

Kitchen Particulate Analysis, and Lung Function of Primary Cooks Using Wood or LPG Fuel in Tamil Nadu, India

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Introduction: Exposure to biomass fuels, used for cooking worldwide, may be the largest risk factor for developing COPD. We sought to thoroughly characterize particulate matter (PM) and other aerosols primary cooks are exposed to in their kitchens using two fuel-types (liquified petroleum gas and wood biomass) in Thanjavur, India, as well as assess cooks' lung function. **Methods:** We measured real-time and gravimetric daily PM $\leq 2.5 \mu\text{m}$ (PM_{2.5}) concentrations using paired Particle and Temperature Sensor (PATS+) and flow-calibrated Ultrasonic Personal Aerosol Sampler (UPAS) devices in 34 primary cooks' kitchens in March 2019. Filter light absorbance (F_{abs}) was assessed using a photo-optical method. We vacuumed settled (7 days) particles ($\leq 40 \mu\text{m}$) from a rug deployed in the cooking area into a filter (DUSTREAM®), and quantified colony forming units (CFU) of the particles, as well as metal content using X-Ray Fluorescence. Endotoxin (EU) concentrations were measured using electrostatic dust collectors (EDC). Lung function was assessed pre- and post-bronchodilation. **Results:** Participants' self-reported age, years as primary cook, and within-home animal entry was similar; however, those within the biomass group worked outside the home more ($p < 0.01$) and were less likely to use a secondary stove ($p = 0.21$). The PATS+ predicted ($r^2 = 0.74$) daily UPAS PM_{2.5} ($n = 32$), and mean concentrations ranged from 18-732 $\mu\text{g}/\text{m}^3$. Biomass kitchens had greater PM_{2.5} concentrations than LPG kitchens ($p < 0.05$). F_{abs} correlated with UPAS PM_{2.5} measurements ($r^2 = 0.71$, $n = 29$). We collected an average of 2 grams of PM₄₀ (range=0.2-6.2 g, SD=1.7, $n = 27$), with no difference in mass between fuel-types ($p = 0.18$). Biomass kitchens tended to have lower total CFUs/mL than LPG kitchens (median=25590 vs 44490 EU/m², respectively, $p = 0.14$). Biomass kitchens had greater Zirconium, Iron, Arsenic and Vanadium content ($p < 0.05$) with a trend of higher Thorium, Cobalt and Titanium ($p < 0.13$). LPG PM had more Sulfur, and a trend of higher Chromium content. Endotoxin concentrations measured over 7 days (time-weighted) ranged from 224635–7179686

EU/m² and were significantly greater in biomass kitchens than LPG kitchens ($p < 0.001$). Lung function was not significantly different between participant fuel-type groups; however, 30% of those using biomass had respiratory obstruction defined as $\text{post-FEV}_1/\text{FVC} < 0.80$, and a mixed obstructive-restrictive phenotype appeared evident in participants using this fuel-type. Conclusions: Biomass kitchens had significantly greater metal, endotoxin, and $\text{PM}_{2.5}$ concentrations than LPG kitchens. Cooks using LPG had more homogenous spirometry than those using biomass, and 30% of cooks presently using biomass had an obstructive phenotype. Biomass cooks may experience respiratory morbidity based on differences in aerosol exposures.

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Online Abstracts Issue

Quantitative CT Imaging Metrics Correlated to Kitchen Particulate Matter, Endotoxin, Metal, and Bioaerosol Content in Cooks Using Wood and LPG Fuel in Tamil Nadu, India

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Introduction: In a pilot study, carried out in Thanjavur, India, we have used quantitative computed tomography (QCT) to characterize lungs of primary cooks exposed to liquified petroleum gas (LPG) or wood biomass and have correlated QCT-based findings with in-home assessments of indoor environmental exposures. **Methods:** With local ethical committee approval, QCT was performed via a GE Optima 128 slice scanner utilizing a standardized protocol at coached total lung capacity (TLC) and residual volume (RV). Image analysis (VIDA Diagnostics) included, in addition to standard metrics, image registration-based measures using a disease probability map (DPM): functional small airways disease (fSAD), emphysema (EMPH), jacobians (J), and an anisotropic deformation index (ADI). Standard spirometry was performed. Environmental exposure was measured via real-time and gravimetric daily PM $\leq 2.5 \mu\text{m}$ (PM_{2.5}) concentrations using paired PATS+ and flow-calibrated UPAS devices. Settled (7 days) particles ($\leq 40 \mu\text{m}$) were sampled from deployed rugs yielding quantified colony forming units (CFU), as well as metal content. Endotoxin (EU) concentrations were measured using electrostatic dust collectors (EDC). Lung function was assessed pre- and post-bronchodilation. **Results:** QCT images demonstrated a predominance of diffuse increase in lung density and many individuals from both groups presented with significant air trapping visually. Using a QCT threshold of -856Hu at RV, no quantitative air trapping was observed. When assessed via DPM which includes a metric of regional volume change, individuals with up to 50% air trapping (fSAD) were identified. Very little emphysema was noted. Images from biomass homes were considerably more variable than individuals from LPG homes. Participants' self-reported age, years as primary cook, and within-home animal entry was similar; however, those within the biomass group worked outside the home more ($p < 0.01$). Lung function was not significantly different between participant fuel-type groups; however values were considerably more heterogeneous amongst biomass fuel users.

