Effects of Traffic-Related Nanoparticles in the animal model *C. elegans*: Neurodegeneration and Neurodegenerative Diseases

25th ETH-Conference on Combustion Generated Nanoparticles
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Traffic-related Air Pollution

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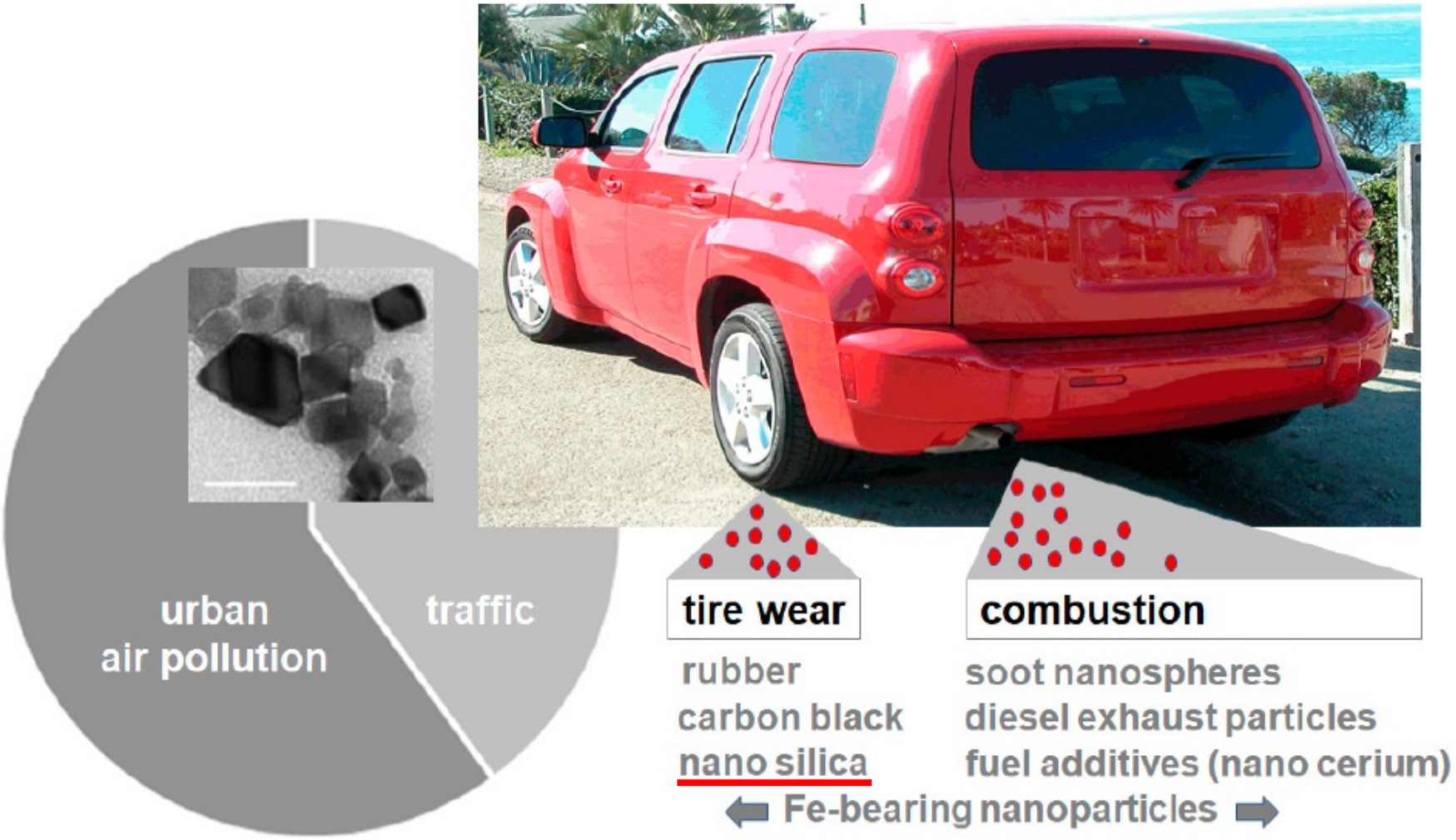

von Mikecz and Schikowski, Nanomaterials (Basel) (2020)

How does traffic-related air pollution have an impact on human health?

