**Background**

- The World Health Organisation estimates that ambient outdoor air pollution leads to 4.2 million deaths every year, mostly from heart disease, stroke, chronic obstructive pulmonary disease, lung cancer and acute respiratory infections.¹
- An increasing source of atmospheric particulate comes from microplastics (84% from road and braking emissions).²
- Evidence suggests microplastic particles that reach the lung induce inflammatory responses.³

**Statement of The Problem**

- Tightening of emission standards have reduced tailpipe emissions, but large European cities have not experienced a sharp drop in PM₂.₅ concentrations. This suggests that quantity attributed to non-exhaust emissions has been underestimated.⁴
- To date there is no major in vitro or in vivo information about the toxicity of environmentally weathered microplastic particles. As well as considerable variation concerning quantities, concentrations and the methodologies used to monitor them in the environment.⁵

**Particulate Panel**

**Bottom-Up Approach:**
- Literature review to identify microplastics to focus on.
- Choose a selection of polymer types.
- Control particle surface chemistry, size, shape, and crystallinity.

**Top-Down Approach:**
- Obtain a number of samples from the environment e.g. road dust.
- Perform chemical analysis to identify components and percentage that are likely to come from source of interest e.g. tyre wear.

**Cellular Models**

- **Simple Cellular / Co-Culture Models**
- **ALI Models**
- **Bacteria Models**

**Policy and Scientific Innovation**

- Currently no EU law in place applying to microplastics (inc. non-exhaust particulate matter).
- Tyre-wear composition and emissions is not regulated.
- Changes in vehicle emissions over past 40 years has been primarily driven by policy interventions.
- Research has the potential to influence policy and ultimately improve air quality in our cities.

**Epidemiological Study**

- Extensive research into the pathogenesis of COVID-19 suggests that severe disease likely stems from an excessive inflammatory response, but the exact predisposing factors contributing to increased clinical severity and death in patients remain unclear.
- Several national and international studies have linked long term air pollution exposure to incidence and mortality of COVID-19. However, findings have mostly been drawn from ecological analyses (population level).
- NHS data from Greater Manchester will be used to perform a retrospective cohort study looking at the effects of individuals’ long-term exposure to air pollution, and any connection with the severity of COVID-19 symptoms in patients that were admitted to hospital. We will also look at the effect on other respiratory infections such as COPD, and asthma.

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⁴ Halvorson, B. (2020). "Tire dust is pollution, and this invention will help vehicles clean up as they go." from https://www.greencarreports.com.