# Abstractbok

# Arbets- och miljömedicinskt höstmöte

# Uppsala 14-15/11-2018

Höstmötet är en mötesplats för alla verksamma inom arbets-och miljömedicin. Mötet är ett forum för debatt om aktuella ämnen samt en möjlighet att få presentera forskningsprojekt med efterföljande diskussion, chans till nya infall och/eller nya samarbetspartners.

Tema för årets konferens är ”Framtidens forskning inom arbets- och miljömedicin” där unga forskare ges möjlighet och särskild uppmuntran att presentera sina vetenskapliga arbeten.

Arrangör för mötet är Svenska läkaresällskapets sektion för arbets- och miljömedicin (ARM) i samarbete med Arbets- och miljömedicin, Akademiska sjukhuset, Region Uppsala, Region Gävleborg, Landstinget Dalarna och Uppsala Universitet.

# Information om ARM

Sektionen för arbets- och miljömedicin (ARM) inom Svenska läkarsällskapet (SLS) är en medlemsorganisation för intresserade med medicinsk, naturvetenskaplig, teknisk eller beteendevetenskaplig bakgrund. Två stora aktiviteter för ARM är att årligen arrangera höstmötet och att dela ut stipendier till unga forskare inom området. Vi välkomnar alltid nya medlemmar. Årsavgiften är 150 kr som betalas till Plusgiro 661610-6. Ange Ditt namn och e-postadress. Om du vill veta mer så kontakta Gun Johansson, ordförande ARM, gun.johansson@ki.se

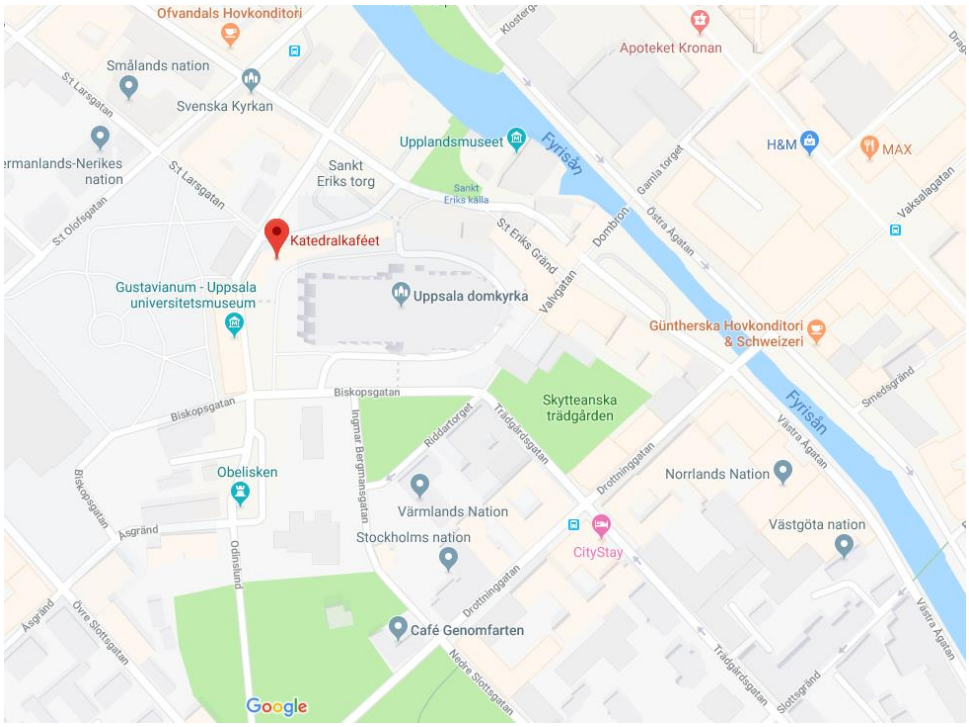
# Sponsorer

Vi tackar AFA Försäkring som sponsrar denna konferens. Genom deras stöd möjliggörs en lägre konferensavgift vilket bidrar till att fler deltagare kan delta på konferensen.

# Praktisk information

## Middag

Middagen hålls onsdagen den 14/11 kl. 19 på Katedralkafeét, vid Domkyrkan.




## Hitta till konferenslokalen – Hubben från Centralstationen i Uppsala

**Promenad:** Det är ca 2,2 km att gå från Centralstationen till Hubben, Dag Hammarskjölds väg 38. Gå via Vretgränd till Östra Ågatan där ni svänger vänster. Gå över Islandsbron och följ Munkgatan till Sjukhusvägen. Ta där vänster och följ Sjukhusvägen till Dag Hammarskjölds väg. Ta sedan första tvärgatan till vänster och då är ni inne på det område där Hubben ligger. Sväng höger vid första gata så är ni sedan framme vid konferensen!

**Buss***:* Bussar med nr 3, 4 och 8 fungerar och biljett kan köpas med Swish i appen UL alternativt med bankkort direkt på bussen. Samtliga bussar stannar vid busshållplats Uppsala Science Park. Korsa Dag Hammarskjölds väg så är ni sedan inne på området där konferensen äger rum. Fortsätt rakt in på området så kommer ni fram till konferenslokalen!

**Parkering:** Det kan vara svårt att hitta parkering så var ute i god tid. Det finns parkeringsplatser i området. Närmaste parkeringshus finner du här Parkeringshus

Parkering längre bort finns vid följande platser:
Ångströmslaboratoriet
Akademiska sjukhuset
BMC
Studenternas IP – Parkering söder om arenan

# Program Höstmötet

| Onsdag 14/11 | Konferenscentrum Hubben<br>WiFi: KonferensHubben, lösen: Coor2017Q3-twa | Dag Hammarskjölds väg 38 |
|---|---|---|
| 08.30-09.15 | Registrering och kaffe | |
| 09.15-09.30 | Introduktion - Gun Johansson, Martin Tondel och Magnus Svartengren | |
| Plenarföreläsare | Framtidens behov inom Arbets- och miljömedicinsk forskning | Moderator Magnus Svartengren<br>Gun Johansson |
| 09.30-10.00 | AFA Försäkring - inkl utdelning av postdocstipendium<br>Susanna Stymne Airey | |
| 10.00-10.20 | Forte - Thomas Jacobsson | |
| 10.20-10.40 | Mistra - Christopher Folkeson Welch | |
| 10.40-11.00 | Mynak - Myndigheten för arbetsmiljökunskap<br>Annika Hed Ekman | |
| 11.00-11.10 | Bensträckare | |
| 11.10-12.10 | Vetenskapliga presentationer<br>Risker och prevention<br>Realtidsdata som kvalitetsförbättring av värmevarnings-system - Christofer Åström<br><br>Associations between serum levels of perfluoroalkyl substances (PFASs) and serum lipid levels over 10-years in a prospective cohort study- Linda Dunder<br><br>Vägen framåt vad gäller vibrationsskador - Ett fruktbart samarbete mellan AMM-klinikerna och Arbetsmiljöverket<br>Catarina Nordander | Moderator<br>Hans Pettersson<br>Therese Hellman |
| 12.10-13.10 | Lunch - Posterutställning | |
| 13.10-14.20 | Vetenskapliga presentationer<br>Belastningsergonomi<br>The reliability and validity of six observational methods for manual and repetitive work - Kristina Eliasson<br><br>Biomechanical risk factors for surgically treated ulnar nerve entrapment in a cohort of Swedish male construction workers - Jennie Jackson<br><br>Is whole day measurement of arm elevation with accelerometers an option when performing risk assessments at work? - Peter Palm | Moderator<br>Marika Drijovska<br>Teresia Nyman |
| 14.20-14.50 | Kaffe | |
| | | |

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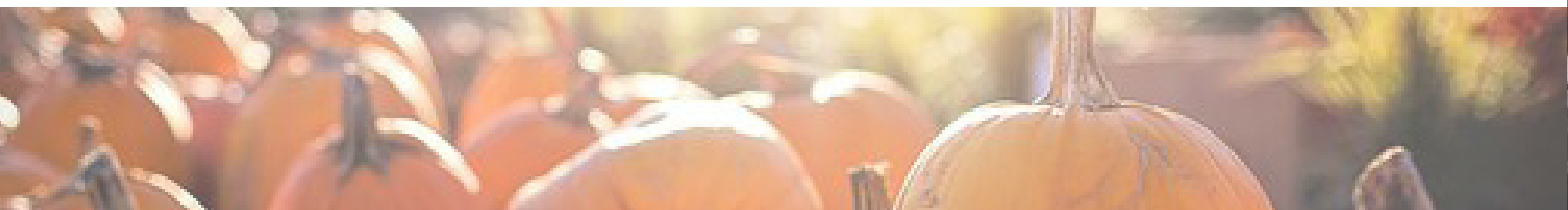
|---|---|---|
| 14.50-16.10 | Vetenskapliga presentationer<br>Organisatorisk och social arbetsmiljö<br>Utvärdering av en intervention för att minska organisatoriska och sociala belastningar inom en kommun i Stockholms län - Emma Cedstrand<br><br>Planning and designing flexible office work environements - Linda Rolfö<br><br>Upplevd produktivitet vid övergång från cellkontor till flexkontor - Maria Öhrn<br><br>Development of organizational and psychosocial work factors across industries with different gender composition in Sweden, 2003-2013. - Sara Cerdas | Moderator<br>Markus Wikborg<br>Robert Wålinder |
| BYTE AV LOKAL | Arbets- och miljömedicin | Dag Hammarskjölds väg 60 |
| 16.30-17.30 | Specialist- och satellitmöten - SAMF, HINTA, MM | |
| 19.00 | Middag, Katedralcaféet bredvid Domkyrkan | |
| | | |
| Torsdag 15/11 | Konferenscentrum Hubben<br>WiFi: KonferensHubben, lösen: Coor2017Q3-twa | Dag Hammarskjölds väg 38 |
| Plenarföreläsare | Multipla exponeringar en anledning till tvärprofessionell samverkan ? Hur designa studier, samla in och statistiskt analysera data? | Moderator<br>Martin Tondel<br>Peter Palm |
| 08.30-09.10 | Hur hanterar vi multipla exponeringar - Liisa Byberg | |
| 09.10-09.30 | Buller och luftföroreningar - ett exempel i miljön<br>Jenny Selander | |
| 09.30-09.50 | Fysisk belastning och psykosocial belastning - ett exempel i arbetslivet - Svend Erik Mathiassen | |
| 09.50-10.00 | Hur gör vi framtidens smarta studier?<br>Sammanfattande diskussion | |
| 10.00-10.20 | Kaffe | |
| 10.20-11.20 | Vetenskapliga presentationer<br>Metaller, luftvägar och allergi<br>An Interdisciplinary Approach to Evaluate the Toxicity of Metal Oxide Nanoparticles in Human Monocytes and Plasma – a Pilot Study. - Maria Assenhöj<br><br>Quality and learning aspects of the first 9000 spirometries of the LifeGene study - Mikaela Qvarfordt<br><br>Levels of horse allergen Equ c 4 in dander and saliva from ten horse breeds - Susanne Victor | Moderator<br>Monica Lind<br>Anna Rask-Andersen |
| 11.20-11.25 | Bensträckare | |