Strong correlations between imaging metrics and environmental-based metrics were observed with the strongest being: DPM ADI mean vs. Rug Mass (R=0.96); DPM Jacobian Mean vs UPAS (R=0.8); DPM ADI Mean vs. Cr (R=0.91); DPM fSAD vs. S (R=0.74); DPM Emphysema vs. Rb (R=0.81). Amongst the biomass fuel users, the strongest imaging vs. environmental-based metrics was DPM ADI mean and DPM ADI StdDev vs. Endotoxins (R=0.54 and 0.65 respectively) Conclusions: Cooks using LPG had more homogenous spirometry than those using biomass and stronger correlations between environmental-based measures and imaging metrics. Endotoxins were found to have the dominant correlation with imaging metrics for cooks using biomass fuels.

This abstract is funded by: NIH

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RATIONALE

Household air pollution causes approximately 0.5 million deaths in India every year, most occurring in people <70 y/o. Sixty-six percent of the population uses solid-biofuels to cook, increasing the risk of developing COPD, chronic bronchitis and acute lower respiratory tract infections. Our pilot study quantified pollution known to cause adverse health-effects, including: PM_{2.5}, black carbon, PM mass (≤40 μm) and metal content, and bioaerosols from kitchens of primary cooks in Thanjavur, India.

HYPOTHESES

Hypothesis 1: Biomass kitchens will have higher PM_{2.5}, black carbon, and endotoxin than homes using liquified petroleum gas (LPG)

Hypothesis 2: PM composition (metal content) will be different between Biomass and LPG kitchens

METHODS

PM_{2.5}: 24h PM_{2.5} concentrations were assessed using Pats+ (direct-reading instrument) and flow-calibrated UPAS measurements (gravimetric)

Black carbon: Filter light absorption coefficients F_{abs} were calculated using UPAS Teflon filters from 27 biomass homes and 7 LPG kitchens using the following equation:

$F_{abs} = \frac{F}{V}$, where F = sample deposit area (30.5 mm) and V = known sampled volume (m³) and $t = 0.5 \ln \frac{R_f}{R_s}$ where R_f = average reflectance of the field blank filters for a given batch of samples and R_s = reflectance of the sample filter

Endotoxin: We assessed within-kitchen endotoxin (EU) using electrostatic dust collectors (EDC) deployed over 24-hrs and 7 days

XRF: We used X-ray fluorescence to assess filter metal content and total metal content in whole particles (≤ 40 μm)

STUDY POPULATION

We collected data on the aforementioned endpoints in kitchens of primary cooks (22-79 years old) in Thanjavur, India in March, 2019. Seven homes primarily used LPG, while 27 used biomass (wood)

PM_{2.5} time-series

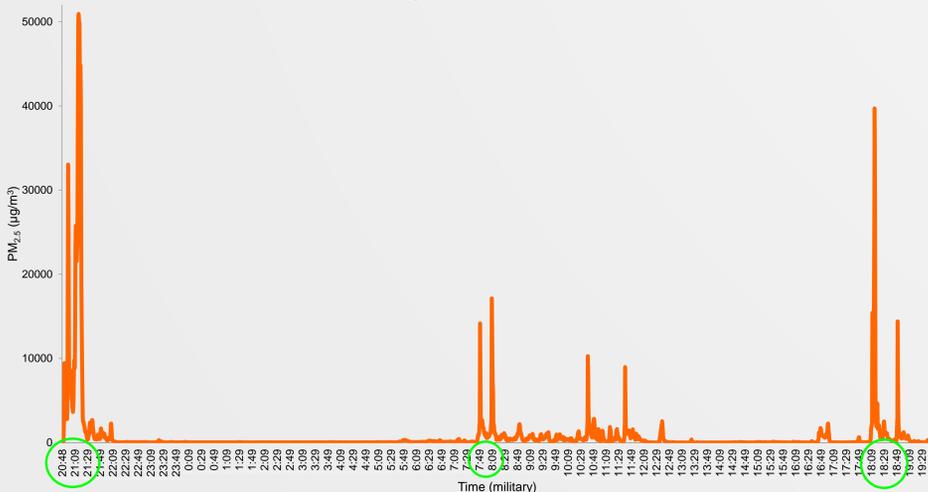


Figure 1. 24h real-time PM_{2.5} quantification from one biomass kitchen. Peak exposures >50,000 μg/m³, cooking times correlate with peak exposures

RESULTS

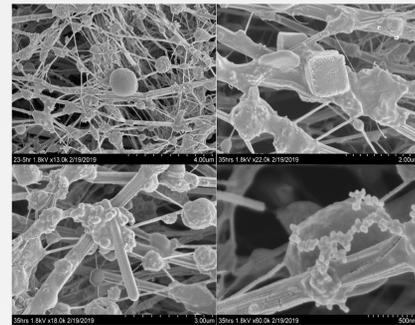


Figure 2. Scanning electron microscopy (SEM) images of UPAS filters

UPAS/Pats+ correlation

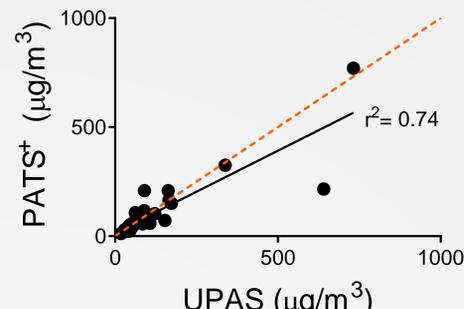


Figure 3. Correlation between UPAS & Pats+ 24h PM_{2.5} (r²=0.74)

