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KEEPING THE RIVER CLEAN! MINIMIZING IODINATED CONTRAST MEDIA IN SURFACE WATERS IN MÜLHEIM, GERMANY

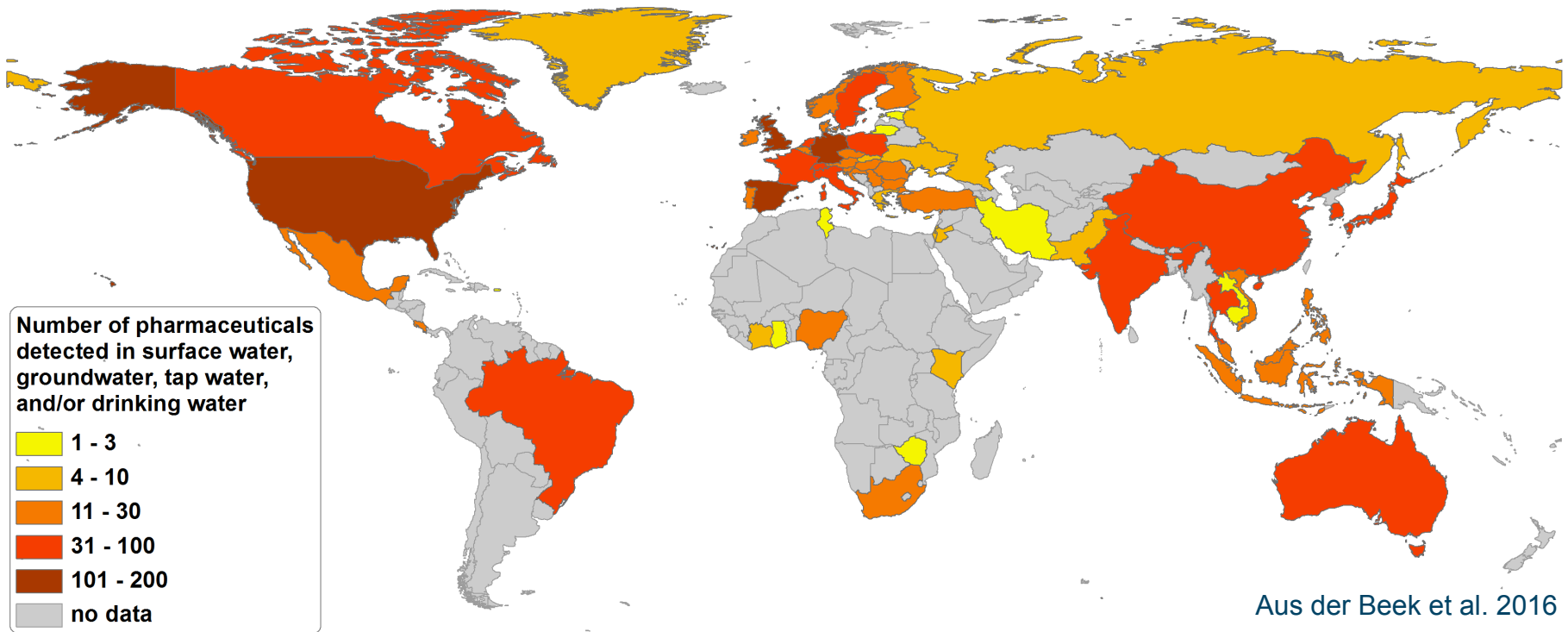
WEBINAR: PHARMACEUTICALS IN THE ENVIRONMENT – A NEW STRATEGIC APPROACH IS NEEDED

Oct 17th 2018

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Motivation



→ hundreds of different pharmaceuticals occur in the global environment

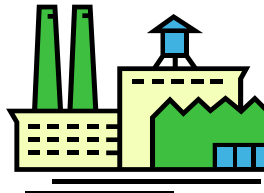
→ how can we mitigate their input into the environment?

Sources of input of pharmaceuticals into the environment

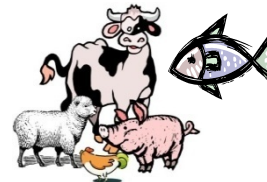
Consumer



Pharmaceutical Industry



Hospital



Agriculture/Aquaculture

Iodinated contrast media (ICM)

What are contrast materials and how do they work?