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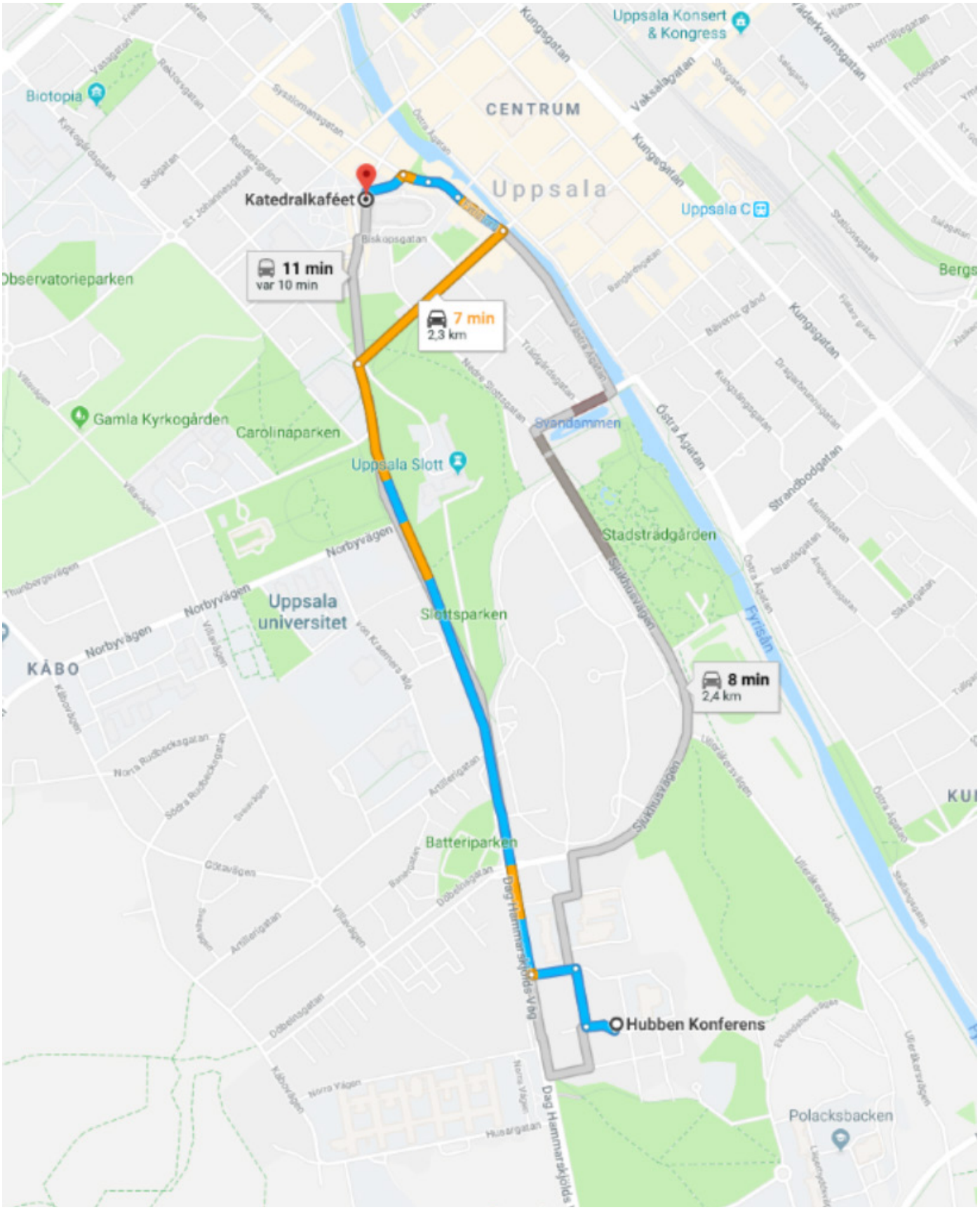
|---|---|---|
| 11.25-12.45 | Vetenskapliga presentationer<br>Hur vi håller oss friska<br>Association between occupational exposures and gestational hypertension, preelampsia and gestational diabetes in Sweden, 1994-2012. - Claudia Lissåker<br><br>Procurement and implementation processes for Occupational Health Services in Sweden - Sofia Åström Paulsson<br><br>Hur påverkar arbetsmarknadsanknytning hälsa bland arbets-, flykting-, och anhörigmigranter? En longitudinell studie i ett varierande invandringspanorama med en svenskfödd referenspopulation.<br>Maria Brendler-Lindqvist<br><br>Health economic assessment of a scenario of increased bicycling – comparing costs from the health care sector perspective - Hedi Katre Kriit | Moderator<br>Pia Rehfisch<br>Anita Gidlöf Gunnarsson |
| 12.45-13.40 | Lunch - Restaurang Hubben | |
| 13.40-14.00 | Vetenskaplig presentation<br>Nya analysmetoder<br>Why do men and women differ in atherosclerotic cardiovascular disease? What we have learnt from proteomics<br>Liam J Ward | Moderator<br>Magnus Svartengren<br>Lisbeth Slunga Järvholm |
| 14.00-15.00 | Riktlinjer för författarskap - en presentation av Codex<br>Inkl diskussion 15 min - Stefan Eriksson | |
| 15.00-15.30 | Kaffe | |
| 15.30-16.10 | Open access - Publiceringslandskapet i förändring<br>Inkl diskussion 10 min - Christer Lagvik | Moderator<br>Ingela Helmfrid<br>Magnus Svartengren |
| 16.10-16.30 | Avslutning | Gun Johansson |

Föreläsare
Byberg Liisa, docent i medicinsk epidemiologi, Uppsala universitet
Eriksson Stefan, docent och lektor i forskningsetik, Uppsala universitet
Folkeson Welch Christopher, programansvarig, Mistra
Jacobsson Thomas, forskningssekreterare, Forte
Hed Ekman Annika, Ergonom, Mynak, Myndigheten för arbetsmiljökunskap
Johansson Gun, ordförande Svenska Läkaresällskapets sektion för arbets- och miljömedicin
Lagvik Christer, Uppsala universitetsbibliotek
Mathiassen Svend Erik, professor i belastningsskadeforskning, Högskolan i Gävle
Selander Jenny, docent, Institutionen för miljömedicin, Karolinska Institutet
Stymne Airey Susanna, chef för AFA Försäkrings FOU-stöd
Svartengren Magnus, professor. Arbets- och miljömedicin, Uppsala
Tondel Martin, docent, Arbets- och miljömedicin, Uppsala

WiFi: KonferensHubben, lösen: Coor2017Q3-twa

ARM · Akademiska sjukhuset · Uppsala universitet · Region Uppsala · Landstinget Dalarna · Region Gävleborg

# Karta från konferens Hubben till middagen kl 19.00 vid Katedralcafeét vid Domkyrkan



# Muntliga presentationer av vetenskapliga arbeten

**Realtidsdata som kvalitetsförbättring av värmevarningssystem**

Christofer Åström[1], Andreas Tornevi[1], Pär Bjelkmar[2], Bertil Forsberg[1]

*1 Umeå Universitet*
*2 Folkhälsomyndigheten*

Bakgrund: I många länder med en längre tids erfarenhet av värmevarningssystem används realtidsdata, exempelvis antalet ambulansuppdrag eller antalet akutbesök senaste dygnet, tillsammans med bedömningar av experter inom hälsoområdet för att avgöra vilken nivå på varning som ska gälla och hur länge varningen ska ligga kvar. Att använda realtidsdata som beskriver aktuellt hälsoläge i varningssystem anses som ett viktigt stöd för att välja rätt åtgärder enligt WHO. Hur allvarliga konsekvenser en värmebölja får för ökad ohälsa kan bero på när den inträffar, exempelvis hur vädret och hälsoläget i befolkningen var innan värmeböljan. Med realtidsdata kan man se om effekterna av en värmebölja verkar vara ”typiska” eller avvikande så att varningsnivån ska modifieras.

Syfte: Denna studie utfördes på uppdrag av Folkhälsomyndigheten för att undersöka möjligheten att använda realtidsdata i form av antalet dagliga telefonkontakter med 1177-Vårdguiden för att kunna utfärda mer relevanta värmevarningar i framtiden.

Metod: Dygnsvisa uppgifter om uppmätt temperatur och antalet dödsfall i sammanlagt 9 län samlades in för åren 1990-2016. Data över det totala antal samtal till 1177 Vårdguiden per dygn samt för 17 specifika kontaktorsaker med potentiell koppling till värmerelaterad ohälsa samlades in för de län och de år dessa data fanns tillgängliga. I regel var det från 2009 och framåt i 7 län. Utifrån de 17 utvalda kontaktorsakerna skapades ett värmestressindex för att verka som en indikator när populationen verkade påverkade av höga temperaturer. Vi modellerade hur hög temperatur ökar antalet dödsfall beroende på om ett högt eller lågt värmestressindex observerats.

