Indoor particle pollution from cooking in Denmark

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Background: In most developed countries, people spend most of their lives in their homes, where particle pollution from cooking food is a significant pollution source. The pollution increases the risk of cancer, cardiovascular diseases, blood clots and respiratory disorders. Powerful cooker hoods discharging the pollution outside are efficient solutions. However, our hypothesis is that many families still do not have powerful cooker hoods or use their cooker hood on a level that is too low. **Purpose:** The purpose was to investigate how efficient cooker hoods are in 20 Danish homes and if they are used correctly. **Methods**: Particle measurements (PN and $PM_{2.5}$ with calibrated P-Traks and DustTraks from TSI), ventilation calculations and in-depth interviews in 20 representative Danish homes with cooker hoods: 7 detached houses with a traditional separate kitchen, 3 newer detached houses with a combined kitchen and living room (new building style), and 10 apartments of which 7 apartments have recirculating cooker hoods with activated carbon filters (often used in apartments). In each measurement, we used a carefully developed reproducible bacon frying setup on our own cooking plate with our clean pan (homogeneous pollution source): Without the use of the cooker hood, with the cooker hood on medium level, with the cooker hood on the highest level, with the cooker hood on the highest level and a carefully cleaned grease filter. All measurements were carried out simultaneously in the kitchen and the connected room in two separate measurement rounds with open and closed door to the kitchen, respectively. In addition, an efficient air purifier was tested as supplement - and alternative – to cooker hoods in 7 apartments with recirculating cooker hoods. In total around 150 measuring situations were made (ventilation between each measurement). The type of cooker hood in each kitchen was noted, and the volume of each kitchen was measured and sketched - the distance between the cooker hood and the stove is indicated. The location of the hood above the stove was noted to evaluate it in relation to the requirements of the Danish building code. Finally, acoustic measurements of the noise levels were carried out during each cooker hood's various operating levels. Candles, tobacco smoking, wood stoves, vacuum cleaning or other activities that could generate air pollution inside the house were avoided during measurements. **Results:** This study confirms that many Danish homes do not have powerful cooker hoods and/or use their cooker hood on a level that is too low due to noise. The particle pollution from cooking food (PN and $PM_{2.5}$) quickly spread to the rest of the home when the door to the kitchen is left open thereby polluting the entire home to much higher particle levels than observed on the most polluted streets in Copenhagen during rush hour. Families are not aware of the health consequences of particle pollution from cooking food. Recirculating cooker hoods were not at all as efficient as cooker hoods discharging outside. In general, the placement of the cooker hoods fulfills the requirements of the Danish building code. Cooker hoods discharging the pollution outside used on a high level with cleaned grease filters can efficiently remove pollution from cooking thereby significantly reducing particle pollution in the home. In addition, efficient air purifiers or through draught can be a supplement/alternative to recirculating cooker hoods. **Acknowledgement:** This study is funded by the philanthropic organisation Realdania.