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Exploring the ecotoxicity of graphene-based material in aquatic environments: from single-species studies to aquatic microcosm approach

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Exploring the ecotoxicity of graphene-based material in aquatic environments: from single-species studies to aquatic microcosm approach

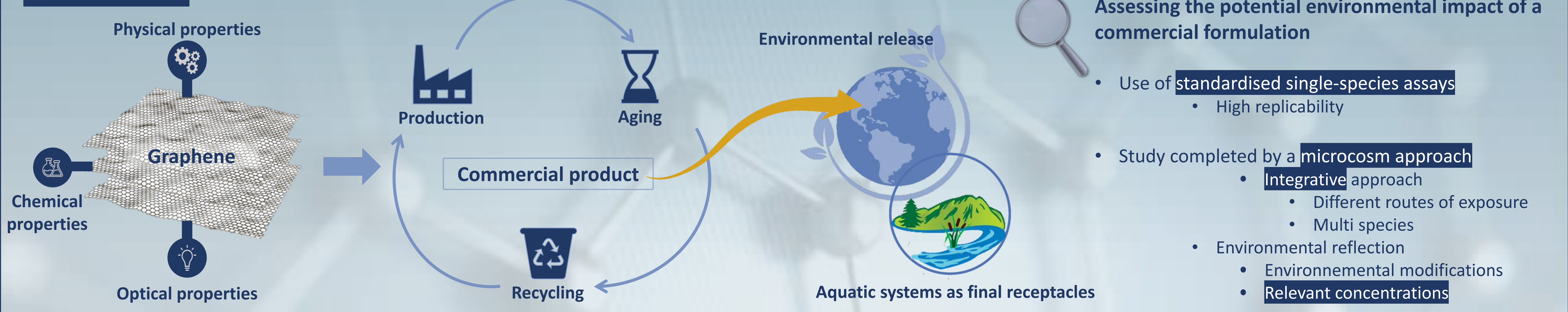
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Introduction



Material and methods

Commercial Ink

1% of Few Layer Graphene (FLG)

1% of Deoxycholic acid (SDC)

	Results	Methods
FLG concentration (g/L)	1	TGA
SDC concentration (g/L)	1	TGA
Number of graphene layers	2-20	TEM
NP lateral size (µm)	1-4	TEM
NP thickness (nm)	0.7-7	TEM
Specific surface area (m ² /g ink)	7.7	BET
Graphite residues (%)	40	Raman

Standardised tests

Microcosms

Algae : *R.subcapitata*

OECD TG 201

Crustacean : *D.magna*

OECD TG 202

Amphibian : *X.laevis*

ISO 21427-1 (2006)

