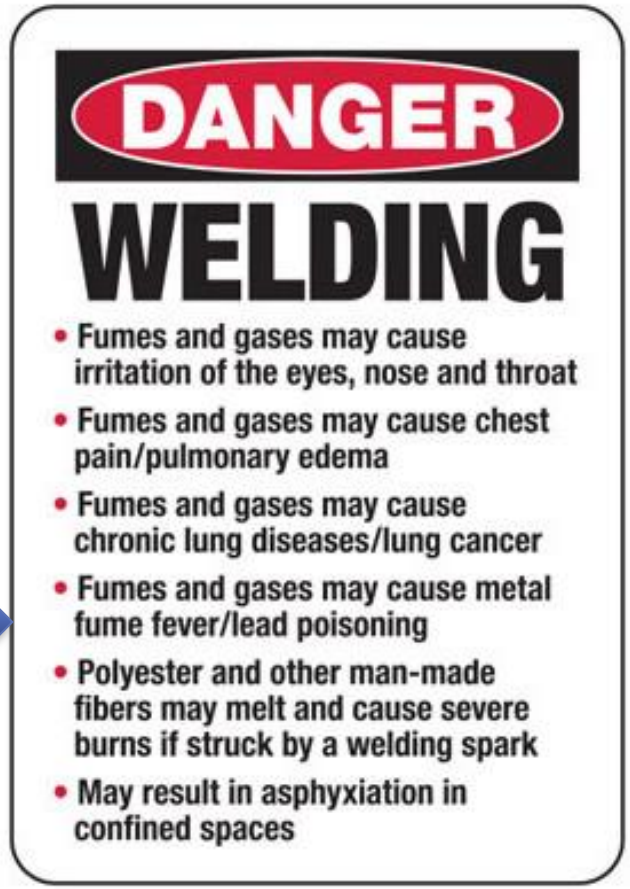

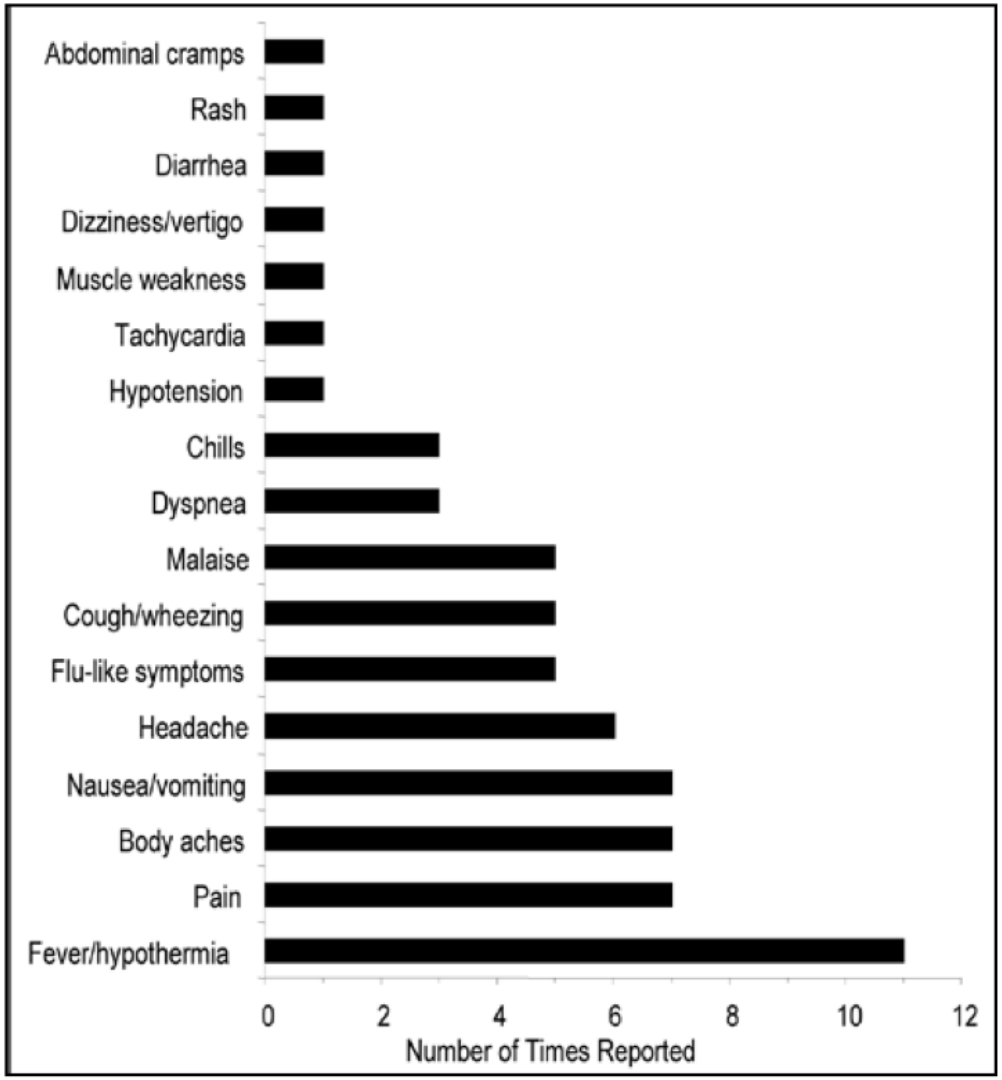

Metal fume fever

Michele Malaguarnera, Filippo Drago, Giulia Malaguarnera, Giovanni Li Volti, Salvatore Salomone, Filippo Caraci, Fabio Galvano, Marco Vacante, Claudio Bucolo, Mariano Malaguarnera

In September, 2011, a 28-year-old man with an 8-year history of occupational welding developed paraesthesiae, severe pain in both legs, weakness, myalgia, wheezing, malaise, conjunctivitis, dyspnoea, and high-grade fever. This fever developed 8 h after metal fume exposure and lasted for 24 h. Fever was recurring for 4 weeks.

In October, 2011, the possiblity of heavy metal intoxication was investigated because of fever and osteoporosis in the patient. Urinary cadmium was 69·3 µmol/g creatinine (normal values 8·8–46·2 µmol/g creatinine). Other toxic metals did not differ from normal reference range. The patient changed jobs and started treatment with calcium and

Lancet 2013; 381: 2298

Metal fume fever

Michele Malaguarnera, Filippo Drago, Giulia Malaguarnera, Giovanni Li Volti, Salvatore Salomone, Filippo Caraci, Fabio Galvano, Marco Vacante, Claudio Bucolo, Mariano Malaguarnera

increased osteoporosis and osteomalacia.[1] Diagnosis of metal fume fever is based on exposure to metal fumes within the last 48 h and development of influenza-like symptoms with resolution within 24–48 h

Although exposure to cadmium oxide fumes is the most frequent and best characterised cause of metal fume fever, other metal oxides such as arsenic, boron, zinc, chromium, copper, magnesium, manganese. nickel. and titanium are also suggested causes.[2]

Lancet 2013; 381: 2298

Is metal fume fever a determinant of welding related respiratory symptoms and/or increased bronchial responsiveness? A longitudinal study

M El-Zein, C Infante-Rivard, J-L Malo, D Gautrin

Table 6 Association between possible MFF and welding related respiratory symptom suggestive of welding related asthma and increase in bronchial responsiveness in multiple logistic regression analysis*

	At least one welding related respiratory symptoms (n = 32)	Persistent welding related respiratory symptoms (n = 19)	Increase in BR (n = 23)
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Possible MFF (n = 91)	4.92 (2.10–11.52)	13.72 (3.63–51.84)	1.26 (0.49–3.24)

Conclusion: There is a strong association between welding related MFF and welding related respiratory symptoms suggestive of OA. As such, MFF could be viewed as a pre-marker of welding related OA, a hypothesis that requires further investigation.

Occup Environ Med 2005;**62**:688–694. doi: 10.1136/oem.2004.018796

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Polmonite infettiva

Table 3 Mortality risk for infectious pneumonia among male Swedish construction workers aged 20–64 years exposed to inorganic dust, chemicals, metal fumes and wood dust, adjusted for age and smoking based on Poisson regression models

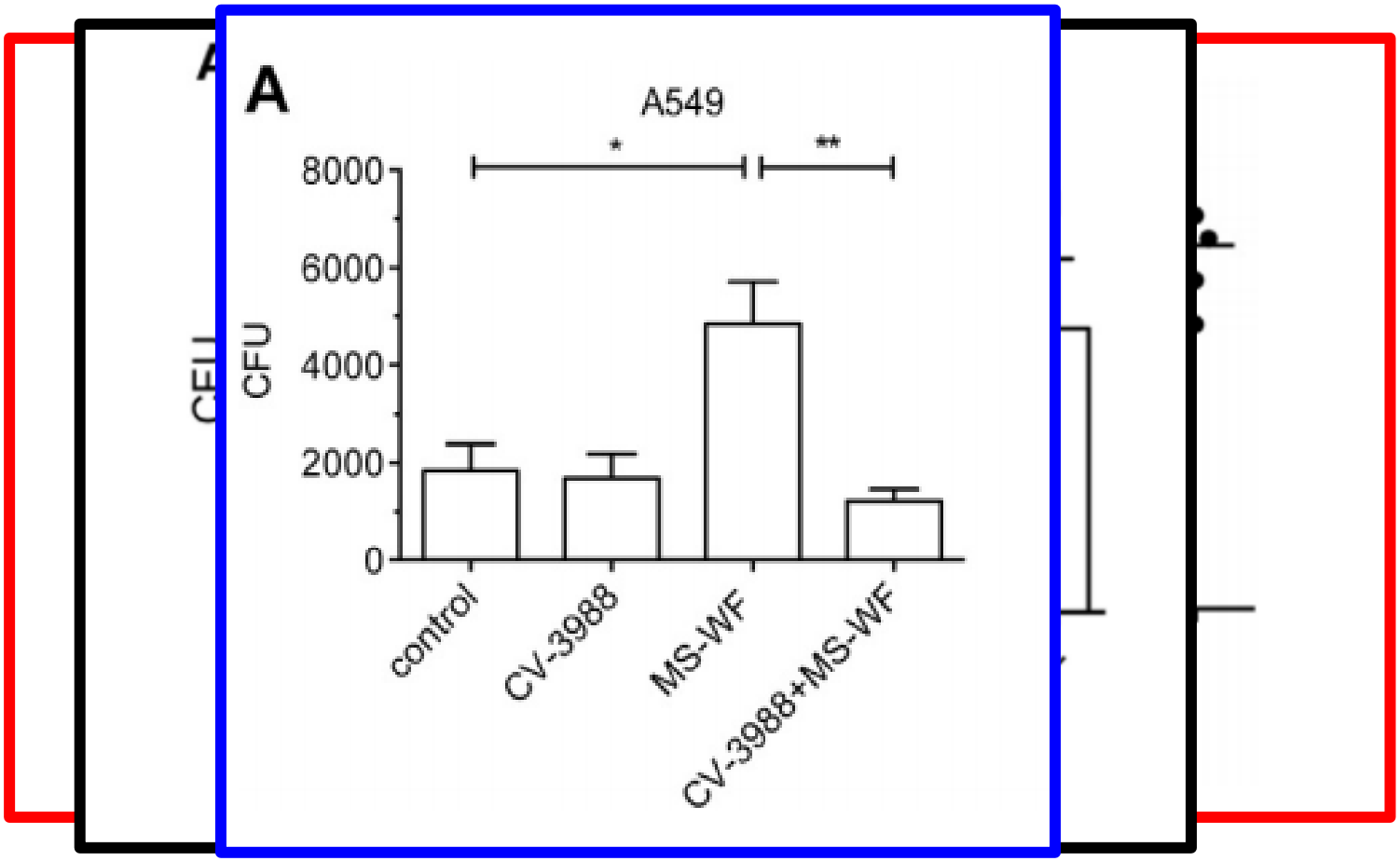
	RR (95% CI)		
Predictor (exposure)	**Infectious pneumonia (n=145)**	**Lobar pneumonia (n=49)**	**Pneumococcal pneumonia (n=36)**
Referents	1	1	1
	n=26	n=5	n=3
Inorganic dust*	1.87 (1.22 to 2.87)	3.37 (1.32 to 8.57)	4.29 (1.28 to 13.86)
	n=108	n=37	n=28
Chemicals*	1.91 (1.37 to 3.22)	4.53 (1.63 to 12.58)	5.80 (1.62 to 20.88)
	n=31	n=14	n=10
Metal fumes*	2.31 (1.35 to 3.95)	3.67 (1.33 to 10.11)	5.77 (1.53 to 21.73)
	n=27	n=9	n=8
Wood dust*	0.90 (0.37 to 2.19)	1.59 (0.31 to 8.17)	2.61 (0.44 to 15.83)
	n=6	n=2	n=2
Any exposure*	1.80 (1.18 to 2.75)	3.45 (1.37 to 8.70)	4.21 (1.29 to 13.72)
	n=119	n=44	n=33

Mortalità per polmonite lobare 3.7 volte maggiore e per polmonite da pneumococco 5.8 volte maggiore

Increased mortality from infectious pneumonia after occupational exposure to inorganic dust, metal fumes and chemicals.
Toren K, et al. Thorax. 2011;66:992-6.