24h PM_{2.5} by fuel-type: UPAS and Pats+

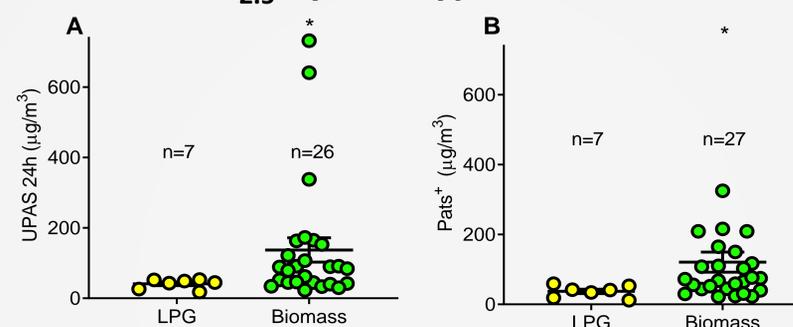


Figure 4A-B. UPAS and Pats+ predicted significantly more PM_{2.5} with biomass fuel, * p<0.05

Filter light absorption coefficients, F_{abs}

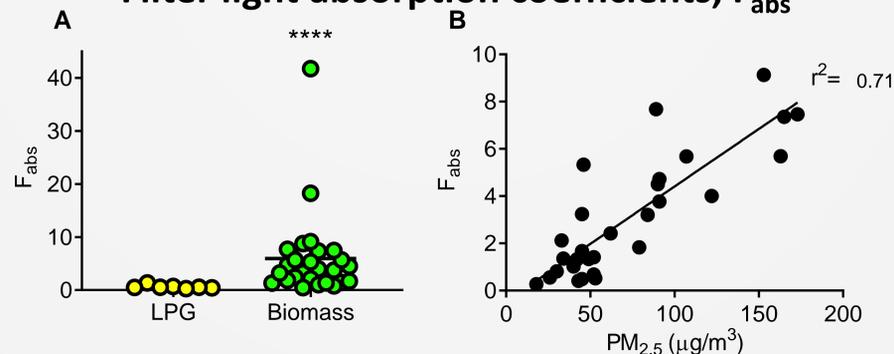


Figure 5A. LPG fuel resulted in lower F_{abs} , indicative of less black carbon, than biomass, **** p<0.0001 **B.** PM_{2.5} predicts F_{abs} (r²=0.71). Overloaded filters (PM_{2.5}>330 μg/m³, n=3) not reported

Time weighted kitchen endotoxin levels (24 hr & 7 days)

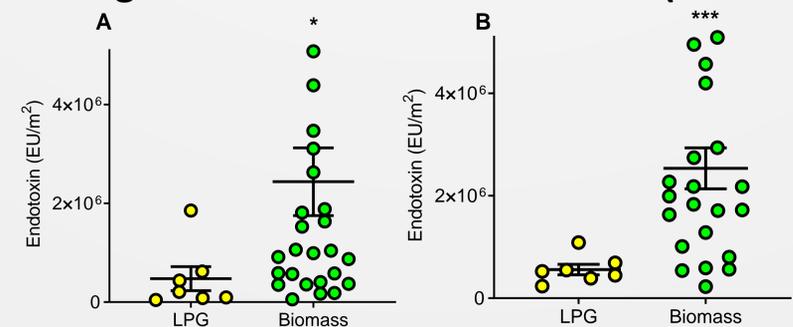


Figure 6A. 24h endotoxin concentrations are greater in biomass kitchens than LPG * p<0.05 **B.** 7-day endotoxin concentrations are greater in biomass than LPG, *** p<0.001

PM₄₀ metal content: Biomass > LPG

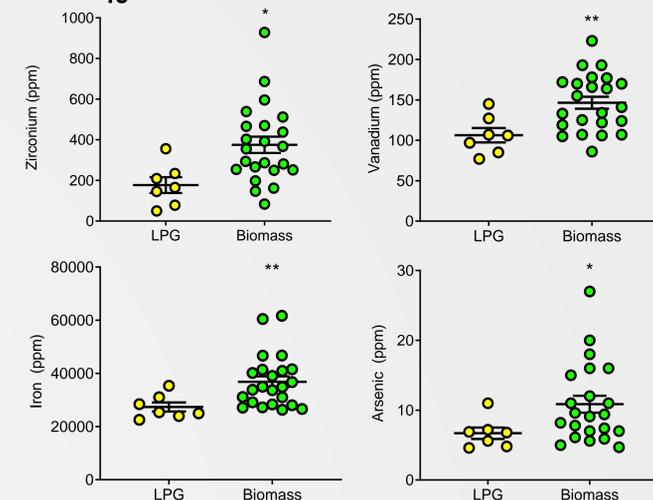


Figure 6. Biomass had significantly more Zirconium, Arsenic, Iron and Vanadium (ppm) than LPG, * p<0.05, ** p<0.01

PM₄₀ metal content: LPG > biomass

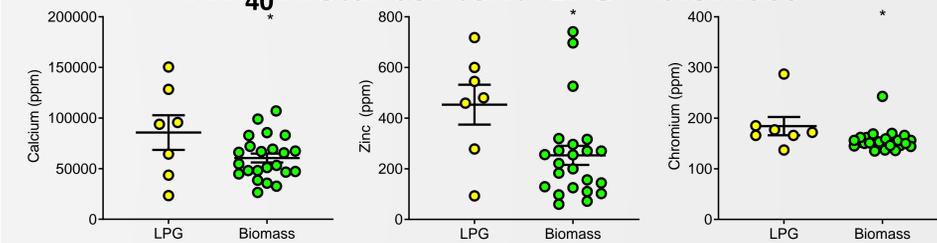


Figure 7. LPG had significantly more Calcium, Zinc and Chromium (ppm) than LPG, * p<0.05

