**Supporting Information for**

# Airborne Aluminum as an Underestimated Source of Human Exposure: Quantification of Aluminum in 24 Human Tissue Types Reveals High Aluminum Concentrations in Lung and Hilar Lymph Node Tissues

Clara Ganhör[a], Lukas Mayr[a], Julia Zolles[b], Marion Almeder[c], Matin Kazemi[a], Markus Mandl[a], Christian Wechselberger[a], Dave Bandke[c], Sarah Theiner[b], Christian Doppler[a*], Andreas Schweikert[b], Marina Müller[a], Špela Puh[a], Michaela Kotnik[a], Rupert Langer[c], Gunda Koellensperger[b], David Bernhard[a, d]

[a] Division of Pathophysiology, Institute of Physiology and Pathophysiology, Medical Faculty, Johannes Kepler University, Linz, Austria

[b] Institute of Analytical Chemistry, Faculty of Chemistry, University of Vienna, Vienna, Austria

[c] Institute of Clinical Pathology and Molecular Pathology, Kepler University Hospital and Johannes Kepler University, Linz, Austria

[d] Clinical Research Institute for Cardiovascular and Metabolic Diseases, Medical Faculty, Johannes Kepler University, Linz, Austria

* *Corresponding author at:* christian.doppler@jku.at

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**Text S1. Chemicals and reagents, sample preparation and ICP-MS/MS measurements of patients 1-8**

Samples of patients 1-8 were divided into three sets, every set was measured on a different day. No bone sample was provided for patient 3, and toenail instead of fingernail was provided for patient 6.

*Chemicals and reagents*

Ultrapure water (18.2 MΩ cm) was purified using the ELGA Water Purification System (Purelab Ultra MK 2, United Kingdom). $HNO_3$ Suprapur® ($w$ = 65%) was purchased from Supelco® (VWR, Vienna, Austria). $H_2O_2$ Suprapur® ($w$ = 30%) was purchased from Merck (Vienna, Austria). All utensils were cleaned in 10% $HNO_3$ Suprapur® for 24 hours, followed by 24 hours in 1% $HNO_3$ Suprapur® and washing with ultrapure water.

To validate trueness, the certified reference material BCR-639 (Joint Research Centre, Institute for Reference Materials and Measurements, European Commission, Geel, Belgium) was used for reference extractions. Furthermore, In and Re were used as internal standards during IP-MS/MS measurements. Both were used as single element standards with a concentration of 1000 +/- 3 mg · $L^{-1-}$ and were purchased from LabKings (Hilversum, the Netherlands). The quality control 26-element standard solution for calibration was purchased from LabKings (Hilversum, the Netherlands).

Sample preparation was performed in a cleanroom of ISO class 8, ICP-MS/MS measurements were performed in an ISO class 7 clean room.

*Sample preparation for elemental analysis*

After delivery to the laboratory, 5 mL of 30% $HNO_3$ were added to each frozen (-18 °C) sample and transferred to PFA extraction tubes. Two BCR-639 plasma reference material and four blank extractions only containing $HNO_3$ were included in every extraction run. During the first three extraction days, 250 µL of reference material were weighed and used for reference material extraction. Measurements were close to or below LLOQ, thus the volume was increased to 500 µL for all following reference material

extractions. In total, 16 extractions with 500 µL, which were weighed before digestion, were performed yielding a median Al concentration of 214 +/- 12 µg/L (median +/- standard deviation), which is in the certified range of 194 +/- 14 µg/L. Due to high instrumentation cleaning efforts required after ICP-MS measurement of patients 1-5, 1 mL of 30% $H_2O_2$ was added to all extraction tubes of patients 6-8 to ensure full digestion of samples. Anton Paar Multiwave PRO was used for microwave digestion, where temperature increased to 180°C within 20 minutes, was constant at 180°C for 10 minutes followed by cooling to 70°C. Extracts were transferred into metal free tubes, diluted with 5 mL ultrapure water or, for samples containing 1 mL $H_2O_2$, 4 mL ultrapure water, and weighed. Samples were diluted 1 to 5 with ultrapure water by weighing, to reach a total $HNO_3$ concentration of approximately 3%. Extracts with Al concentrations exceeding 1000 ppb were diluted 1 to 10 with 3% $HNO_3$. After each sample digestion cycle, one cleaning cycle using $HNO_3$ and applying the microwave program as for the sample digestion was performed to minimize the risk for carryover.