Resultat: Vi fann generellt större temperatureffekter på dödligheten vid ett högt värmestressindex. När ett lågt värmestressindex observerats så fann vi inga signifikanta samband mellan temperatur och ökad dödlighet, medan när ett högt index observerats så fann vi signifikanta effekter av dygnstemperaturen på ökad dödlighet i 5 av 7 län, samt att den sammanvägda effektskattningen för de 7 länen fanns vara signifikant.

Slutsats: Den större temperatureffekten på mortalitet i samband med ett högt värmestressindex kan komma att vara en användbar indikator för att kunna vidta rätt åtgärder vid en värmebölja. Informationen kan komma att användas i det konsekvensbaserade varningssystem som SMHI förväntas införa i framtiden.

**Associations between serum levels of perfluoroalkyl substances (PFASs) and serum lipid levels over 10-years in a prospective cohort study**

Linda Dunder[1], Samira Salihovic[2], Jordan Stubleski[3], Anna Kärrman[3], Lars Lind[4], P. Monica Lind[1]

*[1]Department of Medical Sciences, Occupational and Environmental Medicine, Uppsala University (UU), Uppsala, Sweden, [2]Department of Medical Sciences and Science for Life Laboratory, Molecular Epidemiology Unit, UU, Uppsala, Sweden, [3]MTM, School of Science and Technology, Örebro University, Örebro, Sweden, [4]Department of Medical Sciences, Cardiovascular Epidemiology, UU, Uppsala, Sweden*

Introduction: Poly-and perfluoroalkyl substances (PFASs) are a ubiquitous group of chemicals in our environment. PFASs are used as surfactants and water-and oil repellents in a variety of industrial and consumer applications, ranging from fire-fighting foams to pizza boxes. Diet and drinking water are the main exposure routes for PFASs. Several areas of Sweden (including Uppsala) that are geographically close to air force bases, or commercial airports, have drinking water contaminated with PFASs due to fire-fighting foam used during training. The knowledge about possible health effects of the around 3000 different PFASs that are on the market today is scarce.

The aim of this present study was to investigate associations between serum levels of 8 different PFASs and serum levels of total cholesterol, triglycerides, LDL and HDL over 10 years in a large background-level exposed population of men and women included in the Prospective Investigation of the Vasculature in Uppsala Seniors (PIVUS) cohort.

Methods: Serum lipid and PFASs levels were analyzed in a total of 1,016 randomly selected men and women (50% women), aged 70 years and living in Uppsala (2001-2004). Reinvestigations were performed at age 75, (n=826), and at 80 years (n=606). PFASs were analyzed in plasma using isotope-dilution ultra-pressure liquid chromatography coupled to tandem mass spectrometry (UPLC-MS/MS); serum lipid levels were analyzed with traditional methods.

Results: Strong positive associations were observed between 5 out of 8 PFASs investigated and total cholesterol and HDL, 4 out of 8 PFAS were associated with triglycerides and only 1 out of 8 with LDL. The strongest association was observed for PFUnDA where a one unit increase in PFUnDA (ng/ml on a ln-scale) was associated with a 0.29 mmol/l increase in serum total cholesterol ($p$<0.002). In addition, the changes in PFHpA (0.085 [0.022], $p$<0.002), PFOA (0.13 [0.040], $p$<0.002], PFNA (0.15 [0.039], $p$<0.002) and PFDA (0.22 [0.044], $p$<0.002) were also positively associated with serum levels of total cholesterol.

In conclusion, we identified that serum PFAS levels are associated with serum total cholesterol, triglycerides, LDL and HDL mainly in a positive fashion over a 10-year period in the PIVUS-cohort. The present prospective study strengthens previous cross-sectional findings of a possible role of PFASs in human lipid metabolism.

## Vägen framåt vad gäller vibrationsskador - Ett fruktbart samarbete mellan AMM-klinikerna och Arbetsmiljöverket

Catarina Nordander[a], Richard Davidsson[a], Marie Lewné[b], Maria Albin[b]

[a] *Arbets- och miljömedicin Syd*
[b] *Centrum för arbets- och miljömedicin (CAMM)*

Bakgrund: På klinikforum i oktober 2017 träffades representanter från de arbets- och miljömedicinska klinikerna och Arbetsmiljöverket. En samstämmig bild framkom – klinikerna ser ett stort antal vibrationsskadade patienter. De är ofta mitt i sitt yrkesliv och många av dem har nervskador i händerna som är så grava att de får rekommendationen att snarast byta till andra arbetsuppgifter (i praktiken annat yrke). Vid exponeringsutredning framkommer att den pågående exponeringen både för patienterna och deras arbetskamrater ligger på en skadlig nivå. Trots att vi sedan 2005 har regler (baserade på ett EU-direktiv) som innebär att det ska finnas skriftlig riskbedömning av arbetet och att man så snart denna visar att någon exponeras för mer än 2,5 $m/s^2$ A(8) (= 100 vibrationspoäng per dag) ska det finnas en skriftlig åtgärdsplan för hur detta ska undvikas, saknas oftast båda dessa. De anställda har sällan fått den utbildning om riskerna och om företagets hälsofrämjande arbete på området, och lagstadgade medicinska kontroller förekommer långt ifrån alltid. Något behöver göras.

Syfte: Ett initiativ togs för att vi tillsammans skulle utforma en vägkarta för att beskriva vad olika aktörer kan göra för att förbättra situationen.

Metod: Via mailväxling mellan AMM-representanter utarbetades ett förslag som diskuterades på verksamhetschefsmötet i november 2017. Därefter inhämtades synpunkter från AV via mail och telefonmöte. Därefter togs en ny diskussion på Klinikforum i maj 2018.

Resultat: Vi har nu ett dokument där AMM- klinikerna är överens om hur vi kliniker kan arbeta för att minska vibrationsexponeringen och antalet personer som drabbas av skador. Det innefattar bland annat att utbilda och bistå FHV inom respektive region så att de kan hjälpa arbetsgivaren med riskbedömning, åtgärdsplan, utbildning och medicinsk kontroll. Vidare att utreda patienter med misstänkt vibrationsskada och återföra information till arbetsplatsen vid behov, samt i tillämpliga fall anmäla till Arbetsmiljöverket om flera arbetstagare berörs. Dokumentet innehåller också information om vad andra samhällsaktörer kan göra, exempelvis Arbetsmiljöverket, standardiseringskommittéer och företag som hyr ut vibrerande verktyg.

Slutsats:
Genom återkommande och nära samarbete har klinikernas verksamhetschefer kommit överens om en gemensam strategi som har goda förutsättningar att minska antalet vibrationsskador. Detta har dessutom diskuterats med Arbetsmiljöverket som har bidragit med värdefulla synpunkter.

## The reliability and validity of six observational methods for manual and repetitive work

Teresia Nyman[1,2], Peter Palm[1,2], Kristina Eliasson[1,2], Ida-Märta Rhén[3,4], Katarina Kjellberg[3,4], Per Lindberg[5], Mikael Forsman[3,4]

*[1]Department of Medical Sciences, Occupational and Environmental Medicine, Uppsala University, Sweden, [2]Division of Occupational and Environmental Medicine, Uppsala University Hospital, Sweden, [3]IMM Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, [4]Centre for Occupational and Environmental Medicine, Stockholm County Council, Sweden, [5]Centre for Musculoskeletal Research, University of Gävle, Sweden*

Musculoskeletal disorders are still a major concern in working life and can, besides suffering for the individual, cause employers economic consequences due to sick leave and reduced productivity. Risk assessments of physical factors are of importance for identifying harmful work tasks and for prioritizing and designing work place interventions. Risk assessments should be cost effective, valid and reliable, but as concluded by Takala et al. (2010), many methods are insufficiently tested.

The purpose of this project was to evaluate six selected risk assessment methods, concerning their reliability and validity.

The methods were
1. Occupational Repetitive Actions checklist (OCRA)
2. Quick Exposure Checklist (QEC)
3. Strain Index (SI)
4. Assessment of Repetitive Tasks (ART)
5. Hand Arm Risk-assessment Method (HARM)
6. Repetitive work model by the Swedish Work Environment Authority (SWEA)

Ten video-recorded (3-6 minutes) work tasks were included: 2 supermarket work tasks, meat cutting and packing, engine assembly, hairdressing, 2 cleaning tasks and 2 post sorting tasks. For each work task data of work task length, pause schedules, handled weights, physical factors, employees' ratings of force exertion, work demands and control were given in text.

Twelve experienced ergonomists made assessments using the six methods – twice – with a wash-out period of three weeks. Before the first assessment, the ergonomist were trained in each method.

As alternative for predictive validity, consensus assessments were carried out by three experts and their assessments were used as gold standard for concurrent validity of the ergonomists' ratings.
Linearly weighted Kappa, $K_w$, was chosen for inter- and intra-observer reliability and validity[8].

The $K_w$ of the inter-observer reliability for over-all risk in three levels were in OCRA 0.37, QEC 0.54, HARM 0.65, and SWEA 0.28. The $K_w$ for specific body parts were, in QEC, 0.44 (shoulder), 0.49 (back), 0.67 (shoulder), 0.86 (neck), SI 0.47 (hand), ART 0.58 (left side) and 0.65 (right side).

The relatively high reliability of HARM seems to depend on data that were given to the ergonomists in text, for example “work task length”, since for the separate items that had to be determined through observation the $K_w$ were low. For the items repetition, movements and postures the $K_w$ was < 0.3. Throughout the methods, the $K_w$ was generally the lowest for ratings of body postures.

As expected, the intra- observer $K_w$ was somewhat higher than the corresponding inter- observer $K_w$ in all methods, and the validity $K_w$ correlated with the inter-rater $K_w$.

