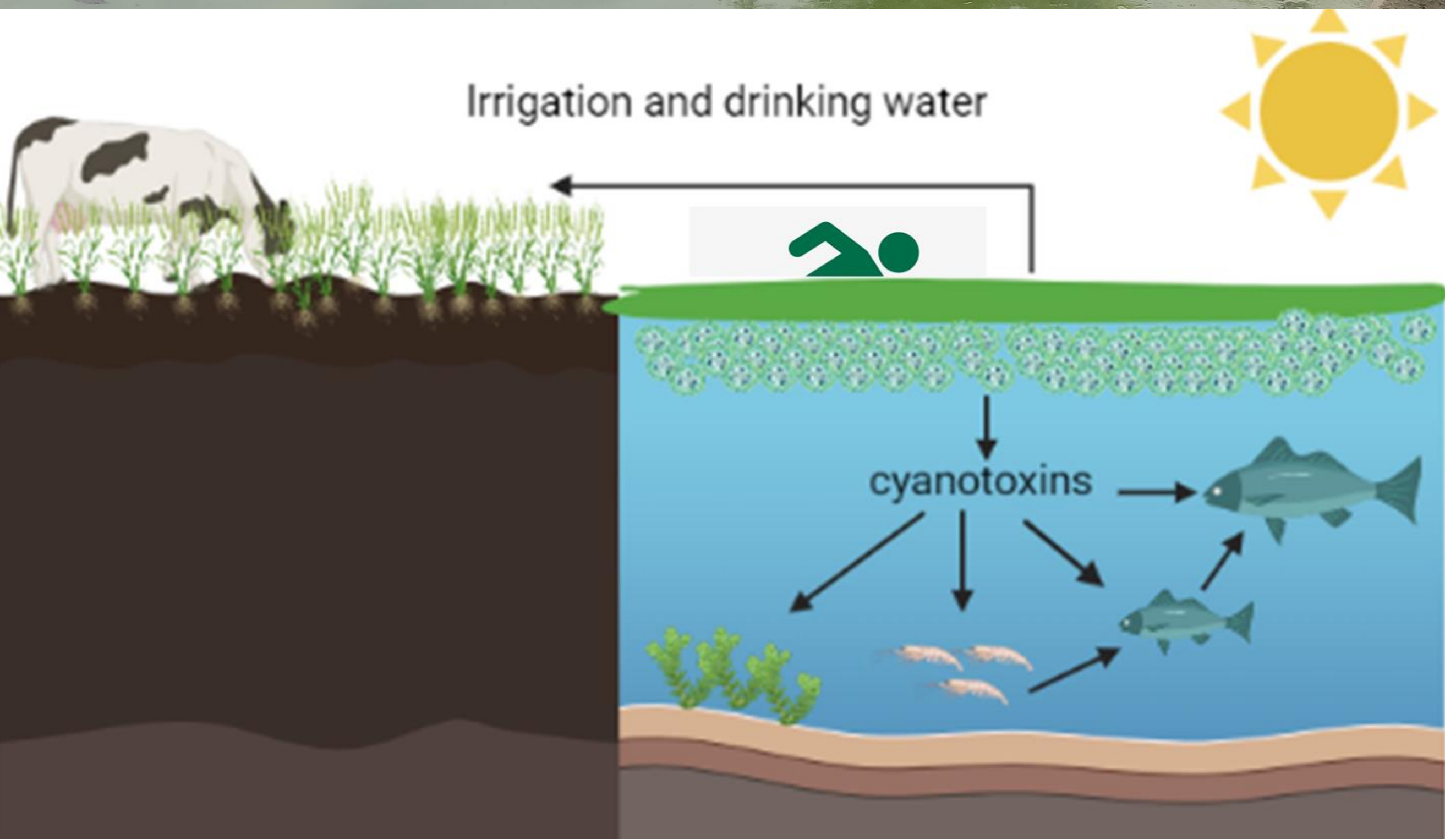


Towards a better quantification of cyanotoxins in environmental and food matrices in a food safety context

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Introduction

- Toxic cyanobacteria blooms are prevalent throughout the world
- Cyanotoxins spread through the environment and up the food chain
- Analytical methods necessary for different matrices
- Evaluate the health impact on human and animal populations is restricted => Lack of reliable quantitative in different matrices
- Methodological adaptations per matrix
 - Limits of detection and quantification
 - Reproducibility
 - Measurement uncertainty