Quantification was performed by a 9-point matrix-matched external calibration with standard solutions containing Al ranging from 0.1 $\mu g \cdot L^{-1}$ – 200 $\mu g \cdot L^{-1}$. To validate trueness, certified reference material TM 35.2 (trace element matrix reference material made from filtered and diluted Lake Ontario water, certified for Al) was measured with every sample set.

The plasma reference material BCR-639 provides certified values for Al, Se and Zn. The sample preparation procedure and ICP-MS analysis were also suitable for the analysis of Se and Zn, which were thus also quantified. The clear focus of this study is Al, therefore the results of Se and Zn measurements were not provided in this publication.

*ICP-MS/MS measurements*

Inductively coupled plasma mass spectrometry (ICP-MS/MS) measurements were performed using Agilent 8800 ICP-MS/MS (Agilent Technologies, Tokyo, Japan) equipped with an CETAC ASX-520 autosampler (CETAC Technologies, Omaha, USA) and a MicroMist nebulizer operated at a sample

uptake rate of approximately 0.25 mL/min. For ICP-MS/MS calibration, Quality Control Standard #26 (LabKings, Hilversum, The Netherlands) was used. The Agilent MassHunter software packages (Workstation Software, Version C.01.03, 2019) was used for data evaluation. The instrumental parameters are summarized in Supporting Table S1.

**Table S1. ICP-MS parameters for tissue Al measurements**

***Table S1.*** *Instrumental parameters for ICP-MS/MS measurements of tissue Al concentrations*

| ICP-MS/MS parameters | |
|---|---|
| RF power | 1550 W |
| Sampling depth | 8.0 mm |
| Nebulizer | MicroMist |
| Spray chamber | Scott double-pass |
| Spraying chamber temp. | 2°C |
| Monitored Isotopes | $^{27}Al \rightarrow {}^{43}Al$, $^{64}Zn$, $^{82}Se$, $^{82}Se \rightarrow {}^{98}Se$, $^{115}In$, $^{185}Re$ |
| Measurement modes | no gas, $O_2$, |
| Plasma gas | 15 L/min |
| Nebulizer gas | 1.00 L/min |
| Auxiliary gas | 0.90 L/min |
| Cones | Ni |
| Cell entrance | -40 V |
| Cell exit | -50 V |
| Integration time | 0.1 - 0.5 s |

**Text S2. Chemicals and reagents, sample preparation and ICP-SFMS measurement of patients 9-20**

*Chemicals and reagents*

Laboratory water type I (Milli-Q® water, 18.2 MΩ · cm, SG Water GmbH, Barsbüttel, Germany) was purified using a duoPUR Quartz sub-boiling-system (Milestone-MLS GmbH, Leutkirch, Germany). Pro analysis (p.a.) grade $HNO_3$ ($w$ = 65 %) was obtained from Merck (Darmstadt, Germany). $H_2O_2$ suprapur® ($w$ = 30 %), HF suprapur® ($w$ = 40 %) and $H_3BO_3$ suprapur® were obtained from Supelco®. $HNO_3$ was sub-boiled using a Savillex DST-1000 acid purification-system. Certified ICP single element standards for trace analysis were purchased from Inorganic Ventures (Al, Si and In at concentration of 1000 mg $L^{-1}$). All laboratory consumables used for sample preparation and analysis were made of plastic material and double acid cleaned ($HNO_3$/HCl, $w$ = 10 %/2 % (v/v) and $w$ = 1 %/0.2 % (v/v) 24 h each, rinsed three times with Milli-Q®-water and dried in a clean bench before single use. 50 mL PE bottles used for sample storage were conditioned with 10 % (v/v) sub-boiled $HNO_3$/0.2 % (v/v) HF after the acid cleaning procedure until further use.

To validate trueness, certified reference materials TM 35 (trace element matrix reference material made from filtered and diluted Lake Ontario water, certified for Al) and BOVM-1 Bovine Muscle Certified Reference Material for Trace Metals and other Constituents (National Research Council Canada, information value for Al given), have been processed. Additionally, spike recovery experiments at two different concentration levels were conducted.

Preparatory laboratory work for elemental analysis and measurements were performed in an ISO class 8 and an ISO class 7 clean room with laminar flow hoods ISO class 5 according to ISO 14644-1, respectively.