PM_{2.5} metal content: UPAS filters

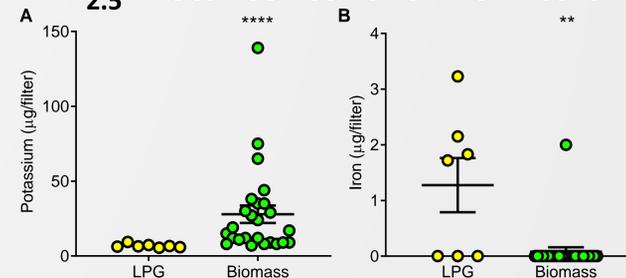


Figure 8A. Biomass PM_{2.5} had significantly more Potassium than LPG, **** p<0.0001 **B.** LPG PM_{2.5} had significantly more Iron than biomass ** p<0.01

CONCLUSIONS

- Peak PM_{2.5} exposures correlate with cooking, and are extremely high (>1,500x EPA limits)
- SEM depict wide variety of particle types, and likely bacteria, in Teflon filters
- Field PM_{2.5} measurements using the UPAS and Pats+ machines correlate (r²=0.74)
- Biomass kitchens had significantly higher endotoxin levels than LPG kitchens (p<0.05)
- Biomass kitchen PM_{2.5}, F_{abs} , Zirconium, Vanadium, Iron, Arsenic and (filter) Potassium was greater than LPG (p<0.05)
- LPG kitchen PM had higher levels of Calcium, Zinc, Chromium and (filter) Iron than biomass kitchens (p<0.05)
- Results indicate unique micro-environments between wood biomass and LPG kitchens

Funding: UI Environmental Health Research Center Pilot NIH P30 ES005605, the Functional CT Assessment of Pulmonary Arterial Dysfunction in Smoking Associated Emphysema NIH HL130883-03 and the Origins of Cystic Fibrosis Airway Disease NIH PPG HL091842-11

**Imaging Based Assessment of Lung Function in a Population
Cooking Indoors with Biomass Fuel**

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| Complete List of Authors: | <p>Kizhakke Puliyakote, Abhilash; The University of Alabama at Birmingham, Medicine; University of California San Diego, Radiology; The University of Iowa, Biomedical Engineering Stapleton, Emma; The University of Iowa, Internal Medicine Durairaj, Kumar; Saveetha University Saveetha Dental College, Microbiology Navaneethakrishnan, Suresh; Suresh Scan Centre Karuppusamy, Kesavan; Periyar Maniammai Institute of Science and Technology, Physics Kathiresan, Geetha; Periyar Maniammai Institute of Science and Technology, Electronics and Communication Engineering Shanmugam, Kumaran; Periyar Maniammai Institute of Science and Technology, Biotechnology Abdul Rahim, Sirajunnisa; K Ramakrishnan College of Engineering, Chemistry Bilas, Monalisa; The University of Iowa, Radiology Huang, Rui; The University of Iowa, Statistics and Actuarial Science; Nanjing University School of Economics Metwali, Nervana; The University of Iowa, Occupational and Environmental Health Jeronimo, Matthew; The University of British Columbia School of Population and Public Health Chan, Kung-Sik; The University of Iowa, Statistics and Actuarial Science Guo, Junfeng; The University of Iowa, Biomedical Engineering; The University of Iowa, Radiology Nagpal, Prashant; The University of Iowa, Radiology Peters, Thomas; The University of Iowa, Occupational and Environmental Health Thorne, Peter; The University of Iowa, Occupational and Environmental Health Comellas, Alejandro; University of Iowa, Internal Medicine Hoffman, Eric; The University of Iowa, Biomedical Engineering; The University of Iowa, Internal Medicine; The University of Iowa, Radiology</p> |
| Subject Category: | 8.17 Imaging: Physiologic Correlates < INTEGRATIVE PHYSIOLOGY AND PATHOLOGY, 6.20 Indoor Air < ENVIRONMENTAL AND OCCUPATIONAL HEALTH |
| Keywords: | Hut lung, Quantitative Computed Tomography, Image Registration, |

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| | Functional Small Airways Disease, Environmental Exposure |
| | |

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Manuscripts

Biomass CT submission to AJRCCM

2 messages

Abhilash KP <kpabhis@gmail.com>

Sat, Oct 30, 2021 at 8:10 AM

To: Eric Hoffman <eric-hoffman@uiowa.edu>

Cc: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>, kumardurai1963@gmail.com, navkeerth1112@gmail.com, kesavan karuppusamy <kk7blr@gmail.com>, kumarans@pmu.edu, rktgeetha@gmail.com, sirajunnisaadr@gmail.com, "Bilas, Monalisa" <monalisa-bilas@uiowa.edu>, huangrui@nju.edu.cn, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, matty.jeronimo@ubc.ca, "Chan, Kung-Sik" <kung-sik-chan@uiowa.edu>, "Nagpal, Prashant" <prashant-nagpal@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Kizhakke Puliyakote, Abhilash" <akizhakkepuliyakote@ucsd.edu>, "Guo, Junfeng" <junfeng-guo@uiowa.edu>

Hello all,

Please see attached a copy of our submission of the Biomass CT research results to the Blue journal (AJRCCM). The original manuscript and the online supplement are all combined into one PDF for the initial submission. Fingers crossed that it is received favorably. If you do discover any needed edits, please let me know and we will include them in the second review stage if we get there. We will keep everyone updated on the status as we hear from the journal. Thanks once again for all your help!