Exposure to welding fumes and lower airway infection with *Streptococcus pneumoniae*

Reetika Suri, PhD[a], Jimstan Periselneris, MB BS[b], Sophie Lanone, PhD[c], Patti C. Zeidler-Erdely, PhD[d], Geoffrey Melton, BSc[e], Keith T. Palmer, MD[f], Pascal Andujar, MD[c], James M. Antonini, PhD[d], Vanessa Cohignac, MSc[c], Aaron Erdely, PhD[d], Ricardo J. Jose, MB BS[b], Ian Mudway, PhD[g], Jeremy Brown, MD[b], and Jonathan Grigg, MD[a]



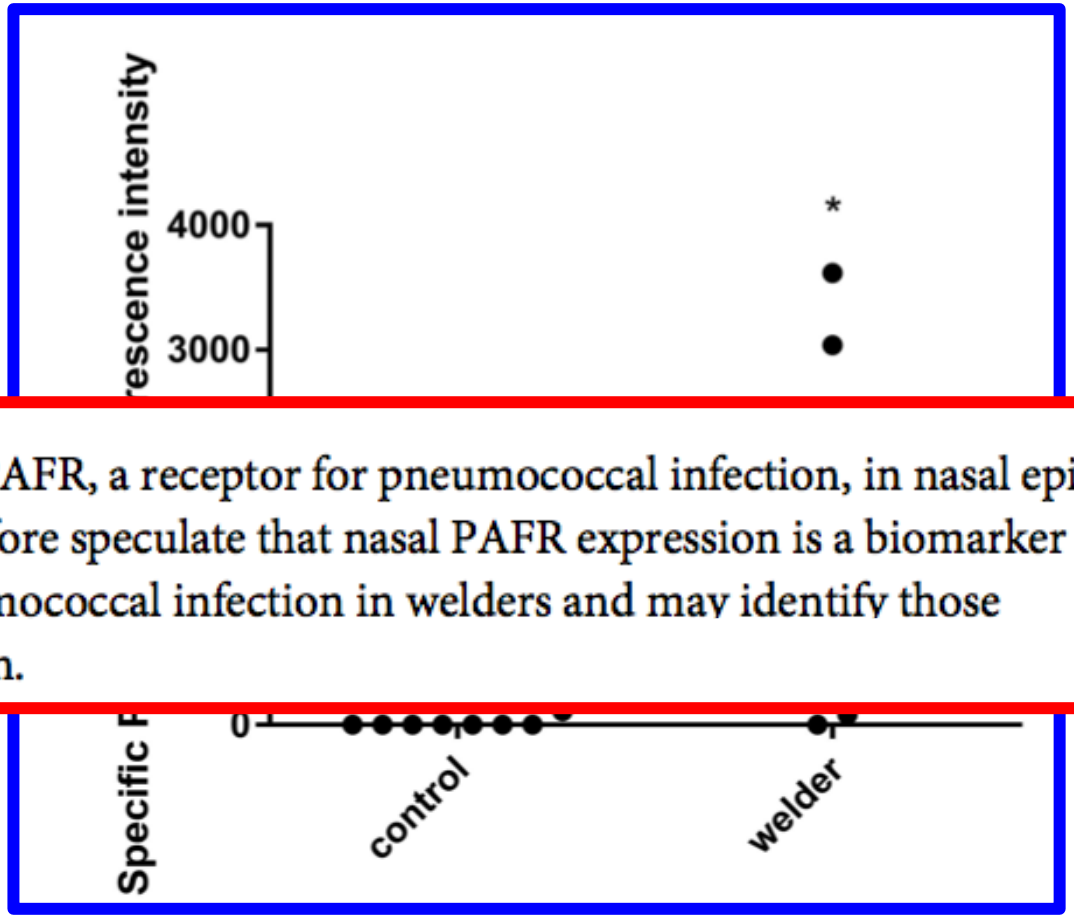
J Allergy Clin Immunol. 2016 Feb;137(2):527-534

RESEARCH ARTICLE

Pneumococcal infection of respiratory cells exposed to welding fumes; Role of oxidative stress and HIF-1 alpha

Jonathan Grigg, Lisa Miyashita, Reetika Suri*

PAFR has been proposed to

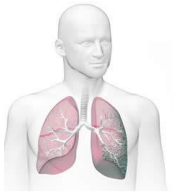


We found increased expression of PAFR, a receptor for pneumococcal infection, in nasal epithelial cells from welders. We therefore speculate that nasal PAFR expression is a biomarker for increased susceptibility to pneumococcal infection in welders and may identify those requiring pneumococcal vaccination.

PLoS One. 2017 Mar 9;12(3):e0173569

Individuals at occupational risk

There is an association between exposure to metal fume and pneumonia and infectious pneumonia, particularly lobar pneumonia (Palmer *et al.*, 2003; Palmer *et al.*, 2009; Industrial Injuries Advisory Council, 2010; Toren *et al.*, 2011) and between welding and invasive pneumococcal disease (Wong *et al.*, 2010). PPV23 (single 0.5ml dose in those who have not received PPV previously) should be considered for those at risk of frequent or continuous occupational exposure to metal fume (e.g. welders) taking into account the exposure control measures in place. Vaccination may reduce the risk of invasive pneumococcal disease but should not replace the need for measures to prevent or reduce exposure.



Polmonite infettiva

Nel 2011 il Dipartimento di Sanità in Inghilterra aveva **raccomandato la vaccinazione antipneumococcica per i saldatori (PPV23**)

VANTAGGI	LIMITI
Singola dose	Protegge solo dai sierotipi presenti nel vaccino
Sicuro con comparsa degli anticorpi dopo 3 settimane	Protezione per 5 anni
Riduzione dell'incidenza di Polmonite da pneumococco	Non sono raccomandate dosi successive
Riduzione della mortalità per Polmonite da Pneumococco	Età anagrafica/anni di esposizione

Palmer KT, Cosgrove MP. *Vaccinating welders against pneumonia*. Occup Med (Lond). 2012 July ; 62(5): 325–330

Polmonite infettiva

REPUBBLICA ITALIANA

BOLLETTINO UFFICIALE
REGIONE DEL VENETO

Bollettino ufficiale vaccini 2015

Tab. 1 – Condizioni di rischio per malattia invasiva pneumococcica (MIP)

Condizioni	Rischio uniforme: Vaccinazione raccomandata a tutti	Rischio eterogeneo: Valutare la necessità della vaccinazione per singolo caso
Condizioni con rischio moderato		
- Immunosoppressione iatrogena (esclusi trapianto d'organo)		X
- Diabete mellito (in particolare in labile compenso o complicato)		X
- Malattia celiaca		X
- Malattie polmonari croniche, insufficienza respiratoria		X
- Persone che hanno avuto polmonite o malattia invasiva pneumococcica		X
- Cardiopatie croniche (in particolare patologie congenite con cianosi e insufficienza cardiaca)		X
- Alcolismo		X
- Tabagismo		X
- Individui con aumentato rischio per il tipo di lavoro (laboratoristi, saldatori)		X

n.89 del 12 settembre 2014

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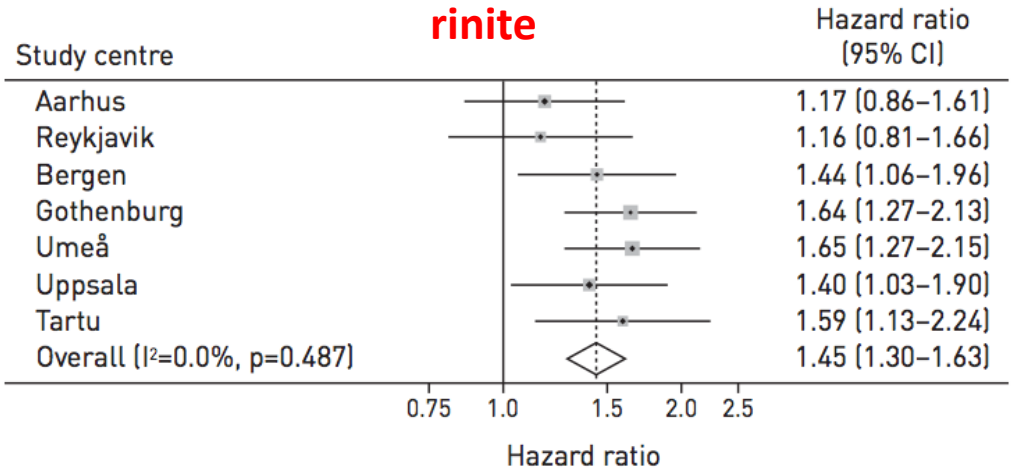
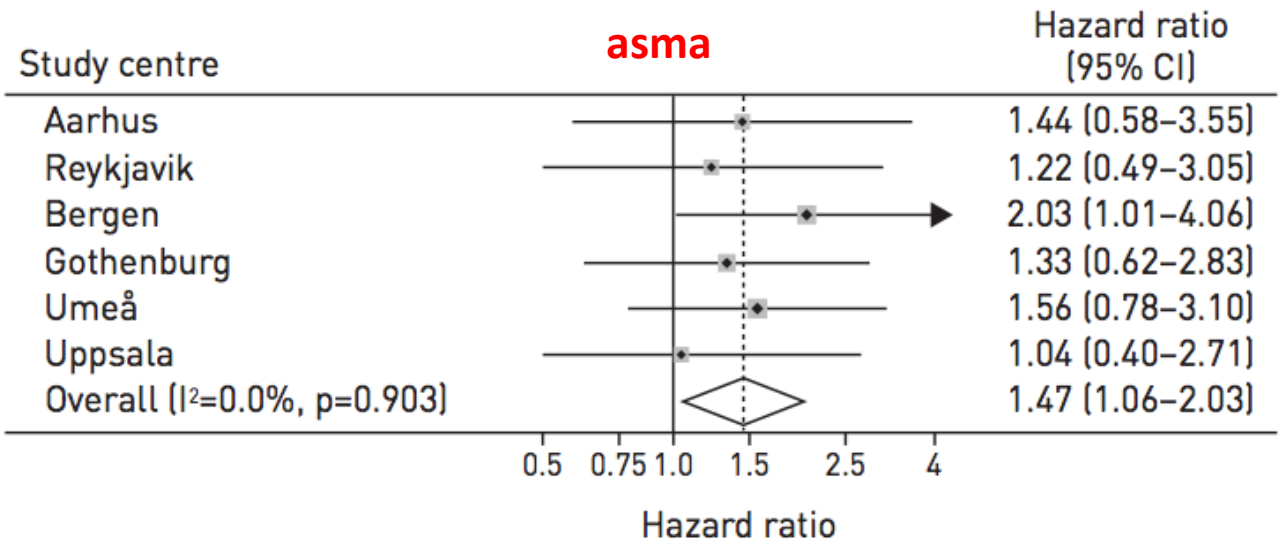
Incidence of rhinitis and asthma related to welding in Northern Europe