*Sample preparation for elemental analysis*

After delivery to the laboratory, the frozen (-18 °C) tissue samples were mineralized by microwave assisted acid digestion. Approximately 0.300 g of sample were accurately weighted into PTFE vessels

of the microwave (Anton Paar, Graz, Austria, Multiwave 3000, rotor 16 HF 100). In a first step, sample digestion was performed with 4 mL of concentrated sub-boiled $HNO_3$, 1 mL of $H_2O_2$ and 50 µL of HF at 1400 W for 15 min (+ 15 min ramp). In a second step, complexation of HF with $H_3BO_3$ was performed. Therefore, the microwave vessels were quickly opened after cooling down to approx. 30 °C, 500 µL of super-saturated re-crystallized $H_3BO_3$ were added, vessels were closed again and another digestion cycle was performed at 1000 W for 10 min (+ 15 min ramp). After cooling down the vessels to room temperature, the obtained digests were quantitatively transferred into 50 mL mL PP-bottles and gravimetrically diluted to 30 g with sub-boiled water. After each sample digestion cycle, two cleaning cycles, using $HNO_3$/$H_2O_2$/HF and applying the microwave program as for the sample digestions were performed to minimize the risk of analyte carry-over.

For analysis, the samples were, depending on the concentrations of the analytes, not diluted and further gravimetrically diluted by a factor of 5, 50 and 100, respectively, to fit within the applied working range (0.1 – 100 µg $L^{-1}$) and spiked with the internal standard to obtain a final concentration of 1 µg $L^{-1}$ In in the sample. To minimize matrix induced measurement- and quantification errors, dilutions were performed using diluted digestion blanks and keeping the acid concentrations constant.

Quantification was performed by an 8-point matrix-matched external calibration with standard solutions of Al and Si ranging from 0.1 µg $L^{-1}$ – 100 µg $L^{-1}$ and internal standardization via In. The CRM TM 35 was used for verification of the analytical method. To verify matrix induced signal intensities and resulting slopes, calibration standards were prepared in synthetic solutions containing 13.3 % (v/m) $HNO_3$ + 0.17 % (v/m) HF, and solutions obtained by dilutions of digestion blanks and digested BOVM-1 with 13.3 % (v/m) $HNO_3$ + 0.17 % (v/m) HF, respectively, by a factor of 10 and 100.

*ICP-SFMS measurements*

Quantification was performed on the ICP-SFMS *Element2* High Resolution ICP-SFMS (ThermoFisher, Bremen, Germany) in the high-resolution mode (HR, $m/\Delta m$ >10000), equipped with a PFA scott-type

spray chamber and an injector made of sapphire (both AHF Analysentechnik). Measurements were performed by continuous acquisition (sample intake via PFA-ST nebulizer and a 0.2 mm i.d. uptake capillary (Elemental Scientific Inc,. ESI, Omaha) in self-aspiration mode (sample uptake:50 µL $min^{-1}$). Tuning parameters were optimized to obtain best possible sensitivity (min $1x10^6$ cps/1 µg $L^{-1}$ In in LR), signal stability and an oxide rate $^{238}U^{16}O^+/^{238}U^+$ ratio <5%. Instrumental parameters and masses monitored are shown in Table S2.

**Table S2. ICP-SFMS parameters**

***Table S2.*** *Instrumental parameters for ICP-SFMS measurements of Al and Si in tissues of patients 9-20.*

| Parameter | Value |
|---|---|
| Plasma [W] | 1200 |
| Plasma gas flow [L $min^{-1}$] | 16 |
| Auxiliary gas flow [L $min^{-1}$] | 0.9 |
| Nebulizer gas flow [L $min^{-1}$]/ | 1.186 |
| Additional gas flow [L $min^{-1}$] | 0.1 |
| HR mode | $^{27}Al$,$^{28}Si$, $^{29}Si$ and $^{30}Si$, $^{115}In$ (internal standard) |
| Data acquisition | E-scan mode, 3 runs*3 passes, 80% mass window, 45% integration window, 100 samples/peak, 800 ms |

**Text S3. Al measurement in $PM_{10}$ and $PM_{2.5}$**

*Sample collection*

High volume aerosol sampler DHA-80 with an inlet for $PM_{10}$ and $PM_{2.5}$ sampling (DIGITEL environsense, Bürs, Austria) was used for airborne particle collection on quartz fiber filters. Samples were taken by the Department of Environmental Protection of the Environment and Water Management Directorate in the state of Upper Austria, Austria, for the governmental air quality monitoring program in accordance with the EU Ambient Air Quality Directive.

