The Diesel"Scandals" - an Attempt to Sequence the Importance

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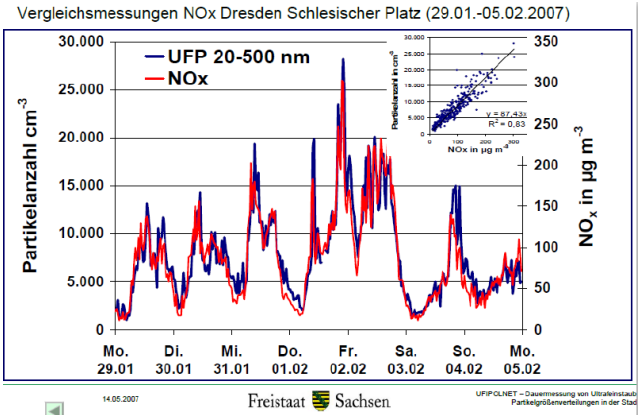
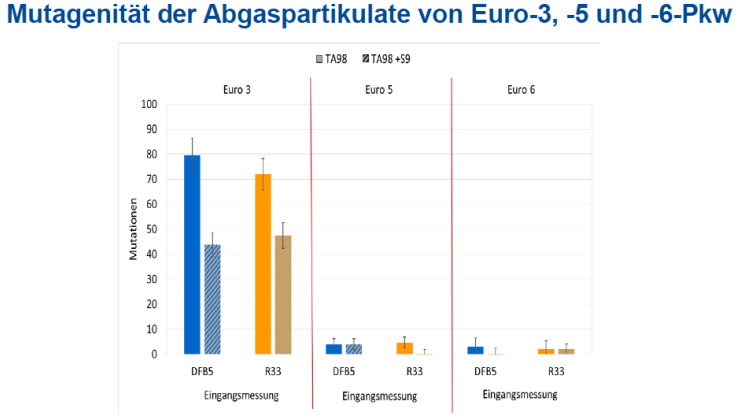
1. The burden of disease of traffic emissions is high and undisputed, as the last WHO report say[1]
2. Nitrogen dioxide - NO_2 is not harmless, but effects of concentrations measured at the highest polluted sites and in cars do probably harm only asthmatics; other harm is unclear. It dilutes fast – in the next street bisection is common it and degrades quickly indoors – where we spend 92% of our time.
3. NO_2 is an irritant gas, which has different limits for harm (6000 µg/m³ is in Switzerland the occupational limit for eight hours, 100 µg/m³ the US environmental limit for 24 hours). Secondary particles from NO_2 are water-soluble – therefore they do not reach alveoli and do not persist. NO_2 is a precursor for ozone – a substance which could increase in dry heat waves due to climate change. Some studies show negative effects of NO_2 to common allergen plants. Epidemiologically some more effects are attributed to NO_2 – but not plausible.
4. Diesel Particles occur parallel with nitrogen oxides (picture 1) because of the same source (unfiltered diesel engine). Engines above EURO IV emit only ultrafine particles, which cannot be measured with PM_{10} und rarely with $PM_{2,5}$. They have to be counted as EU-Regulations for Euro 5 and EURO VI demand. One way to find out their harmful potential is to measure the lung deposited surface area – lot of ongoing work.



Pic. 1: Same source- same amount of nitrogen dioxide and ultrafine particles



2. not all DME are cancerogen, only unfiltered (pre Euro 5; VI) are

5. most of the harm from NO_2 is not plausible because lacking modes of action; it could be explained with UFP
6. there is no harmless limit for Diesel particles; it is carcinogen for sure; therefore they have to be reduced as much as possible; WHO says recommended $PM_{2,5}$-Limits are not safe (EU Limits are twice high).
7. UFP are dangerous for everybody; they can be found even in the brain of unborn. Pediatrics warned 2018 for mental dysfunctions due to damages of the blood-brain-barrier. The consequences of ultrafine particles in organs like kidney, brain or liver cannot be estimated yet.
8. Effects of inflammation through oxygen radicals, through rising coagulation levels are quite clear: EEA (European Environments Agency) estimates about 66.000 deaths per year through $PM_{2,5}$ only in Germany.
9. Chronic health effects of particles might be much higher than acute ones.
10. Global warming: soot is (with methane) second behind CO_2 and has to be reduced to 1/5[2]. 400 scientists appealed in Science 01/2012 to reduce them immediately to win time in the climate run. CO_2 will remain hundred years.

Conclusion: From the viewpoint of public health, traffic related concentrations of NO_2 are more an irritant than a toxic risk; NO_2 is perceived because of the cheating, therefore causing political action. In contrast, ultra-fine particles cannot be perceived directly; however, they constitute a substantial harm to public health and climate. Consequently, particle-filter retrofit should be given absolute priority, as the World Medical Association, representing 11 million doctors, called for already in 10/2014[3]. Particle filters (DPF) eliminate 99% of all particles. Hence, there is no reason to ban diesel engines equipped with filters. Make it expensive for Lorries without DPF to enter as London does (~100 £ a day), ban lorries without filters (Israel from 10/2018 on). Switzerland retrofitted 50.000 engines with DPF – and is one of the most competitive countries of the world. We should do this worldwide - deficit costs like illness, care and early retirement are much more expensive (for Switzerland the damage of diesel-particles were estimated 10 times higher as the costs for retrofitting).

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[1] http://www.who.int/news-room/detail/02-05-2018-9-out-of-10-people-worldwide-breathe-polluted-air-but-more-countries-are-taking-action

[2] Gruber et al, NATURE ENERGY | VOL 3 | JUNE 2018 | 515–527

[3] Emiss. Control Sci. Technol. (2017) 3:243–244