Torgeir Storaas[1,2], Jan-Paul Zock[3], Ana Espinosa Morano[3], Mathias Holm[4], Eythor Bjørnsson[5], Bertil Forsberg[6], Thorarinn Gislason[7,8], Christer Janson[9], Dan Norback[10], Ernst Omenaas[11], Vivi Schlünssen[12], Kjell Torén[4] and Cecilie Svanes[1,13]





Storaas T et al. Eur Respir J. (2015)

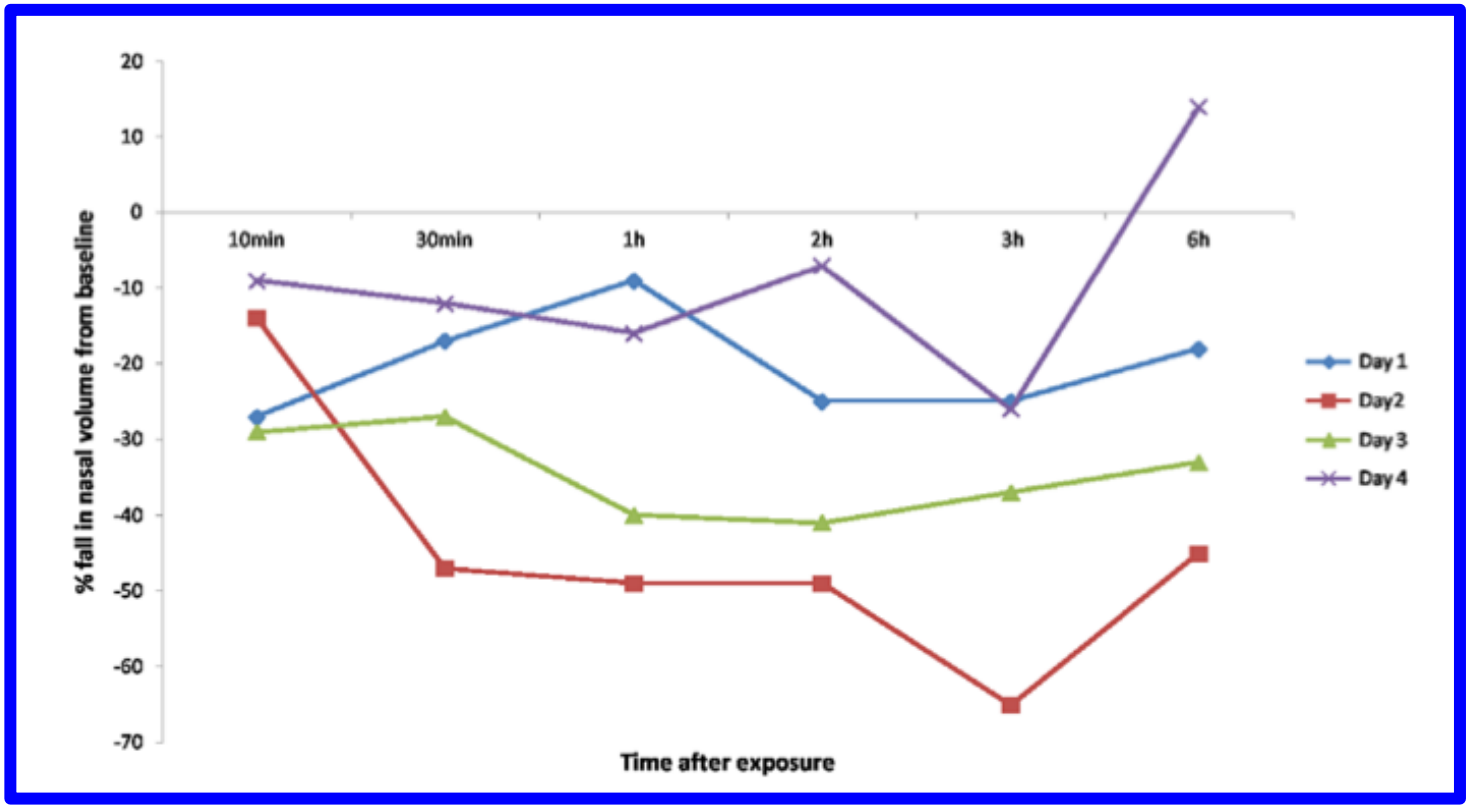
Incidence of rhinitis and asthma related to welding in Northern Europe

Torgeir Storaas[1,2], Jan-Paul Zock[3], Ana Espinosa Morano[3], Mathias Holm[4], Eythor Bjørnsson[5], Bertil Forsberg[6], Thorarinn Gislason[7,8], Christer Janson[9], Dan Norback[10], Ernst Omenaas[11], Vivi Schlünssen[12], Kjell Torén[4] and Cecilie Svanes[1,13]

	All participants		
	Number #	Incidence rate	HR
Incident rhinitis subsequent to welding debut n	11 203		
Never welded	3279	16.8	1 (Reference)
Ever welded	405	20.3	1.4 (1.3–1.6)
Welded <25% of working time	230	21.3	1.5 (1.3–1.7)
Welded >25% of working time	171	18.9	1.4 (1.2–1.6)
Welded, but not in stainless steel	364	20.0	1.4 (1.3–1.6)
Welded in stainless steel >6 months	38	23.4	1.6 (1.2–2.2)
Welding activity ⩽8 years	162	22.0	1.5 (1.3–1.8)
Welding activity >8 years	222	18.8	1.3 (1.2–1.5)

Occupational Rhinitis Due to Steel Welding Fumes

Roberto Castano, MD, PhD[1,2*] and Eva Suarthana, MD, PhD[2]



AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 57:1299–1302 (2014)

METAL-INDUCED ASTHMA AND CHEST X-RAY CHANGES IN WELDERS

TOMASZ WITTCZAK[1], WOJCIECH DUDEK[2], JOLANTA WALUSIAK-SKORUPA[2], DOMINIKA ŚWIERCZYŃSKA-MACHURA[2], WOJCIECH CADER[3], MONIKA KOWALCZYK[1], and CEZARY PAŁCZYŃSKI[1,2]

Patient	Challenge test with:	↓$FEV_1 \geq 20\%$ during test/ type of reaction	Positive SPT with:
1 (group A)	Ni	+/late	Ni
2 (group A)	Ni	+/late	Ni
3 (group A)	Ni	+/dual	V
4 (group A)	Cr	+/late	–
5 (group A)	Cr	+/late	–
6 (group A)	Cr	+/dual	Ni
7 (group A)	Cr	+/late	V
8 (group A)	Co	+/late	Co
9 (group A)	Mn	+/late	–

International Journal of Occupational Medicine and Environmental Health 2012;25(3):242–250

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- Tumore del polmone

Occupational chronic obstructive pulmonary disease: a standard of care

D. Fishwick[1], D. Sen[2], C. Barber[1], L. Bradshaw[1], E. Robinson[1], J. Sumner[1] and The COPD Standard Collaboration Group*

Table 2. Evidence-based statements for occupational COPD relating to prevention, causation, behavioural issues and risk

Evidence grade	Evidence-based statement
A1 *** SIGN 2++	Occupational exposures are a risk factor for the development of COPD and account for approximately 10–15% of all COPD
A2 ** SIGN 2+	The prevalence of COPD in working populations varies and can be as high as 30% in the working age population
A3 *** SIGN 2++	Occupational agents reported to cause COPD with varying degrees of supporting evidence include coal mine dust, silica, asbestos, refractory ceramic fibres, flour, endotoxin, cadmium, carbon black, agricultural dusts (from poultry, animal and arable farming products and practices), dusts from rubber, cotton, wood, iron/steel and smelting, welding fumes, isocyanates and other chemicals

Occupational Medicine 2015;**65:**270–282
doi:10.1093/occmed/kqv019

Occupational chronic obstructive pulmonary disease: a systematic literature review

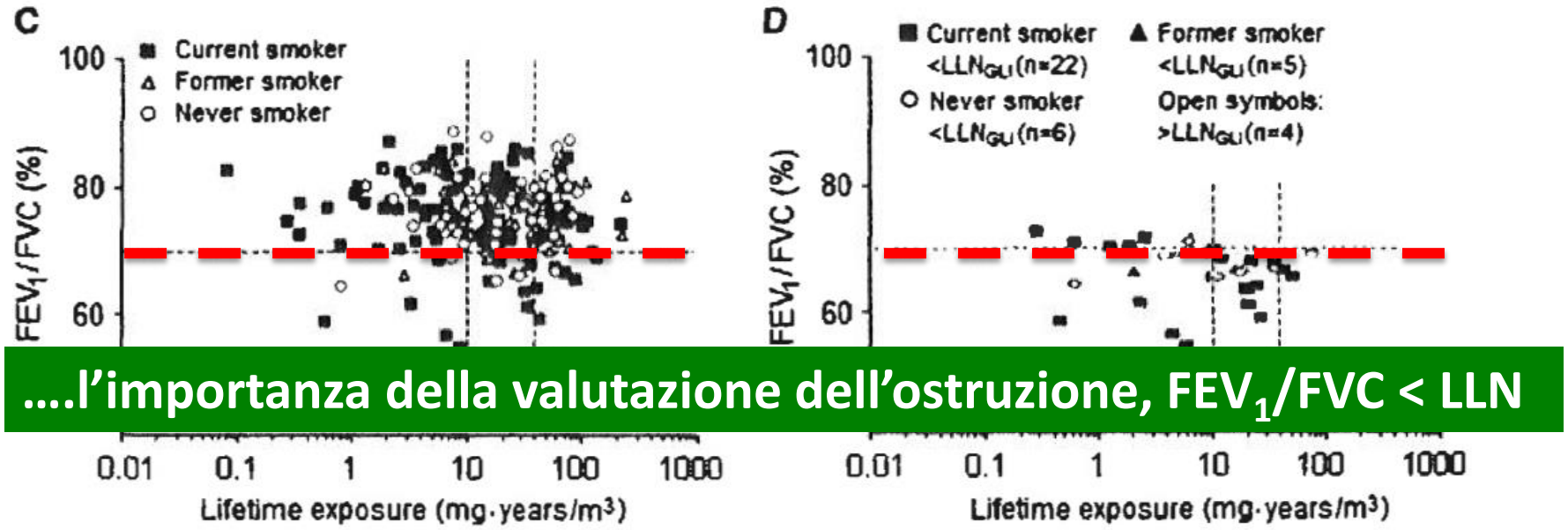
by Øyvind Omland, MD, PhD,[1,2] Else Toft Würtz, MHS,[1] Tor Brøvig Aasen, MD,[3] Paul Blanc, MD, PhD,[4] Jonas Brisman, MD, PhD,[5] Martin Reginald Miller, MD,[6] Ole Find Pedersen, MD, DMSc,[2] Vivi Schlünssen, MD, PhD,[2] Torben Sigsgaard MD, PhD,[2] Charlotte Suppli Ulrik, MD, DMSc,[7] Sven Viskum, MD [1]

Reference	Exposure	Study design	Population	Outcome	Measure of association
Welding					
Lou et al, 2006 (57)	Spot and arc welders Air sampling	Cross-sectional study	N=247 (130 referents) Age 22–56 yrs	FEV_1/FVC <0.75	Non significant. Borderline linear trend (P=0.08) to FEV1 decline and spot welding.
Gennaro et al, 1993 (58)	13 job categories in shipyard workers Questionnaire-defined	Cross-sectional study	N=657 (174 referents) Mean age 45.7 yrs	Obstructive pulmonary function: Normal FVC and low FEV_1/FVC Mixed pulmonary function impairment: Low FVC and low FEV_1/FVC	Obstructive pulmonary function: No significant association with job title Mixed pulmonary function: No significant association with job title Significant OR 2.52 (95% CI 1.15–5.53) for >20 yrs compared with <20 yrs experience for mixed impairment
Bogadi-Šare, 1990 (59)	Dust and fumes of stainless steel welding Defined by work place.	Cross-sectional study	N=186 (80 referents) Mean age exposed 38.5 yrs referents 36.9 yrs	FEV_1/FVC ratio	Significant lower FEV1/FVC ratio: Smokers: 79.2% compared with referents 84.4%, P<0.05 Non-smokers: 80.4% compared with referents 92.8%, P<0.01.
Wang et al, 1996 (67)	Dust exposure in steelworkers Record (steel corporation)-defined	Longitudinal study; 4–9 yrs	N=475 (internal referents) Age at baseline 20–61 yrs	FEV_1/FVC ratio	Significant reduce in FEV_1/FVC ratio of 0.03%/yr, P=0.02

Scand J Work Environ Health. 2014;40(1):19–35. doi:10.5271/sjweh.3400

Effects of Exposure to Welding Fume on Lung Function: Results from the German WELDOX Study

M. Lehnert, F. Hoffmeyer, K. Gawrych, A. Lotz, E. Heinze, H. Berresheim, R. Merget, V. Harth, R. Van Gelder, J.-U. Hahn, A. Hartwig, T. Weiß, B. Pesch, and T. Brüning, for the WELDOX Study Group



….l'importanza della valutazione dell'ostruzione, $FEV_1/FVC < LLN$

Adv Exp Med Biol. 2015;834:1-13

Smoking, cadmium, and emphysema

D J Hendrick

Does cadmium contribute to the development of smoking induced emphysema?

