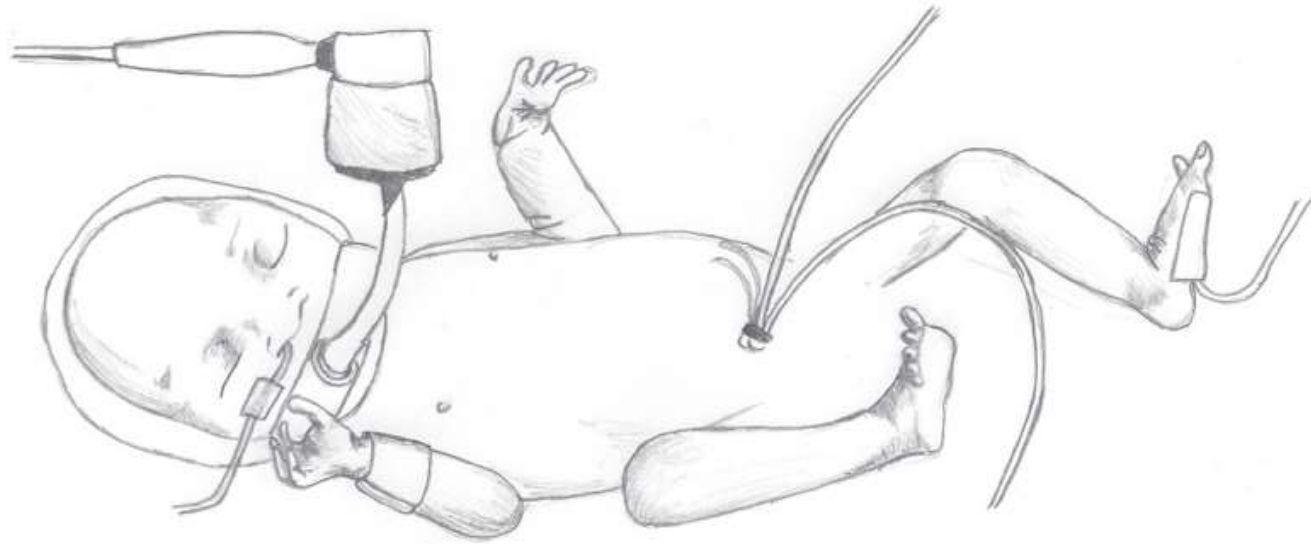


# Exposure to plasticizers at the neonatal intensive care unit: *respiratory support equipment as a major source*



GDA 2021

17/09/2021 - Lucas Panneel

Promotors

Prof. Dr. A. Mulder, Prof. Dr. P. Jorens, Prof. Dr. A. Covaci

LEMP

UZA

fwo



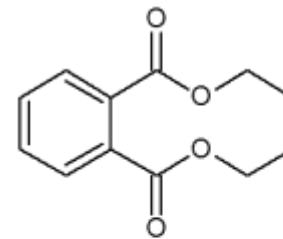
Universiteit  
Antwerpen

# Plasticizers

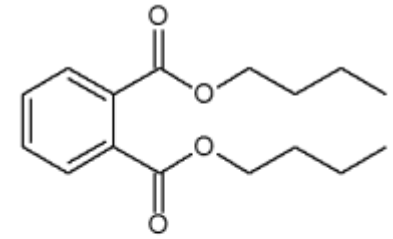
# Plasticizers



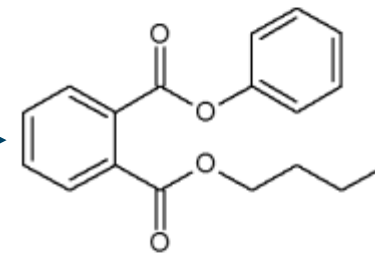
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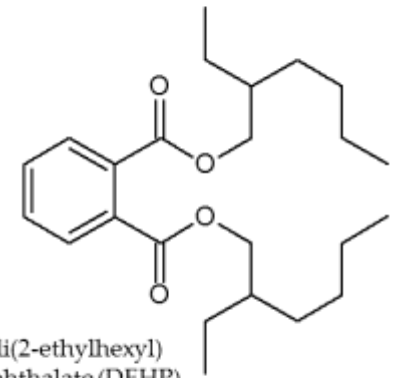
diethyl phthalate (DEP)