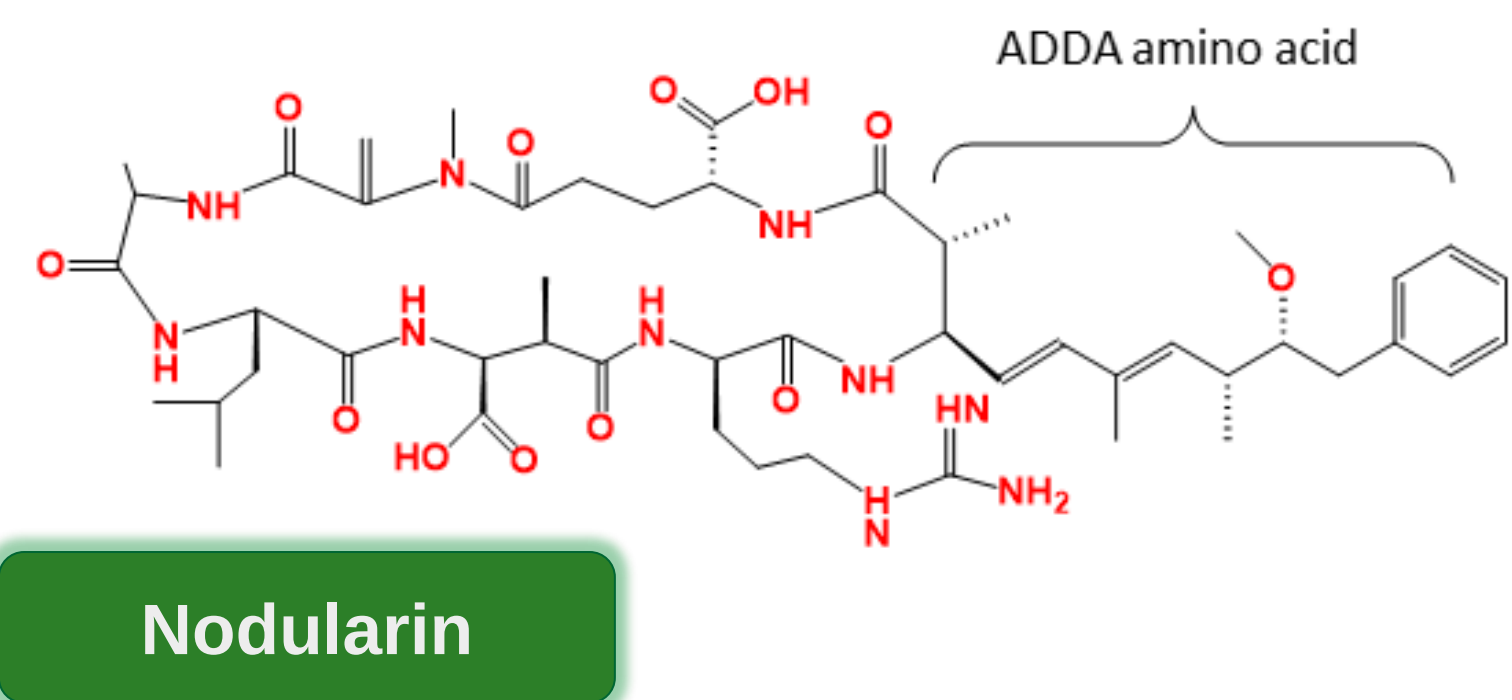
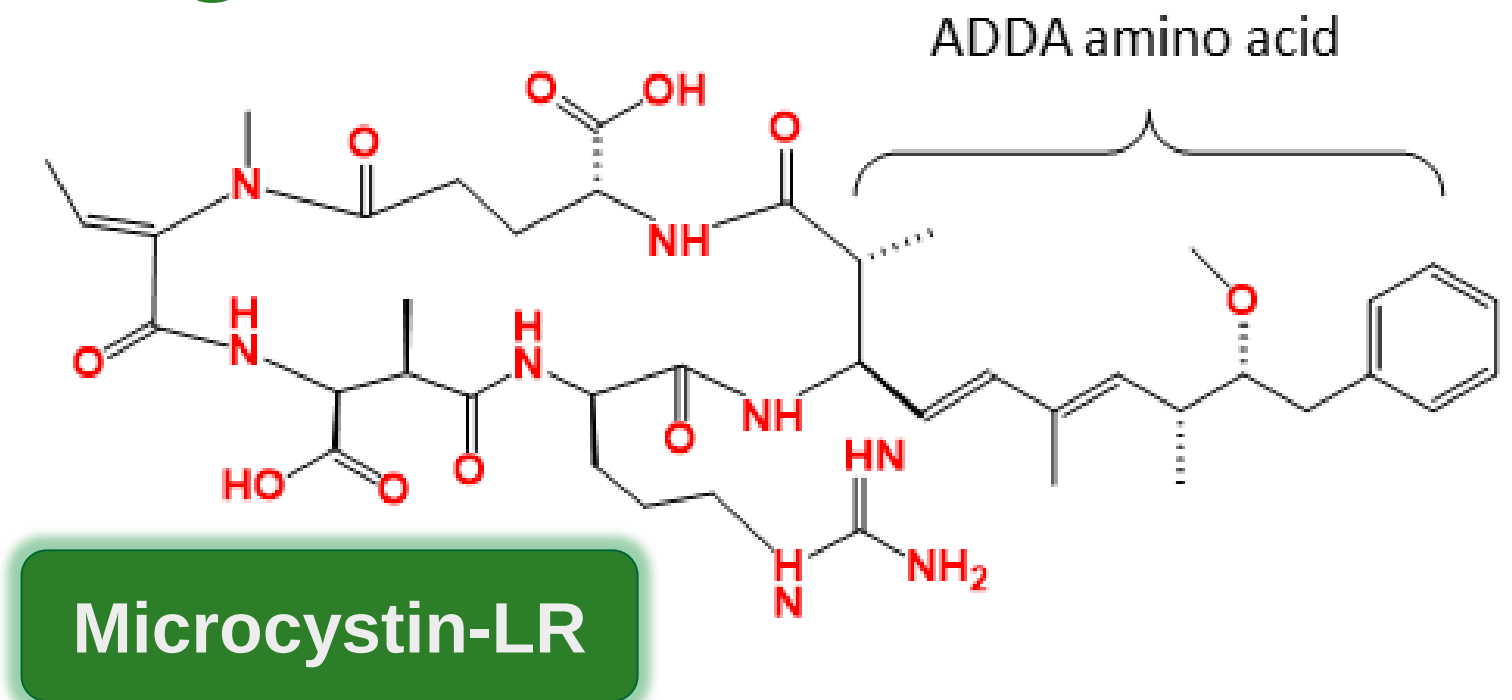
- The microcystin congeners are currently the most observed in Europe
- Targeted matrices and validation range:
 - Water (environmental and for consumption) (0.5, 1, 20 µg L⁻¹)
 - Food supplements (50, 400, 1200 µg kg⁻¹)
 - Cyanobacterial biomass (12.5, 50, 125 µg kg⁻¹)
 - Fruits and vegetables (1, 5, 25 µg kg⁻¹)
 - Culinary herbs (1, 5, 25 µg kg⁻¹)
 - Fish muscle and liver (5, 30, 60 µg kg⁻¹)
 - Milk (1, 5, 10 µg L⁻¹)