Urinary cadmium levels predict lower lung function in current and former smokers: data from the Third National Health and Nutrition Examination Survey

D M Mannino, F Holguin, H M Greves, A Savage-Brown, A L Stock, R L Jones

Thorax 2004;**59**:194–198. doi: 10.1136/thorax.2003.012054

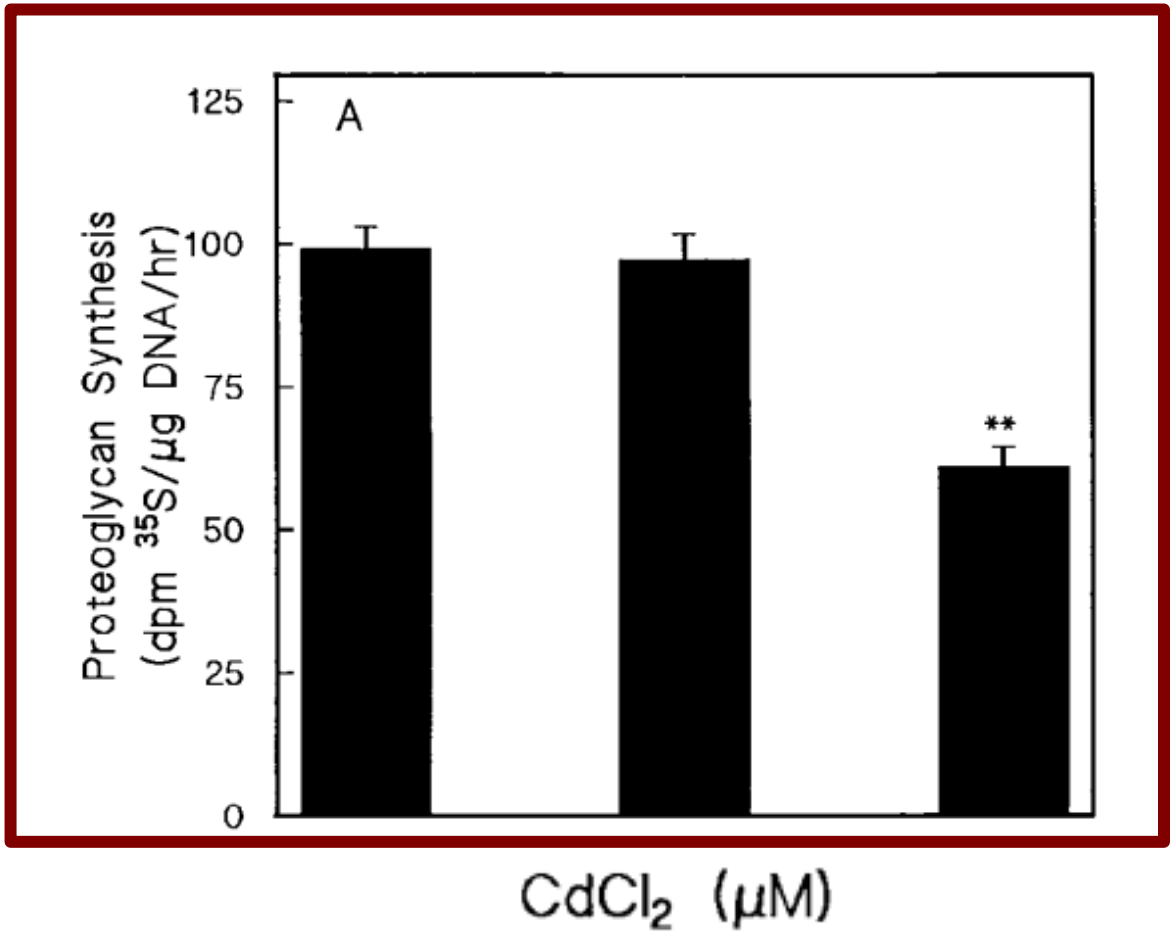
THE LANCET
Volume 331, Issue 8587, 26 March 1988, Pages 663-667

Lung function and chest radiographs of 101 men who had worked for 1 or more years manufacturing copper-cadmium alloy were compared with those of a referent group matched for age, sex, and employment status. Cigarette consumption was similar in the two groups. The cadmium workers had an excess of abnormalities of lung function and of radiographic changes consistent with emphysema. Classification of the cadmium workers by exposure categories based on either estimated cumulative cadmium exposure or liver cadmium measured by neutron activation analysis showed that abnormalities of lung function were greatest in those with the highest cumulative cadmium exposure or liver cadmium. The difference in the transfer coefficient (KCO) between cadmium workers and referents increased linearly with increasing cumulative exposure without evidence for a threshold. The estimated mean decrement in KCO for a cadmium worker employed 5 or more years with a cumulative exposure of 2000 yr.μg.m^{-3} (exposure to the current UK control limit of 50 μg.m^{-3} for a working lifetime of 40 yr) lies between 0·05 and 0·3 mmol.min^{-1}.kPa^{-1}.l^{-1} (95% confidence interval). This decrement is consistent with the functional and radiological changes of emphysema observed in this group of workers.

Cadmium Inhibits Proteoglycan and Procollagen Production by Cultured Human Lung Fibroblasts

Rachel C. Chambers, Geoffrey J. Laurent, and Gunilla Westergren-Thorsson

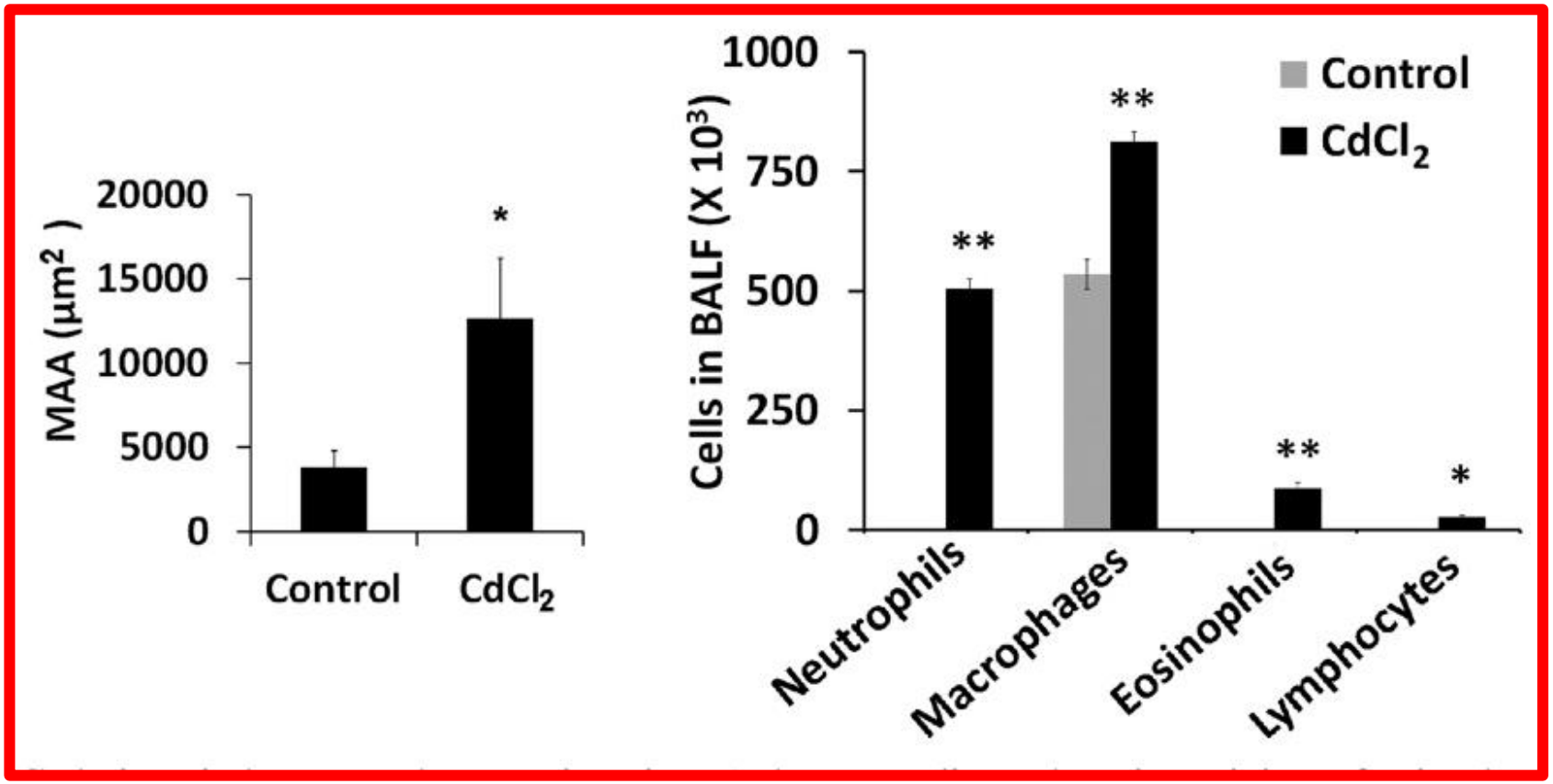
Centre for Cardiopulmonary Biochemistry and Respiratory Medicine, University College Medical School, Rayne Institute, London, United Kingdom; and Department of Cell and Molecular Biology, Lund University, Lund, Sweden



Am. J. Respir. Cell Mol. Biol. 1998: 19:498–506.

Am J Physiol Lung Cell Mol Physiol 309: L280–L292, 2015.
First published June 12, 2015; doi:10.1152/ajplung.00097.2015.

Heme oxygenase-1-mediated autophagy protects against pulmonary endothelial cell death and development of emphysema in cadmium-treated mice



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Pulmonary fibrosis and exposure to steel welding fume

M. P. Cosgrove

Table 2. Histological findings

Paper, year of publication [reference]	Number of cases with histology	Number of cases with evidence of fibrosis	Alveolar macrophages containing welding fume	Perivascular fibrosis	Peribronchial fibrosis	Interstitial/ alveolar fibrosis
Buerke, 2002 [7]	13	13	Yes	Yes	Yes	Yes
Müller, 2000 [8,33]	43	38	Yes	Yes	Yes	Yes
Radenbach, 1995 [26]	11	7	Not stated	Not stated	Not stated	Not stated
Rösler, 1995 [34]	6	6	Not stated	Yes	Yes	yes
Funahashi, 1988 [25]	10	10	Yes	Yes	Yes	Yes

BMJ Open

Effects of smoking, gender and occupational exposure on the risk of severe pulmonary fibrosis: a population-based case-control study

Magnus Ekström,[1,2] Torbjörn Gustafson,[3] Kurt Boman,[3] Kenneth Nilsson,[3] Göran Tornling,[4] Nicola Murgia,[5] Kjell Torén[6]

Table 3 Dose-response effect of smoking on the risk of severe pulmonary fibrosis

Smoking, pack-years*	PF OR (95% CI)	IPF OR (95% CI)
0	1	1
1–9	1.03 (0.62 to 1.70)	0.90 (0.52 to 1.57)
10–19	2.26 (1.35 to 3.80)	2.10 (1.20 to 3.68)
≥20	2.66 (1.56 to 4.55)	2.25 (1.26 to 4.02)

ORs for levels of smoking estimated using conditional logistic regression adjusted for age and stratified for year of birth, year of diagnosis, gender and occupational exposure.
*Pack-years of smoking up to 10 years before the year of PF diagnosis.
IPF, idiopathic pulmonary fibrosis; PF, pulmonary fibrosis.