NPs Increase Risk of Developing Neurodegenerative Diseases

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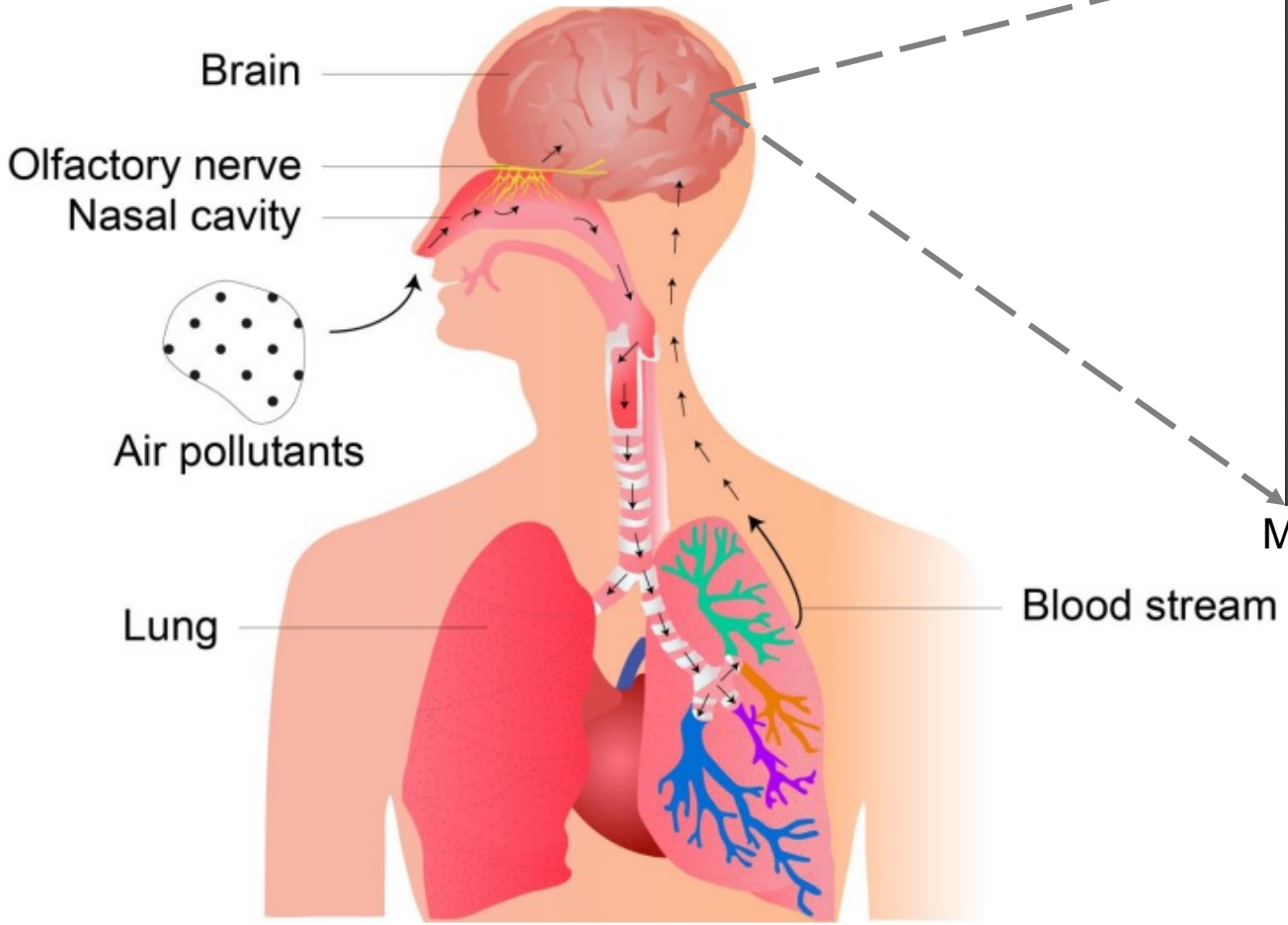
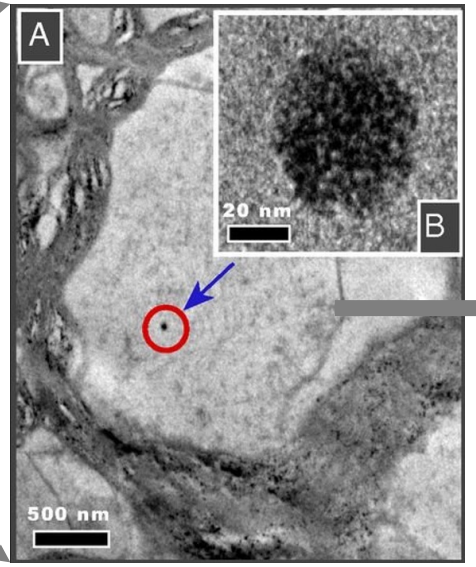


