

Experiencias con contaminantes emergentes en EDARs de la Región de Murcia

Valencia, 12 de Febrero de 2019

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CONTAMINANTES DE PREOCUPACIÓN EMERGENTE

ASPECTOS BÁSICOS A CONSIDERAR :

➤ **Medición**

➤ **Efectos**

➤ **¿ Eliminación ?**

▪ **Prevención**

Eliminación no es gratis

MEDICIÓN

Muy bajas concentraciones

¿Qué medimos ?

- Muy alta variabilidad en tiempo y localización
- Coste de los análisis
- Nuevos compuestos aparecen cada día
- Metabolitos
- Interferencias

Líneas de trabajo

Indicadores

Bioensayos (múltiples posibles afecciones)

FORTUNA	26-may	influyente (ug/l)	efluente (ug/l)	largo aireación (ug/l)	largo espesado (ug/l)	sobrenadantes espesador (ug/l)	fango deshidratado (mg/kgMS)	escumido centrífuga (ug/l)
		14AR04966	14AR04962	14VA02448	14VA02464	14VA02385	14VA02480	14VA02401
Acetaminofeno	ug/l	93.9000	0.0000	0.0000	0.5900	0.0000	0.0000	0.4820
Acetamidrid	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cafeína	ug/l	88.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1420
Carbamazepina	ug/l	0.1260	0.0000	0.0000	0.0000	0.2120	23.3910	0.1360
Claritromicina	ug/l	0.2970	0.0000	0.0000	0.0000	0.8200	0.0000	0.0000
Diclofenac	ug/l	1.3900	0.0100	0.2060	0.3180	1.0100	19.2780	0.9040
Erofloxacina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Eritromicina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ofloxacina	ug/l	3.2300	0.0000	0.3940	1.4900	1.2900	0.0000	4.9400
Tiabendazol	ug/l	0.1130	0.0000	0.0000	0.0000	0.1710	0.0000	0.1560
Trimetoprim	ug/l	0.0000	0.0000	0.0000	0.0000	0.1470	0.0000	0.0000
E.coli	ufc/100ml	6.5E+06	0.0E+00	1.1E+03	1.0E+04	1.0E+04	3.9E+04	5.0E+04
Salmonella	presencia/ti o 25g	no	no	no	si	no	si	no

FORTUNA	10-jun	influyente (ug/l)	efluente (ug/l)	largo aireación (ug/l)	largo espesado (ug/l)	sobrenadantes espesador (ug/l)	fango deshidratado (mg/kgMS)	escumido centrífuga (ug/l)
		14AR04967	14AR04963	14VA02449	14VA02465	14VA02386	14VA02481	14VA02402
Acetaminofeno	ug/l	163.0000	0.0000	0.0000	1.1000	0.0000	0.0000	0.3360
Acetamidrid	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cafeína	ug/l	76.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2290
Carbamazepina	ug/l	0.1250	0.1700	0.0000	0.0000	0.1130	12.5700	0.1400
Claritromicina	ug/l	0.2640	0.0703	0.0000	0.0000	0.0000	4.6840	0.0000
Diclofenac	ug/l	1.4000	0.0290	0.2480	0.0000	1.0300	14.4430	0.8800
Erofloxacina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Eritromicina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ofloxacina	ug/l	1.0600	2.2200	0.7420	1.5000	2.5100	0.0000	8.0400
Tiabendazol	ug/l	0.0000	0.0572	0.0000	0.0000	0.0000	0.0000	0.1140
Trimetoprim	ug/l	0.0000	0.0910	0.0000	0.0000	0.1240	0.0000	0.0000
E.coli	ufc/100ml	7.6E+06	0.0E+00	4.2E+03	1.1E+04	3.1E+03	7.0E+04	6.6E+05
Salmonella	presencia/ti o 25g	no	no	si	no	no	si	si

FORTUNA	30-jun	influyente (ug/l)	efluente (ug/l)	largo aireación (ug/l)	largo espesado (ug/l)	sobrenadantes espesador (ug/l)	fango deshidratado (mg/kgMS)	escumido centrífuga (ug/l)
		14AR04968	14AR04964	14VA02450	14VA02466	14VA02387	14VA02482	14VA02403
Acetaminofeno	ug/l	163.0000	0.0000	0.0000	0.1210	0.0000	0.0000	0.0000
Acetamidrid	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cafeína	ug/l	101.0000	0.0000	0.0000	0.0000	0.0000	0.1050	0.1050
Carbamazepina	ug/l	0.0000	0.1780	0.0000	0.0000	0.2080	17.8760	0.1650
Claritromicina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	16.1080	0.0000
Diclofenac	ug/l	1.3000	0.1290	0.2800	0.2880	0.9550	6.4210	0.7850
Erofloxacina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Eritromicina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ofloxacina	ug/l	1.8600	0.2430	1.0100	1.0400	2.2000	0.0000	4.7400
Tiabendazol	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Trimetoprim	ug/l	0.1080	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E.coli	ufc/100ml	6.8E+06	0.0E+00	3.4E+03	2.2E+04	1.3E+04	4.2E+04	4.0E+05
Salmonella	presencia/ti o 25g	no	no	no	no	si	no	no

