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# Risk Assessment of Exhaust Aerosols from Ethanol Supplemented and Normal Gasoline on Human Lung Cells in Vitro

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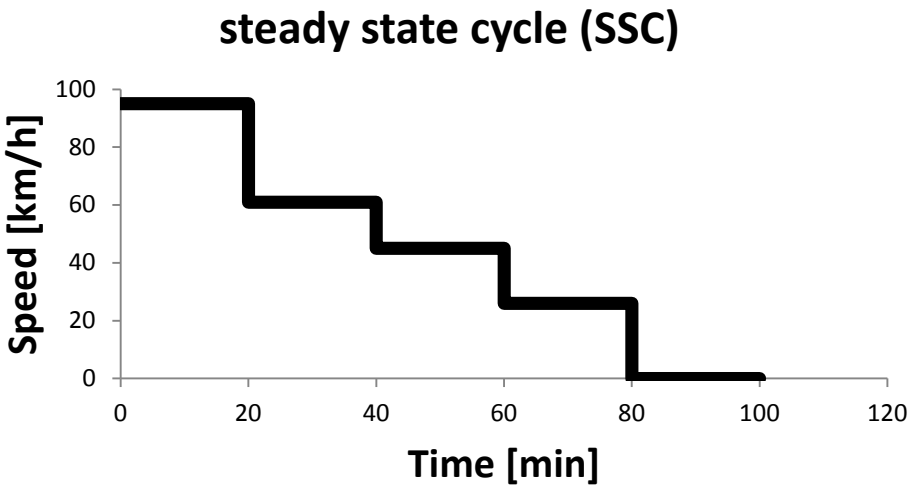
# Ethanol in fuel

- Ethanol vs fossil fuel:
  - renewable
  - environmental benefits (better combustion, energy gain)
- E10 (10% ethanol, 90% gasoline) is already the «standard» gasoline in the US
- In Brazil the standard fuel is 10-27 % ethanol
- In Europe the general use of E10 is still under discussion
- E85 is also on the market
- **Ethanol in fuels are already widely used – what about adverse effects of the exhaust?**
- **Previous study: BioDIESEL showed adverse effects *in vitro***

http://www.epa.gov/otaq/regs/fuels/additive/e15/index.htm
http://www.reuters.com/article/2015/02/02/brazil-ethanol-blend-idUSL1N0VC0X120150202
Hill *et al «environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels»* PNAS 2006

# Experimental approach- technical

- Vehicle and test cycle
  - Flexfuel passenger car (euro 5)
  - Steady state cycle (SSC) → 6 h
- Exhaust
  - 10x diluted
  - Characterised
    - particle number
    - size distribution
    - volatile fraction
- Tested fuels
  - **E10**: 10 % ethanol, 90 % gasoline
  - **E85**: 85 % ethanol, 15 % gasoline
  - **REF**: 0 % ethanol, 100 % gasoline




This presentation

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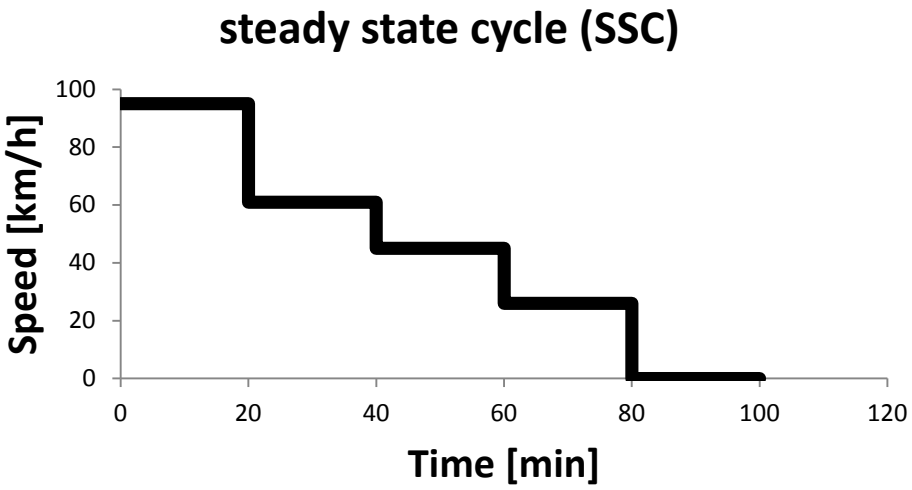
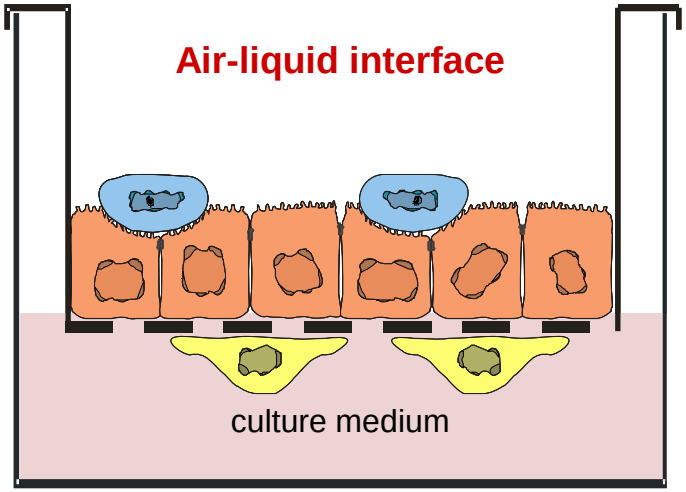