There is a considerable variation only between ergonomists’ assessments of risks levels for MSDs in the observation methods, and it may be time to, to a larger degree, combine observations with validated methods of direct measurements.

**Biomechanical risk factors for surgically treated ulnar nerve entrapment in a cohort of Swedish male construction workers.**

Jennie A. Jackson, PhD[1*], David Olsson, PhD[1], Laura Punnett, ScD[2], Alex Burdorf, PhD[3], Bengt Järvholm, PhD[1], Jens Wahlström, PhD[1]
*1. Department of Public Health and Clinical Medicine, Occupational and Environmental Medicine Unit, Umeå University, Umeå, Sweden. 2. College of Health Sciences, University of Massachusetts Lowell, Lowell, USA. 3. Department of Public Health, Erasmus MC, Rotterdam, The Netherlands.*

Background: The literature on occupational risk factors for ulnar nerve entrapment (UNE), also called cubital tunnel syndrome is sparse.

Objectives: The aim was study the association between occupational biomechanical exposures and UNE.

Methods: The occurrence of UNE was examined prospectively in a cohort of 229 689 Swedish male construction workers who participated in a nation-wide occupational health surveillance program between 1971 and 1996. UNE case status was defined on the basis of a surgical release of ulnar nerve entrapment; case data were obtained from a national out-patient database for a 13 year observation period (2001-2013). Individual risk factors considered were smoking status, BMI and age. Biomechanical exposure estimates were assigned at the occupational group level using a job exposure matrix developed specifically for the study and included 10 ergonomic (force/posture/repetition) and 2 hand-arm vibration exposure parameters determined a priori to be relevant to UNE. Relative risks (RR) for all biomechanical factors were modelled using negative binomial regression analyses and adjusted for age, smoking habits and BMI.

Results: There were 555 cases of surgically treated UNE in the cohort and the average annual incidence was 19.2 cases per 100,000 person-years. Smoking status (ever vs. never smoker RR=1.28, 95% CI=1.07-1.54) and BMI ($\geq$25 kg/m$^2$ vs. < 25 kg/m$^2$ RR=1.60 , 95% CI=1.34-1.91) were associated with increased risk of UNE.

Increased grip force (RR=1.54, 95% CI =1.24-1.92), hand-Arm-vibration (RR=1.35, 95% CI=1.07-1.71) upper extremity load (RR=1.63, 95% CI=1.30-1.92), and increased frequency of hand tool use (RR =1.37, 95% CI=1.09-1.71), elbow flexion and extension (RR=1.36, 95% CI=1.10-1.68), and static work (RR=1.36, 95% CI=1.12-1.65) were also associated with increased risk of UNE.

Discussion and Conclusions: Our findings demonstrate that multiple biomechanical factors were associated with increased risk of UNE. Many of the identified risk factors involved elevated hand grip force (grip force, upper extremity load, and frequency of hand tool use and hand-arm vibration) which may indicate it is a key etiological aspect of UNE.

## Is whole day measurement of arm elevation with accelerometers an option when performing risk assessments at work?

Peter Palm

*Department of Medical Sciences, Occupational and Environmental Medicine, Uppsala University*

Work with elevated arms is one risk factor for neck/shoulder pain (NSP). Ergonomists often assess arm elevation by short visual observations. Such observations may be inaccurate and can only cover short periods of the workday. Accelerometers have been suggested as an alternative to measure arm elevation over full workdays. Unsupported, elevated arms >60˚ for more 10% of the workday has been suggested as a reasonable exposure limit. The objective was to explore if and how accelerometers could be used for risk assessment purpose. To do this, we explored two materials with arm elevation data over several days and related this to the suggested exposure limit.

The aim was to

1) assess how arm elevation differed between work and leisure among occupations with different work demands in the NOMAD material (n=197).

2) assess if there was an association between arm elevation at work and a) NSP and b) self-rated physical demands at work among transportation workers, cleaners and manufacturing workers within the DPHACTO material (n=660).

As arms are more likely to be supported during sitting time, additional analysis was performed without periods of sitting time in the analysis. Periods of sitting were identified from a second accelerometer on the participants thighs.

In NOMAD, the % of time with arms above 60° (%timeAbove60°) during leisure was as high as the suggested exposure limit (10.4%, SD 7.2). None occupation had higher exposure at work than during leisure. However, when periods of sitting were excluded, arm elevation during leisure was lowered to (2.1%, SD 2.5) and eight occupations had significantly larger %timeAbove60° during work than leisure.

In the DPHACTO cohort, transportation workers reached the exposure limit (10.2%, SD 6.5 %timeAbove60°) This was lowered to 4.2%, SD 4.3 when sitting was excluded. There was a weak trend that arm elevation was negatively associated to NSP.

There was a positive association between %timeAbove60° and self-rated physical demands at work when sitting time was excluded from the analysis but not before exclusion.

This shows that a substantial proportion of arm elevation may derive from sitting time. It is likely that the arms mostly are supported during sitting time. If whole day measurements should be used for risk assessment of arm elevation, it is important to know if the captured arm elevation in the data really correspond to potentially harmful arm postures?

**Utvärdering av en intervention för att minska organisatoriska och sociala belastningar inom en kommun i Stockholms län**

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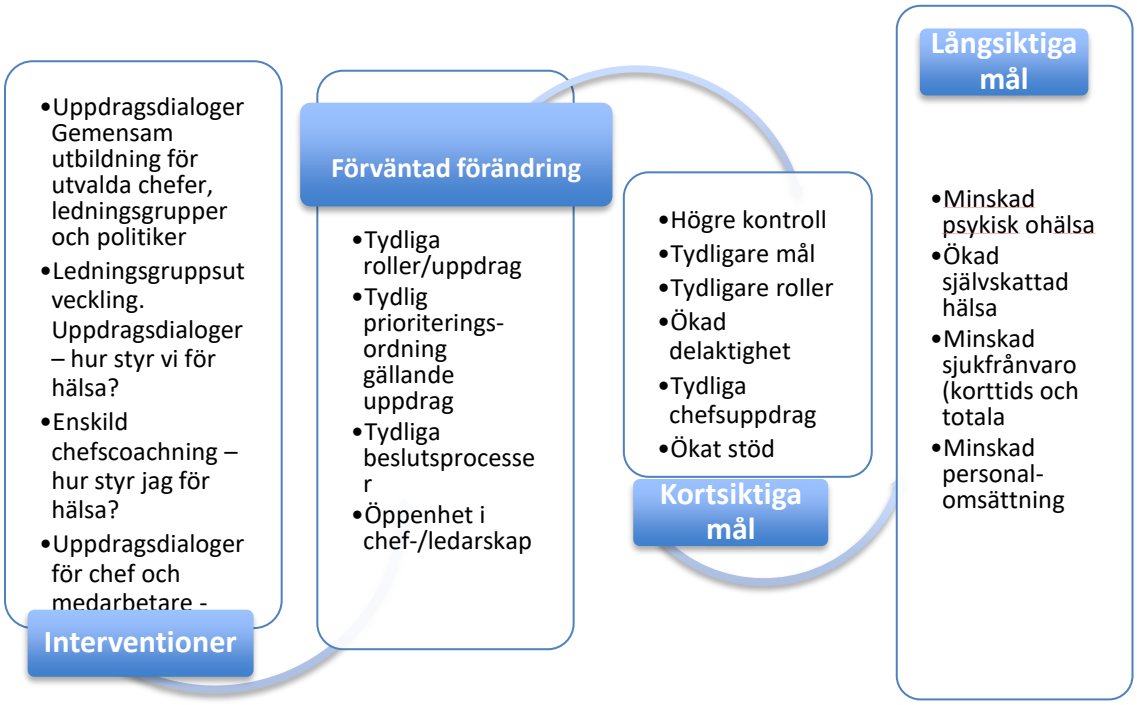
*Bakgrund*

Våren 2016 trädde föreskriften ”Organisatorisk och social arbetsmiljö” (OSA) i kraft, vilken ställer lagkrav på arbetsgivaren att bedöma risker kring arbetsbelastning, arbetstider, och kränkande särbehandling samt vidta nödvändiga åtgärder. En kommun i Stockholms län påbörjade samma år ett projekt för att minska psykisk ohälsa, sjukfrånvaro och personalomsättning bland sina anställda. Projektet bestod bl.a. av s.k. uppdragsdialoger kring det enskilda och det gemensamma åtagandet och drevs inom två förvaltningar i kommunen. Planerade interventioner, förväntade förändringar och mål beskrivs i figuren nedan. Projektet avslutas i sep 2018. Utvärdering av aktiviteter som genomförs på arbetsplatser i relation till OSA ger värdefull kunskap kring hur organisatoriska och sociala arbetsförhållanden kan förbättras.




Syftet med föreliggande studie är att utvärdera projektet genom att studera:

- Om de förväntade kort- och långsiktiga målen uppnåtts (effektutvärdering)
- Om de planerade aktiviteterna inom uppdragsdialoger genomförts som förväntat och hinder och möjligheter för detta (processutvärdering)

*Metod*

**Effektutvärderingen** genomförs med en före- och efter design med kontrollgrupp. För interventionen valdes fyra arbetsgrupper (n=100) i den ena förvaltningen och två (n=60) i den andra. Som kontrollgrupp valdes arbetsgrupper inom respektive förvaltningar, som bedömdes ha liknande verksamheter som interventionsgruppen Både medarbetare och chefer ingår i interventionen. Ingen randomisering har gjorts mellan interventions- och kontrollgrupp. Information hämtas via enkät (t.ex. arbetsförhållande, självskattad psykisk ohälsa) och genom

kommunens register (t.ex. sjukfrånvaro,) och samlas vid baseline, halvtid, projektslut och 6 respektive 12 månader efter att interventionen avslutats.

