

Pharmaceuticals in landfill leachates and receiving WWTP influents



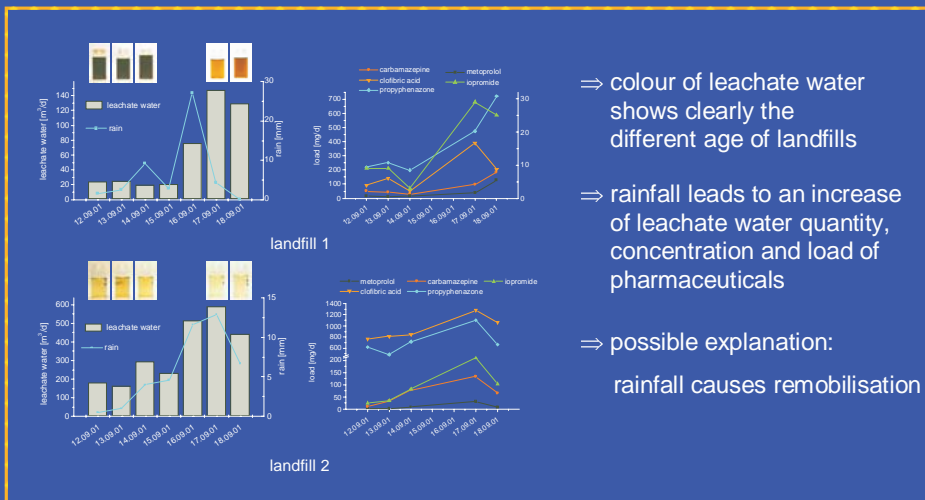
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Characteristics:

- both landfills receive household waste from the same districts
- same sampling period → similar influence of weather
- landfills differ in age (and thus in degradation phase), size and resulting quantity of leachate water

Table 1: Concentration of pharmaceuticals in landfill leachates (median values)

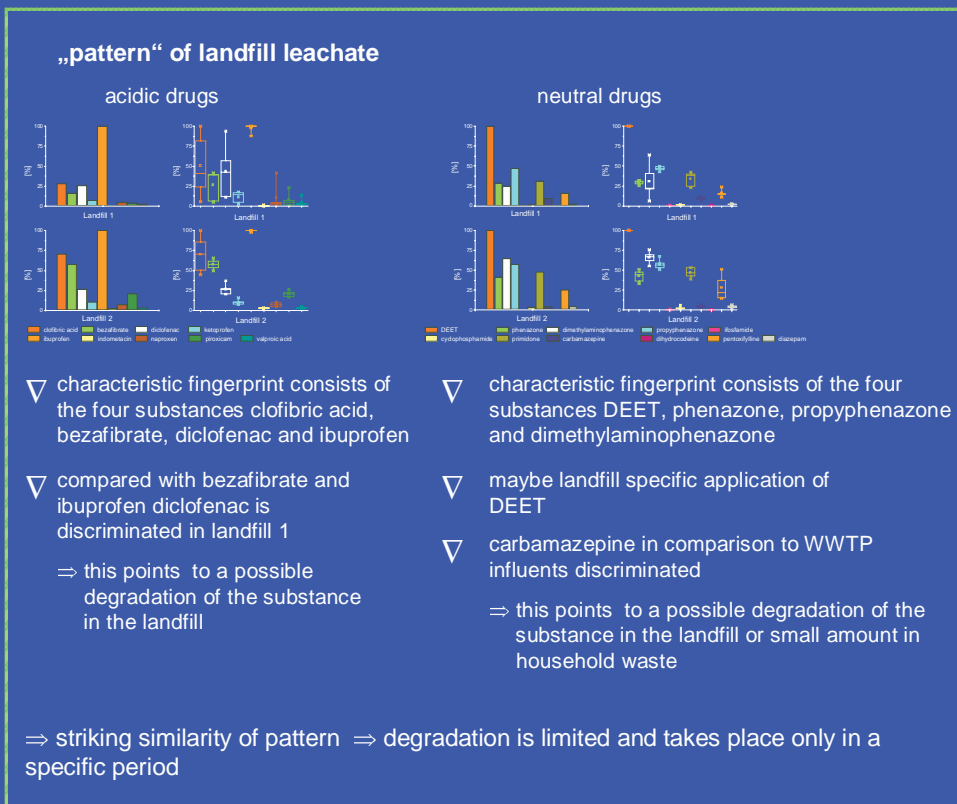
Pharmaceutical class	substance	landfill 1 [ng/l]	landfill 2 [ng/l]
analgesic	diclofenac	3190	1183
	dimethylaminophenazone	4764	2668
	ibuprofen	9362	4894
antiphlogistic	indomethacine	17	141
anti-inflammatory	ketoprofen	697	438
	naproxen	445	288
	phenazone	5507	1761
antiepileptic	piroxicam	481	931
	propyphenazone	9173	2455
	carbamazepine	1415	202
antineoplastic	primidone	5011	2002
	valproic acid	205	122
antitussiva	cyclophosphamide	192	97
	ifosfamide	42	32
beta-blocker	dihydrocodeine	101	14
	atenolol	44	34
bronchodilator	metoprolol	31	24
	propranolol	10	10
lipid regulator	bezafibrate	<10	<10
psychiatric drug	clofibrac acid	1353	2773
	clofibrac acid	2658	2879
repellent	diazepam	453	192
	DEET (N,N-diethyl-m-toluic acid amide)	18586	4826
vasodilator	pentoxifylline	2875	1116
	amidotrizoic acid	242	n.d.
x-ray contrast media	lomeprol	92	42
	lopamidol	2485	2944
	lopromide	199	236



⇒ colour of leachate water shows clearly the different age of landfills

⇒ rainfall leads to an increase of leachate water quantity, concentration and load of pharmaceuticals

⇒ possible explanation: rainfall causes remobilisation



∇ characteristic fingerprint consists of the four substances clofibrac acid, bezafibrate, diclofenac and ibuprofen

∇ compared with bezafibrate and ibuprofen diclofenac is discriminated in landfill 1
 ⇒ this points to a possible degradation of the substance in the landfill

⇒ striking similarity of pattern ⇒ degradation is limited and takes place only in a specific period

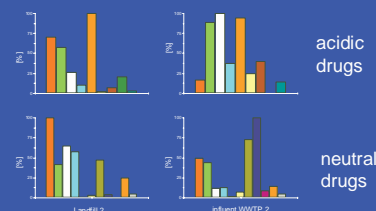
∇ characteristic fingerprint consists of the four substances DEET, phenazone, propyphenazone and dimethylaminophenazone

∇ maybe landfill specific application of DEET

∇ carbamazepine in comparison to WWTP influents discriminated
 ⇒ this points to a possible degradation of the substance in the landfill or small amount in household waste

Comparison

landfill leachate ↔ WWTP influent



∇ pattern of WWTP influent reflects the present ⇒ snapshot

∇ pattern of landfill leachate reflects the history ⇒ retrospective

∇ pattern are not similar

∇ contribution of the partial stream leachate water to the total amount of pharmaceuticals in the WWTP influent is low

∇ direct contamination of groundwater might occur if landfill sealing is insufficient

∇ also disposal sites, where water penetrates into landfill body from the sides, may represent a problem