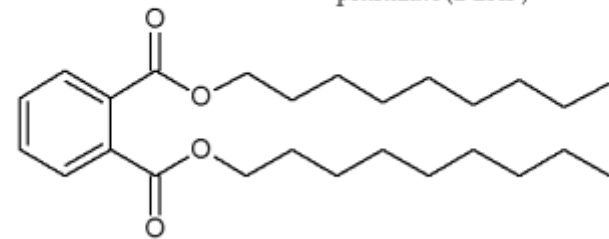
dibutyl phthalate (DBP)



butyl benzyl phthalate (BBzP)



di(2-ethylhexyl)  
phthalate (DEHP)



di-iso-nonyl phthalate (DINP)

DEHP



# DEHP

## Adverse health effects

- Endocrine Disrupting Chemical
- Carcinogenic Mutagenic or toxic for Reproduction



# DEHP



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- Justification and labelling
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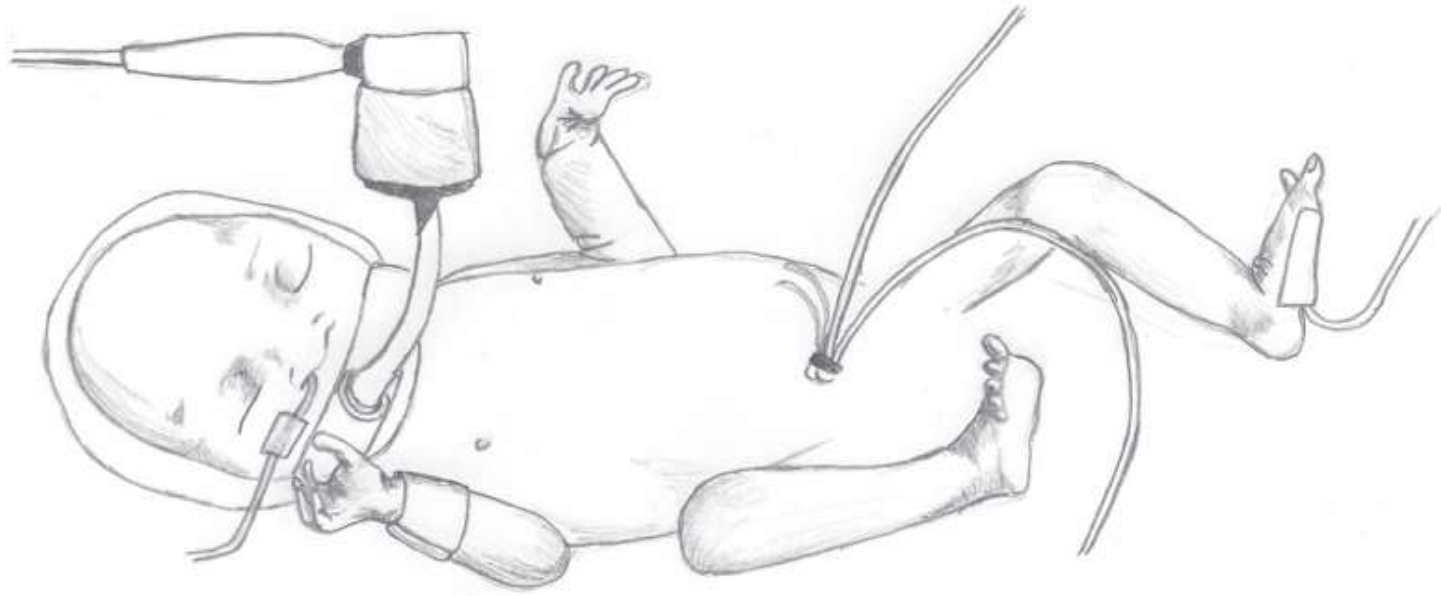
## Medical Devices Regulation (2017)