*Sample preparation and analysis*

Sample preparation was performed using nitric acid, hydrogen peroxide and hydrochloric acid according to DIN EN 14902. Reference material ERM-CZ120 (Joint Research Centre, Institute for Reference Materials and Measurements, European Commission, Geel, Belgium) was used to calculate the recovery of Al. ICP-MS measurements were performed using NexION 300D ICP-MS (PerkinElmer, Rodgau, Germany).

*Data analysis*

In total, data was provided for 18 locations. Continuous quarterly data for 2014-2020 was available for four locations (Enns/Kristein, Neue Welt, Römerberg, Stadtpark). In the case of the location Berufsschule Wels, continuous quarterly data was available for 2015-2020. Al data of these five locations was analyzed. Overall, data for three quarters was missing for these five locations over the entire sampling period. Al concentrations in $PM_{10}$ were provided for all five sampling sites. Furthermore, for Berufsschule Wels and Stadtpark, data for $PM_{2.5}$ was also provided. Quarterly averages of $PM_{10}$ for the five locations available and the average of these sites are given in Figure S2. Al was detected across all locations and all years, with the highest average of 151 $ng \cdot m^{-3}$ found in Q2 of Enns/Kristein (data from 2014-2020), while Q4 of Berufsschule Wels showed the lowest average with

67 ng · $m^{-3}$ (data from 2015-2020). $PM_{2.5}$ values were always lower than $PM_{10}$ values, which is in accordance with expectations because $PM_{2.5}$ particles are included in $PM_{10}$.

**Table S3. Patient information**

*Table S3. Information on cause of death, pre-existing conditions and medications of patients 1-20.*

| Patient | Cause of death | Pre-existing conditions | Medication |
|---|---|---|---|
| 1 | acute necrotizing pancreatitis with peritonitis | septic shock, hypothyreosis, acute renal failure, pancreatitis, arterial hypertension, colon carcinoma, hypercholesterolemia, appendectomy | Euthyrox, Lisinopril, Simvastatin |
| 2 | respiratory arrest / apoplex | coronary heart disease, hypercholesterolemia, prediabetes, chronic nicotine abuse, arterial hypertension | Candecam, Concor, Atorvastatin, Thrombo ASS, Nitro spray |
| 3 | fat embolism | coronary heart disease, status post stenting, spinal canal stenosis, dementia, status post cysticus stent, status post embolectomy | Hidrasec, Lixiana, Lovenox, Novalgin, Paracetamol, Piritramid, Bicalutamid, Candeblo, Laevolac, Laxis |
| 4 | massive aspiration | asystolia | NA |
| 5 | cardiorespiratory failure | structural epilepsy, dementia onset, arterial hypertension, suspected stroke, non-small cell liver carcinoma | Amlodipine, Atorvastatin, Combivent, Ebrantil, Isosource Standard Fibre, Lasix, Lovenox, Molaxole, Thrombo ASS, Zyvoxid, Oxygen |
| 6 | cardiac decompensation | coronary heart disease, mitral valve insufficiency, aortic aneurysm, hypertension | Ramipril, Bisoprolol, Rosuvastatin, Thrombo ASS, Lasix |
| 7 | liver failure | hypermenorrhea, uterus myomatosus, suspected head of pancreas carcinoma, painless icterus, non-small cell carcinoma | Piperacillin, Elomel, Pantoprazol, Lovenox, Fortimel, Metamizol, Zofran |
| 8 | liver failure | lymphadenopathy, arterial hypertension, renal colic, suspected metastasizing cervic carcinoma | NA |
| 9 | heart failure | endometrium carcinoma, adipositas, diabetes, arterial hypertension, chronic renal insufficiency, cardiac decompensation | Herion, Novomix, Paracodin, Vendal |
| 10 | cardiac insufficiency with renal failure | diabetes, chronic obstructive pulmonary disease, arterial hypertension, chronic renal insufficiency, dementia, cardiac | Atorvastatin, Berodual Spray, Burinex Leo, Combivent, |