Thanks and regards,
Abhilash KP

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1049K

KUMARAN S <kumarans@pmu.edu>

Sat, Oct 30, 2021 at 9:43 AM

To: Abhilash KP <kpabhis@gmail.com>

Cc: Eric Hoffman <eric-hoffman@uiowa.edu>, "Stapleton, Emma M" <emma-stapleton@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>, Kumar Durairaj <kumardurai1963@gmail.com>, navkeerth1112@gmail.com, kesavan karuppusamy <kk7blr@gmail.com>, Geetha <rktgeetha@gmail.com>, sirajunnisaadr@gmail.com, "Bilas, Monalisa" <monalisa-bilas@uiowa.edu>, huangrui@nju.edu.cn, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Jeronimo, Matthew" <matty.jeronimo@ubc.ca>, "Chan, Kung-Sik" <kung-sik-chan@uiowa.edu>, "Nagpal, Prashant" <prashant-nagpal@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Kizhakke Puliyakote, Abhilash" <akizhakkepuliyakote@ucsd.edu>, "Guo, Junfeng" <junfeng-guo@uiowa.edu>

Dear Dr. Abhilash,

Warm greetings!

Thank you very much for your sharing the manuscript, we will go through and if you have any comments, we will send it to you.

Best regards,

Kumaran

Dr. S. Kumaran, M.S.c., Ph.D. (Anna Univ.) Ph.D. (Charles Univ.)

Postdoctoral Training (Osaka Univ.)

Associate Professor

Department of Biotechnology
Faculty of Engineering & Technology

Final manuscript version

4 messages

Stapleton, Emma M <emma-stapleton@uiowa.edu>

Mon, Feb 3, 2020 at 11:11 PM

To: KP <abhilashkp@ucsd.edu>, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Jeronimo, Matthew" <matty.jeronimo@ubc.ca>, "Manges, Robert B" <robert-manges@uiowa.edu>, "Thornell, Ian M" <ian-thornell@uiowa.edu>, "lkbkma@gmail.com" <lkbkma@gmail.com>, "dentist1675@gmail.com" <dentist1675@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "kk7blr@gmail.com" <kk7blr@gmail.com>, "rktgeetha@gmail.com" <rktgeetha@gmail.com>, "sirayusuff@pmu.edu" <sirayusuff@pmu.edu>, "kumarans@pmu.edu" <kumarans@pmu.edu>, "michael.brauer@ubc.ca" <michael.brauer@ubc.ca>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

Dear all,

Thank you for all of your help on our manuscript (attached)! We are hoping to submit to Environment International on 2/14.

If you are able, we would love your final thoughts on the manuscript, and also *please confirm that your name, affiliation and email address listed are correct*, see "Names and affiliations India" Word doc.

Best,

Emma

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3 attachments

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Names and affiliations India.docx
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Supplementary material.docx
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Kumar Durairaj <kumardurai1963@gmail.com>

Tue, Feb 4, 2020 at 6:14 AM

To: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>

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Nice effort.
I will go through.

Kind regards
D Kumar
[Quoted text hidden]

KUMARAN S <kumarans@pmu.edu>

Tue, Feb 4, 2020 at 7:49 AM

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Cc: KP <abhilashkp@ucsd.edu>, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Jeronimo, Matthew" <matty.jeronimo@ubc.ca>, "Manges, Robert B" <robert-manges@uiowa.edu>, "Thornell, Ian M" <ian-thornell@uiowa.edu>, "lkbkma@gmail.com" <lkbkma@gmail.com>, "dentist1675@gmail.com" <dentist1675@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "kk7blr@gmail.com" <kk7blr@gmail.com>, "rktgeetha@gmail.com" <rktgeetha@gmail.com>, "sirayusuff@pmu.edu" <sirayusuff@pmu.edu>, "michael.brauer@ubc.ca" <michael.brauer@ubc.ca>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

Dear Dr. Emma and Colleagues,

Thank you very much for your efforts. We will go through and send our comments soon.

Best regards

Kumaran
[Quoted text hidden]

Thorne, Peter S <peter-thorne@uiowa.edu>

Mon, Feb 10, 2020 at 12:49 AM

To: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>, KP <abhilashkp@ucsd.edu>, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Jeronimo, Matthew" <matty.jeronimo@ubc.ca>, "Manges, Robert B" <robert-manges@uiowa.edu>, "Thornell, Ian M" <ian-thornell@uiowa.edu>, "lkbkma@gmail.com" <lkbkma@gmail.com>, "dentist1675@gmail.com" <dentist1675@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "kk7blr@gmail.com" <kk7blr@gmail.com>, "rktgeetha@gmail.com" <rktgeetha@gmail.com>, "sirayusuff@pmu.edu" <sirayusuff@pmu.edu>, "kumarans@pmu.edu" <kumarans@pmu.edu>, "michael.brauer@ubc.ca" <michael.brauer@ubc.ca>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

Hi Emma:

Please see my comments and corrections on the manuscript. Overall, it reads very well.