adapted from: Aretz et al., Environ Res (2021)



Maher et al., PNAS (2016)

higher risk for Alzheimer‘s and Parkinson‘s Disease development

Block and Calderón-Garciueñas, Trends Neurosci (2009)

Models for Neurodegenerative Diseases

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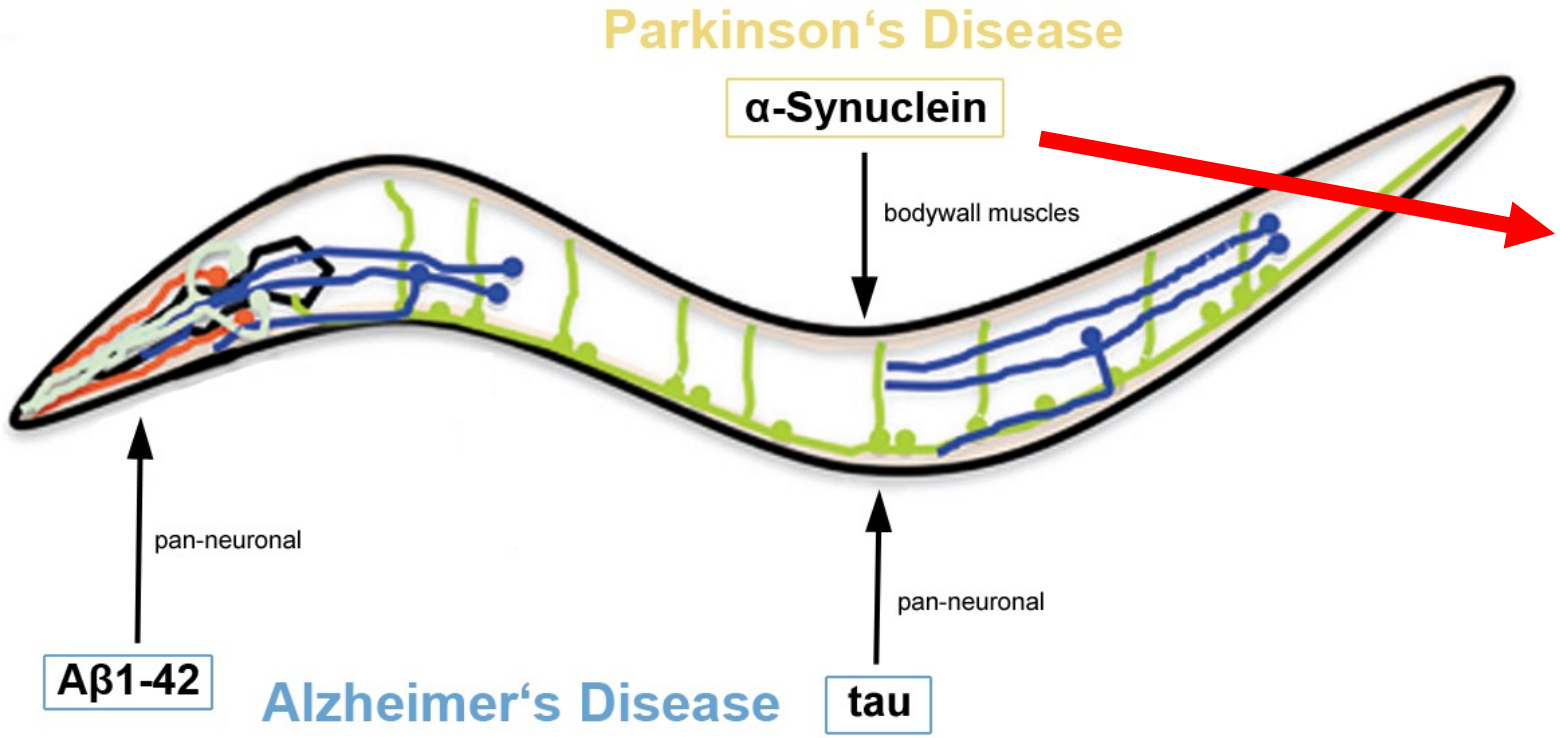
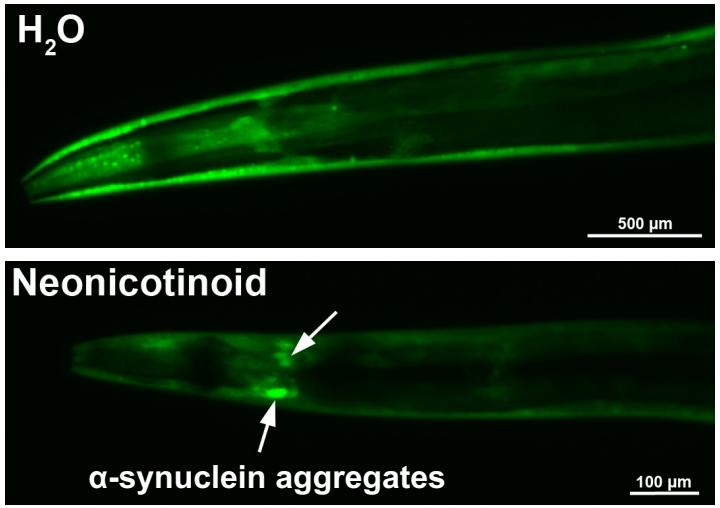