| | | | |
|---|---|---|---|
| | | decompensation, pleural effusion | Doxazosin, Lasix, Nephrotrans, Novorapid, Prednisolut |
| 11 | cardiorespiratory failure with pulmonary embolism | rupture of aortic wall, arterial hypertension, hypercholesterolemia, diabetes, frozen elephant trunk | Amlodipin, Calciduran, Euthyrox, Ferretab, Metafelan, Metohexal, Pantip, Paracetamol, Ramicomp, Rosovastatin, Thrombo ASS, Synjardy |
| 12 | peritonitis | adipositas, arterial hypertension, endometrium carcinoma, arterial fibrillation | Dormicum, Novalgin, Cefotaxim, Diclobene, Elomel, Folsan, Xarelto, Lovenox, Metropolol, Metronidazole, Paracetamol, Piritramid, Ramipril, Rosovastatin |
| 13 | onset of pneumonia with cardiac hypertrophy | hypercholesterolemia, diabetes, arterial hypertension, coronary heart disease, fatty liver | ASS Hexal, Ezegelan, Gliclazid, Rosuvastatin |
| 14 | respiratory insufficiency | trigeminal neuralgia, polyneuropathy, status epilepticus, depression, irritable colon, suspected pneumonia | Airvo Fio2, Combivent, Elozell Soezial, Fycompa, Lacosamid, Lasix, LEvebon, Lovenox, Vendal, Psychopax, Quetialan, Unasyn |
| 15 | cardiorespiratory failure | pneumonia, hyponatremia, urinary tract infection | Lovenox, Metegelan, Paracetamol, Fenistil, Halcion, Metamizol |
| 16 | progressive tumor with metastases | urothelial carcinoma with metastases | Calciduran, Calcitonin, Dronabinol, Fragmin, Haldol, Hydal, Ibuprofen, Lasix, Metamizol, Mirtabene, Molaxole, Piperacil, Pregabalin, urosin, Voltaren, Vendal, Zofran, Zoldem, Zyvoxid |
| 17 | respiratory | arterial hypertension, ischemic | Ceftriaxon, Concor, |

| | | | |
|---|---|---|---|
| | insufficiency | cardiomyopathy, dyspnoea, covid-19 | Dutasterid, Eliquis, Molaxole, Patnip, Rosovastatin, Sifrol, Teveten, Tritico, Vendal |
| 18 | cardiorespiratory insufficiency in pneumonia and inner layer infarction | hypertension, mitral insufficiency, interstitial lung disease, atrial fibrillation, basalioma | Amlodipin, Combivent, Eliquis, Latanovision, Pantoprazol, Prednisolon, Zithromax, Fenistil, Fentanyl, Lasix, Metagelan, Piperacillin, Vendal |
| 19 | decompensated heart failure | chronic obstructive pulmonary disease, coronary heart disease, Alzheimer's disease, permanent atrial fibrillation | Combivent, Lovenox, Novalgin, PCA, Piperacillin, Mirtabene, Molaxole, Pantolol Sertralin, Euthyrox |
| 20 | cardiac decompensation | chronic renal insufficiency, ischemic cardiomyopathy, covid-19, gout arthropathy | Ceolat, Dicloakut, Dilatrend, Dominal, Enterobene, Entresto, Ezegelan, Unasyn, Lasix, Lecicarbon, Lexotanil, Metegelan, Microlax, Prednisolon, Rosuvastatin, Temesta |

**Table S4. Organ weights**

*Table S4. For all patients except patient 2, organ weights of heart, lungs, liver, spleen and kidneys were determined during autopsy. NA = not available*

| Patient | Heart (g) | Lungs (g) | Liver (g) | Spleen (g) | Kidneys left+right (g) |
|---|---|---|---|---|---|
| 1 | 265 | 945 | 970 | 100 | 215 |
| 2 | NA | NA | NA | NA | NA |
| 3 | 480 | 960 | 1,238 | 124 | 235 |
| 4 | 460 | 1,475 | 1,860 | 230 | 300 |
| 5 | 355 | 1,565 | 1,320 | 85 | 275 |
| 6 | 720 | 1,010 | 1,260 | 120 | 255 |
| 7 | 400 | 875 | 4,470 | 285 | 310 |
| 8 | 450 | NA | 3,105 | 250 | 385 |