- Justification and labelling
- COVID-delay → 26/05/2021

## Alternative Plasticizers (AP)

- TOTM, DEHT, DINCH, DEHA
- No reference

# Neonatal Intensive Care Unit



# Exposure to plasticizers in the NICU

***In vivo*: level of exposure**

***Ex vivo*: sources of exposure**

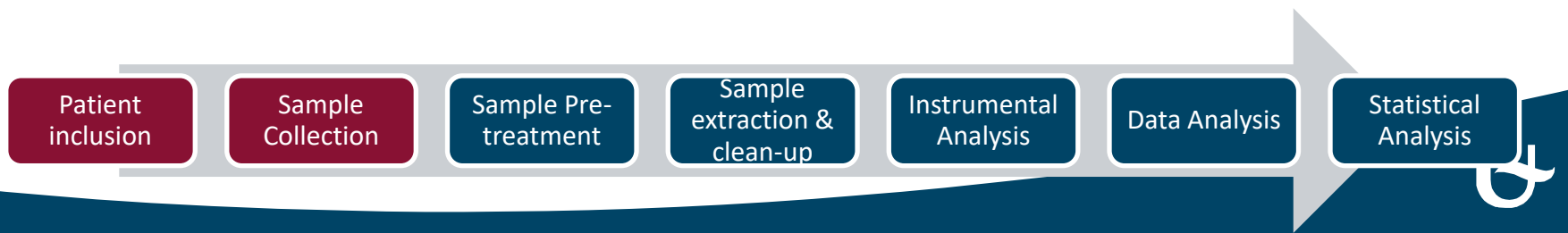
***Follow up*: effects of exposure**

# Plastic-NICU cohort



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GA < 31w and/or BW <1500g (N = 69)



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## Biomonitoring

- Urine
- Hair



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# Instrumental analysis (urine)

## First batch

- 12 patients
- 5 controls
- 106 samples



  **Toxicological Centre**  
University of Antwerp



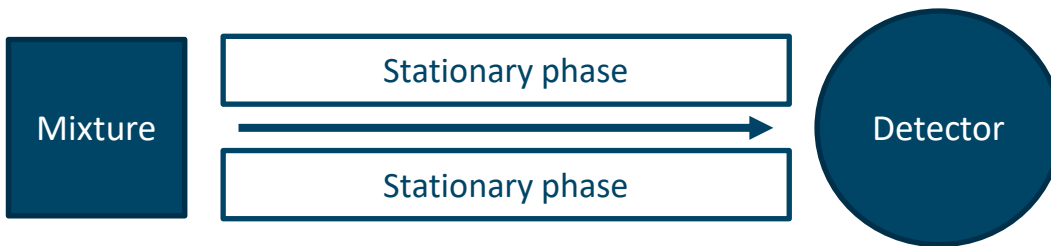


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## LC-MS



# Urine - Results

## Detection Frequency

- Phthalate metabolites > 85%
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## UZA-NICU

- PM
  - >> Flemish adolescent population
  - < other NICU populations
- AP
  - >> Flemish adolescent population
  - ≈ other NICU populations
- Neonates > Mothers
- NICU > Maternity



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  - >> Flemish adolescent population
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- AP
  - >> Flemish adolescent population
  - $\approx$  other NICU populations
- Neonates > Mothers
- NICU > Maternity

## Secondary DEHP-metabolites (MEHHP-MEOHP)

- Preferred biomarkers
- Strongly positive correlated (rho 0.7)
- Weakly negative correlation with
  - Birth Weight (rho -0.2)
  - Gestational Age (rho -0.3)