Regards,

Peter

[Quoted text hidden]

3 attachments

200203_India manuscript-PST.docx
578K

Names and affiliations India-PST.docx
17K

Supplementary material-PST.docx
345K



Dean Research <deanresearch@pmu.edu>

FW: Indo US Grant application to ICMR from Saveetha & Iowa

5 messages

Kizhakke Puliyakote, Abhilash <akizhakkepuliyakote@health.ucsd.edu> Fri, Oct 16, 2020 at 7:53 AM
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Hello everyone,

The grant application was submitted to ICMR by Dr. Balarama Kaimal at Saveetha Medical College. Thank you all for your inputs in getting everything ready in time for the application. We will submit the corresponding collaborative application to NIH from the US within two weeks and will keep you informed on the status of the application from both sides.

Thanks again. Fingers crossed for a good review!

Regards,

Abhilash KP

From: [Dr. S. Balarama Kaimal](#)
Sent: Thursday, October 15, 2020 3:53 AM
To: callindous@gmail.com
Cc: [Kizhakke Puliyakote, Abhilash](#)
Subject: Indo US Grant application to ICMR from Saveetha & Iowa

To

The Project review committee

Indo US Memorandum of Understanding on Environment and Occupational Health

The Indian Council for Medical Research

New Delhi-110029.

Dear review committee members,

We are pleased to submit our grant application in response to the call For Joint Research Proposals Under Indo-US Collaboration On Environment And Occupational Health (2020-21). We hereby submit our application for our project titled *"Imaging and Environmental Assessment of Biomass Cooking Effects on Lung Health"*. Our research collaborators in

the US, Drs. Eric Hoffman and Alejandro Comellas, from the University of Iowa (Iowa City, IA), will be presently submitting a concurrent application to the NIH in response to the same call. Please note that the US team is eligible for an extension to the NIH deadline and will be submitting their application in the next two weeks.

We are excited to have this opportunity to continue our collaborative efforts, and are grateful to both the Government of India, and that of the United States for making this opportunity available to us. We believe our research is topical, and timely in the current context of increasing respiratory disease.

We look forward to the decisions of the review groups.

Yours sincerely,

Balarama Kaimal

--

Prof. S. Balarama Kaimal. PhD
Dept. of Biochemistry
Saveetha Medical College & Hospital
Saveetha Institute of Medical & Technical Sciences
(Deemed University)
Thandalam, Chennai- 602 105
Ph: +91-7550 159 541
Mail: balaneuron@gmail.com

 **ICMR Indo US Grant application Saveetha Iowa.pdf**
7122K

Kumar Durairaj <kumardurai1963@gmail.com>

Fri, Oct 16, 2020 at 3:04 PM

To: "Kizhakke Puliyakote, Abhilash" <akizhakkepuliyakote@health.ucsd.edu>

Cc: KUMARAN <kumarans@pmu.edu>, Dean Research <deanresearch@pmu.edu>, Dr A Ashokkumar AP/Chem Eng <ashokkumar@pmu.edu>, "Dr. S. Gomathi" <gomathichemist@pmu.edu>, Geetha <rltgeetha@gmail.com>, kesavan karuppusamy <kk7blr@gmail.com>

Nice

D Kumar

[Quoted text hidden]

Dr A Ashokkumar AP/Chem Eng <ashokkumar@pmu.edu>

Fri, Oct 16, 2020 at 3:50 PM

To: "Kizhakke Puliyakote, Abhilash" <akizhakkepuliyakote@health.ucsd.edu>

Cc: KUMARAN S <kumarans@pmu.edu>, Dean Research <deanresearch@pmu.edu>, Kumar Durairaj <kumardurai1963@gmail.com>, "Dr. S. Gomathi" <gomathichemist@pmu.edu>, Geetha <rltgeetha@gmail.com>, kesavan karuppusamy <kk7blr@gmail.com>



Dean Research <deanresearch@pmu.edu>

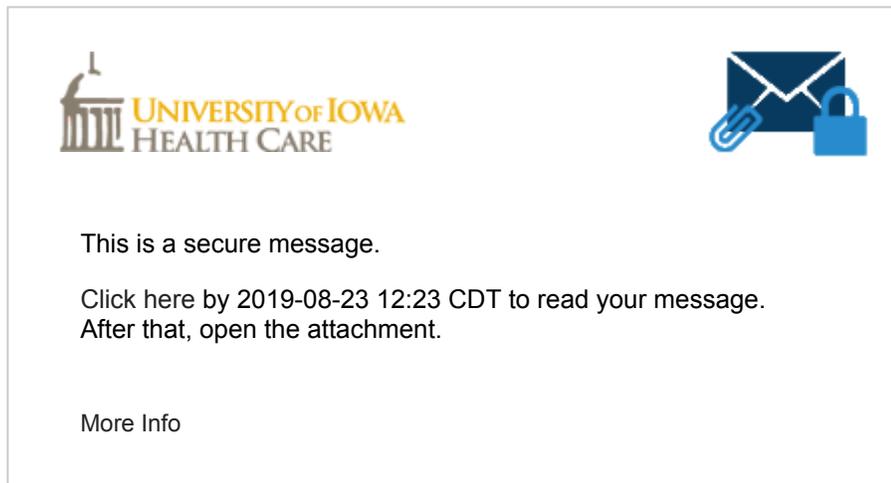
ISES/ISIAQ poster

10 messages

Stapleton, Emma M <emma-stapleton@uiowa.edu>

Fri, Aug 9, 2019 at 10:53 PM

To: KP <abhilashkp@ucsd.edu>, Dean Research <deanresearch@pmu.edu>, kesavan karuppusamy <kk7blr@gmail.com>, Sirajunnisa Chemistry <sirayusuff@pmu.edu>, barani kathiresan <rktgeetha@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>