**Table S5. Statistical information**

*Table S5. Data was tested for statistical significance between all of the following tissue types: fingernail, abdominal skin, lung - right upper lobe, lung - right inferior lobe, hilar lymph node, diaphragm, vena cava, thoracic aorta, bone; These tissues showed normally distributed data. * $p \leq 0.05$; ** $p \leq 0.01$; *** $\leq 0.001$; **** $p \leq 0.0001$; ns not significant*

| Tukey's multiple comparisons test | Summary | Adjusted P Value |
|---|---|---|
| Fingernail vs. Abdominal skin | **** | <0.0001 |
| Fingernail vs. Lung - right upper lobe | ns | 0.4613 |
| Fingernail vs. Lung - right inferior lobe | ns | 0.0574 |
| Fingernail vs. Hilar lymph node | * | 0.0365 |
| Fingernail vs. Diaphragm | **** | <0.0001 |
| Fingernail vs. Vena cava | **** | <0.0001 |
| Fingernail vs. Thoracic aorta | **** | <0.0001 |
| Fingernail vs. Colon | **** | <0.0001 |
| Fingernail vs. Bone | *** | 0.001 |
| Abdominal skin vs. Lung - right upper lobe | ** | 0.0052 |
| Abdominal skin vs. Lung - right inferior lobe | ns | 0.0938 |
| Abdominal skin vs. Hilar lymph node | **** | <0.0001 |
| Abdominal skin vs. Diaphragm | ns | 0.9701 |
| Abdominal skin vs. Vena cava | ns | 0.9908 |
| Abdominal skin vs. Thoracic aorta | ns | 0.897 |
| Abdominal skin vs. Colon | ns | 0.9997 |
| Abdominal skin vs. Bone | ns | 0.8856 |
| Lung - right upper lobe vs. Lung - right inferior lobe | ns | 0.9908 |
| Lung - right upper lobe vs. Hilar lymph node | **** | <0.0001 |
| Lung - right upper lobe vs. Diaphragm | **** | <0.0001 |
| Lung - right upper lobe vs. Vena cava | *** | 0.0001 |
| Lung - right upper lobe vs. Thoracic aorta | **** | <0.0001 |
| Lung - right upper lobe vs. Colon | *** | 0.0005 |

| | | |
|---|---|---|
| Lung - right upper lobe vs. Bone | ns | 0.3479 |
| Lung - right inferior lobe vs. Hilar lymph node | **** | <0.0001 |
| Lung - right inferior lobe vs. Diaphragm | ** | 0.0027 |
| Lung - right inferior lobe vs. Vena cava | ** | 0.0052 |
| Lung - right inferior lobe vs. Thoracic aorta | ** | 0.0011 |
| Lung - right inferior lobe vs. Colon | * | 0.0155 |
| Lung - right inferior lobe vs. Bone | ns | 0.9183 |
| Hilar lymph node vs. Diaphragm | **** | <0.0001 |
| Hilar lymph node vs. Vena cava | **** | <0.0001 |
| Hilar lymph node vs. Thoracic aorta | **** | <0.0001 |
| Hilar lymph node vs. Colon | **** | <0.0001 |
| Hilar lymph node vs. Bone | **** | <0.0001 |
| Diaphragm vs. Vena cava | ns | >0.9999 |
| Diaphragm vs. Thoracic aorta | ns | >0.9999 |
| Diaphragm vs. Colon | ns | >0.9999 |
| Diaphragm vs. Bone | ns | 0.2093 |
| | | |
| Vena cava vs. Thoracic aorta | ns | >0.9999 |
| Vena cava vs. Colon | ns | >0.9999 |
| Vena cava vs. Bone | ns | 0.2981 |
| Thoracic aorta vs. Colon | ns | 0.9981 |
| Thoracic aorta vs. Bone | ns | 0.1168 |
| Colon vs. Bone | ns | 0.5057 |

**Table S6. Tissue water content**

*Table S6. Tissue water content as described by Ali and Saber.*[1]

| Tissue type | Muscle | Fat | Spleen | Lung | Liver | Kidney | Bone |
|---|---|---|---|---|---|---|---|
| Water content (%) | 73-78 | 5-20 | 76-81 | 80-83 | 73-77 | 78.79 | 44-45 |

**Table S7. Total Al tissue content**

***Table S7.*** *The average lung was found to have a ten-times higher absolute Al amount than liver, the tissue with the second highest absolute Al content. <LOQ = below limit of quantification; NA = not available*

| | Total Al in tissue / mg | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| patient | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mean | SD |
| Lung | 19.5 | NA | 20.3 | 7.94 | 2.36 | 1.44 | 0.59 | NA | 8.68 | 9.05 |
| Heart | 2.77 | NA | <LOQ | 0.08 | 0.06 | 0.08 | 0.10 | 0.09 | 0.45 | 1.02 |
| Kidney | 0.04 | NA | <LOQ | <LOQ | 0.04 | 0.06 | 0.04 | 0.05 | 0.03 | 0.02 |
| Spleen | 0.07 | NA | 0.06 | 0.11 | 0.02 | 0.01 | <LOQ | 0.04 | 0.04 | 0.04 |
| Liver | 0.80 | NA | 0.56 | 2.10 | 0.31 | 0.27 | 1.11 | 0.54 | 0.81 | 0.64 |