adapted from: Alexander et al., Front Genet (2014)

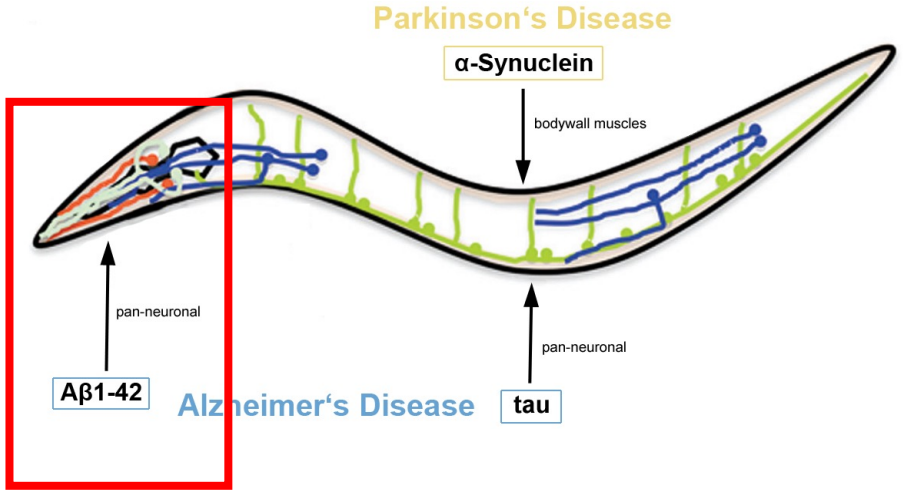
hallmark of neurodegenerative diseases: **protein aggregation**

Alzheimer‘s Disease – Aβ1-42

- disease characterized by presence of amyloid plaques and neurofibrillary tangles in the brain
- Aβ1-42 predominant peptide in these amyloid deposits
- induces loss of neuron functionality

In *C. elegans*:

- expression of human Aβ1-42 in all neurons
- age-related increase of amyloid deposits
- causes neuromuscular defects



((Roher et al., Proc Natl Acad Sci U S A (1993); Fong et al., Scientific reports (2016)))