Table 2 Effect of smoking on the adjusted risk of pulmonary fibrosis, according to gender and occupational exposure

	PF OR (95% CI)		IPF OR (95% CI)	
	Women	Men	Women	Men
No occupational exposure	1.10 (0.50 to 2.42)	1.97 (0.64 to 6.13)	1.12 (0. 49 to 2.59)	1.44 (0.43 to 4.83)
Occupational exposure	1.10 (0.52 to 2.34)	4.63 (2.08 to 10.33)	1.32 (0.58 to 3.03)	2.96 (1.34 to 6.52)

BMJ Open. 2014 Jan 9;4(1):e004018.

Rischio di fibrosi e attività lavorative note per essere associate a IPF

Table 2. Job at risk for idiopathic pulmonary fibrosis, adjusted for gender, age and smoking and then stratified for gender.

	All	Men	Women
Exposure	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
None	**1**	**1**	**1**
Any job at risk of IPF	**4.14** (2.27-7.53)	**4.40** (2.13-9.05)	**3.91** (1.18-12.86)
Costruction workers	1.31 (0.58-2.98)	1.37 (0.60-3.12)	-
Wood industry workers	1.36 (0.46-3.97)	1.35 (0.46-3.95)	-
Metallurgical and steel industry	**4.80** (1.50-15.33)	**4.76** (1.50-15.15)	-
Farmers, vets and gardeners	**2.73** (1.47-5.10)	**2.42** (1.14-5.11)	**3.91** (1.18-12.86)

Paolocci G BMC Pulm Med *in revisione*

Pulmonary fibrosis and exposure to steel welding fume

M. P. Cosgrove

Key points

- Health surveillance with spirometry is neither sensitive nor specific for detecting this condition and enquiry should also be made about dyspnoea and cough, which if present may need investigation despite normal spirometry, if the welder has been exposed to a high level of fume for a long period of time.
- Pulmonary investigation of welders in secondary care should include high-resolution computerized tomography.

Occupational Medicine 2015;**65**:706–712

- Febbre da fumi metallici
- Polmonite
- Asma
- BPCO
- Fibrosi polmonare
- Tumore del polmone

American Journal of Epidemiology

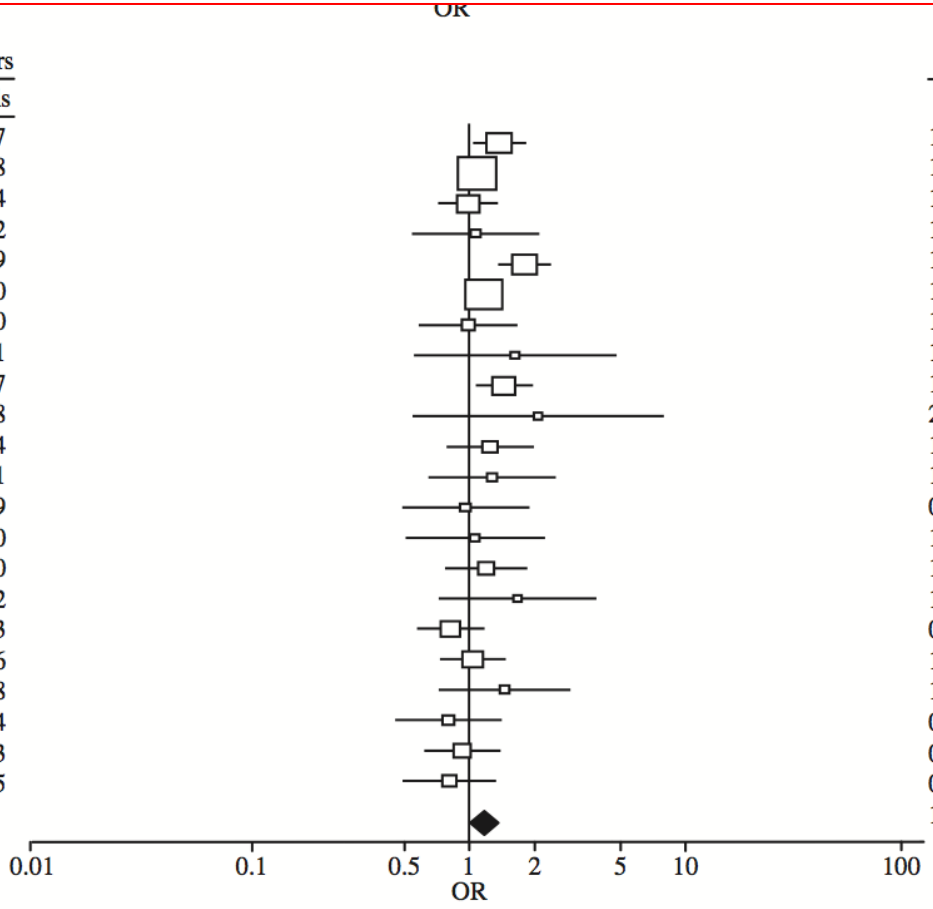
Vol. 178, No. 10
DOI: 10.1093/aje/kwt201
Advance Access publication:
September 19, 2013

Systematic Reviews and Meta- and Pooled Analyses

Welding and Lung Cancer in a Pooled Analysis of Case-Control Studies

B)

First Author, Year (Reference No.)	Occasional Welders		Never Welders		OR (95% CI)
	Cases	Controls	Cases	Controls	
Jöckel, 1998 (15)	160	123	637	697	1.39 (1.05, 1.85)
Bruske-Hohlfeld, 2000 (33)	459	385	2,099	2,268	1.10 (0.93, 1.31)
Richiardi, 2004 (29)	90	111	822	1,104	1.00 (0.73, 1.38)
Fortes, 2003 (34)	25	21	265	242	1.08 (0.55, 2.13)
Consonni, 2010 (35)	184	129	1,312	1,449	1.82 (1.37, 2.42)
Guida, 2011 (28)	382	374	1,784	2,320	1.18 (0.97, 1.43)
Stücker, 2002 (36)	42	45	258	250	1.00 (0.59, 1.69)
Kazma, 2012 (37)	21	16	138	201	1.64 (0.56, 4.82)
Gustavsson, 2000 (14)	83	130	912	2,137	1.46 (1.07, 1.99)
Beulens, 2009 (40)	6	10	35	98	2.10 (0.55, 8.00)
't Mannetje, 2012 (22)	38	64	221	474	1.26 (0.79, 2.02)
't Mannetje, 2012 (22)	27	29	200	261	1.29 (0.65, 2.55)
't Mannetje, 2012 (22)	30	23	243	199	0.97 (0.49, 1.92)
't Mannetje, 2012 (22)	22	18	280	220	1.07 (0.51, 2.25)
't Mannetje, 2012 (22)	60	53	466	510	1.21 (0.78, 1.87)
't Mannetje, 2012 (22)	21	13	113	132	1.69 (0.73, 3.92)
't Mannetje, 2012 (22)	83	83	407	403	0.83 (0.58, 1.19)
Vallieres, 2012 (16)	90	103	595	776	1.05 (0.74, 1.49)
Brenner, 2010 (38)	11	18	175	348	1.47 (0.73, 2.96)
Corbin, 2011 (27)	35	58	162	344	0.81 (0.46, 1.43)
López-Cima, 2010 (39)	72	71	651	603	0.94 (0.62, 1.42)
Tse, 2012 (30)	42	53	1,146	995	0.77 (0.47, 1.27)
Overall (I^2 = 20.9%, P = 0.186)					1.17 (1.08, 1.27)



ORIGINAL ARTICLE

Lung cancer risk in welders and foundry workers with a history of heavy smoking in the USA: The National Lung Screening Trial

Jason Y Y Wong, Bryan A Bassig, Wei Jie Seow, Wei Hu, Bu-Tian Ji, Aaron Blair, Debra T Silverman, Qing Lan

	I) All lung cancer subtypes				
	Total cases	py	HR	95% CI Lower	95% CI Upper
Never welder or foundry worker	1824	300192.4	Ref		
Ever welder, never foundry worker	101	14056.5	1.12	0.91	1.37
Ever foundry worker, never welder	70	9715.2	1.09	0.85	1.39
Ever welder and foundry worker†	39	3870.6	1.48	1.08	2.04*

Occup Environ Med. 2017

American Journal of Epidemiology

Vol. 175, No. 7
DOI: 10.1093/aje/kwr358
Advance Access publication:
February 16, 2012

Welding and Lung Cancer in Central and Eastern Europe and the United Kingdom

Table 5. Association Between Duration of Exposure to Welding Fumes and Lung Cancer, With and Without Chromium Exposure, Central and Eastern Europe and the United Kingdom, 1998–2001[a]

Exposures to Welding Fumes and Chromium	No. of Cases	No. of Controls	OR	95% CI
No welding fumes, no chromium	1,470	1,655	1.00	Referent
Welding fumes with chromium	190	159	1.34	1.04, 1.71
1–8 years	54	42	1.47	0.94, 2.30
9–25 years	64	52	1.28	0.85, 1.92
>25 years	71	65	1.27	0.87, 1.85
Welding fumes without chromium	393	363	1.14	0.95, 1.36
1–8 years	123	134	0.98	0.74, 1.30
9–25 years	117	120	1.00	0.75, 1.34
>25 years	153	109	1.48	1.11, 1.97
Chromium without welding fumes	144	118	1.32	1.00, 1.75

Abbreviations: CI, confidence interval; OR, odds ratio.
[a] Model adjusted for age, center, education, smoking, and asbestos, as well as silica exposure.