Patient inclusion

Sample Collection

Sample Pre-treatment

Sample extraction & clean-up

Instrumental Analysis

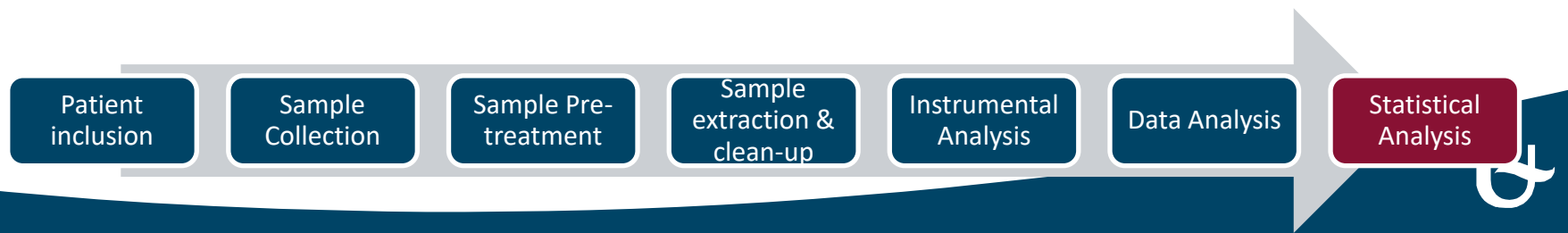
Data Analysis

Statistical Analysis

# Medical device use

## Prospective daily inventory of medical equipment exposure

1. Binary exposure score per day
2. Time window prior to urine specimen collection: 2 days prior to collection
3. Comparison exposure to no exposure of a specific medical product category

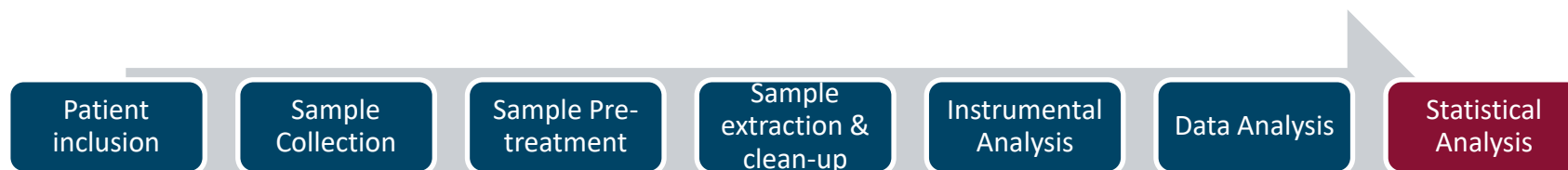


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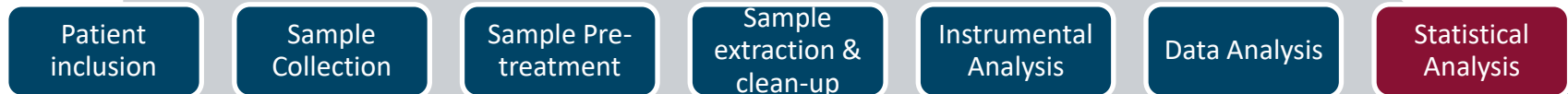
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		MEHHP (ng/mL)	MEOHP (ng/mL)
<b>Overall NICU</b>	N = 86	1.90 (0.85-3.25)	1.10 (0.60-2.15)
<b>Peripheral line</b>	No (n=60)	1.60 (0.80-3.00)	1.30 (0.70-2.10)
	Yes (n=26)	2.30 (1.58-6.48)	0.70 (0.48-2.23)
	P	0.0503	0.1415
<b>Central line</b>	No (n=46)	1.40 (0.50-2.75)	1.35 (0.70-1.93)
	Yes (n=40)	2.50 (1.60-6.30)	0.90 (0.60-2.30)
	P	<b>0.0004*</b>	0.3726
<b>Parenteral nutrition</b>	No (n=46)	1.35 (0.50-2.75)	1.30 (0.70-1.93)
	Yes (n=40)	2.50 (1.80-6.30)	0.90 (0.60-2.30)
	P	<b>0.0001*</b>	0.5107
<b>Respiratory support</b>	None (n=14)	1.00 (0.40-2.00)	0.75 (0.40-1.50)
	Non-invasive (n=65)	1.90 (1.00-3.45)	1.40 (0.70-2.35)
	Invasive (n=7)	4.25 (2.05-8.38)	0.60 (0.18-1.95)
	P	<b>0.0086*</b>	<b>0.0324*</b>