Method: Locomotion Fitness Test

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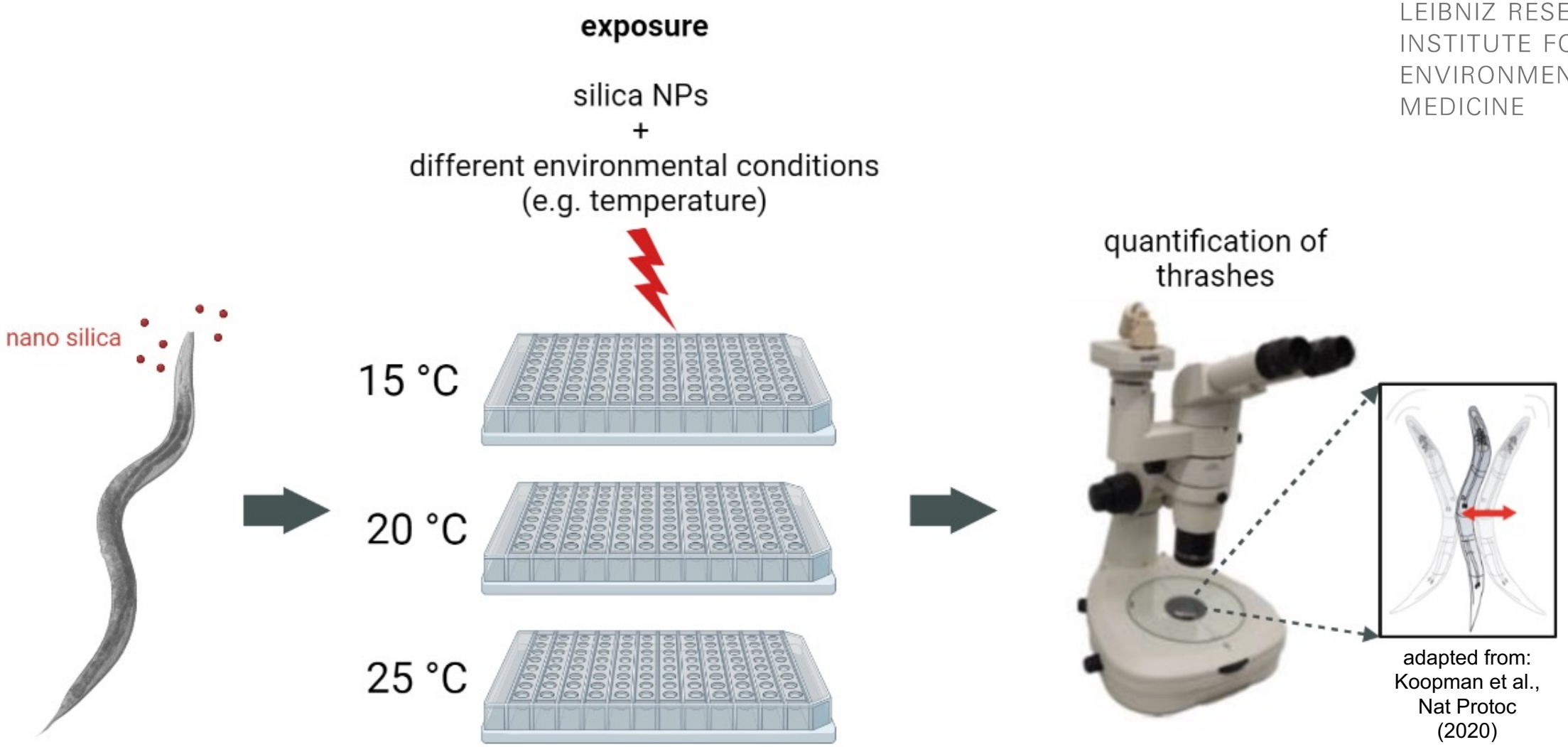