För **processutvärderingen** används intervjuer och dokumentation gällande närvaro, frekvens på träffar etc. Intervjuerna gjordes fortlöpande under projekttiden med strategiskt utvalda chefer och medarbetare från de två förvaltningarna. Totalt genomfördes ca 40 intervjuer. Intervjuerna hämtar information om t.ex. medarbetarnas syn på hindrande och underlättande faktorer för att genomföra interventionen och villighet och mogenhet för förändringar.

*Resultat*

Vi har påbörjat analysarbete och planerar att presentera preliminära resultat såsom:

- hur interventionens förväntade kort- och långsiktiga mål infriats vid projektslut
- Om projektet genomförts som planerat
- Vilka hindrande och underlättande faktorer som funnits för att genomföra projektet

## Planning and designing flexible office work environments

Linda Rolfö

*Ergonomics unit, KTH*

In recent years, there has been an increase of organizations relocating to activity-based flexible offices (A-FOs) worldwide to support the new ways of working. The A-FO is suggested to decrease facility costs, increase flexibility, and attract external clients, which translates into increased productivity. Moreover it is suggested that A-FOs provide high work environment satisfaction, health and performance by providing work conditions suitable for the workforce's work tasks. Examples of provided work conditions are inter- and intra-team communication, privacy and autonomy. Research is scarce whether the office type achieve the benefits and improve work conditions, satisfaction and performance. There is a wide range of possible influencers of A-FO outcomes, i.e. satisfaction and performance, and the results are inconsistent.

This study explores and specify design process factors, physical workspace factors, house rules, work tasks and office type prior to relocation that contribute to an A-FO work environment with work conditions that support high work environment satisfaction, and performance of A-FO occupiers.

Longitudinal case and cross-sectional studies were conducted at five A-FOs and a mixed method approach was used with questionnaires, interviews, documentation, observations.

The results show that work environment satisfaction and perceived performance can increase after a relocation to an A-FO. For successful office implementations this study encourage a strive towards the combination of having the right internal organizational preconditions, a sound planning process, a physical office solution that supports work and individual preferences, and rules that support work and clarify how to act in the A-FO. Organizational preconditions, such as innovative work tasks, flat hierarchical structures, strong culture and an open-plan office type prior to relocation facilitate implementations of A-FOs. The planning process is suggested to include meaningful objectives for the employees, allocation of time and financial resources, having an organizational focus, employee empowerment, and a methodological approach. The physical office is suggested to have ample desk-sharing ratios, various acoustic settings and corridors separated from workstations. Rules in the A-FO needs to be discussed, for example allowance of occupying the same workstations in open-plan and enclosed areas in consecutive days, and allocations of areas where speaking on the phone, and verbal interaction with colleagues and interruptions are allowed or forbidden. The rules need to be explicitly stated.

In conclusion, A-FOs can be perceived as noisy, create extra work, decrease interaction and create uncertainties in how to act. However, A-FOs that are well-designed can be perceived as inspiring, pleasant, calm, pulsating, exposed and well-ordered.

**Upplevd produktivitet vid övergång från cellkontor till flexkontor**

Maria Öhrn & Lisbeth Slunga Järvholm

*Umeå Universitet*

Bakgrund och syfte: Den tekniska utvecklingen och en växande tjänstesektor, där alltfler arbetar i kontorsmiljö, har på senare år medfört ett växande intresse för flexibla kontorslösningar. Arbete i flexkontor innebär att de anställda inte har någon fast arbetsplats utan väljer arbetsställe utifrån den typ av arbetsuppgift som ska utföras. Det finns få studier som undersökt hur en övergång från cellkontor till flexkontor påverkar de anställdas upplevda produktivitet. Syftet med denna studie är att undersöka vilka faktorer som påverkar upplevd produktivitet vid flytt från cellkontor till flexkontor.

Metod: Analys av enkätdata från AktiKon-projektet, en kontrollerad longitudinell studie av ca 400 tjänstemän i Örnsköldsviks kommun, som under 2015 flyttade till nya kontorsmiljöer; drygt hälften till flexkontor och knappt hälften till nya cellkontor. Mätningar utfördes vid tre tillfällen, 6 mån innan flytt, 6 mån efter flytt samt 18 mån efter flytt. Produktivitet i kontorsmiljöerna mättes med ett frågeinstrument, bestående av totalt 20 frågor, utformat av Brennan 2002.

Resultat: Den upplevda produktiviteten var i genomsnitt lägre hos anställda i flexkontor 18 mån efter flytt jämfört med före flytt och i förhållande till kontrollgruppen som flyttade till cellkontor. Man angav en försämring avseende tillgång på platser för avskildhet och det upplevdes svårare att vara fokuserad och koncentrerad på arbetet samt att man oftare blev distraherad av andras samtal. I en multipel linjär regressionsmodell undersöktes vilka faktorer som hade betydelse för förändrad upplevd produktivitet 18 månader efter flytt. Chefsskap och upplevelse av att ”spontana möten i arbetet var viktiga” var signifikant relaterade till en ökad produktivitet, medan mycket koncentrationskrävande enskilt arbete och besvär av tinnitus, hörselnedsättning eller stress var relaterat till minskad produktivitet i flexkontor.

Slutsats: Resultaten visar på vikten av att utforma flexkontoret utifrån individuella behov och den typ av arbetsuppgifter som ska utföras.

**Development of organizational and psychosocial work factors across industries with different gender composition in Sweden, 2003-2013**

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In Sweden, the development of mental ill-health and sickness absence has been poorer in female-dominated industries compared to others. One possible explanation is the different developments of psychosocial working conditions across industries. Men and women appear to react similarly to the same psychosocial exposures at work, but differences in exposure patterns may prevail. There is to date a lack of studies on the extent to which psychosocial work exposures are associated with the gender segregation on the Swedish labour market at the industry level. This study aims to investigate how organizational and psychosocial work factors have developed over time across industries with different gender composition in Sweden from 2003 to 2013, and to what extent these factors differ between industries.

The present study is based on repeated cross-sectional data from the Swedish Work Environment Survey (SWES). SWES is conducted biennially by Statistics Sweden (SCB) and includes Swedish workers aged 16-64 years. Six waves from 2003 to 2013, comprising a study sample of 45,631 subjects, were analyzed, Industries were categorized according to gender composition and divided into seven categories: 1) Goods and energy production; 2) Machine handling; 3) Manual services; 4) Public administration; 5) Knowledge intensive services; 6) Education; 7) Health and social care.

Proportions of men and women in each industry who were exposed to adverse or positive organizational and psychosocial work factors were calculated for each of the six waves. Logistic regression analyses, adjusted for age, educational level and year of response to SWES were performed on the full sample (all six waves), in order to estimate the odds of being exposed to organizational and psychosocial work factors in each industry using the knowledge intensive service industry as the reference category.

Preliminary results show that in female dominated industries (Education and Health and Social care), many organizational and psychosocial work factors developed poorly over the study period. Higher odds of exposure to advserse or positive organizational and psychosocial work factors were found for several industries when using the industry of knowledge intensive services as the reference category.

This study is one of the first of its kind analyzing the development of organizational and psychosocial work factors, as well as differences in these factors between industries with different gender composition in Sweden.

**An Interdisciplinary Approach to Evaluate the Toxicity of Metal Oxide Nanoparticles in Human Monocytes and Plasma – a Pilot Study**

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Background: The field of nanotechnology has emerged over the last couple of decades and engineered nanoparticles have a broad spectrum of beneficial applications especially in biomedical and material sciences. However, the increased use of nanoparticles entails challenges from a safety perspective since comparatively little is known about consequences of human exposure. To properly address these issues, an interdisciplinary approach is required. First of all, particle characterization is a pre-requisite for reliable interpretations of possible biological responses. Secondly, studies of protein coronas may reveal the missing link between nanoparticle exposure and subsequent biological responses.

Aim: The overall aim was to investigate if an interdisciplinary approach was suitable to examine characterized nanoparticles and their protein coronas in relation to exposure-related biological responses.

Methods: Initially, nanoparticles of cobalt, iron and cerium/gadolinium were characterized by dynamic light scattering and were further used in the protein corona study. Protein coronas were identified utilizing two-dimensional gel electrophoresis and matrix-assisted laser desorption/ionization time-of-flight mass spectrometry. Protein identities were verified through nanoflow liquid chromatography coupled to tandem mass spectrometry and biological effects of the formed coronas were evaluated through pathway analysis. During in vitro assessment of immunogenicity, flow cytometry was applied to study monocyte viability, while cytokine release was studied using a multiplex immunoassay. Furthermore, a new application for *in silico* major histocompatibility complex class II epitope screening were proposed to examine immunogenicity of endogenous proteins following hypothetical phagocytosis due to nanoparticle binding.

Results: Several nanoparticle-binding proteins were identified and pathway analysis indicated that these proteins mainly are involved in immunological and inflammatory processes. In vitro immunogenicity studies further revealed nanoparticle cytotoxicity as well as increased levels of proinflammatory cytokines. Furthermore, nanoparticle-binding endogenous proteins were found to have stretches along the sequence with high affinity to common MHC class II alleles.

Conclusion
The present study provides a possible framework for assessment of nanoparticle toxicity.

## Quality and learning aspects of the first 9000 spirometries of the LifeGene study

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Spirometry requires the patient to cooperate and do the maneuver 'right' for reliable results. Algorithms to assess test quality as well as educational recommendations for personnel are defined in guidelines. We compared the quality of forced spirometry tests using spirometry systems with different modes of feedback. Tests were in both cases performed by spirometry technicians with little or no previous experience of spirometry. The spirometry technicians received general on-screen feedback based on ATS/ERS guidelines, such as 'exhale faster' and 'exhale longer'. The two systems in addition used a quality grading system in descending scale from 1 to 5. Comparison was made between the two systems in which the quality grading was presented simultaneously on-screen in one, and in the other system printed on the report after the testing were completed. Two parts of the same population-based study (LifeGene), the pilot (LG1) and the first part (LG2) of the subsequent study were compared retrospectively. Approved examination quality according to the ATS / ERS standards is equivalent to Grade 1 or 2.