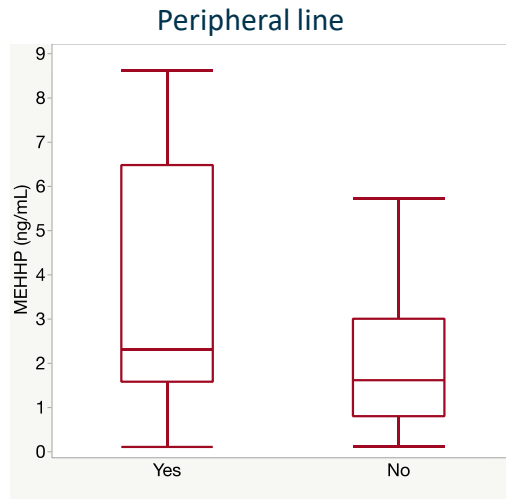


# Medical device use

*MEHHP levels (ng/mL) in urine samples from NICU neonates with different medical device exposure categories*



# Medical device use



*MEHHP levels (ng/mL) in urine samples from NICU neonates with different medical device exposure categories*

Patient  
inclusion

Sample  
Collection

Sample Pre-  
treatment

Sample  
extraction &  
clean-up

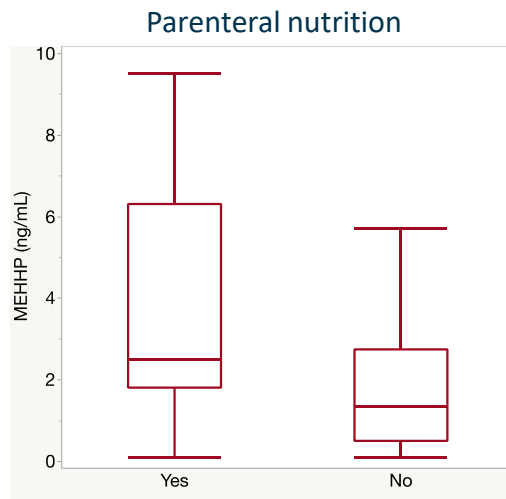
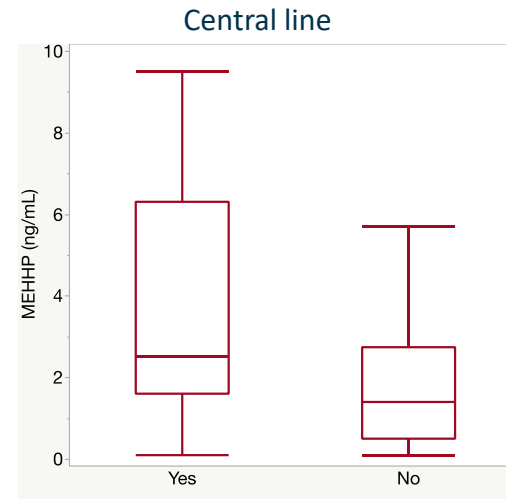
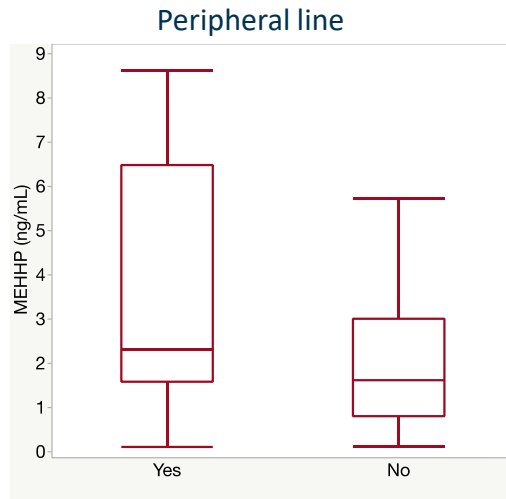
Instrumental  
Analysis