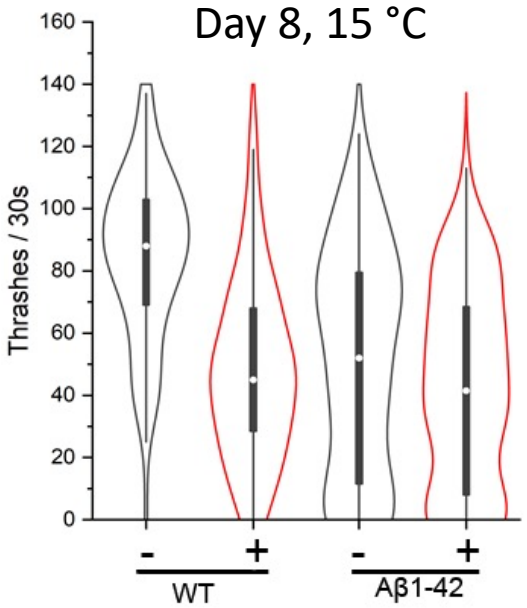
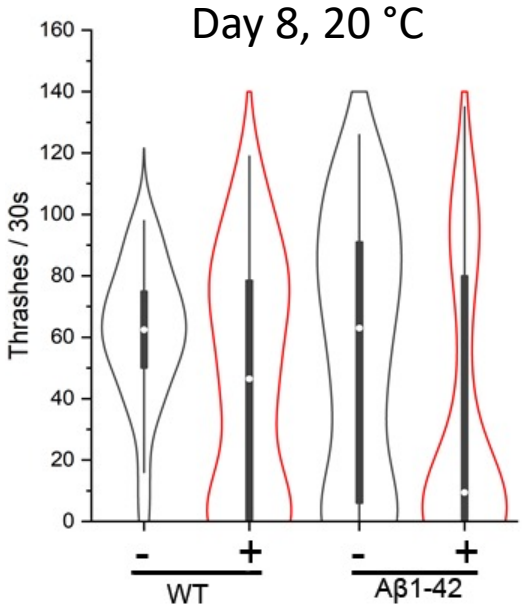
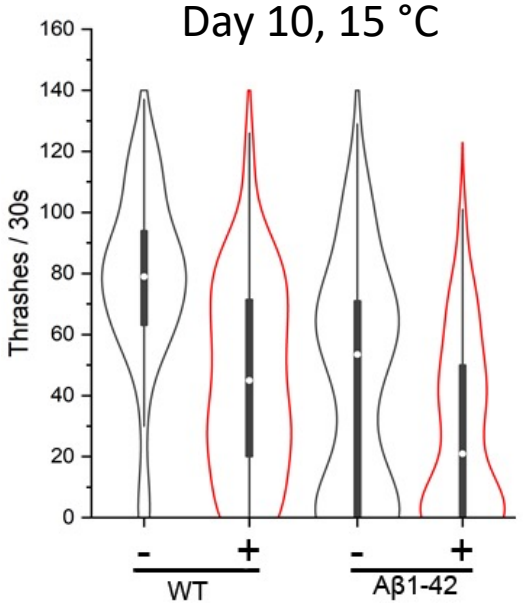