Results showed that in LG1 (on-screen grading) approved examination quality was achieved for 88% of the 10 first subjects for each spirometry technician compared to 70% in LG2 (printed grading afterwards). The corresponding values after 40 subjects was 94 % in LG1, compared to 73% in LG2, and after the first ten subjects there was no apparent quality improvement in either LG1 or LG2. The quality for LG1 is among the highest reported in the literature even though the spirometry technicians were relatively inexperienced.

We conclude that on-screen grading in addition to general technical quality feedback is powerful in enhancing the spirometry test session quality.

## Levels of horse allergen Equ c 4 in dander and saliva from ten horse breeds

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Background: Horses have been recognized as an important source of allergens, but knowledge is lacking about the components of horse allergens. The horse (Equus caballus) allergens that have been identified are Equ c 1-4. Equ c 4 seems to be an important allergen with an IgE binding frequency of 77% in horse-sensitized individuals.

Objectives: The aim of this study was to investigate levels of horse allergen Equ c 4 in dander, saliva and urine from ten horse breeds.
Method: The study population included 252 horses from ten breeds. Horse dander, saliva and urine were collected. The levels of horse allergen Equ c 4 were quantified using a two-site sandwich ELISA (mAb 103 and 14G4). Levels of allergen were expressed as Equ c 4 U/µg protein.

Results: The horse allergen Equ c 4 was present in dander and saliva samples from all horse breeds included in the study, with high within-breed- and inter-breed variations. Equ c 4 was also found in 19/21 urine samples. Adjusted for age, sex and changes over time, no differences between breeds could be seen in dander while in saliva the North Swedish horse showed lower levels of Equ c 4 protein than any other breed. The levels of Equ c 4 protein, in dander and saliva, were significantly higher in the samples from stallions, compared to mares and geldings, independent of breed and in samples taken both in 2013 and 2014.

Conclusions & Clinical Relevance: The results show a high variability in allergen levels of Equ c 4 in dander and saliva between individuals both within and between breeds. We found significantly higher levels in stallions compared to mares and geldings, independent of breed. Our results suggest that none of the horse breeds studied here can be recommended for individuals allergic to Equ c 4.

**Association between occupational exposures and gestational hypertension, preeclampsia, and gestational diabetes in Sweden, 1994-2012**

Claudia Lissåker[1], Filip Norlén[1], Per Gustavsson[1, 2], Pernilla Wiebert[1, 2], Maria Albin[1, 2, 3], Magnus Westgren [4], Lars Rylander[3], Jenny Selander[1]

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Background: Some studies have shown that exposure to air pollution at the residential level is associated with an increased risk of hypertension, preeclampsia and diabetes. However, to our knowledge, no studies have been conducted on airborne occupational exposures during pregnancy and maternal morbidity.

Purpose: To identify whether occupational exposures to dust, gases, fumes, and particles are associated with gestational hypertension, preeclampsia, or gestational diabetes.

Methods: We utilized a nationwide cohort consisting of all working pregnant women in Sweden between 1994 and 2012. Only singleton pregnancies were included in this study. Data on the outcomes (gestational hypertension, preeclampsia, or gestational diabetes) came from the Swedish medical birth register, which also included occupation and employment status reported at week 10 of the pregnancy. Occupations were matched with the Swedish job exposure matrix to obtain information on exposure to various inorganic, organic, and combustion dust, gases, fumes, and particles. Exposures were divided into no exposure, low (<median) or high (≥median). Information on potential confounders were obtained from the longitudinal integration database for health insurance and labour market, Swedish Social Insurance Agency, and medical birth registers.

Results: After excluding those with missing values, 915,712 mother-child pairs were included in this study. Of these, 8881 had gestational hypertension, 27,580 had preeclampsia, and 7078 had gestational diabetes. After adjustment for age, smoking, education, marital status, country of birth, parity, and noise, high exposure to organic and inorganic pollutants was associated with an increased risk of all three studied outcomes among 915,712 pregnant women. However, it was only statistically significant for gestational diabetes (OR: 1.16, 95% CI: 1.03, 1.30). A subgroup analysis of first-time pregnant women with full-time employment showed that only high exposure to inorganic pollutants remained significantly associated with an increased risk of gestational diabetes. No increase in risk was observed for women working in low exposures.

Conclusion: The preliminary results of this exploratory study indicate that inorganic and organic exposures may be associated with an increased risk for gestational diabetes. However, this study is ongoing and further analyses are currently underway.

**Procurement and implementation processes for Occupational Health Services in Sweden**

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Background: Employers are required to consult expertise whenever needed to ensure a safe work environment. Providers of Occupational Health Services (OHS) could be such experts, but are more commonly used to provide health-related support to individuals, not to support preventive Occupational Health and Safety Management (OHSM) or other group-focused interventions. This study investigates what role the processes and implementation of contracts with OHS providers play.

Objective: To investigate how contracts with OHS-providers in Sweden are established and implemented.

Methods: 17 OHS contracts were reviewed and in 7 organizations follow-up interviews were conducted with Human Resource (HR) managers, management, safety representatives and OHS professionals.

Results: Contracts with OHS providers were mainly drawn up by HR departments. The contracts were not integrated with the companies' occupational health and safety management. Managers lacked knowledge on how to use services from their OHS provider. Terms and conditions of contracts were found to be irrelevant to what services that were actually utilized.

Conclusion: The procurement and implementation process promotes reactive rather than preventive interventions. Employers should 1) include managers and safety representatives in procurement- and implementation processes 2) define relevant and measurable goals regarding the collaboration and 3) evaluate collaboration by organizing regularly meetings with the OHS-provider.

**Hur påverkar arbetsmarknadsanknytning hälsa bland arbets-, flykting-, och anhörigmigranter? En longitudinell studie i ett varierande invandringspanorama med en svenskfödd referenspopulation.**

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Bakgrund: Arbete kan ha både positiva och negativa hälsoeffekter och en hållbar integration av utrikes födda kräver inte bara arbetslivsanknytning, utan också rimliga arbetsvillkor och god hälsa. Trots att närmare var femte sysselsatt på den svenska arbetsmarknaden är född utomlands, finns mycket lite kunskap om hur arbetet påverkar hälsan bland dessa. Såväl internationella som svenska studier visar att migranter uppvisar lägre sysselsättningsgrad, högre arbetslöshet, samt befinner sig i arbeten med sämre arbetsmiljö och arbetsvillkor än den infödda befolkningen. Därutöver är migranter i högre grad överkvalificerade i förhållande till sina arbetsuppgifter, vilket har uppmärksammats som en riskfaktor för ohälsa. Studier tenderar att påvisa sämre hälsa bland migranter jämfört med den infödda befolkningen. Resultaten är dock motstridiga och en orsak kan vara den stora heterogeniteten bland migranter. I vilken grad ojämlikhet i hälsa förklaras av arbete är ytterst bristfälligt studerat. Mot denna bakgrund finns ett behov av att studera sambanden mellan arbete och hälsa, samt hur dessa skiljer sig mellan olika grupper av migranter.

Syfte: Syftet med studien är att undersöka arbetets påverkan på hälsa bland utrikesfödda i Sverige. Detta görs genom fyra delstudier med följande frågeställningar:
1. Vilka långsiktiga hälsoeffekter kan kopplas till arbetsmarknadsanknytning?
2. Vad innebär tidig sysselsättning (första fem åren) för senare sysselsättning och hälsostatus?
3. Hur påverkar initial mismatch mellan utbildning och yrke den senare arbetslivs- och hälsoutvecklingen?
4. Hur påverkar tidig sjuklighet senare arbetsmarknadsanknytning?

Metod: Studien är en longitudinell registerstudie i en nationell kohort av utrikesfödda som kommit till Sverige under perioden 1991-2016 och som var i åldrarna 18-59 år när de kom till Sverige (n=1 251 827). Dessa jämförs med en referensgrupp av svenskfödda individer i motsvarande åldrar (n=5 945 930). Utrikes födda differentieras utifrån ursprungsregion, samt grund för bosättning (arbets-, flykting- respektive anhörigmigranter). Individuella data om demografiska och socioekonomiska faktorer hämtas ur SCBs befolkningsdatabaser, och kopplas till Socialstyrelsen/EPCs diagnoser ur patientregistret (slutenvård) och öppenvårdsregistret, samt dödsfall ur dödsorsaksregistret via ett avidentifierat, personligt löpnummer. Diagnoserna omfattar immunologiska-, hjärt- och kärl-, psykiska-, muskuloskeletala-, samt lungsjukdomar. Data analyseras med hjälp av Cox regression, och justeras för relevanta socioekonomiska variabler. Studien har godkänd etikprövning och kommer att påbörjas under 2018.

**Health economic assessment of a scenario of increased bicycling – comparing costs from the health care sector perspective**

Hedi Katre Kriit, Lars Lindholm, Bertil Forsberg, Johan Sommar

Objectives: To conduct a cost-effectiveness analysis by comparing planned investment costs in bicycle infrastructure with expected changes in health care costs as a result of a proportional increase of bicyclists. A secondary aim was to perform an economic assessment including expected changes in mortality change based on the statistical value of life

Design: Planned infrastructure investment costs were obtained from the Stockholm Traffic Planning Office. The impact on disease incidence was estimated based on changes in physical activity, accident risk and air pollution exposure within the general population, among new and current bicyclists. Based on disease specific lifetime costs the estimated expected reduction in health care costs was calculated. The assessment was conducted according to CHEERS checklist.

Scenario: Based on population register data on home and work addresses within Stockholm County, together with empirical data on gender and age specific bicycle speed among current commuters in the same population, we identified those individuals that have the physical capacity to commute to their workplace within 30 minutes, but that currently drive a car to work.

Setting: The population within Stockholm County consisted of N inhabitants, out of which n were current car commuters. In the scenario of increased bicycling 111,487 additional commuters were estimated to have the physical capacity to bicycle to their workplace within 30 minutes.

