

## Akureyri is creating a generation of lung cancer

Atmospheric particulate matter, in short particulate matter, exceeds the limit that is considered to be dangerous for health in Akureyri regularly in the season when car tiers are equipped with spikes. Particulate matter induces epigenetic changes, by which it induces lung cancer. But it also increases allergies, the frequency of asthmatic attacks, middle ear infections, chronic obstructive pulmonary disease, and it also affects the nervous system – with long term effects in children when they grow older, as their nervous system is in a very sensitive phase of development. At times when parents and teachers are worried about ADHD we should carefully think about potential causes – there is scientific evidence that suggests a link between particulate matter and ADHD. The mechanism explaining this is that particulate matter induces neuroinflammation – as a result, both children and older individuals exposed to air pollution exhibit signs of cognitive dysfunction. The further consequences can be stroke, white matter disease and damage to blood vessels in the brain. It was also suggested by some scientific studies that coronary diseases and infarct as well as effects on weight birth of unborn children could be due to particulate matter.

Particulate matter reaches the lungs, because the filter provided by the nose and upper airways lets pass particles with a diameter smaller than  $10\mu\text{m}$ . Therefore we measure particulate matter as concentration of  $\text{PM}_{10}$ . These particles reach the lungs and remain there for a very long time because the lung is not able to effectively clean itself. The result is the same as for smokers – particulate matter exposure increases lung cancer risk independently from cigarette smoking. Particulate matter is designated by the WHO to be a Group 1 carcinogen. In the EU, every year 65.000 people die because of particulate matter, especially because of lung cancer. Time will show whether the Corona Virus can break this sad record. Smoking is banned in public areas in Iceland, whereas driving a car is allowed even in tremendously dangerous conditions for our and our children's health.

However, even smaller particulates, the  $\text{PM}_{2.5}$  (accordingly of  $2.5\mu\text{m}$  size) are even more dangerous because these particles go even deeper into the fine structure of the lungs. These particles reach even the unborn child in pregnant women.  $\text{PM}_{2.5}$  is not measured in Akureyri but it is measured in Húsavík.

An increase of  $\text{PM}_{10}$  in the air to  $10\mu\text{g}/\text{m}^3$  increases the number of hospitalizations because of respiratory failure by 0.5-5.7%, mortality increases by 0.2 to 1.6%. Although there is scientific evidence that exceeding a  $\text{PM}_{10}$  of  $10\mu\text{g}/\text{m}^3$  has negative health consequences, the WHO recommends that the annual average of  $\text{PM}_{10}$  should be no higher than  $20\mu\text{g}/\text{m}^3$ , whereas the average in 24 hours should be no higher than  $50\mu\text{g}/\text{m}^3$ . The limits for  $\text{PM}_{2.5}$  are  $10\mu\text{g}/\text{m}^3$  as the annual mean and  $25\mu\text{g}/\text{m}^3$  as the 24-hour mean. Exceeding this number should happen no more than 7 times a year. How often does this happen in Akureyri? The public can access the 24h recordings of  $\text{PM}_{10}$  on the website of umhverfisstofan, but no public access exists to the annual distribution of values. We need to inform the people about the danger for their health which is a result of their thoughtless use of cars.

A major problem that would be easy to solve are engines that are running in idling state. A Diesel car that is running in idle state is a common picture in Akureyri in the mornings. People want to have a warm car. However, modern motors don't need to run before you drive them and they heat up much more efficiently and with a lower expulsion of particulate matter when driven. An old Dieselmotor in idling state produces  $300\mu\text{g}/\text{m}^3$  – children waking to school are often exposed to a lot of cars in idling state because parents and other adults drive to work, no wonder that the kids are suffering from asthma and allergies.

A responsible policy for our children would be a law that effectively bans driving cars when the particulate matter exceeds a certain threshold. These conditions can be foreseen on days with dry streets and spikes on tiers, i.e. often in spring and fall. If this is not possible, schools should be

effectively closed on those days and children should be kept indoors.

**Concrete recommendations:**

1. Measure PM<sub>2.5</sub>, which is the more dangerous part of particulate matter in Akureyri.
2. Inform people about the daily means of particulate matter. This should be part of the daily weather report in newspapers and TV.
3. Set up a law that effectively protects our children by banning driving in town when particulate matter exceeds the health limit and by keeping children at home when it is unhealthy to send them to school. It is not a solution to drive them to school as this makes the problem even worse (more people driving) and they have to inhale the bad air anyways from the house to the car and from the car to the school building.
4. Effectively control whether cars are running in idling state. This is unnecessary and banned by law in Iceland (788/1999).
5. Shorten the period when tires with spikes are allowed. Climate change has shortened the winter, we have to react accordingly.
6. Use salt on the streets in order to convince people that they do not need spikes on their tires for driving in town. The argument that salt is bad for the cars is really thoughtless, as the spikes lead to particulate matter in the air which is bad for our health – so what is more important, the car or the lungs of our children?

**Links**

[https://apps.who.int/iris/bitstream/handle/10665/69477/WHO\\_SDE\\_PHE\\_OEH\\_06.02\\_eng.pdf;jsessionid=10E6A966BD1516CCEE2C14F4B5812A90?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/69477/WHO_SDE_PHE_OEH_06.02_eng.pdf;jsessionid=10E6A966BD1516CCEE2C14F4B5812A90?sequence=1)

<https://loftgaedi.is/?zoomLevel=7&lat=64.89484120718218&lng=-18.67563283375684>

<https://www.stjornarradid.is/lisalib/getfile.aspx?itemid=735dd264-cfa2-11e7-941f-005056bc4d74>

**Scientific References**

Badabjouni RM, Hodis DM, Radwanski R, Durazo R, Patel A, Liu Q, Mack WJ (2017). Clinical effects of air pollution on the central nervous system; a review. *J Clin Neurosci* 43:16-24.

Li J, Li WX, Bai C, Song Y (2017). Particulate matter-induced epigenetic changes and lung cancer. *Clin Respir J* 11(5): 539-546.

Thompson JE (2018). Airborne particulate matter: Human exposure and health effects. *J Occup Environ Med.* 60(5):392-423.