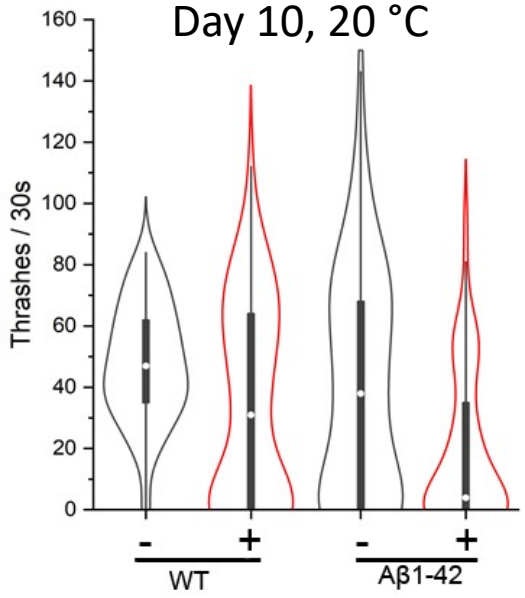
adapted from:
Koopman et al.,
Nat Protoc
(2020)

created with BioRender.com









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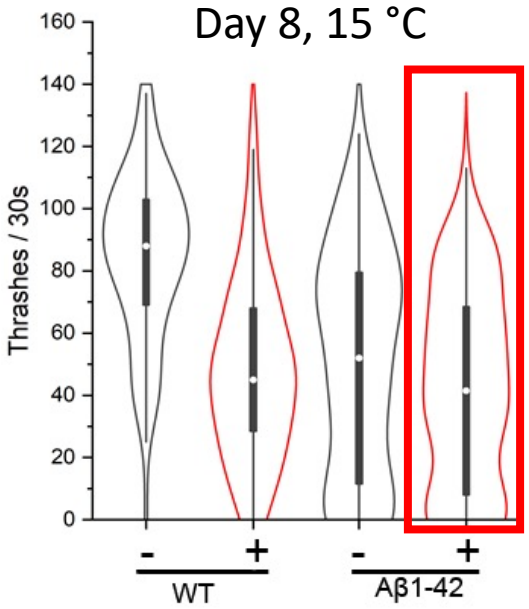
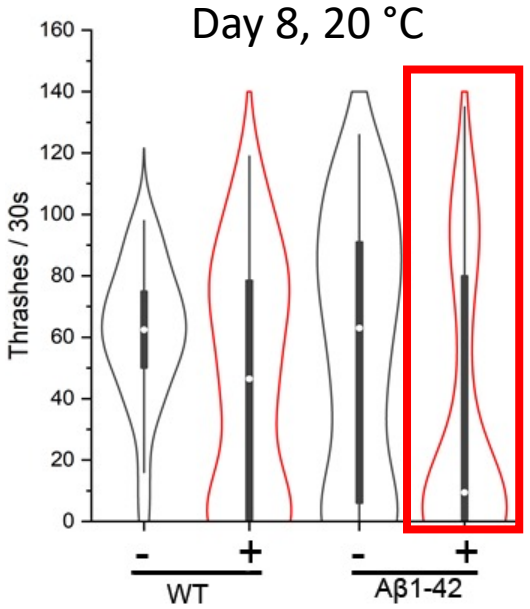
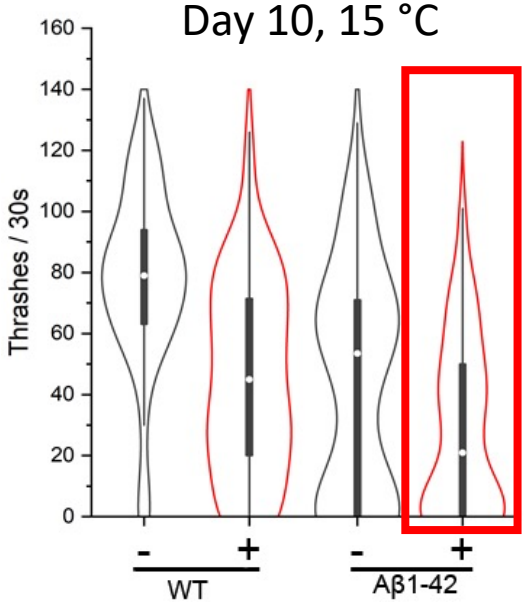
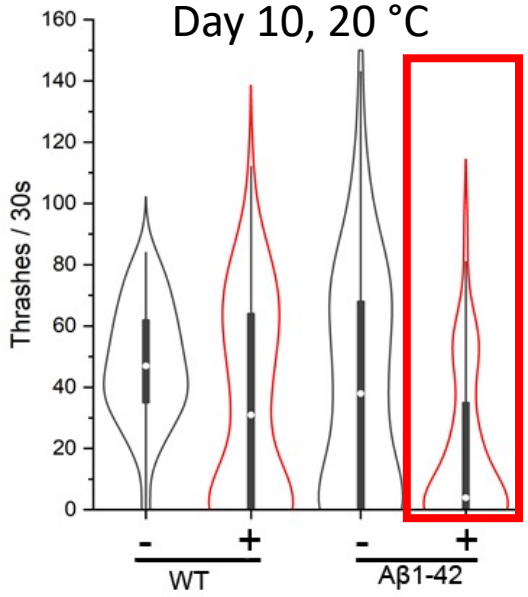
Conclusions