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 **SecureMessageAtt.html**
10343K

Stapleton, Emma M <emma-stapleton@uiowa.edu>

Fri, Aug 9, 2019 at 11:31 PM

To: KP <abhilashkp@ucsd.edu>, Dean Research <deanresearch@pmu.edu>, kesavan karuppusamy <kk7blr@gmail.com>, Sirajunnisa Chemistry <sirayusuff@pmu.edu>, barani kathiresan <rktgeetha@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

My apologies -- apparently it is difficult (security) to open the powerpoint presentation. I am attaching it as a .pdf doc and hopefully this will fix the issue.

Thanks,
Emma

From: Stapleton, Emma M**Sent:** Friday, August 9, 2019 12:23:22 PM**To:** KP; Dean Research; kesavan karuppusamy; Sirajunnisa Chemistry; barani kathiresan; Kumar Durairaj; Metwali, Nervana; Thorne, Peter S; Peters, Thomas M; Hoffman, Eric; Comellas, Alejandro**Subject:** ISES/ISIAQ poster

Dear all,

Attached you will find a copy of our poster for ISES/ISIAQ to be presented in Lithuania (8/20). Please let me know if you would like anything changed.

Since I leave 8/17, I am hoping to get the poster to printing no later than Monday 8/12, at 5 p.m.

Thanks!

Emma

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 **2019 ISES lithuania poster_India findings.pdf**
1041K

Hoffman, Eric <eric-hoffman@uiowa.edu>

Mon, Aug 12, 2019 at 12:46 AM

To: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>, KP <abhilashkp@ucsd.edu>, Dean Research <deanresearch@pmu.edu>, kesavan karuppusamy <kk7blr@gmail.com>, Sirajunnisa Chemistry <sirayusuff@pmu.edu>, barani kathiresan <rktgeetha@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

Seems ok to me.

If room, for 1b in the author list it could say Departments of Radiology, Medicine and Biomedical Engineering

[Quoted text hidden]

[Quoted text hidden]

Metwali, Nervana <nervana-metwali@uiowa.edu>

Mon, Aug 12, 2019 at 8:09 PM

To: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>, KP <abhilashkp@ucsd.edu>, Dean Research <deanresearch@pmu.edu>, kesavan karuppusamy <kk7blr@gmail.com>, Sirajunnisa Chemistry <sirayusuff@pmu.edu>, barani kathiresan <rktgeetha@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

It looks good Emma. Good luck on your poster.

Best

Nervana

From: Stapleton, Emma M <emma-stapleton@uiowa.edu>

Sent: Friday, August 9, 2019 1:02 PM

To: KP <abhilashkp@ucsd.edu>; Dean Research <deanresearch@pmu.edu>; kesavan karuppusamy <kk7blr@gmail.com>; Sirajunnisa Chemistry <sirayusuff@pmu.edu>; barani kathiresan <rktgeetha@gmail.com>; Kumar Durairaj <kumardurai1963@gmail.com>; Metwali, Nervana <nervana-metwali@uiowa.edu>; Thorne, Peter S <peter-thorne@uiowa.edu>; Peters, Thomas M <thomas-m-peters@uiowa.edu>; Hoffman, Eric <eric-hoffman@uiowa.edu>; Comellas, Alejandro <alejandro-comellas@uiowa.edu>
Subject: Re: ISES/ISIAQ poster

My apologies -- apparently it is difficult (security) to open the powerpoint presentation. I am attaching it as a .pdf doc and hopefully this will fix the issue.

Thanks,

Emma

[Quoted text hidden]

Peters, Thomas M <thomas-m-peters@uiowa.edu>

Mon, Aug 12, 2019 at 8:29 PM

To: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>, KP <abhilashkp@ucsd.edu>, Dean Research <deanresearch@pmu.edu>, kesavan karuppusamy <kk7blr@gmail.com>, Sirajunnisa Chemistry <sirayusuff@pmu.edu>, barani kathiresan <rktgeetha@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "Mewali, Nervana" <nervana-metwali@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

Looks good. Here are some thoughts for you.

Some thoughts

- Make the axes on UPAS/PATS+ correlation plot identical (except for labels). That way the 1:1 line will be at 45 degrees. Makes it easier to see difference from a slope of 1 quickly.
- Cap PATS+ or do not; be consistent.
- On PM2.5 time-series, I wonder if log y axis would be better. And then indicate the regulatory value. Also need to specify the averaging time on the plot or in the caption.