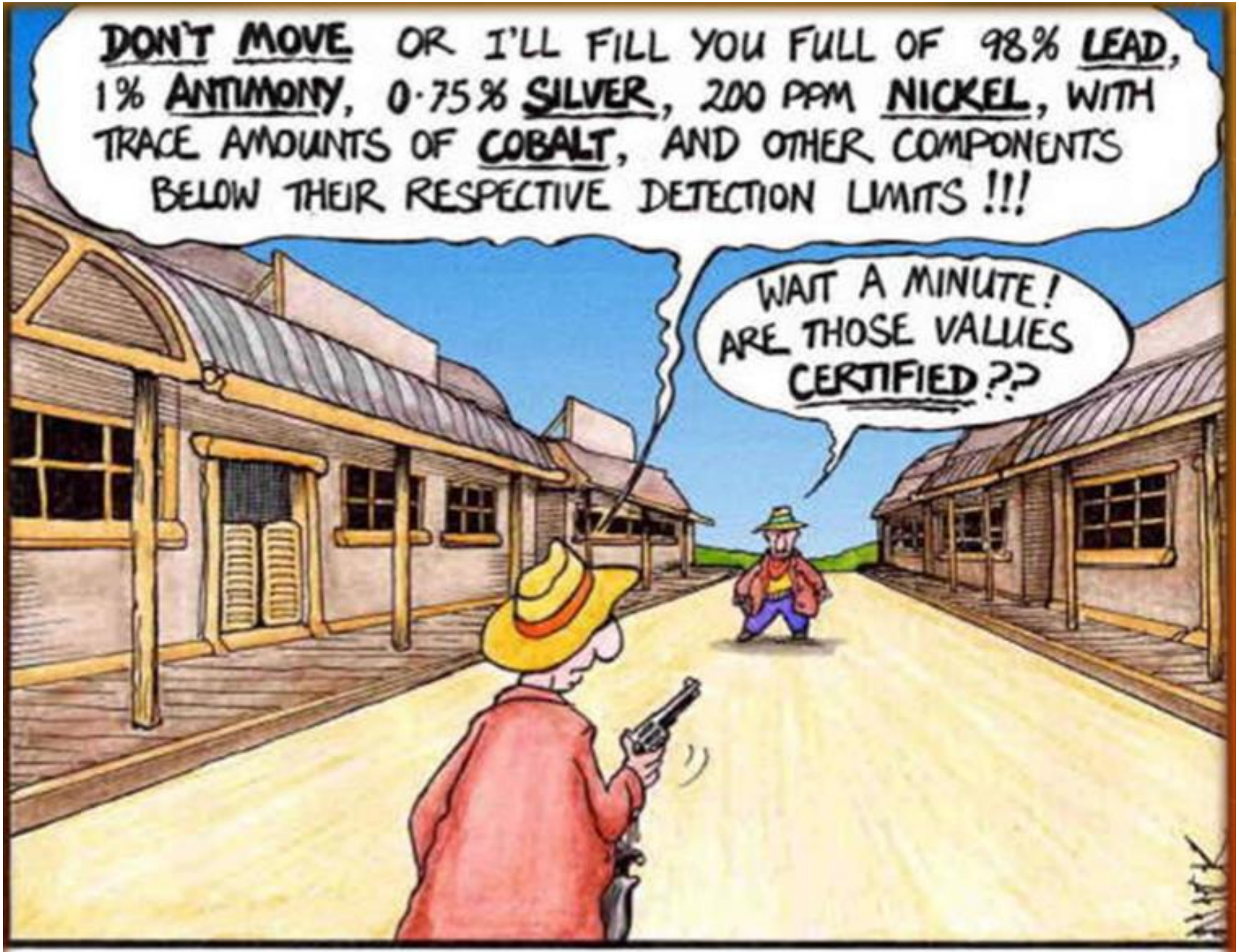
Original Article

Cancer Risks among Welders and Occasional Welders in a National Population-Based Cohort Study: Canadian Census Health and Environmental Cohort

Jill S. MacLeod [1,*], M. Anne Harris [1,2,3], Michael Tjepkema [4], Paul A. Peters [5], Paul A. Demers [1,3,6]

	Welders	
	$n = 12{,}845$	
	Cases	HR (95% CI)[†]
Any cancer*	1,385	1.04 (0.99–1.10)
Lung	265	1.16 (1.03–1.31)
Mesothelioma	15	1.78 (1.01–3.18)
Stomach	45	1.25 (0.93–1.67)
Bladder	100	1.40 (1.15–1.70)
Kidney	60	1.30 (1.01–1.67)
Brain	35	1.16 (0.83–1.63)
Nasal	< 5	–
Ocular melanoma	5	1.55 (0.64–3.76)

Safety and Health at Work 8 (2017) 258e266



ANALYTICAL CHEMISTS IN THE WILD WEST

Gli indicatori biologici di esposizione più comunemente impiegati e confronto con i valori limite e di riferimento

Massimo Corradi

UNIVERSITÀ DI PARMA

DIPARTIMENTO DI MEDICINA E CHIRURGIA

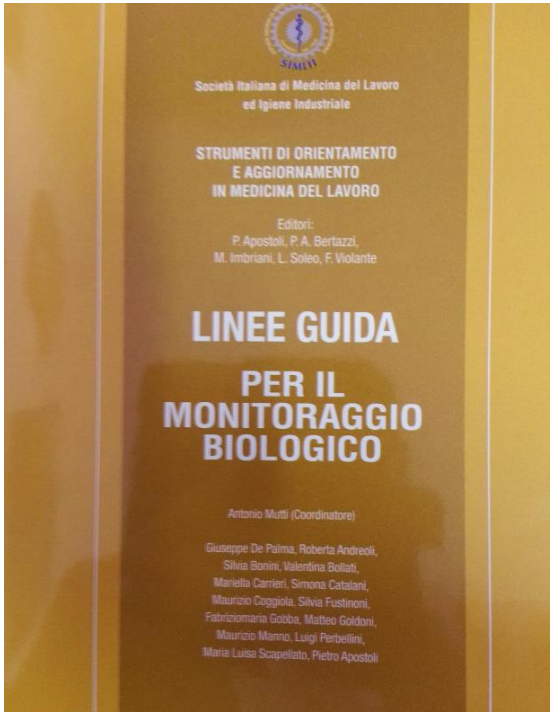
Reggio E, 20 Ottobre 2017

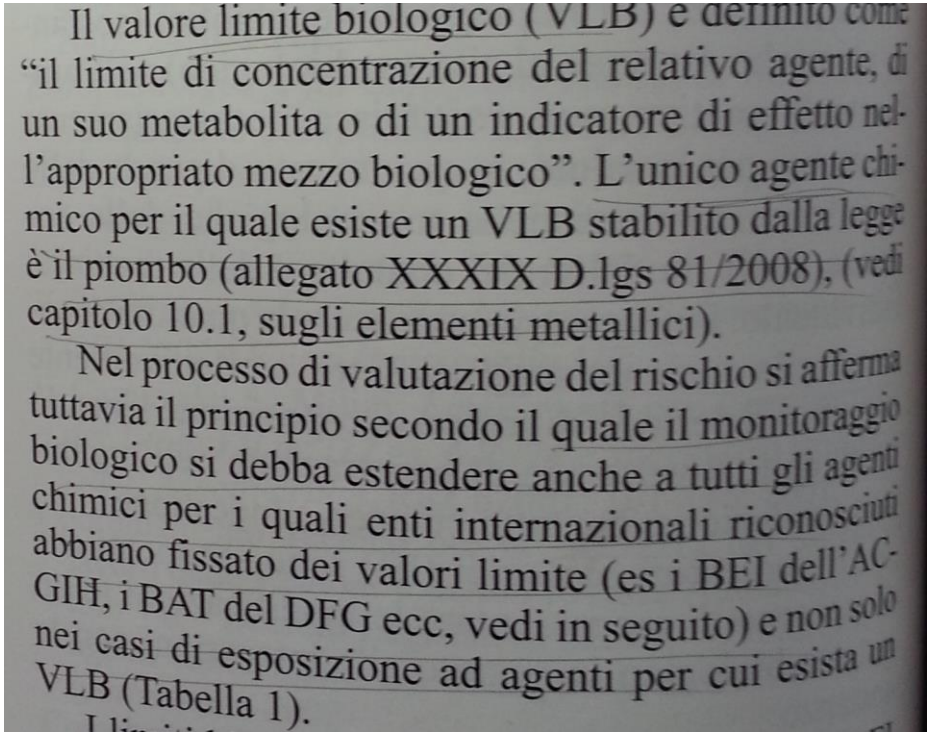
Orientamento SIMLII

"La valutazione periodica dell'esposizione mediante ***indicatori di dose interna e di effetto*** è un compito di esclusiva pertinenza del medico competente, sia come pratica integrativa alla sorveglianza sanitaria, che come complemento alla valutazione del rischio "

Articolo 229 - Sorveglianza sanitaria

Il monitoraggio biologico è obbligatorio per i lavoratori esposti agli agenti per i quali è stato fissato **un valore limite biologico**.

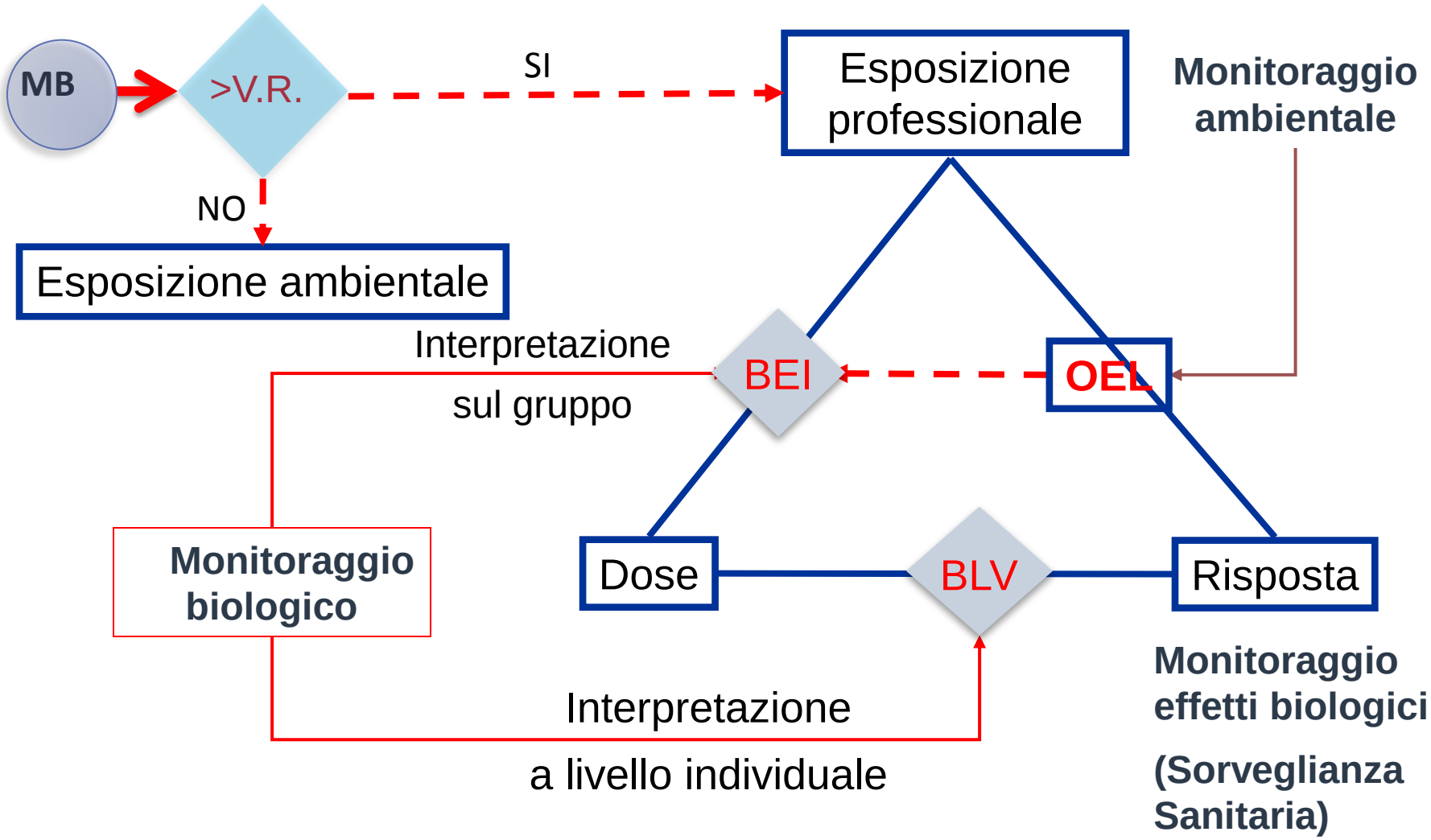




Il valore limite biologico (VLB) è definito come "il limite di concentrazione del relativo agente, di un suo metabolita o di un indicatore di effetto nell'appropriato mezzo biologico". L'unico agente chimico per il quale esiste un VLB stabilito dalla legge è il piombo (allegato XXXIX D.lgs 81/2008), (vedi capitolo 10.1, sugli elementi metallici).

Nel processo di valutazione del rischio si afferma tuttavia il principio secondo il quale il monitoraggio biologico si debba estendere anche a tutti gli agenti chimici per i quali enti internazionali riconosciuti abbiano fissato dei valori limite (es i BEI dell'ACGIH, i BAT del DFG ecc, vedi in seguito) e non solo nei casi di esposizione ad agenti per cui esista un VLB (Tabella 1).