- Contrast media, are used to improve pictures of the inside of the body produced by x-rays, computed tomography (CT), magnetic resonance (MR) imaging, and ultrasound.
- They are substances that temporarily change the way x-rays or other imaging tools interact with the body.
- When introduced into the body prior to an imaging exam, contrast materials make certain structures or tissues in the body appear different on the images than they would if no contrast material had been administered. By improving the visibility of specific organs, blood vessels or tissues, contrast materials help physicians diagnose medical conditions.

Iodinated contrast media (ICM) in surface waters



© City of Essen

No removal at wastewater treatment plants without tertiary treatment

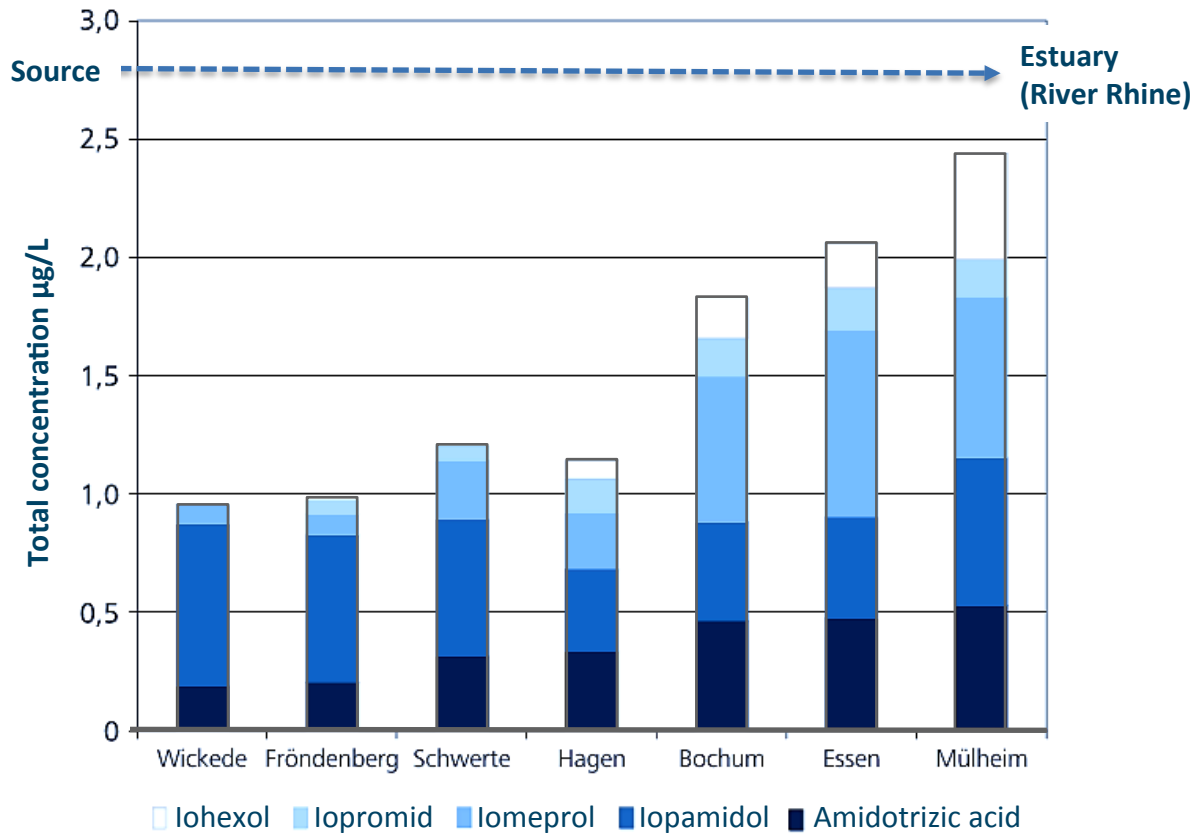
Only partial removal using ozone or powdered activated carbon