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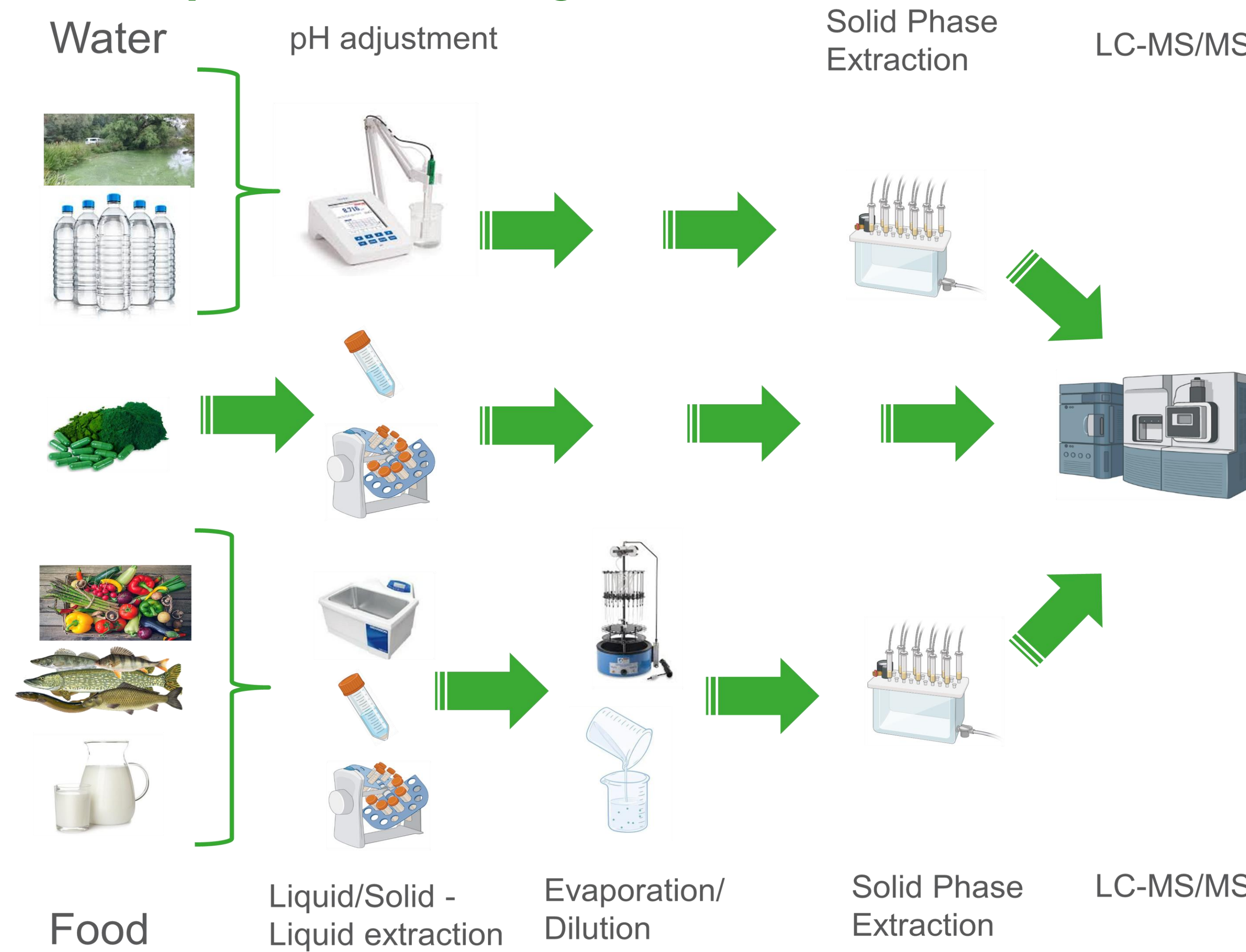
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Targeted Toxins