**Figure S1. Lumogallion and H&E staining of patient 2**

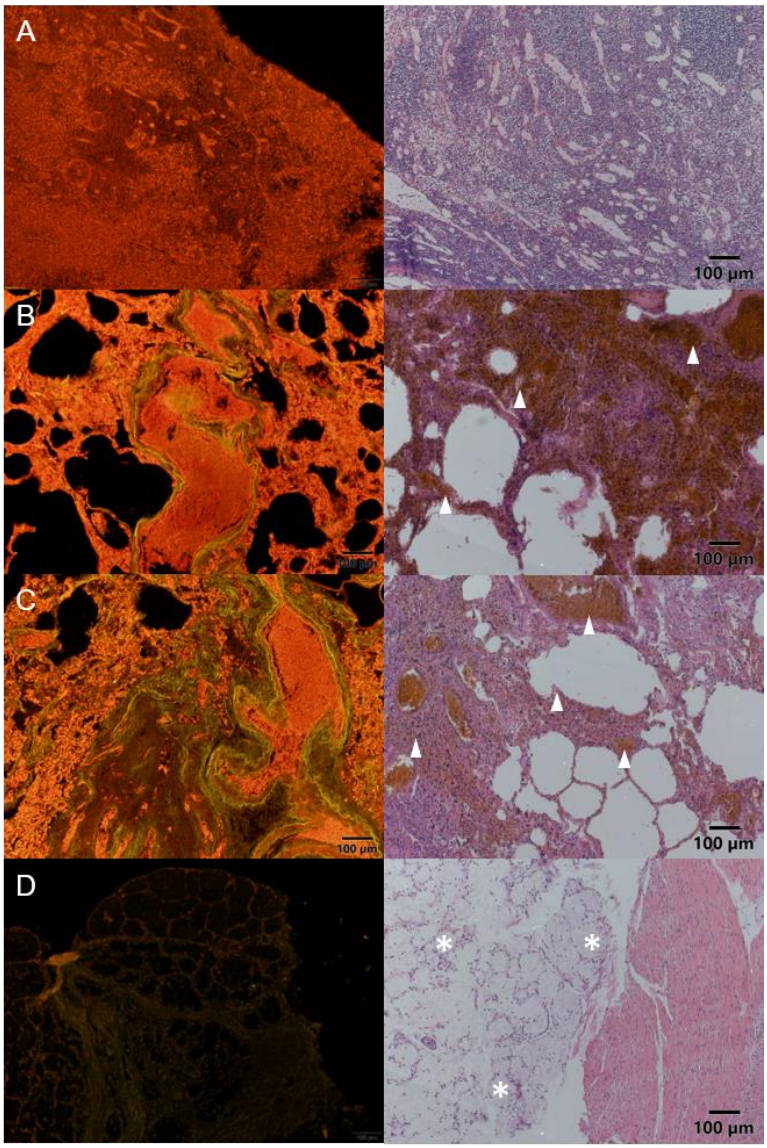


***Figure S1.*** *Lumogallion (left column, red Al-specific fluorescence) and H&E images (right column) of hilar lymph node (A), upper lobe of the lung (B), lower lobe of the lung (C), and duodenum (D) are shown for patient 2. Erythrocytes are stained red using H&E (indicated with triangles) and are found inside blood vessels as well as within the tissue of upper and lower lobe of the lung. Like in patient 4 (see Figure 1), the location of erythrocytes and Al overlap, showing that Al is bound in erythrocytes in lung tissue. Brunner's glands were identified with H&E staining and are the only region of duodenum where Al signals are found (indicated with asterisks).*