Also no complete removal of ICM at water works

Health related indicator value for drinking water in Germany: 1 $\mu\text{g/L}$

1 application results to a calculated concentration at lake Baldeney of ~ 10 ng/L

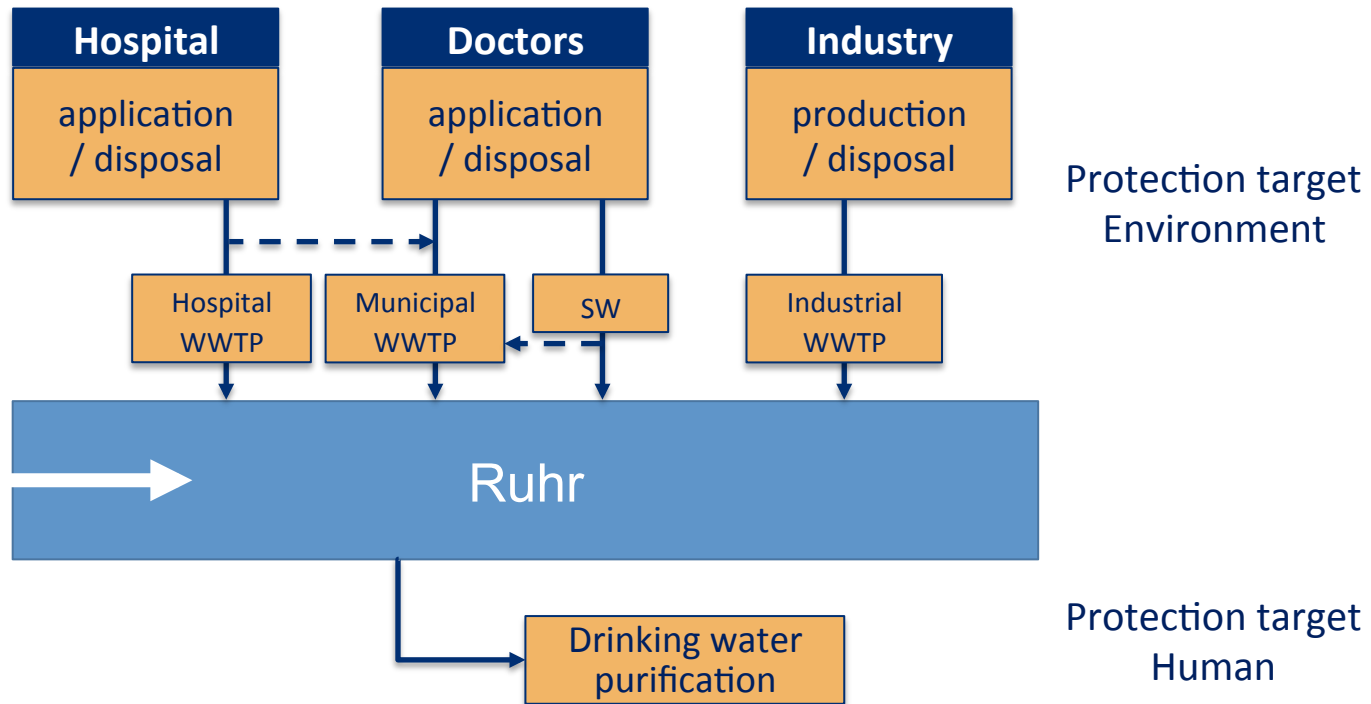
The MERK' MAL-Approach – Brief Explanation