Microcystin-LR (MC-LR)
Microcystin-WR (MC-WR)
Microcystin-YR (MC-YR)
Microcystin-LW (MC-LW)
Microcystin-LY (MC-LY)
Microcystin-LA (MC-LA)
Microcystin-LF (MC-LF)
Microcystin-RR (MC-RR)
Nodularin (NOD)

Developed Methodologies



Major method adjustments

- pH adjustment in water to improve toxin retention on solid phase extraction.
- Fish and milk required dilution of extracts before solid phase extraction
- Optimization of the LC-MS/MS parameters to resolve matrix interference
- Fragment selection for fish
- LC method for Milk

Resulting Method parameters

Method	Recovery (%)	Limit of detection	Limit of Quantification	Reproducibility range (%)	Measurement uncertainty (%)
Water	55 - 103	0.1 µg L ⁻¹	0.5 µg L ⁻¹	5.0 - 21.0	10 - 42
Cyanobacterial biomass	88 - 102	5.63 µg kg ⁻¹	12.5 µg kg ⁻¹	3.2 - 18.5	6 - 44
Food supplements	69 - 103	22.5 µg kg ⁻¹	50 µg kg ⁻¹	3.1 - 21.9	6 - 37
Fruit and vegetables	73 - 93	0.6 - 1 µg kg ⁻¹	1 - 5 µg kg ⁻¹	5.3 - 20.3	11 - 41
Culinary herbs	79 - 90	0.6 - 4.5 µg kg ⁻¹	1 - 5 µg kg ⁻¹	9.7 - 21.2	19 - 42
Fish muscle	76 - 106	3 µg kg ⁻¹	5 - 10 µg kg ⁻¹	9.8 - 17.3	31 - 58
Fish liver	76 - 106	3 µg kg ⁻¹	5 - 10 µg kg ⁻¹	9.8 - 18.7	29 - 55
Milk	75 - 118	0.3 µg L ⁻¹	1 µg L ⁻¹	5.9 - 21.42	12 - 43

Conclusions

- Successful validation for 8 MCs and NOD in 8 matrices
- Concentration range based on available guideline values:
 - Drink water (1 µg L⁻¹ MC-LR)
 - Recreational water (24 µg L⁻¹ MC-LR)
 - Food supplements (1 µg g⁻¹ total MCs)
- Methods allow for:
 - ⇒ Gathering prevalence data for cyanotoxins in multiple matrices
 - ⇒ Increasing the quantity of data for assessment of the human health risks
 - ⇒ Combined exposure assessment from multiple exposure routes
 - ⇒ Continuing food safety surveillance

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