Consider changing conclusions

- Peak PM2.5 exposures coincide with cooking, and are extremely high (>1,500x EPA limits)
- SEM depict wide variety of particle types, and likely bacteria, in Teflon filters [you did not measure bacteria in Teflon filters so I would not put it in conclusions]
- Field PM2.5 measurements using the UPAS and Pats+ machines correlate well ($r^2=0.74$)
- Endotoxin levels were significantly higher in kitchens burning biomass than LPG ($p<0.05$)
- PM2.5, Fabs, Zirconium, Vanadium, Iron, Arsenic and Potassium were greater in biomass kitchens than LPG ($p<0.05$)
- Calcium, Zinc, Chromium and Iron in PM were greater when burning LPG than biomass ($p<0.05$)

[for last bullet, how about "Composition of PM is highly dependent on fuel type used in cooking"]

- Results indicate unique micro-environments between wood biomass and LPG kitchens

From: Stapleton, Emma M <emma-stapleton@uiowa.edu>

Sent: Friday, August 9, 2019 1:02 PM

To: KP <abhilashkp@ucsd.edu>; Dean Research <deanresearch@pmu.edu>; kesavan karuppusamy <kk7blr@gmail.com>; Sirajunnisa Chemistry <sirayusuff@pmu.edu>; barani kathiresan <rktgeetha@gmail.com>; Kumar Durairaj <kumardurai1963@gmail.com>; Metwali, Nervana <nervana-metwali@uiowa.edu>; Thorne, Peter S <peter-thorne@uiowa.edu>; Peters, Thomas M <thomas-m-peters@uiowa.edu>; Hoffman, Eric <eric-hoffman@uiowa.edu>; Comellas, Alejandro <alejandro-comellas@uiowa.edu>

Subject: Re: ISES/ISIAQ poster

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Thanks,

Emma

[Quoted text hidden]

Dean Research <deanresearch@pmu.edu>

Mon, Aug 12, 2019 at 11:09 PM

To: "Peters, Thomas M" <thomas-m-peters@uiowa.edu>

Cc: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>, KP <abhilashkp@ucsd.edu>, kesavan karuppusamy <kk7blr@gmail.com>, Sirajunnisa Chemistry <sirayusuff@pmu.edu>, barani kathiresan <rktgeetha@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "Mewali, Nervana" <nervana-metwali@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

Dear Dr. Emma and other colleagues,

Thanks for sharing the poster, please 7th Results Caption (LPG..... than LPG), it should be biomass. Is it I am right?

Please check, great and good luck!

Best regards,

Kumaran

With kind Regards

Kumaran Shanmugam, M.Sc., Ph.D., (Anna Univ.), Ph.D., (Charles Univ.)

Postdoctoral Training (Osaka Univ.)

Endeavour Executive Fellow (Flinders Univ.)

Office of Dean Research

Periyar Maniammai Institute of Science & Technology,

Vallam, Thanjavur.

Office: 7358053699

PMIST Google Scholar Citationshttps://scholar.google.com/citations?user=SFMZ_IMAAAAJ

[Quoted text hidden]

Stapleton, Emma M <emma-stapleton@uiowa.edu>
To: Dean Research <deanresearch@pmu.edu>

Mon, Aug 12, 2019 at 11:49 PM

Thanks, Kumaran - In this case, actually LPG had greater levels of those metals than Biomass, but good eye!

Best,

Emma

From: Dean Research <deanresearch@pmu.edu>

Sent: Monday, August 12, 2019 12:39:26 PM

To: Peters, Thomas M

Cc: Stapleton, Emma M; KP; kesavan karuppusamy; Sirajunnisa Chemistry; barani kathiresan; Kumar Durairaj; Metwali, Nervana; Thorne, Peter S; Hoffman, Eric; Comellas, Alejandro

Subject: [External] Re: ISES/ISIAQ poster

[Quoted text hidden]

Stapleton, Emma M <emma-stapleton@uiowa.edu>

Mon, Aug 12, 2019 at 11:49 PM

To: Dean Research <deanresearch@pmu.edu>, "Peters, Thomas M" <thomas-m-peters@uiowa.edu>

Cc: KP <abhilashkp@ucsd.edu>, kesavan karuppusamy <kk7blr@gmail.com>, Sirajunnisa Chemistry <sirayusuff@pmu.edu>, barani kathiresan <rktgeetha@gmail.com>, Kumar Durairaj <kumardurai1963@gmail.com>, "Metwali, Nervana" <nervana-metwali@uiowa.edu>, "Thorne, Peter S" <peter-thorne@uiowa.edu>, "Hoffman, Eric" <eric-hoffman@uiowa.edu>, "Comellas, Alejandro" <alejandro-comellas@uiowa.edu>

Thank you to everyone for your helpful comments! I have updated the poster accordingly.

All best,

Emma

From: Dean Research <deanresearch@pmu.edu>

Sent: Monday, August 12, 2019 12:39:26 PM

To: Peters, Thomas M

Cc: Stapleton, Emma M; KP; kesavan karuppusamy; Sirajunnisa Chemistry; barani kathiresan; Kumar Durairaj; Metwali, Nervana; Thorne, Peter S; Hoffman, Eric; Comellas, Alejandro

Subject: [External] Re: ISES/ISIAQ poster

[Quoted text hidden]

Dean Research <deanresearch@pmu.edu>

Tue, Aug 13, 2019 at 9:17 AM

To: "Stapleton, Emma M" <emma-stapleton@uiowa.edu>

Dear Emma,

Great and thanks.

[Quoted text hidden]

[Quoted text hidden]

Dean Research <deanresearch@pmu.edu>
To: Dean Research <deanresearch@pmu.edu>

Fri, Mar 18, 2022 at 11:28 AM

**Dr. S. Kumaran, M.Sc. Ph.D. (Anna Univ.) Ph.D. (Charles Univ.),
Postdoctoral Training (Osaka Univ.)**

Associate Professor & Dean Research (i/c)

Dean Research (i/c)



----- Forwarded message -----

From: **Stapleton, Emma M** <emma-stapleton@uiowa.edu>

[Quoted text hidden]

[Quoted text hidden]

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1041K