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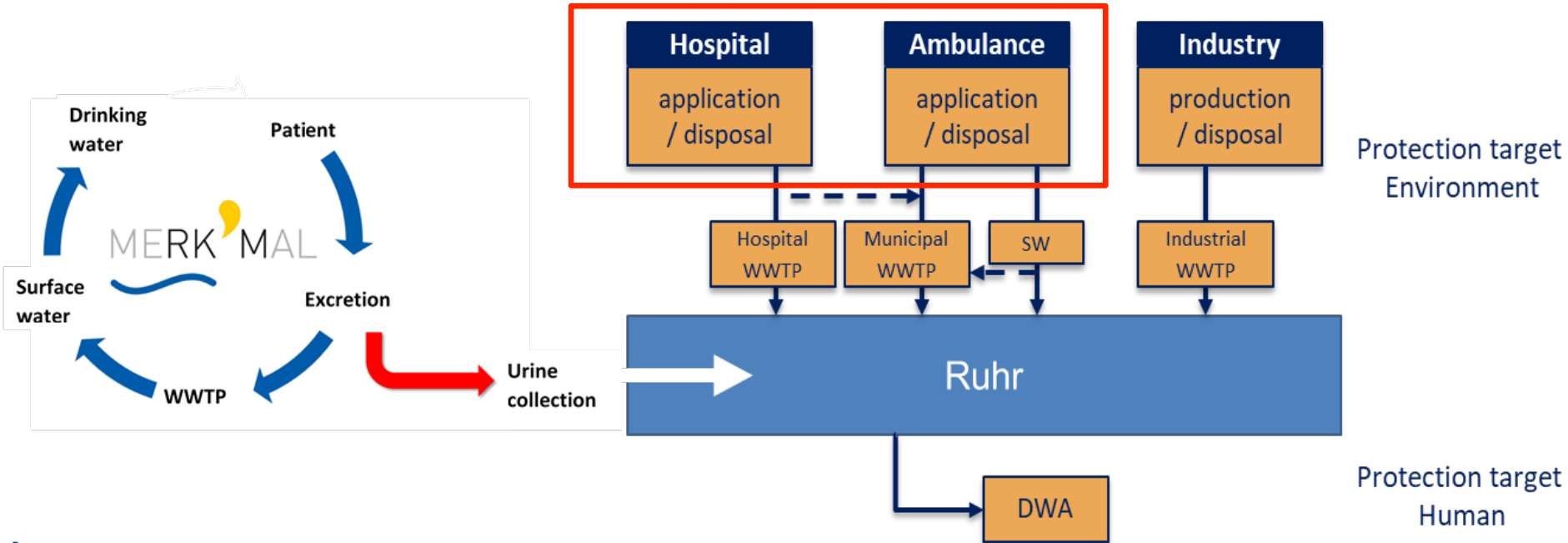
→ increase of concentration from upstream to downstream

The MERK' MAL-Approach – Brief Explanation



The MERK' MAL-Approach – Brief Explanation

Collection & Disposal via Urinbags



1. Optimisation of the concept of collection
2. Design of a communication strategy
onside information and training – newspapers – local radio and local television
3. Testing of the concept of communication (for hospitals and medical practices)
4. Practical application at the city of Mülheim (2 hospitals, 2 radiological practices)
5. Cost determination for rollout

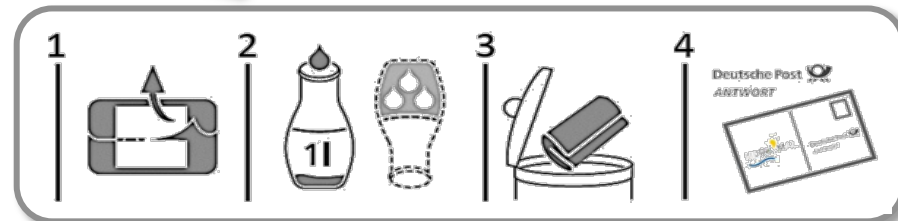
Key Messages: Participation of patients

1. **“The collection concept was successfully implemented in Mülheim. Up to 87% of the participating patients used the urine bags.”**



- **Feedback on participation**

- reply postcards
- online form
- telephone survey (random sample)



Key Messages: Cooperation with medical partners

2. “With the right guidance and support in organization and communication, the collection concept is implementable for the medical partners with reasonable efforts.”