Main outcome measure: Firstly, a cost-effectiveness ratio was estimated adopting a health care perspective and secondly, considering mortality, the return on investment was estimated using the value of statistical life.

Results: Investment in physical infrastructure aiming to increase the number of bicyclists within Stockholm County was estimated to be cost-effective. The expected net benefits from the investment was estimated to correspond to 3.5% of the 2017 health care budget in Stockholm County, and 2.1% after discounting. The cost-effectiveness ratio resulted in a surplus of 50,098€/DALY. Estimating the change in mortality, using the value of a statistical life, the return was estimated to be 11€ per euro invested.

Conclusion: Investing in urban infrastructure to increase bicycling is cost-effective from a health care sector perspective.

**Why do men and women differ in atherosclerotic cardiovascular disease? – What we have learnt from proteomics.**

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Atherosclerotic-cardiovascular diseases (ACVD) are the leading causes of morbidity and mortality globally. There are clear sex differences in the prevalence and development of atherosclerosis with women developing ACVD much later in life than men, and progressing rapidly within the 10 years after menopause. Our recent study suggests that men develop more vulnerable atherosclerotic plaques than women (Stroke, 2018). Revealing the proteomic differences, and any influential factors, associated with these sex differences is vital to help understand molecular mechanisms of sex differences in ACVD, which has been largely neglected in previous studies on atherogenesis.

In our series studies carotid atherosclerotic plaques from 26 patients, equal sex distribution, have been used for proteomic analysis. Due to the large degree of heterogeneity present in atherosclerotic tissue biopsies were taken from distinct regions within the plaques, including: internal control, fatty streak, plaque shoulder, plaque centre, and fibrous cap. Protein extracts from each biopsy were isolated and mass spectrometry analysis was used to identify and quantify protein abundances.

Our first investigation, including the analysis of all 5 plaque regions, resulted in distinct proteomic profiles being found between plaque regions and a number of sex-specific alterations identified, including the dimorphic expression of ferritin light chain across all regions between the sexes (Sci. Reports, 2016). Secondly, further investigation of ferritin, and other iron-related proteins, revealed that men have greater levels of iron storage and metabolism compared to women, which was associated with the development of more vulnerable atherosclerotic plaques (Stroke, 2018). Thirdly, in-depth multivariate proteomic analysis, using 3 plaque regions, revealed sex differences in 16 functional groups of proteins. Men were found to have greater levels of inflammatory response proteins~~,~~ and in women greater levels of blood coagulation and transport proteins were present (Manuscript).

In conclusion, the carotid atherosclerotic proteome from men has a higher abundance of proteins that may contribute to plaque vulnerability, whereas the proteome from women appears to have a greater abundance of proteins that may stabilise the plaque. However, candidate proteins identified require further functional studies to access causal/effect relations. These findings help to understand sex differences ACVD.

# Posterpresentationer av vetenskapliga arbeten

**Reasons to stay at the same workplace- Swedish specialist nurses in perioperative settings**

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Background: Shortage of nurse anaesthetists and operating room nurses in perioperative settings with high staff turnover is a well-known and global issue. However, there are still many nurse specialists that choose to stay in the same workplace for five years or more.

Aim: To study the reasons why specialist nurses within perioperative context chose to stay in the same workplace for five years or more.

Methods: The study had a qualitative design. Fifteen nurse specialists (two men and 13 women aged 43 to 63 years) from four Swedish hospitals participated in the study. Data were analysed with Systematic Text Condensation according to Malterud.

Results: Three themes were identified. A. A feeling of homelikness with a feeling of having equal value and good spirits between colleagues representing stability in organization, B. Continuous professional development. C. A head nurse with caritative leadership skills.

Conclusions: A stable and non-hierarchical organization with a head nurse with caritative leadership skills, represents a welcoming working environment. Specialist nurses have opportunities for professional development and they choose to stay and contribute to organizational development.

**Reasons and the process of leaving one's workplace. Swedish specialist nurses in perioperative settings**

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Background: Lack of specialist nurses in operating theatres is a serious problem in Sweden.

Objective: This study aimed to describe reasons why nurses in operating theatres chose to leave their workplaces and to study the process from the thought to the decision.

Method: Twenty nurse anaesthetista and operating room (OR) nurses from seven university- and county hospitals in Sweden participated in the study. Data were analyzed by Systematic Text Condensation (STC).

Results: Four themes described reasons why specialist nurses quitted their jobs: A- the head nurses' dismissive attitude and betrayal, and that one did not feel needed; B- inhumane working conditions lead to the negative health effects among the nurses; C- the specialist nurses did not feel free to decide about their life, and they described that their family life was more important than work; and, D- colleagues' diminishing behavior.

Conclusion: The closest manager plays an important role in employee satisfaction at work. Creating a friendly, non-violent workplace, may give the opportunity for head nurses to take actions before it is too late and before the specialist nurses' process of leaving their job has started.

## The job demand-control-support model applied in the operation theater

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Background: Healthcare involves more risks factors than most other areas of work, including, threats and violence, shift-work, ergonomic strain, infectious diseases, radiation from X-ray and radionuclides, anesthetic gases, cytostatics, and other chemical exposures. Many of these risks have been controlled, but instead work-related stress is a growing problem not affecting only the health and well-being of employees, but also the productivity of organizations. The job demand-control-social support model (JDCS) has been widely used to characterize working conditions since it was introduced in 1979.

Aim: To illustrate different occupations and personal factors of importance for stress at work.

Methods: Questionnaire data were collected from all personnel in the operating theaters of seven Swedish hospitals (n=1405, with a response rate of 68 %). The questionnaire contained questions on personal factors, job strain, social support, workability, well-being, zest for work and thoughts about leaving their position. Ordinal scale regression was used for analyses.

Results: A majority reported moderate to high zest for work (76%). A minority (30%) had sometimes thought for at least one month during the last year of leaving their position. Lower social support scores and high demand scores together with low control (high-strain) scores were related to lower well-being, lower zest for work and more thoughts about leaving the position. Anesthetists scored in the low-strain field, nurse anesthetists and assistant nurses in the passive field, and operating nurses in the active field, in comparison to all subjects.

Conclusion: Both lower social support and high-strain were related to lower well-being and negative thoughts about the position. There was not much difference in social support scores between different occupational groups in the operating theater. No occupation scored on average in the high-strain field.

**Buller och kall miljö bland byggarbetare ökar risken för mortalitet i hjärtinfarkt och stroke**

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Kunskapsöversikter visar på ett möjligt samband mellan buller i arbete och risken för hjärt-kärlsjukdom. Studier visar på att kallt klimat kan öka risken för mortalitet i kardiovaskulära sjukdomar men få studier fokuserar på kyla arbete. Det finns en möjlig kombinerad effekt av buller och kallt arbete då båda exponeringarna påverkar det kardiovaskulära systemet.

Syftet med studien var att studera om höga bullernivåer och att arbeta i kalla miljöer ökar risken för mortalitet i hjärtinfarkt och stroke samt även undersöka om exponeringarna ger en kombinerad effekt.

Studien baseras på byggarbetare som deltog i hälsoundersökningar var 2-5 år, mellan 1971 fram till 1993. I kohorten finns information om yrkestitel, ålder, vikt, längd, rökvanor och blodtryck. Totalt deltog 389 132 arbetare i hälsokontrollen. En jobb exponeringsmatris skapades av bullermätningarna 1971-1973 där bullernivån kategoriserad i tre nivåer för varje yrkesgrupp (<75dB(A) referensnivå, 75-85 dB(A), > 85 dB(A). För att undersöka arbete i kallt klimat så delades alla deltagare in i tre regioner efter var deras första hälsoundersöknings genomfördes (Norrland, Götaland och Svealand). Dödsfallsregistret användes för att bestämma vilka som dött av hjärtinfarkt eller stroke. Negativ binomial regression användes för att analysera om det fanns ett samband mellan buller och kallt arbete och mortalitet i hjärtinfarkt eller stroke bland de med normalt blodtryck.

Av de arbetare som hade normalt blodtryck vid första undersökningstillfället dog 6218 av hjärtinfarkt och 1806 av stroke. Femton procent av arbetarna kom från Norrland och 46% från Svealand (46%). Elva procent av arbetarna var utsatta för ebullernivåer över 85 dB(A), 65% för bullernivåer mellan 76-85 dB(A) och 14% för nivåer under 75 dB(A). De flesta (65%) hade normalt BMI (18,5-25 kg/m$^2$) men många rökte eller tidigare rökt (160 000).

För de arbetare med högst bullerbelastning var den relativa risken för mortalitet i hjärtinfarkt 1,13 (95% KI 1.03-1,23) och för stroke RR 1,19 (95% KI 1,03-1,38) efter justering för ålder, BMI, rökvanor samt region. För de arbetare som bodde i Norrland var den relativa risken för mortalitet i hjärtinfarkt 1,10 (95% CI 1,01-1,20) och för stroke 1,09 (95% KI 0,94-1,25).

Det fanns en kombinerad effekt av bullerexponering och att arbeta i Norrland på risken för att dö i hjärtinfarkt ($p$ = 0.016) men inte för stroke ($p$ = 0.30).

Arbetare som utsätts för höga bullernivåer har högre risk för mortalitet i hjärtinfarkt och stroke. De som arbetar och bor i kallare klimat har högre risk för mortalitet i hjärtinfarkt men inte stroke.

**SWEJEM - en nationell multidimensionell jobb-exponeringsmatris för svenska förhållanden**

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I Sverige har vi goda möjligheter att bedriva epidemiologisk forskning tack vare vår långa historia av insamling av data på populationsnivå, som har gett oss nationella register av hög kvalitet. Vid studier av sjuklighet kopplat till arbetet krävs också att det finns exponeringsdata av hög kvalitet.

Vi utvecklar nu en multidimensionell jobb-exponeringsmatris, SWEJEM, för exponeringsbedömning i stora populationer där flera viktiga exponeringar på den svenska arbetsmarknaden kan studeras samtidigt.