- Nano silica has adverse effects on locomotion fitness in WT and AD model









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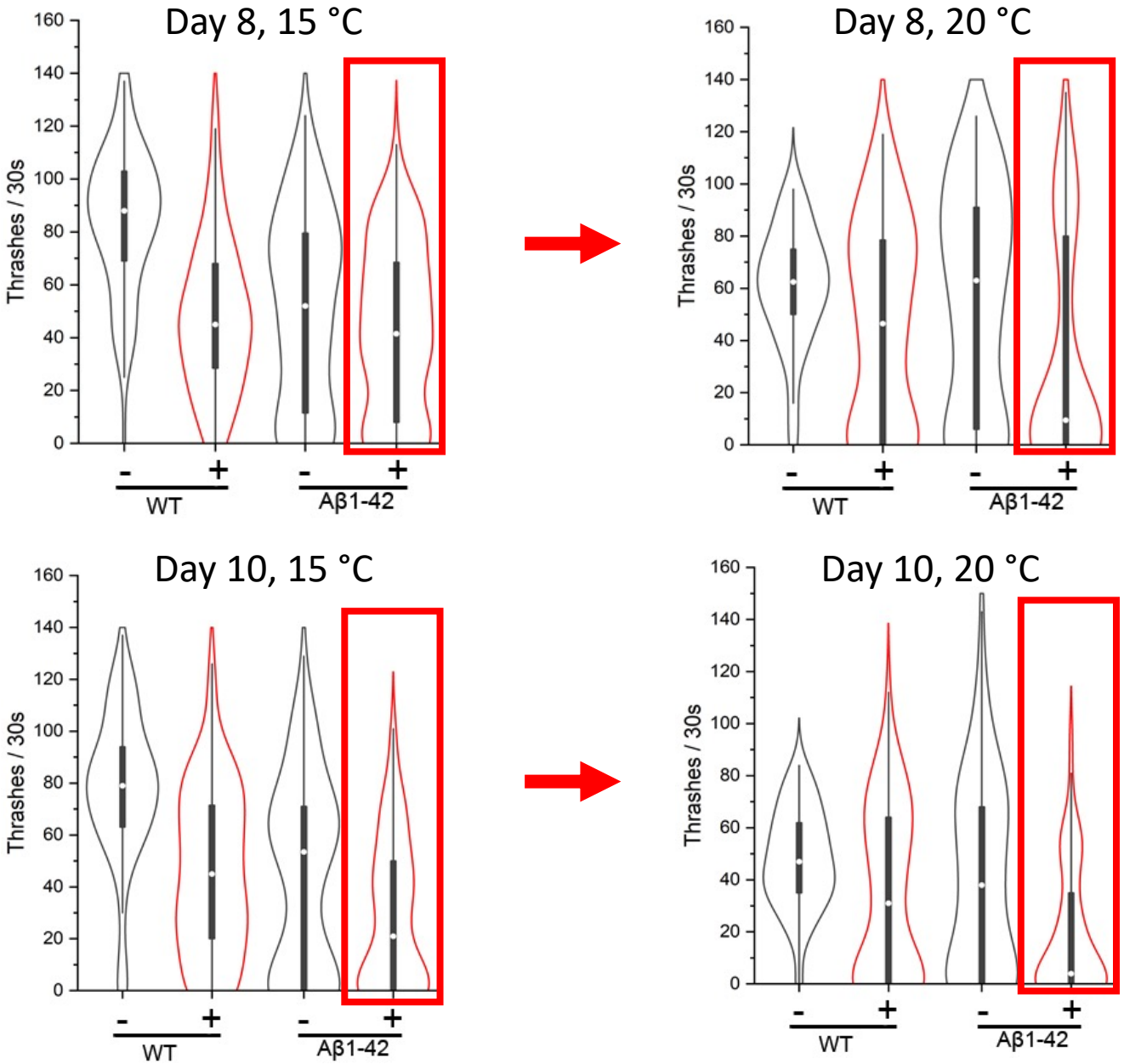
Conclusions

- Nano silica has adverse effects on locomotion fitness in WT and AD model
- Disease models are more vulnerable to NPs



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Conclusions

- Nano silica has adverse effects on locomotion fitness in WT and AD model
- Disease models are more vulnerable to NPs
- global warming may have a negative impact on adverse health effects of nano silica

Outlook

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- fitness tests in Alzheimer‘s and Parkinson‘s disease models at 15 °C, 20 °C and 25 °C
- comparative analyses of tire wear- and combustion-related nanomaterials
- Validate ´one health´ concept

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Thank you for your time and attention

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