0.1 mg/L of Ink or SDC

C.riparius

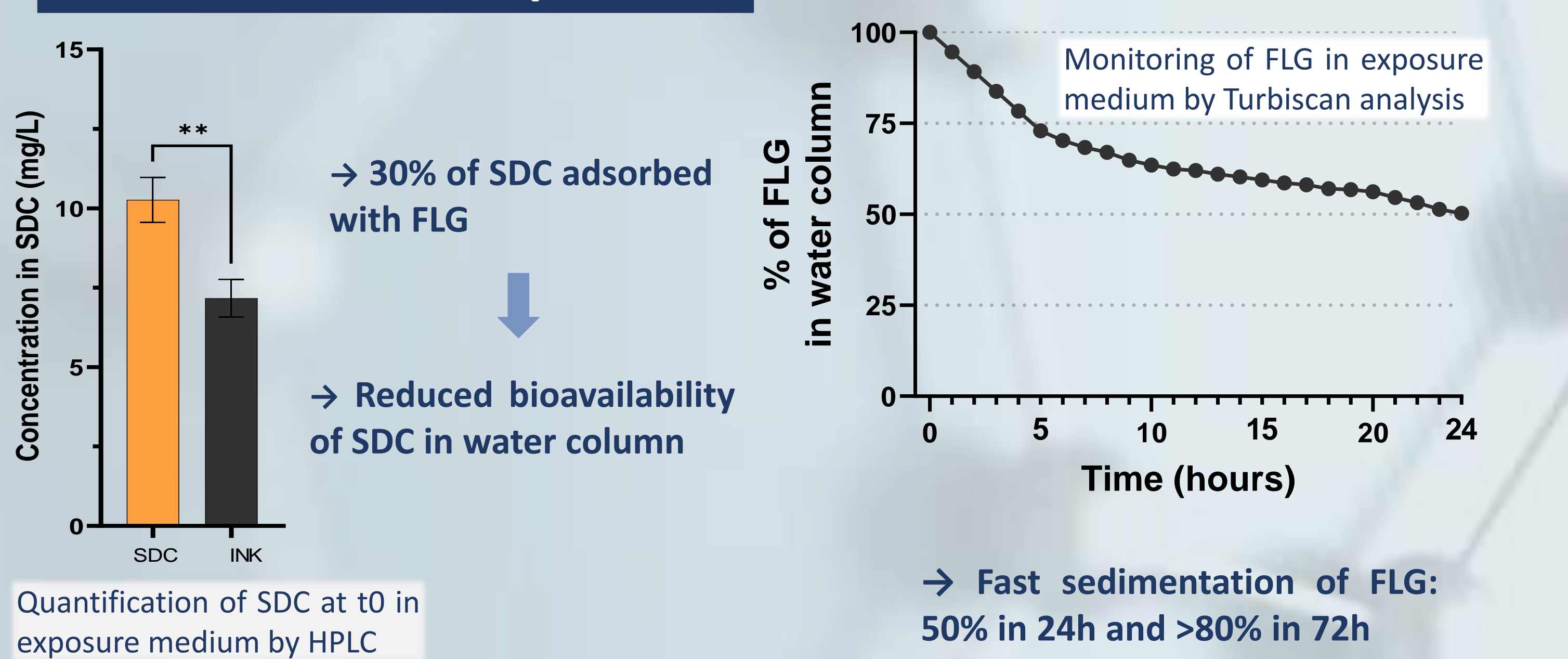
River biofilm

28 days

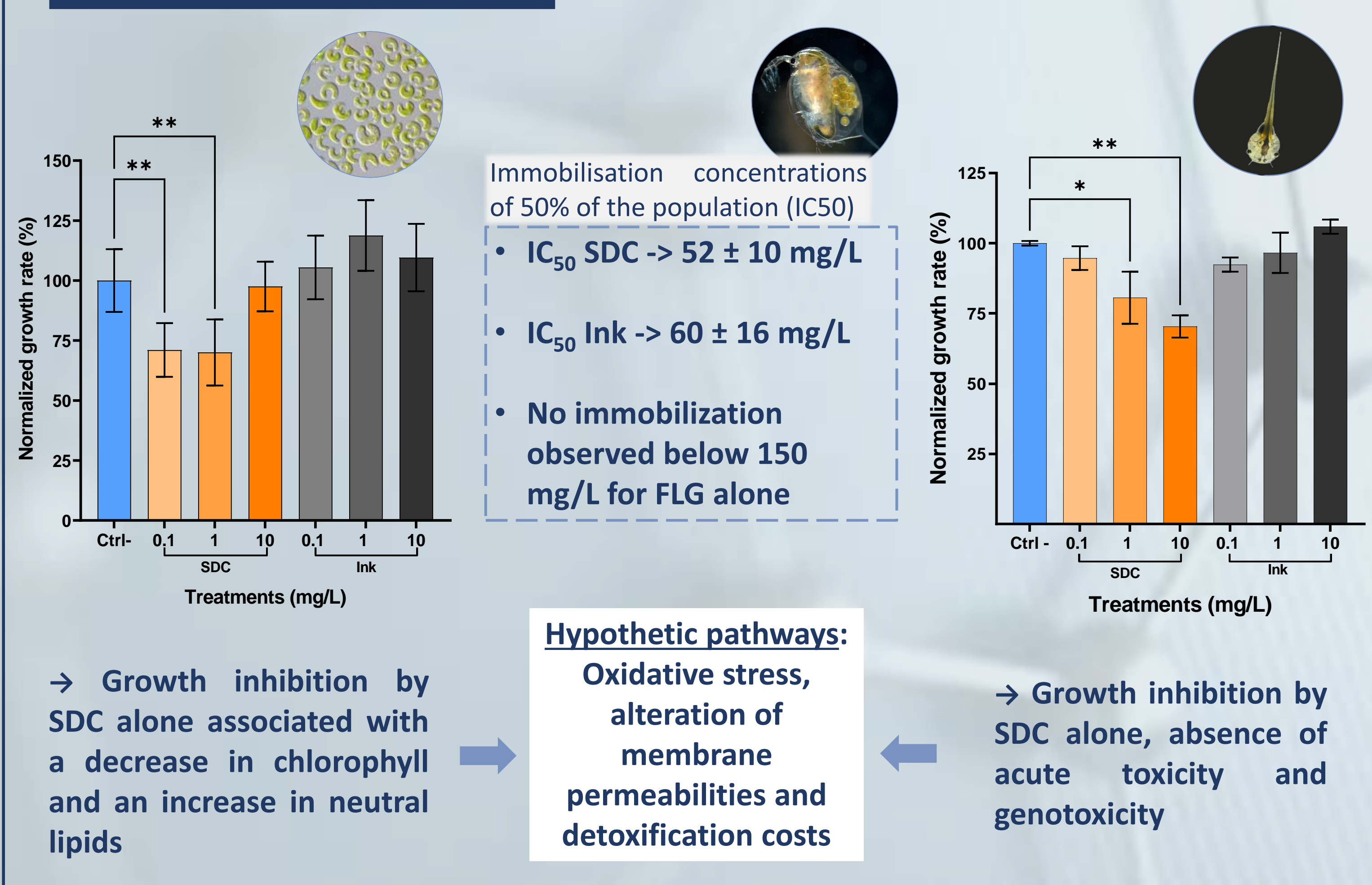
End points :