FORTUNA	08-jul	influyente (ug/l)	efluente (ug/l)	largo aireación (ug/l)	largo espesado (ug/l)	sobrenadantes espesador (ug/l)	fango deshidratado (mg/kgMS)	escumido centrífuga (ug/l)
		14AR04969	14AR04965	14VA02451	14VA02467	14VA02388	14VA02483	14VA02404
Acetaminofeno	ug/l	1.5100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Acetamidrid	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cafeína	ug/l	2.2800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Carbamazepina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	14.4580	0.0000
Claritromicina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diclofenac	ug/l	0.0227	0.0168	0.0221	0.0000	0.0253	4.4010	0.0260
Erofloxacina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Eritromicina	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ofloxacina	ug/l	0.0000	0.1080	0.1050	0.0000	0.1190	0.0000	0.1650
Tiabendazol	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Trimetoprim	ug/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E.coli	ufc/100ml	2.7E+07	0.0E+00	2.2E+03	8.2E+03	6.0E+04	5.6E+04	3.4E+05
Salmonella	presencia/ti o 25g	si	no	si	si	si	si	si

NORMAN

Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances

Individual substance	
Microcystin-LR	2-[2-[4-(1,1,3,3-tetramethylbutyl)phenoxy]ethoxy]ethanol / 4-Octylphenol di-ethoxylate
Microcystin-RR	2-[4-(1,1,3,3-tetramethylbutyl)phenoxy]ethanol / 4-Octylphenol mono-ethoxylate
Microcystin-YR	4-Octylphenoxy acetic acid
Surfinol-104	Cyanoformaldehyde
2,6-Di-tert-butylphenol	Decabromodiphenyl ethane
Butylated hydroxyanisole	Hexabromocyclododecane
tert-Butylhydroquinone	n-Nitrosodimethylamine
Butylated hydroxytoluene	Benzylbutylphthalate
Cybutryne (Irgarol)	Diethyl phthalate
Dibutyl tin ion	Dimethylphthalate
Monobutyl tin ion	Di-n-butylphthalate
Tetrabutyl tin ion	Di-n-octylphthalate
Triphenyltin cation	Bisphenol A
Trichloronitromethane (Chloropicrin)	Triphenyl phosphate
Diethylenetriaminepentaacetic acid	2,4-Dihydroxybenzophenone
Ethylenediaminetetraacetic acid	
Nitrilotriacetic acid	
Oxadixyl	1,2,5,6,9,10-Hexabromocyclododecane
Tetraacetylenediamine	
Naphthalene sulphonic acid	
C10-C14-LAS	2,2',3,4,4',5',6-Heptabromodiphenyl ether
C12-LAS	2,2',4,4',5,5'-Hexabromodiphenyl ether
4-Nonylphenol di-ethoxylate / 2-(2-(4-Nonylphenoxy)ethoxy)ethanol	2,2',4,4',5,6'-Hexabromodiphenyl ether
4-Nonylphenol mono-ethoxylate	2,2',4,4'-Tetrabromodiphenyl ether
4-Nonylphenoxy acetic acid	2,2',3,3',4,4',5,5',6,6'-Decabromodiphenyl ether
2-(2-(4-Nonylphenoxy)ethoxy)acetic acid	Octabromodiphenyl ethers

...

6:2/8:2 Fluorotelomer phosphate diester
8:2/10:2 Fluorotelomer phosphate diester
perfluoropolyethers
3H-perfluoro-3-((3-methoxy-propoxy)propanoic acid) ammonium salt / CF3OCF2CF2CF2OCHFCF2COONH4
Ammonium perfluoro(2-methyl-3-oxahexanoate) / CF3CF2CF2OCF(CF3)COONH4
2, 2, 3, 3, 4, 4, 4-Heptafluoro-1-Butanol
2, 2, 3, 3, 4, 4, 5, 5, 6, 6, 6 - Undecafluoro-1-Hexanol
6:2 fluorotelomer sulfonamide alkylbetaine (trade name Forafac 1157)
6:2 fluorotelomer sulfonamide aminoxide(trade name Forafac 1183)
Perfluorobutanoic acid
Perfluoropentanoic acid
Perfluorohexane sulfonyl fluoride
4:2 Fluorotelomer Thioamido Sulfonate
6:2 Fluorotelomer Thioamido Sulfonate
8:2 Fluorotelomer Thioamido Sulfonate
Clofibrate
Benzoylcegonine (Cocaine)
Amphetamine
Methamphetamine
MDMA (Ecstasy)
THC-COOH (Cannabis)