Data Analysis

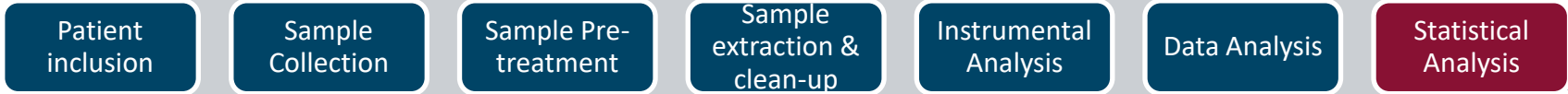
Statistical  
Analysis



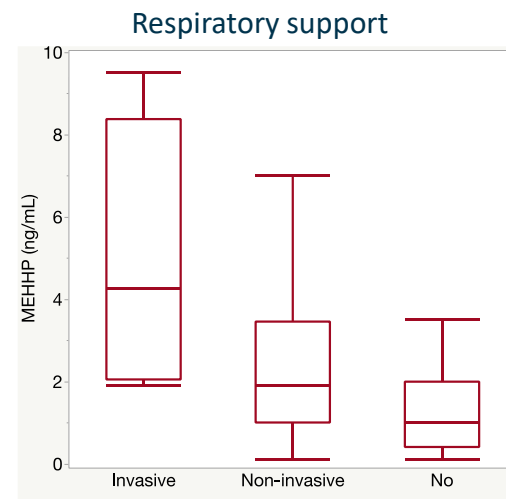
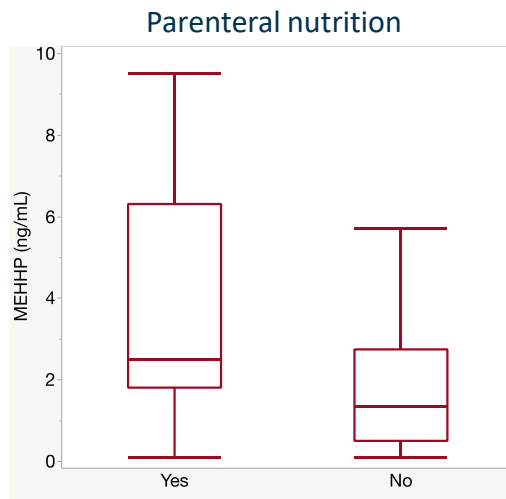
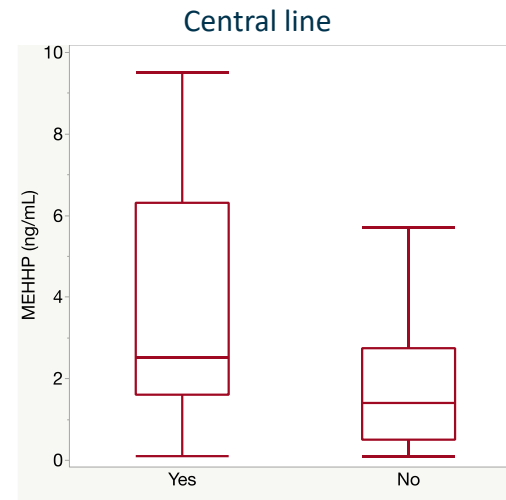
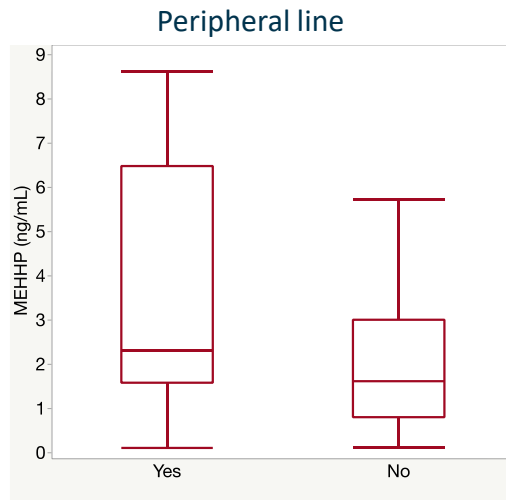
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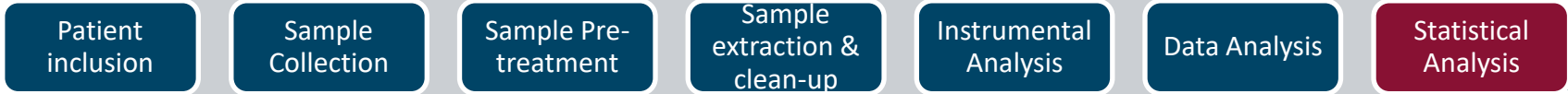
MEHHP levels (ng/mL) in urine samples from NICU neonates with different medical device exposure categories