**Figure S2. Quarterly averages of Al in PM10 between 2014-2020**

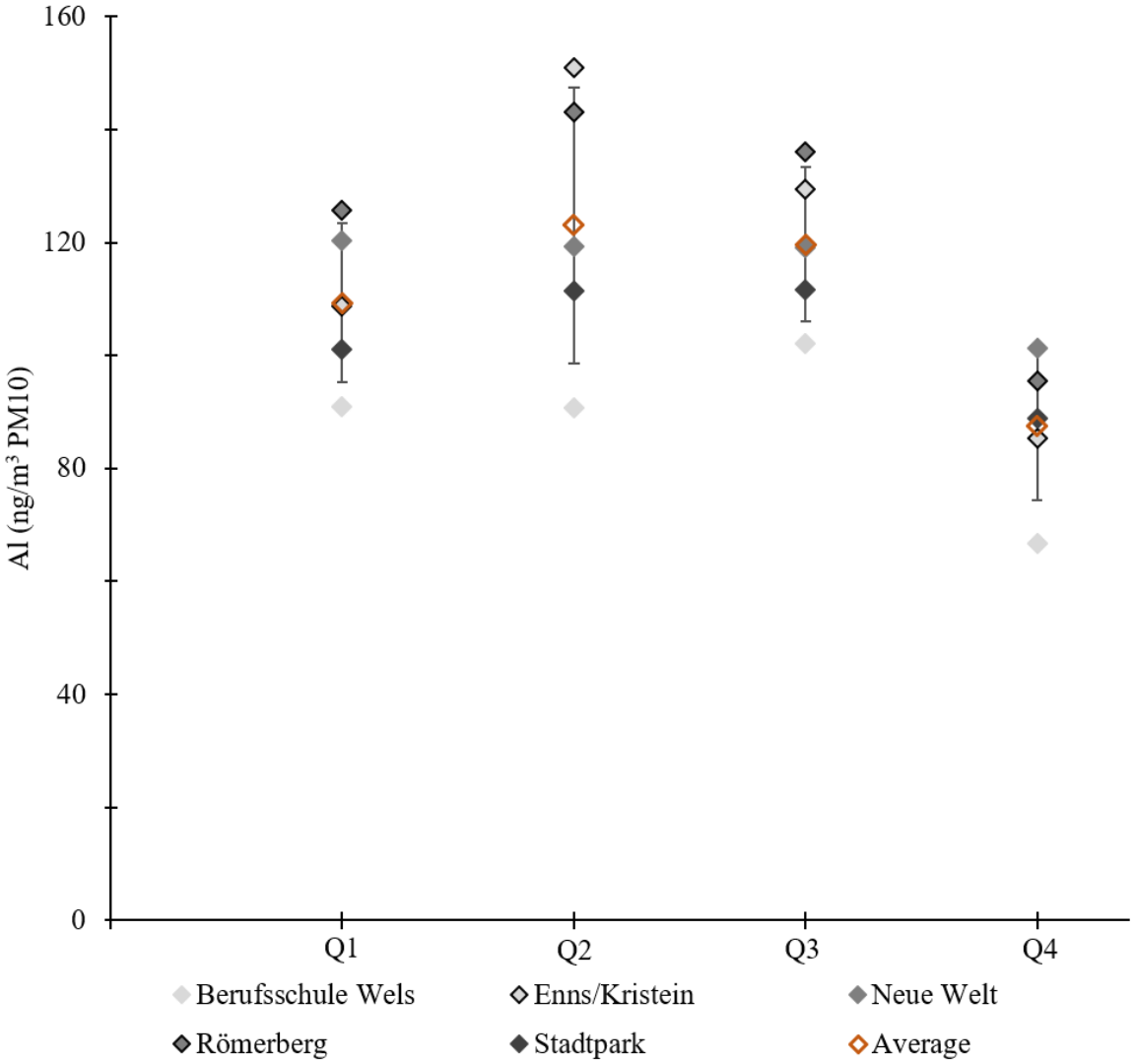


***Figure S2.*** *Quarterly averages of Al in PM10 (in ng/m$^3$) were calculated for Römerberg, Enns/Kristein, Stadtpark and Neue Welt for 2014-2020, while data from 2015-2020 was used for Berufsschule Wels. The average of all quarterly averages of these locations of all years was calculated. Q1: January 1$^{st}$ - March 31$^{st}$; Q2: April 1$^{st}$ - June 30$^{th}$; Q3: July 1$^{st}$ - September 30$^{th}$; Q4: October 1$^{st}$ - December 31$^{st}$*

**Supplementary References**

(1) Ali, Y. E. M.; Alanaz, A. G. Temperatures Variation in Different Human Tissues according to Blood Flow Coefficient. *Int. J. Comput. Appl. Technol.* **2018**, *180* (28), 10–14.