Micropollutants, Metabolites and Mixtures:

Why do we care?

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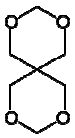
Our Background

- **Main task of IWW: Applied research and consulting for the drinking water sector**

- **Drinking water from surface water (e.g. river Ruhr) in a densely populated area**

- **Drinking water from groundwater close to agricultural sites**

Recent examples of micropollutants and metabolites…



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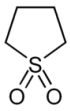
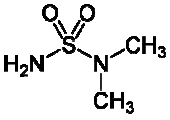


Sulfolane



DMS

PFOA and other PFC

Reaction of German public and media

Illegal Toxicants in Drinking Water

Stadtwerke schließen vorsorglich zwei Brunnen, obwohl Grenzwerte nicht erreicht werden.

Von Ulrich Lhotzky-Knebusch

Elmshorn. Erstmalig wurde im Trinkwasser, das die Stadtwerke Elmshorn liefern, N,N-Dimethylsulfamid (DMS) gefunden. Vorsorglich legten die Werke nicht öffentlichen Teil der Sitzung mit dem Thema. Kommenden Montag soll es im Ausschuss für Stadtwerke und kommunale Dienste behandelt werden.

Trinkwasser unterliegt in

den außer Betrieb gesetzten Brunnen, liegen unter einem Mikrogramm. Geschlossen wurden, erklärte Heike Jahn von Stadtwerken auf EN-Anfrage, die Brunnen als reine Vorsichtsmaßnahme.

5 Truths about our Drinking Water

SAMSTAG 4. AUGUST 2007 RHEINISCHE POST

PFC – poison everywhere

A European Perspective (A Pre-Study for the new EU Watch List)

WATER RESEARCH 44 (2010) 4115–4126

Available at www.sciencedirect.com

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journal homepage: www.elsevier.com/l…

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Pan-European survey on the … ted polar organic persistent poll… …ater

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Survey analysis of >160 groundwater samples
Quantifiable results for ~ 50 substances

Screening for ~ 50 substances

Table 1 – Summary of analytical results for polar organic pollutants

Chemical	LOD [ng/L]	Freq [%]	Chemical	LOD [ng/L]	Freq [%]
DEET	0.4	83.5	Isoproturon	0.2	20.1
Caffeine	1.0	82.9	Hexazinone	0.3	17.7
PFOA	0.4	65.9	Chloridazon-desphenyl	50	16.5
Atrazine	0.4	56.1	PFBS	0.3	15.2
Desethylatrazine (DEA)	0.4	54.9	PFNA	0.4	15.2
1H-Benzotriazole	1.0	53.0	Mecoprop	0.2	13.4
Methylbenzotriazole	1.0	51.8	N,N'-Dimethylsulfamid (DMS)	50	11.6
Desethylterbutylazine (DET)	0.4	49.4	Nonylphenol (NP)	30.0	11.0
PFOS	0.4	48.2	Ketoprofen	1.0	10.4
Simazine	0.5	43.3	Diazinon	0.3	9.1
Carbamazepine	0.5	42.1	MCPA	0.1	7.9
NPE1C	0.5	41.5	Chlortoluron	0.3	7.9
Bisphenol A	1.0	39.6	Ibuprofen	0.2	6.7
PFHxS	0.4	34.8	Chloridazon-methyldesphenyl	50	6.1
Terbutylazine	0.3	33.5	Methabenzthiazuron	0.3	5.5
Benzazone	0.4	31.7	Dichlorprop	0.1	4.9
Propazine	0.3	31.7	Diclofenac	0.2	4.9
PFHpA	0.4	29.9	Alachlor	0.3	4.9
2,4-Dinitrophenol	1.0	29.3	2,4-D	0.1	3.7
Diuron	0.3	28.7	2,4,5-T	0.2	3.7
Sulfamethoxazole	0.5	24.4	Linuron	0.3	2.4
PFDA	0.4	23.8	Triclosan	2.0	1.8
tert-Octylphenol (OP)	0.4	23.2	Estrone	1.0	0.6
Metolachlor	0.3	20.7			
Nitrophenol	4.0	20.1			

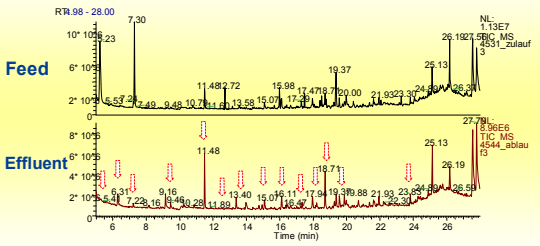
Implementation of ozone treatment

- Some WWTPs now with additional O_3 treatment
- Objective: reduce micropollutants in the effluent
- Is that really an enhancement?
  - Complete degradation or transformation?

Formation of transformation products by O_3

GC-MS-Screening (TIC)

- Before and after ozone treatment



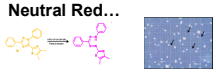
➔ Numerous new substances (transformation products)

Summary

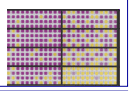
- The closer we look, the more substances we find
- But what is their relevance?
- We ought to give an answer
  - to the public
  - to drinking water suppliers
  - to operators of waste water treatment plants
  - ...
- How can we do that?
  - chemical analysis alone is not enough

Examples of test systems to determine effects

Cytotoxicity
- Interference with cellular functions
- MTT/XTT, Trypan Blue, Neutral Red…

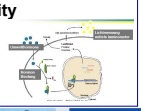


Mutagenicity
- Changes in DNA sequence
- Hereditary
- Ames Test



Genotoxicity
- DNA damage
- Micronucleus test, Comet Assay, Chromosomal aberrations

Endocrine Acitivity
- Influences on the hormonal system
- Estrogenicity
- ER Calux



But…

- Which effect based tools to be applied?
- How to evaluate the results?
- How to derive limit/treshold values from „new tools“?
- Is this manageable for each single substance?
- What ideas / concepts are currently discussed in other countries?
- Is there a perspective for a (European) harmonised approach?
- What‘s going on at DG ENV as regards new regulation or guidance docs