# Medical device use



MEHHP levels (ng/mL) in urine samples from NICU neonates with different medical device exposure categories



# Primum non nocere

Conclusion

Plan

# Primum non nocere

## Conclusion

### NICU neonates

- Still highly exposed to DEHP
- AP are less abundant - despite changing legislation

### Highest risk

- More preterm neonates
- Respiratory support

Source of DEHP exposure during ventilation?

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### Biomonitoring

- Increase cohort
- Hair samples

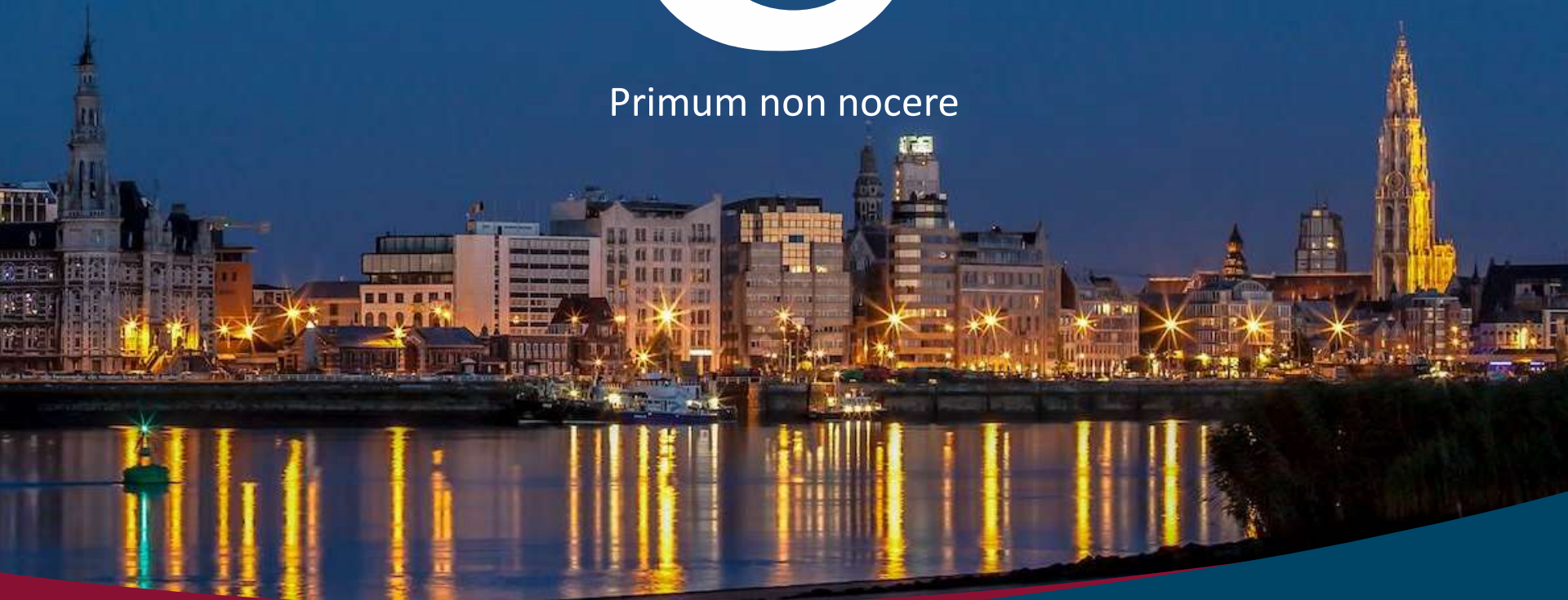
### *Ex vivo* experiments

### Clinical follow-up

- 3 – 12 months cGA
- Neurodevelopmental
- Respiratory



Primum non nocere



Lucas Panneel – 17/09/21

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