- **Active support during the collection phase (preparation, implementation)**
 - Information and advertising material
 - documentation forms

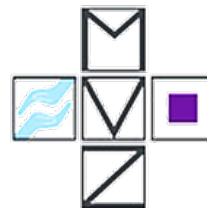


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St. Marien-Hospital
Mülheim an der Ruhr

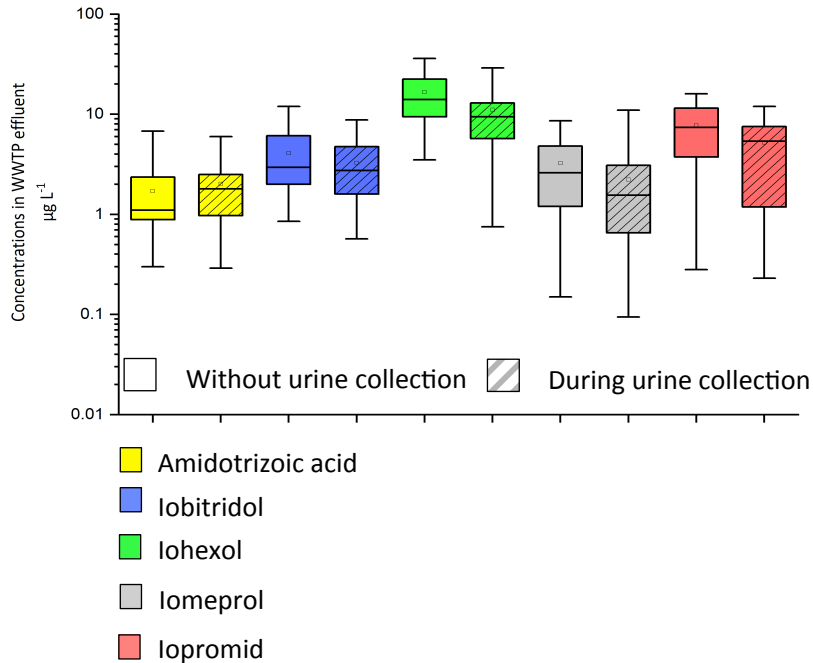


Evangelisches
Krankenhaus Mülheim
Ein Haus der ATEGRIS

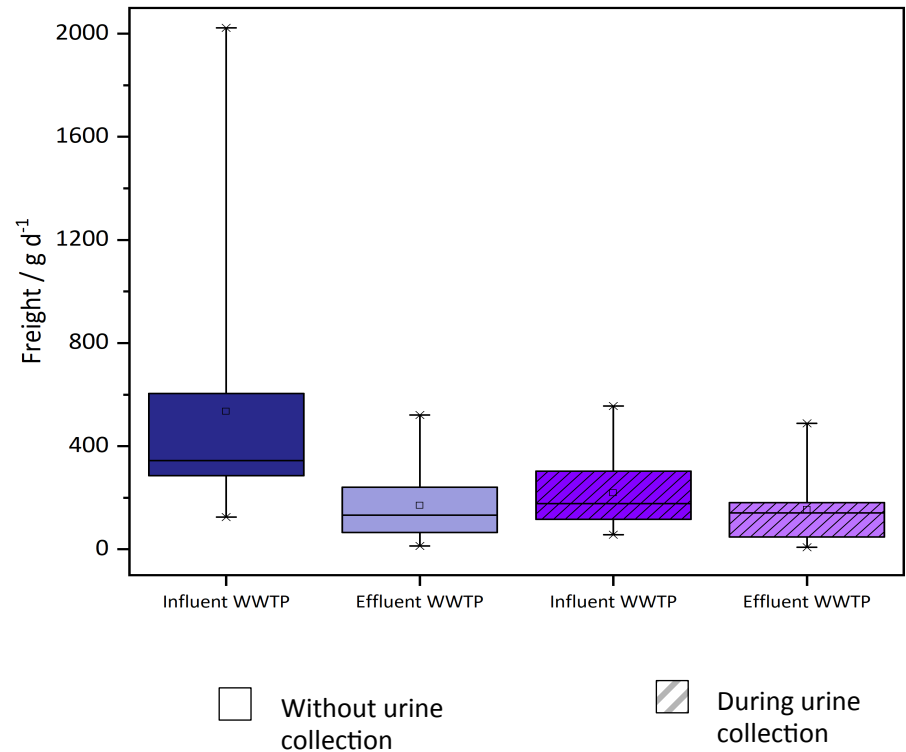


Effects of the collection phase

Decrease of concentrations (effluent of the corresponding WWTP)