Monitoraggio biologico



Position Paper

Criteri metodologici per la valutazione e proposta di valori-guida (VG) nazionali per il controllo dell'esposizione professionale a fattori di rischio chimici

(valori-limite, livelli d'azione, valori di riferimento)

A cura del

Sottogruppo di lavoro per la valutazione del rischio chimico (Sottogruppo-VRC)

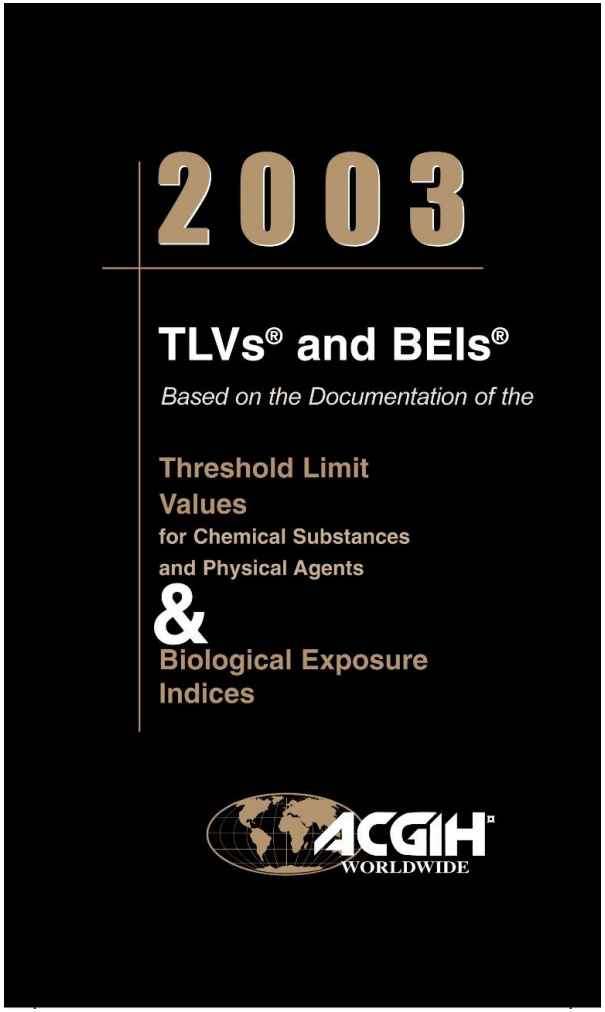
M. Manno (Referente), M.C. Aprea, R. Bonfiglioli, A. Moretto, M.L. Scapellato

VALORI DI RIFERIMENTO PER LA POPOLAZIONE GENERALE

Metalli	µg/l (5° e 95° percentile)	µg/g creatinina
Cr-U	0,05-0,35	< 0,2
Ni-U	0,1-5 µg/l	< 3,3
Cd-U	0,1 - 1,5	< 1

SIVR edizione 2011

- **BEIs®** are intended for use in the practice of industrial hygiene as guidelines or recommendations to assist in the control of potential workplace health hazards.
- Represent **mean levels** of determinants that are most likely to be observed in specimens collected from a healthy worker who **has been exposed to the TLV®-TWA.**



Methodology for the Derivation of Occupational Exposure Limits

Scientific Committee on Occupational Exposure Limits (SCOEL)

'A **Biological Limit Value (BLV)** is a reference value for the evaluation of potential health risk in the practice of occupational health. [...] Exposure concentrations equivalent to the BLV generally do not affect the health of the employee adversely, when they are attained regularly under workplace conditions (8 hrs/day, 5 days/week), except in cases of hypersensitivity.'

Deutsche
Forschungsgemeinschaft

List of MAK and BAT Values 2016

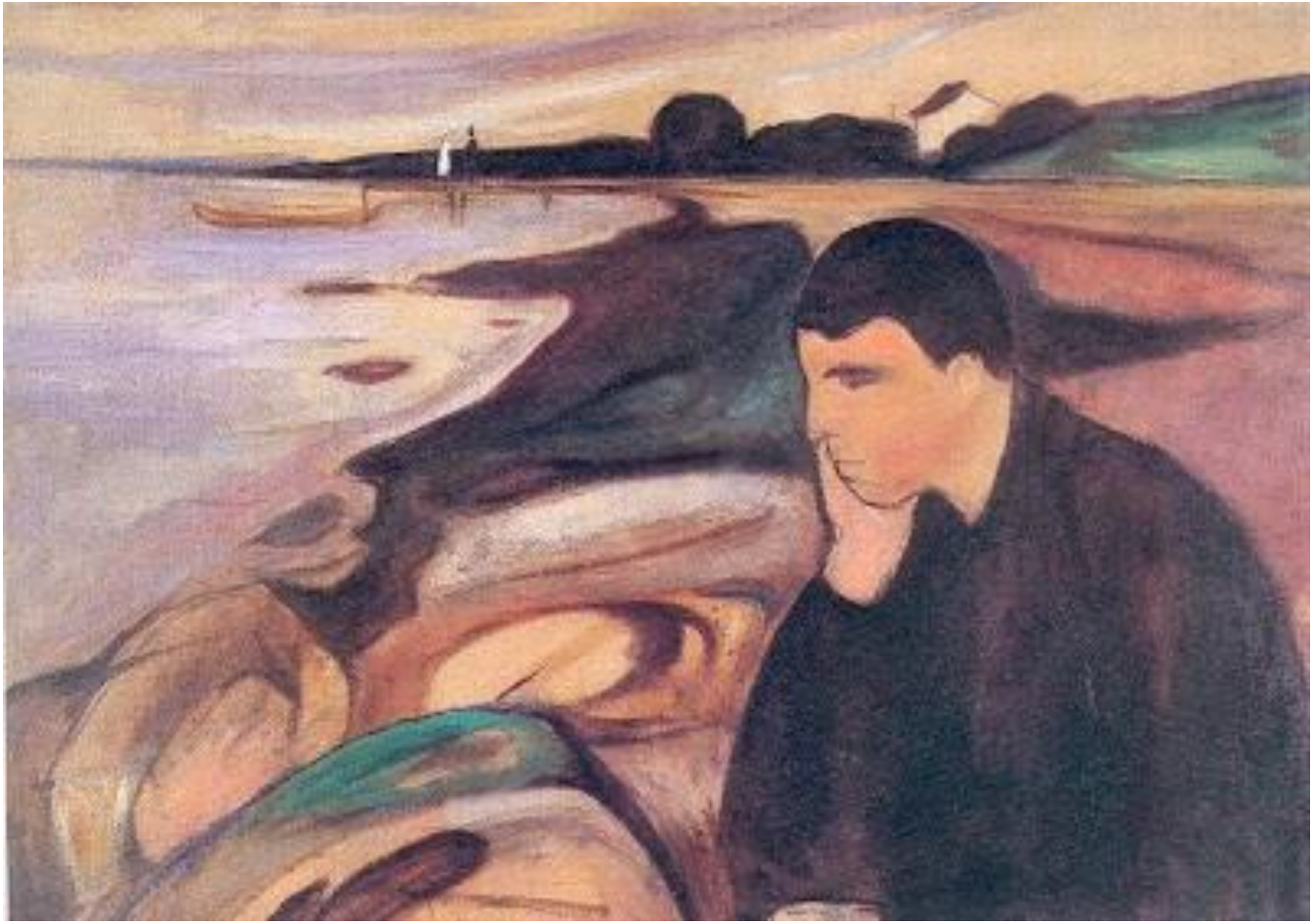
Occupational Exposure Limits — Three limit values are in use in Germany:

- Maximum Workplace Concentrations ("Maximale Arbeitsplatzkonzentrationen" – MAK)
- Technical Guidance Concentrations ("Technische Richtkonzentrationen" – TRK), and
- Biological Tolerance Value for occupational exposures ("Biologische Arbeitsstofftoleranzwerte" – BAT).

Exposure assessment at the workplace: Implications of biological variability

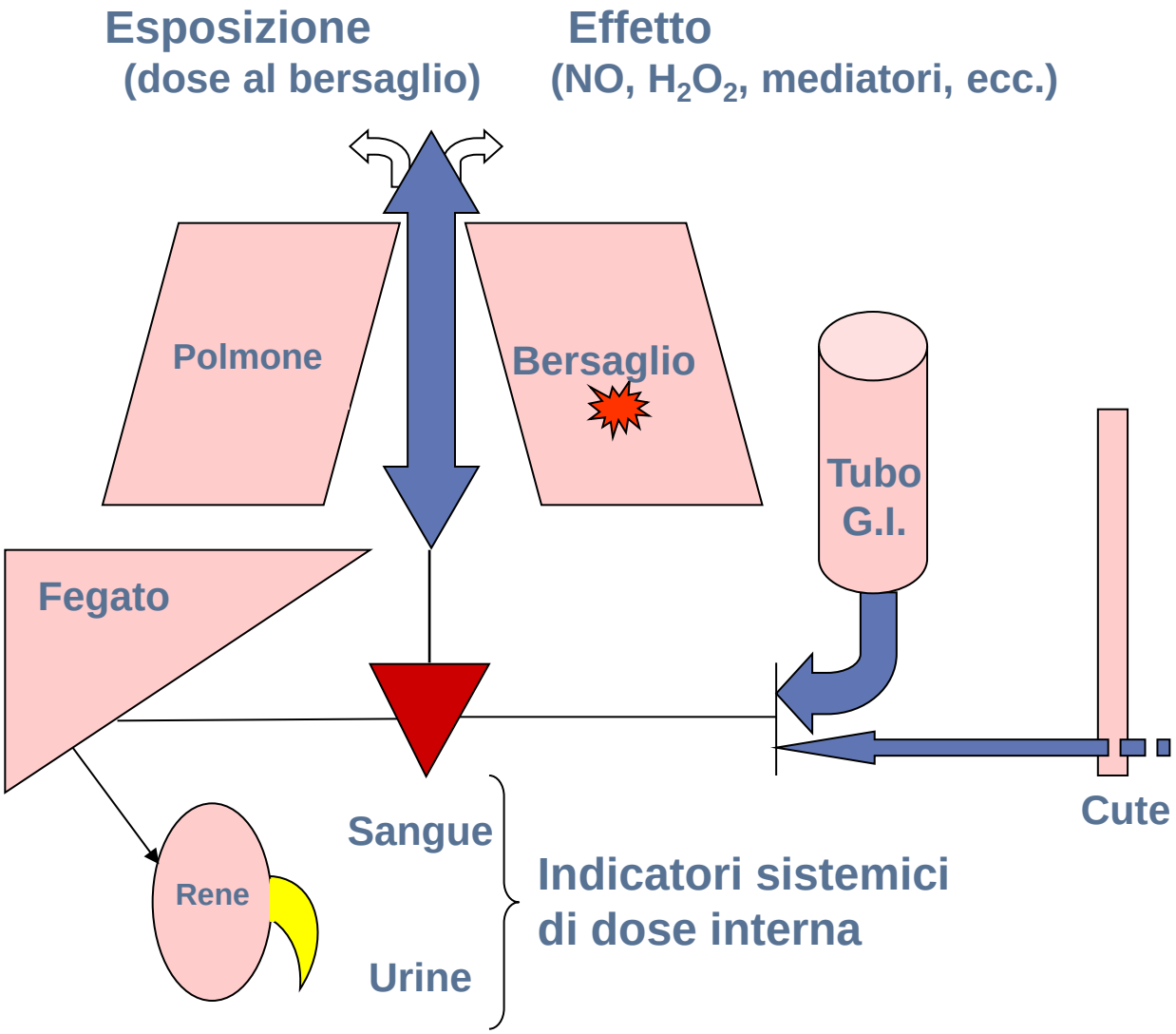
Table 2
Comparison among different biological limits, e.g. BEI® (ACGIH), BAT (DFG), and BLV (SCOEL), in terms of their origin and interpretation

	BEI® (ACGIH)	BAT (DFG)	BLV (SCOEL)
Origin	Exposure-dose (dose–response[a])	Dose–response or exposure–dose	Dose–response (OEL–dose)
Corresponds to	Mean value (NOAEL[a])	Ceiling values	NOAEL, ceiling values
Interpretation	Groups (individuals[a])	Individuals or groups	Individuals and groups
Criterion	TLV®-related (health-based[a])	Health-based or MAK-related	Health-based
Carcinogens	Yes	No (EKA)	No