- Growth
- Emergence
- Sex ratio
- Teratogenicity
- Survival
- Metabolic profiles
- Diversity (16S seq)

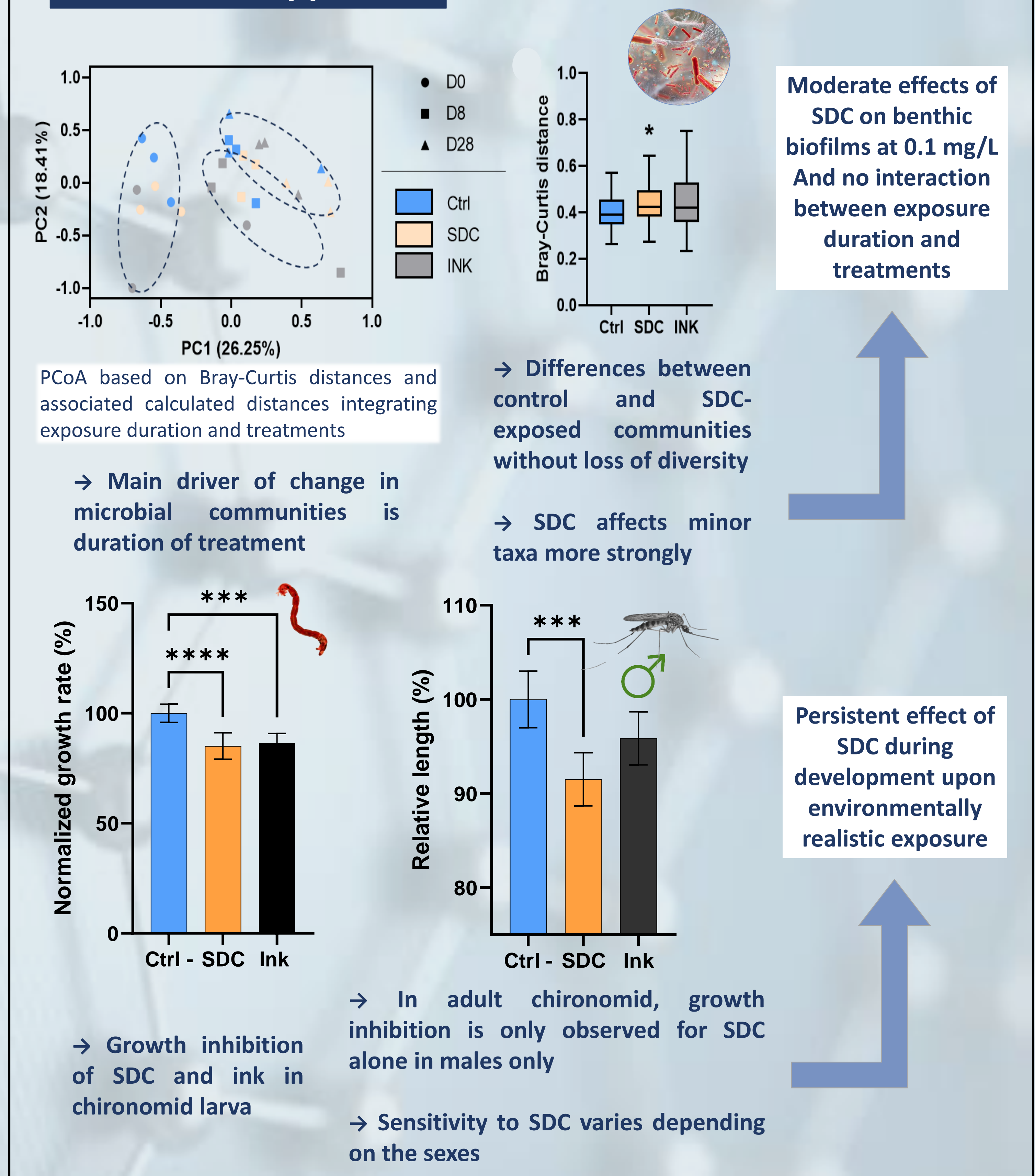
Behaviour of Compounds



Standardised assays



Microcosm approach



Conclusion

- Absence of acute toxicity BUT metabolic damages and ecosystem disturbances of Deoxycholic acid
- Deoxycholic acid toxicity >> toxicity of graphene-containing commercial formulation
- Interactions between few layer graphene and deoxycholic acid → decrease in bioavailability
- In microcosm, the toxicity is preserved despite interactions with matrices and biological organisms

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