Jobb-exponeringsmatrisen har flera dimensioner och gäller för samtliga yrken på den svenska arbetsmarknaden. Exponeringsuppgifter finns angivet för flera yrkeskodsystem, från Folk- och bostadsräkningen på 1980-talet fram till dagens moderna yrkeskoder enligt SSYK12, över en tidsperiod från 1950-talet fram till idag. Yrkesexponeringarna i matrisen inkluderar kemiska ämnen, buller, vibrationer, värme/kyla, fysiska (biomekanisk och cirkulatorisk belastning) och psykosociala faktorer samt prekära anställningsförhållanden. Exponeringen är bedömd kvantitativt (t ex procent, mg/m$^3$) eller semikvantitativt (t ex hög-låg nivå). Informationen till SWEJEM hämtas från flera olika källor. Kemisk exponering kommer ursprungligen från en finsk jobb-exponeringsmatris (FINJEM) baserad på mätdata, där en anpassning görs till svenska förhållanden. Buller i arbetsmiljön bygger på ljudnivåmätningar utförda på svenska arbetsplatser. Fysisk och psykosocial exponering, samt exponering för värme och kyla, är baserat på enkätsvar från nationella arbetsmiljöundersökningar. Information om vibrationsexponering hämtas från en mätdatabas. Prekära anställningar baseras på en operationalisering av begreppet med variabler från LISA-registret. Matrisen beräknas vara färdigställd 2019 och kommer att användas för att studera utfall som sjuklighet och dödlighet i olika sjukdomar kopplat till exponeringar i arbetet samt för att studera förändring av exponeringar över tid.

Vi välkomnar samarbeten kring att använda SWEJEM som är tänkt som en nationell resurs för epidemiologisk forskning.

**Occupational exposure to organic particles during pregnancy and birth outcome – a nationwide cohort study in Sweden**

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Background: Few studies have assessed the association between occupational exposure to particles during pregnancy and birth outcomes.

Objective: The aim was to investigate if occupational exposure to organic particles during pregnancy was related to negative birth outcomes.

Methods: The cohort study consisted of all occupationally active mothers in Sweden and their children from single births during 1994 to the end of 2012 (995,843 observations). From registers as the Medical birth register the information about birth outcomes, low birth weight, preterm birth and small for gestational age were collected together with information on absence from work, education, occupation, age, nationality, and smoking habits. To assess the exposure to organic particles (mg/m3), a job exposure matrix was used.

Results: The infants of mothers that were working full time (with less than 50 days (median) of absence) and had the highest exposure to organic particles during pregnancy, had an increased risk of being small for gestational age (OR = 1.22; 95% CI: 1.07–1.38), low birth weight (OR = 1.19; 95% CI: 1.07–1.32), and preterm birth (OR = 1.17; 95% CI: 1.08–1.27) compared to the unexposed. Subgroup analyses showed that the risk was highest in association with exposure to oil mist, paper dust, cooking fumes, and a group of other organic dust.

Conclusions: The results indicate that some organic particles might be harmful to the fetus of women occupationally exposed during pregnancy; more research is needed to confirm the findings.

## Cancerförekomst och exponering för tungmetaller i glasbruksområden

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Bakgrund: Glasriket i Småland är ett känt besöksmål för turister med en omfattande glasindustri sedan 1700-talet. Myndigheterna har upptäckt att marken kring glasbruken var starkt förorenad av arsenik, kadmium, bly och antimon. Enligt muntliga uppgifter från boende i området och myndigheter har en del glasavfall använts till utfyllnad vid vägbyggen, parker och bostadsområden.

En del av metallerna blir kvar i markens ytskikt medan andra lakas ut till vattendrag och sjöar. Livsmedel som fisk, bär, grönsaker, svamp, dricksvatten m.m. från dessa områden kan innehålla förhöjda halter av metaller och andra föroreningar. Konsumtion av lokala livsmedel under lång tid kan medföra hög kroppsbelastning av toxiska ämnen. Exponering för vissa metaller kan öka risken för cancer, ha neurotoxiska och hormonstörande effekter samt påverka skelett och njurar. Tidigare registerstudie området har påvisat ökad risk för totalcancer, cancer i mag-tarm-kanalen, pancreas, prostata och i bröst jämfört med Kalmar län och med Sverige.

Syfte: Syftet med studien var att kartlägga metallexponering och cancerförekomsten hos boende i glasbruksområden i relation till konsumtion av lokal föda.

Metod: Studiepersonerna (2200 ind.) rekryterades från en tidigare registerstudie. Efter inklusionskrav på minst fem års boende i studieområdet och med en latenstid på 10 år före cancerdiagnos ingick 1846 individer i studien. Dessa besvarade en enkät med frågor om livsstil, rökning, boende, yrke, sjukdom, kostfrågor etc. Ett urval (660 ind.) av studiepersonerna ingick i en exponeringsstudie och har också lämnat blod- och urinprover. Vid utvärdering av data har multipel regression, principalkomponentanalys (NIPALS//PCA) och main effect ANOVA använts.

Resultat: Hög konsumtion av lokalt fångad fisk var signifikant förenat med ökad risk för totalcancer (OR=2,69; CI=1,36-5,32) och prostatacancer (OR=5,52; CI=1,59-19.8). Hög konsumtion av lokalproducerat kött som kyckling, lamm och viltkött var signifikant förenat med mag-tarm cancer (OR=4,06; CI=1,17-14,1). Hög konsumtion av lokalt odlade rotfrukter, bladgrönsaker, övriga grönsaker, lokalproducerat kött som kyckling, lamm och viltkött, och lokalfångad fisk hade signifikant högre kadmium- och blyhalter i blod och urin än låg- och mellankonsumenter. Rökning och tidigare arbete inom glasbruks- och metallindustrin bidrog till högre metallhalter i blod och urin.

Slutsats: Boende i Glasriket har inte högre metallerhalter i blod och urin än andra grupper av befolkningen. Däremot har högkonsumenter av lokala livsmedel högre metallhalter i blod och urin än de som äter lite av dessa livsmedel. Även om det finns signifikanta riskökningar för vissa cancerformer vid hög konsumtion av lokala livsmedel, går det inte att fastställa om detta är orsakssamband.

## Occupational metal exposure during additive manufacturing

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Background: Three-dimensional printing, also known as Additive Manufacturing (AM), is a new promising manufacturing method that enables the creation of complex structures from digital models. However, the knowledge of airborne contaminant exposure in relation to health effects is limited. In the present study, measurements of airborne metal particles in the range 10nm-10 µm were performed along with investigations of clinical exposure markers in AM operators, welders and office staff.

Aims: The main aim is to clarify the following questions;
-What particle masses, numbers, sizes and origins could be found in a metal printing AM - facility?
-Are there particularly risky work tasks?
-Is there a correlation between airborne metal particles and metal levels in the urine of operators?

Materials and Methods: The AM technique used is selective laser melting (SLM). AM machines in the workshop include Eosint M280, EOS M290 and EOS M400-4 and the metal powder is Hastelloy X. Gravimetric analyses were performed by pumping air over filters followed by ICP-MS metal analysis in accordance with Swedish standards (SS-EN 689). Two different particle counting instruments were used; Lighthouse 3016-IAQ for the measurement of fine-ultrafine particles 300nm-10µm and Nanotracer for the detection of ultrafine particles-nanoparticles 10nm-300nm. Human exposure markers (urine metals) were assessed using ICP-MS.

Results: Gravimetric analyses were within the OEL, with the exception of a personal exposure measurement for cobalt in inhalable dust in the AM-facility. Personal exposure of cobalt was higher in AM-operators compared to welders. There were significantly higher levels of manganese in the welding facilities compared to AM-facilities. Welding generates high numbers of particles < 300nm, while in AM facilities particles from 10nm-65µm could be found. During AM different work tasks generate different particle sizes. Metal analyses in urine show exposure risks in both welders and AM operators.

Conclusion: Gravimetric analyses do not reflect the exposure to fine or ultrafine particles. The broad range in particle sizes in AM facilities demands reflection when choosing ventilation. Powder handling has to be limited.Urine metal analysis is a useful tool estimating human exposure.

**Small particles in the indoor air may stimulate the inflammatory system**

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Background: In the developed part of the world, we are spending as much as 65% of the time in our homes. The indoor air contains small particles from different sources. There is a growing concern for health effects of small particles. In spite of that, only few investigations are dealing with the effects in humans of well-characterized particle exposure. In this work, we developed a method for imitating levels for particles relevant for four common indoor sources in an exposure chamber. The objective of this study was to clarify if exposure to particles derived from candle burning, terpene-ozone reactions, hamburger frying and zeolites from detergent in exposure levels relevant for modern dwellings caused acute effect in the eyes and in the airways of humans.

Method: 20 women were exposed for 3 hours in an exposure chamber to particles from candlelight smoke, terpene/ozone reaction products and filtered air (FA) respectively, in a double-blind manner. Another group consisting of 10 men and 12 women was exposed in the same manner to zeolites from detergents, frying fumes and FA. Symptoms from the eyes and airways, nasal and lung functions were registered before and after exposure. Blood and nasal lavage (NL) were sampled before, immediately after and the morning after exposure for analysis of inflammatory markers Interleukin 6 (IL-6) and Interleukin 8 (IL-8). Exhaled breath condensate (EBC) for analysis of Leukotriene B4 (LT-B4) was sampled before and after exposure.

Results: Fumes from frying hamburgers increased symptoms from eyes and NL-IL-8 decreased the day after. Candlelight fumes decreased S-IL-6 after exposure. At exposure to terpene/ozone reaction products nasal symptoms decreased ($p=0.063$), rhinometry improved and S-IL-6 decreased the day after. Zeolite exposure decreased the nasal function, and S-IL-8 decreased after exposure.

Conclusion: Although only small adverse effects on symptoms were registered changes in inflammatory markers may indicate effects on the inflammatory system at exposure levels relevant for indoor air.