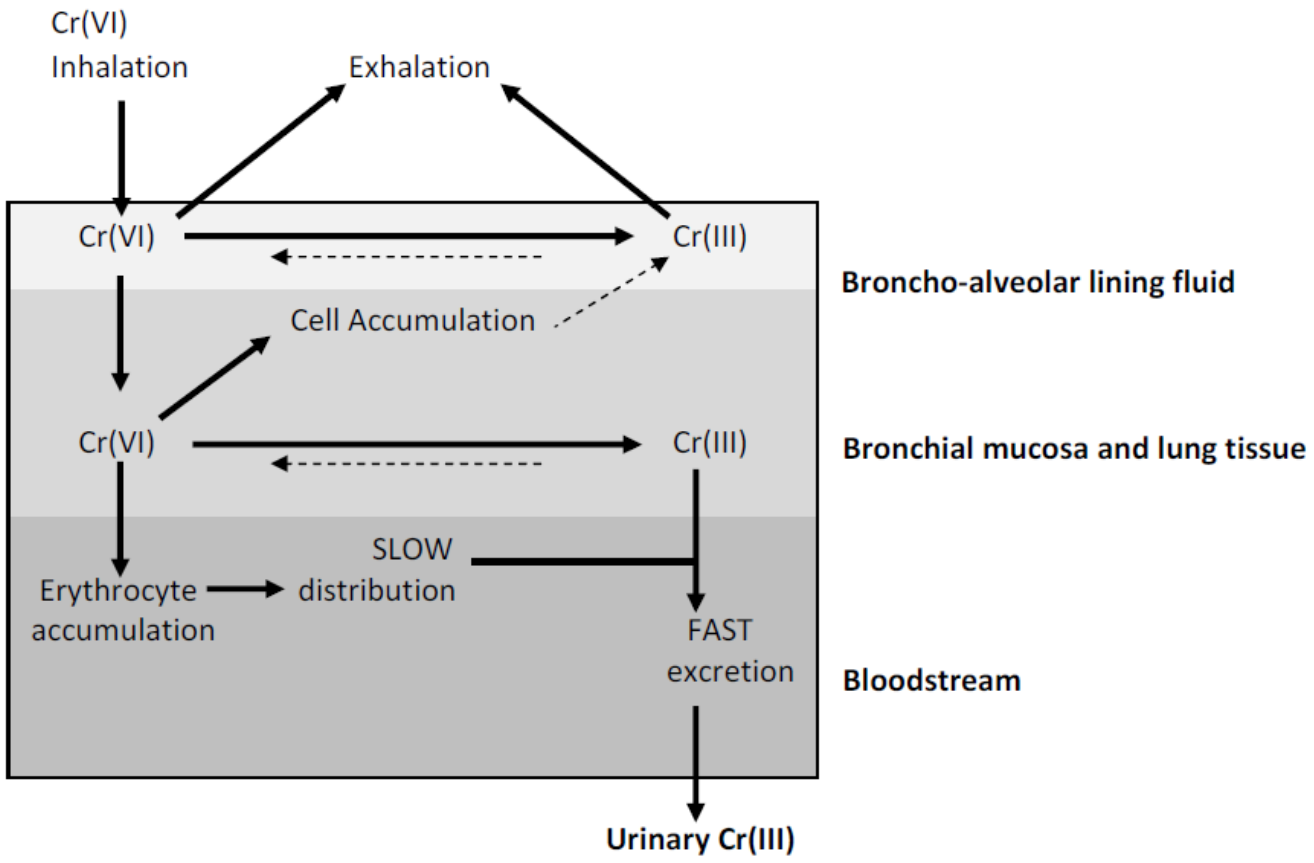


Il significato hanno gli indicatori di dose

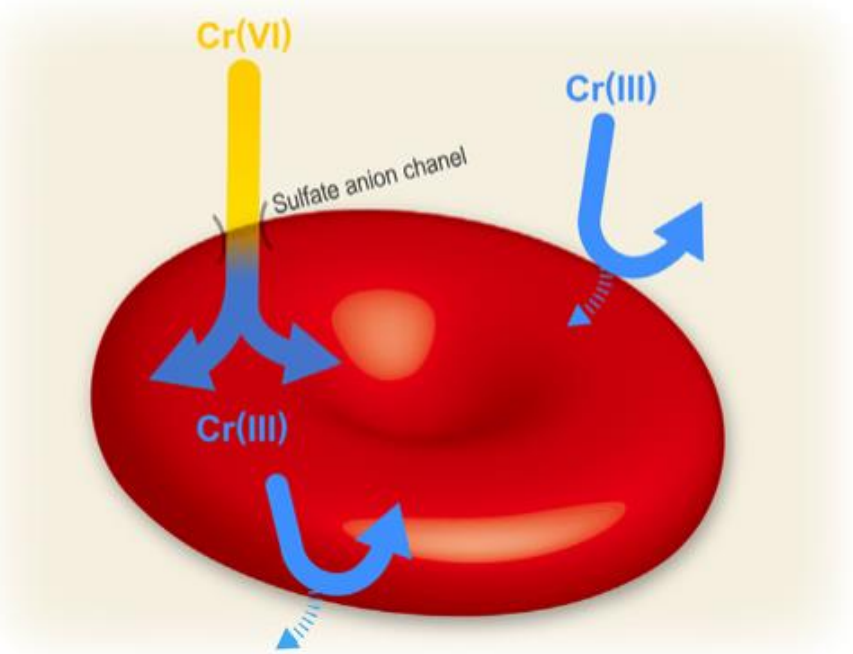
Gli effetti nocivi degli inquinanti sulle vie respiratorie possono essere dovuti alla loro **forte reattività o scarsa solubilità**. In entrambi i casi, la dose **ritenuta** (esposizione) sembra il determinante principale della pneumotossicità e del tumore polmonare

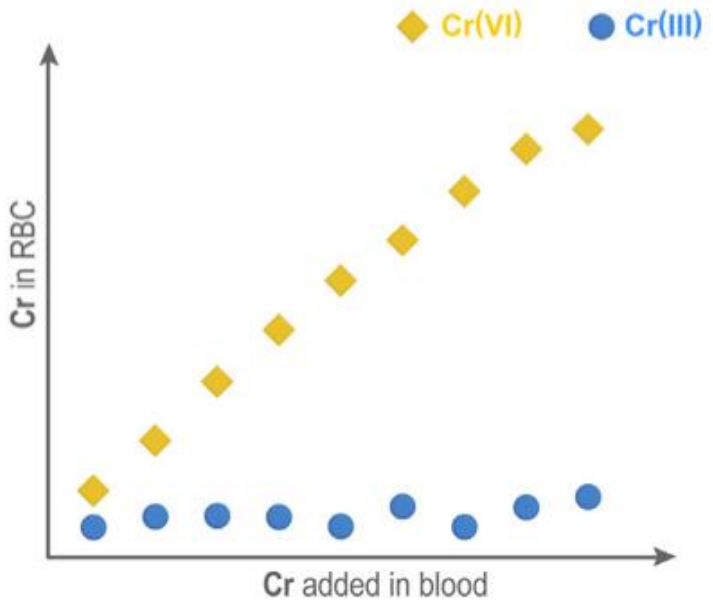


Cinetica esposizione polmonare a cromo



Cr VI nei globuli rossi

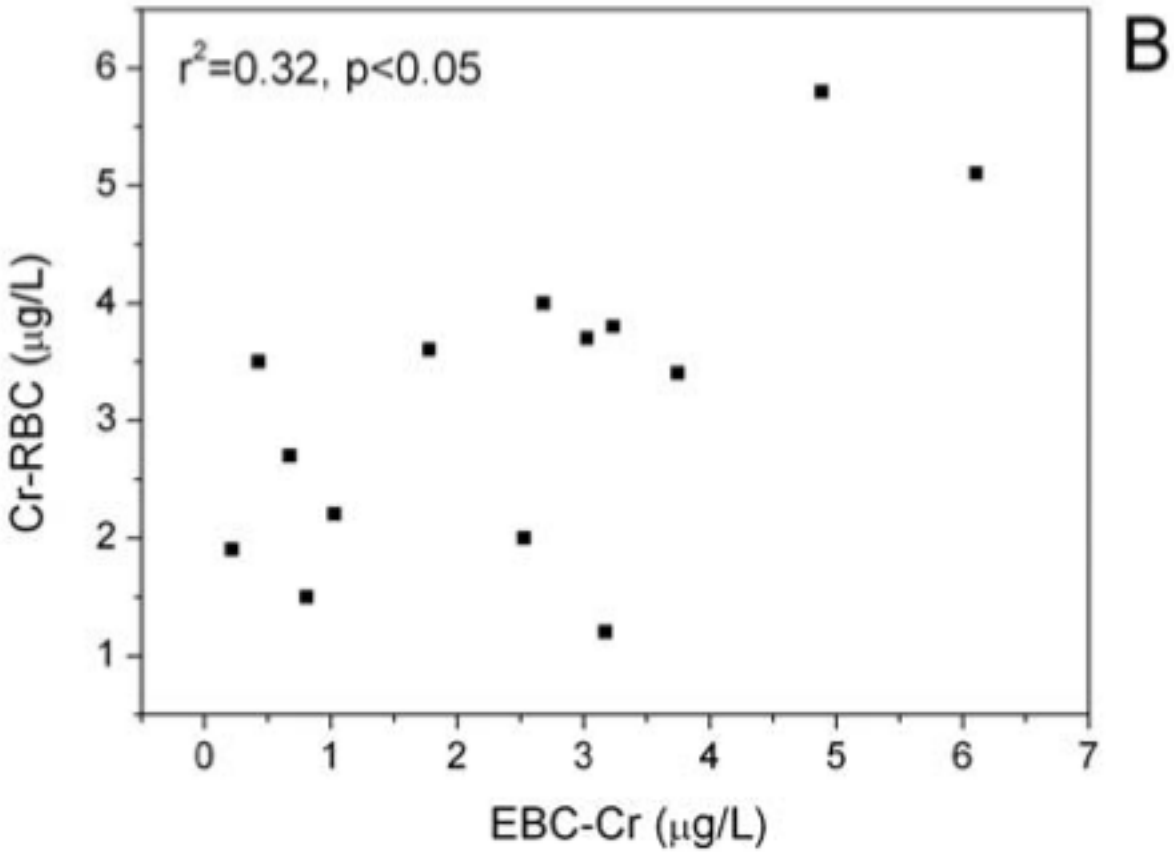




Biomarkers. 2008 Aug; 13(5): 467–477.

Chromium in exhaled breath condensate (EBC), erythrocytes, plasma and urine in the biomonitoring of chrome-plating workers exposed to soluble Cr(VI)

Matteo Goldoni,[ab] Andrea Caglieri,[ab] Giuseppe De Palma,[c] Olga Acampa,[ab] Petra Gergelova,[d] Massimo Corradi,[a] Pietro Apostoli[c] and Antonio Mutti*[a]



J. Environ. Monit., 2010, **12**, 442–447

Risultati: Cromo nel CAE

Metalli	T_0	T_1	T_2	*p*
Cr-CAE (µg/L)*	0.06 (< LoD-0.14)	0.08 (< LoD-0.22)	< LoD# (< LoD-0.10)	T_2 vs T_1 *p* <0,0001 T_2 vs T_0 *p* =0,023

Test non parametrico di Friedman seguito da test dei ranghi di Wilcoxon. *I valori sono espressi come mediana (25°-75° percentile). #Lod: *Limit of detection*

In 9 lavoratori che mostravano valori di Cr-CAE > 0.40 µg/L
si è proceduto con la determinazione della frazione esavalente (Cr VI-CAE).

In 2 campioni sono emersi valori di Cr VI-CAE sopra il LOD (0.1 µg/L)

Prepared for

The American Welding Society
8669 NW 36th Street #130
Miami, FL 33166-6672

Document type

Final

Date

August 2017

HEALTH EFFECTS FROM WELDING EXPOSURES:

2016 LITERATURE UPDATE

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DI PARMA

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