Unveiling the hidden impact of motor vehicle emissions on epigenetic age acceleration

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BACKGROUND

- Motor vehicle emissions along the road network are:
  - an emerging source of pollutant exposure in urban areas worldwide
  - associated with various diseases e.g. cardiovascular disease, impaired cognitive function cancer, metabolic outcomes and mortality
- Motor vehicles produce various pollutants including:
  - toxic elements e.g. As, Cr, Mo
  - fine particulate matter PM2.5, PM10
  - black carbon and gaseous pollutants
- Recent evidence indicates accelerated biological ageing in response to toxic elements exposure and traffic related air pollutant exposure (Fig.1)

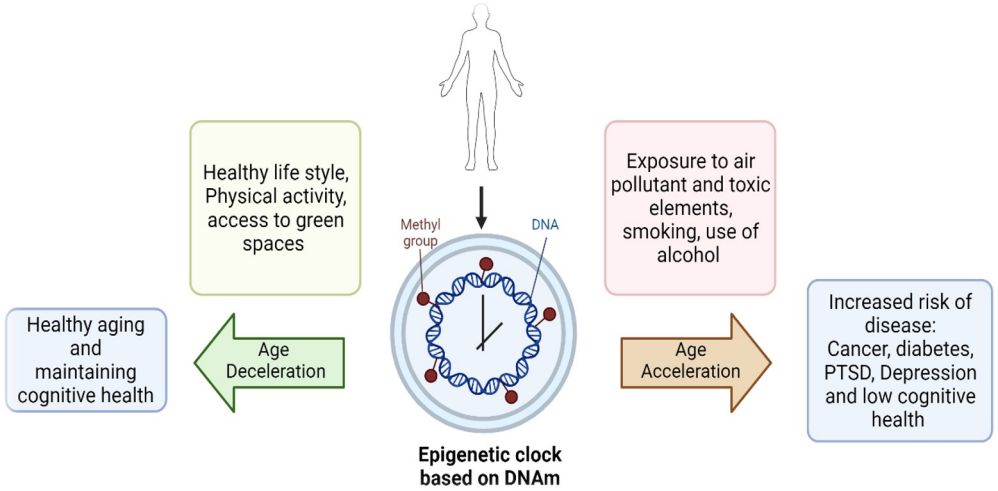

Fig.1. Epigenetic age based on DNAm and its association with environmental exposure and lifestyle

OBJECTIVE

- Investigate the relationship between soil toxic and non-toxic elements profile of road traffic buffer zone and epigenetic age acceleration in the NICOLA cohort (>55 years) using blood-derived DNA

METHODS AND STATISTICAL APPROACHES

- Road network around the motorways was divided into four buffer zones
  - 300m, 500m, 1000m and 2000m
- Soil toxic and non-toxic elements data was collected for participants in the buffer zones (*Tellus project*)
- DNA methylation (DNAm) was measured using the Infinium Methylation EPIC array
- DNAm data quality control and pre-processing steps were performed using RnBeads
- Epigenetic age acceleration was measured using the six epigenetic clocks
  - Horvath, Hannum, GrimAge, PhenoAge, DunedinPACE and DNAmTL
- Further association between epigenetic age acceleration and soil toxic and non-toxic elements will be conducted using regression analysis

CONCLUSIONS

- Interrogation of motor vehicle toxic pollutant exposure on independent epigenetic clocks in older adults can provide insight into the biological adverse effects of toxic pollutants exposure and aging-related diseases

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