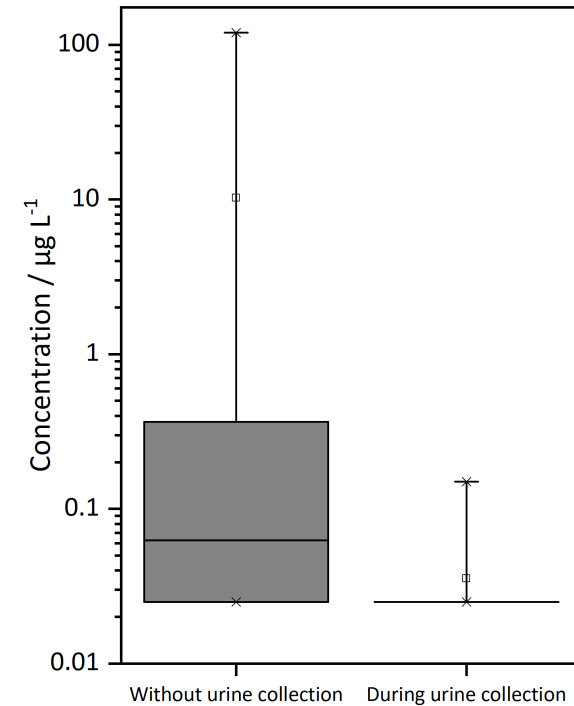
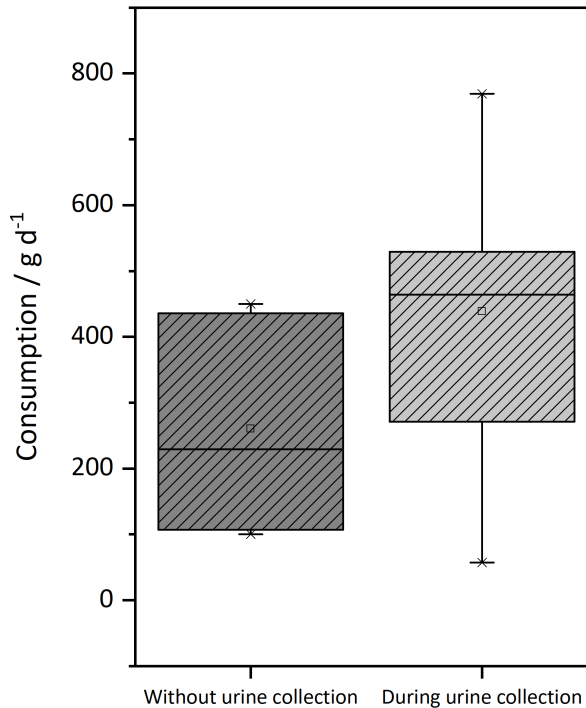
Decrease of load (influent and effluent of the corresponding WWTP)



Key Messages: Reduction of ICM in sewer wastewater

3. „The MERK´MAL reduction approach was successful: The concentration of individual x-ray contrast media in the wastewater could be reduced significantly.”

- **Consumption**
(ICM distributed by the practice)
- **Sampling in sewer following discharge of wastewater of the practices**
(24 h composite samples)



Potential of the ICM retention by MERK´MAL per year at the city of Mülheim an der Ruhr

(rough estimations after 4 months collection: ~300 kg/a total application)

- **Worst case (19 %)** **60 kg**
(active feedback)
- **Best case (87 %)** **270 kg**
(patient survey)
- **Weighted (68 %)** **210 kg**
(patient amount and participation rate
per institution)



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Key Messages: Cooperation with medical partners

4. “The additional costs for using urine bags after the examination amount to less than 10%. This is economically much more favourable than additional treatment steps for wastewater, resp. drinking water. “

■ Additional costs per examination

costs	Urine bag	delivery	storage	personnel	disposal	Sum
radiological practices	3,20 €	0,15 €	0,0027 €	1,96 €	0,05 €	5,37 €
hospitals	3,20 €	0,15 €	0,0027 €	2,58 €	0,15 €	6,08 €