Following presentation of L. Müller: *Effect of Gasoline Exhaust Emission on Bronchial Epithelial Cells and Natural Killer Cells*

# Experimental approach- biological



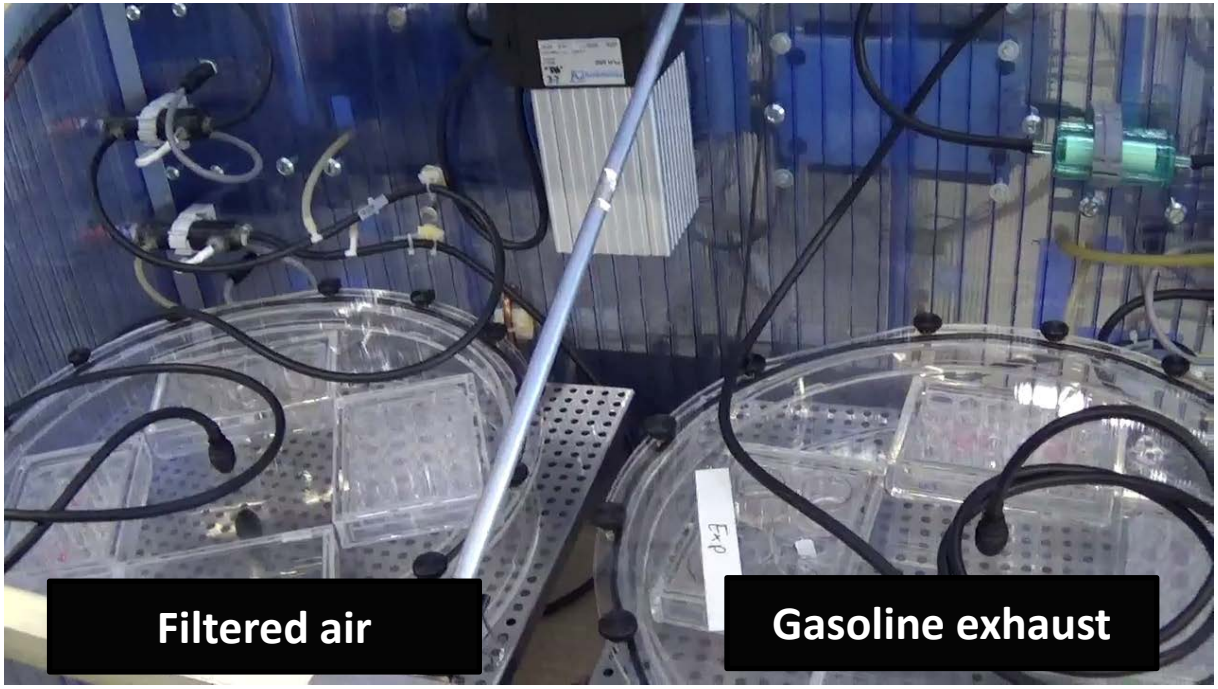

3D HUMAN cell model of the epithelial airway barrier

- Macrophages (from human blood)
- Bronchial epithelial cells (16HBE14o- cell line)
- Dendritic cells (from human blood)

Endpoints measured after 6h exposure and 6h post-exposure

- Cytotoxicity
- Morphology
- Oxidative stress
- (Pro)inflammation
- Mutagenicity

# Experimental approach- Exposure chamber





**Exhaust related effects = $\frac{\text{Gasoline exhaust exposure}}{\text{Filtered air exposure}}$**

# Experimental approach- video

# Thank you very much

Foundation:

Schweizerische Eidgenossenschaft
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Confederaziun svizra

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**Swiss Federal Office of Energy SFOE**

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