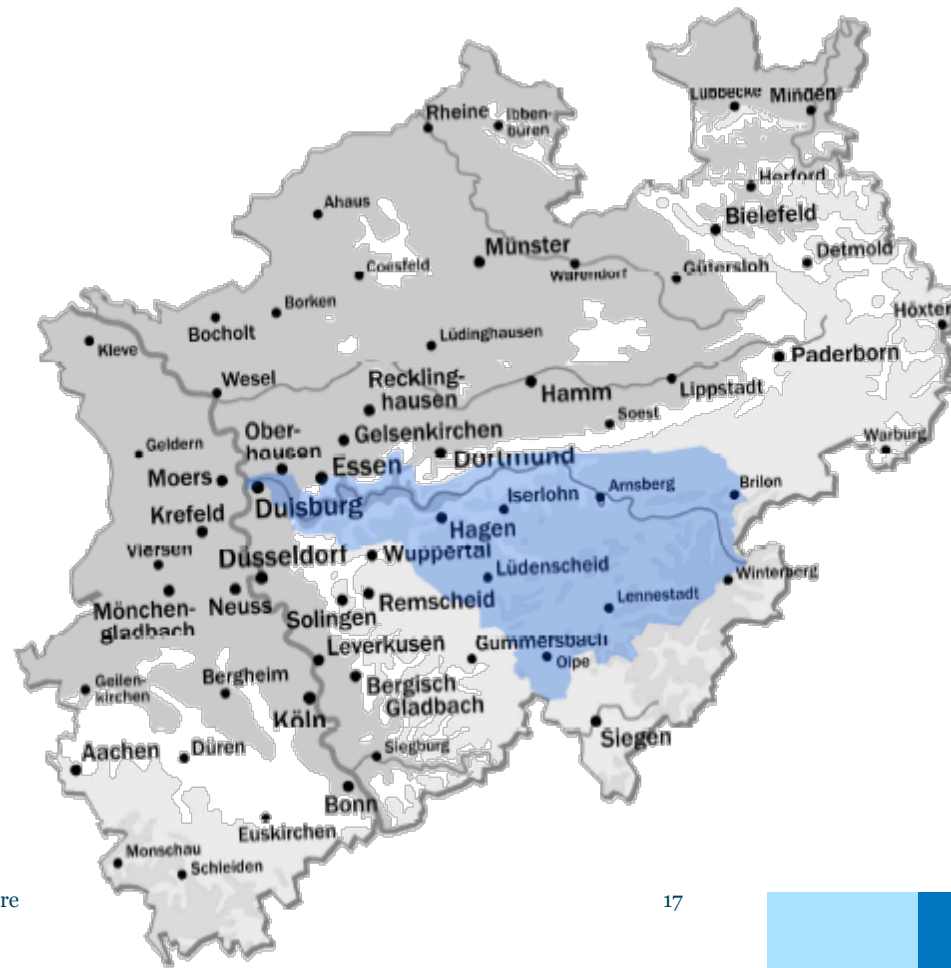
- **Average additional costs* in relation to...**
...costs of a health insurance medical examination (≈ 50 €) in Germany: **11.3%**
...costs of a private medical examination (≈ 350 €) in Germany: **1,62 %**

* Only the sets and delivery directly cause additional costs; all other costs are only calculatory additional costs.

5. **“The MERK’MAL information material and the education in hospitals and medical offices causes the patients to develop environmental awareness and interest in preventive water protection.”**

6. **“The MERK’MAL approach is a successful contribution to the reduction of x-ray contrast media in water bodies, consistent with the trace substances strategy of the German federal government. From the pilot project to nationwide standards in preventive water protection – that is what we work for in MERK’MAL-2.”**
 - **Ruhr catchment**
 - At least nine cities with 29 hospitals and 58 radiological practices

MERK´MAL-2 will be successful if a significant reduction in the concentration of ICM in the Ruhr can be measured. An institutional carrier of the collection approach has been initiated.



Acknowledgements

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www.dbu.de

Thank you!

MERK'MAL Project Homepage: <https://merkmal-ruhr.de/> (in German)



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