Prioritisation Working Group



LIST OF EMERGING SUBSTANCES

> 1000

INDICADORES

Table 2.1 Hazard identification: CECs shortlisted by NEREUS D5.1

Group	Specific substance	Nature of substance
Pharmaceutical	Carbamazepine	Anti-epileptic and anti-depressant
Biocide	Triclosan	Antibacterial and antifungal agent
Other	Perfluorooctanoic acid (PFOA); Perfluorooctanesulfonic acid (PFOS)	A fluorosurfactant e.g. used in the emulsion polymerization of fluoropolymers
Other	N-Nitrosodimethylamine (NDMA)	By-product of several industrial processes; present at very low levels in certain foodstuffs (carcinogen)
Pharmaceutical	Diclofenac	Nonsteroidal anti-inflammatory
Oestrogenic substances	17alpha-Ethinylestradiol (EE2)	Synthetic, steroidal oestrogen

Compuestos seleccionados

- Ibuprofeno
- Oxitetraciclina
- 17 alpha-Ethinylestradiol
- Imidacloprid
- Diclofenac
- Sulfadiazina
- Triclosán
- Eritromicina
- Carbamazepina
- Glifosato

EFFECTOS

Cuando
culpa



¿Qué son los
suponen un p
volver a nuest



Las depuradoras no eliminan el 30% de los antibióticos de las aguas residuales hospitalarias

1  1.494 



+ Seguir

 9 SEGUIDORES



Sobre la Entidad



Una gran cantidad de antibióticos son consumidos habitualmente en las instalaciones hospitalarias. Una vez administrados a los pacientes, estos compuestos son en parte **excretados a través de las heces y orina**, que forman parte de las aguas residuales de los hospitales. Estas son habitualmente tratadas, junto con las aguas residuales urbanas, en las estaciones de depuraciones de aguas residuales (EDARs). Aunque una gran parte de los

< Previous A

Antibiotics in Fresh Water on Carbamazepine

Joshua Maor¹, and Benny Chefetz¹
¹University of Jerusalem, Jerusalem

alem 9112001, Israel
health
inment, The Hebrew University of

Study



an alternative and
have been raised
pharmaceuticals. This
ously detected in
a randomized
ied wastewater-
e, while subjects
antly lower levels of
n at this low exposure
ept" study
on of reclaimed
risk assessments and

SAFETY OF RECYCLED WATER: Health Significance of Carbamazepine Detected in Fruits and Vegetables Irrigated with Recycled Water

Water Reuse Cons

The number of years it w
vegetables and fruits irrig
acceptable intake of carb

744,600,000

Facua reclama una advertencia en el prospecto de 'Dalsy' sobre los efectos secundarios de su colorante



Compartido 2747

More Common Scen

The more common scenari

- The consumer of fru
of fruits and vegetal
scenario, and
- the mix of vegetable
markets and source
above scenario

In that case, the calculation

Daily In

The number of years it w
acceptable intake of carbamazepine would be:

$744,600,000 \text{ ng} / (1,000 \text{ ng/day} \times 365 \text{ days/year}) = 2,040 \text{ Years}$

36 Comentarios



Detalle de la presentación del producto. | EL MUNDO

- Para cumplir con la normativa europea sobre el uso de aditivos
- El uso del E-110 se ha asociado con efectos adversos sobre la atención



Descarga a cauce

- Ecosistema fluvial ?
- Acuíferos ?
- Usos posteriores (riego, potabilización,etc) ?



Reutilización directa

- Salud consumidores ?
- Afección a suelo ?
- Afección a acuíferos ?



CENTRO DE EDAFOLOGÍA Y BIOLOGÍA
APLICADA DEL SEGURA

“Evaluation of potential emergent contaminant risks associated to the use of re
in agricultural systems”

Prof. Vicente Martinez and Dr. Teresa Mestre (CEBAS-CSIC)



Contents lists available at ScienceDirect

Agricultural Water Management

journal homepage: www.elsevier.com/locate/agwat



Absorption of carbamazepine and diclofenac in hydroponically cultivated lettuces and human health risk assessment

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ARTICLE INFO

Keywords:

Pharmaceuticals
Human health risk
Wastewater treatment plants (WWTPs)
Effluents
Irrigation

ABSTRACT

Due to current water shortages, the use of water from wastewater treatment plants (WWTPs) for horticultural crop irrigation is becoming increasingly common. This practice implies the risk of introducing pharmaceutical compounds into the food chain. The main aim of this work was to study the accumulation of two drugs in lettuces and their subsequent transfer into the food chain. The study focused on two widely used drugs, the anticonvulsant carbamazepine (CBZ) and the anti-inflammatory diclofenac (DCF), with different physico-chemical properties in terms of their hydrophobicity and solubility in water. Three varieties of lettuce were selected and irrigated with water containing a mixture of the two pharmaceutical compounds at different concentrations. The results show the leaves presented the highest levels of uptake and greatest bioconcentration factors in the case of CBZ; however, in the case of DCF, by contrast, the highest uptake levels and greatest bioconcentration factors were observed in the roots. For CBZ, the C_{leaf}/C_{root} ratio was greater than 1, indicating good root-to-leaf drug translocation, whereas all C_{leaf}/C_{root} ratios were less than 1 for DCF. From the data acquired, our evaluation suggests that the concentrations of CBZ and DCF detected in the edible part of the lettuces do not imply any risk to human health.

- Colaboración con Proyecto Rousseau
- Proyecto REUSAGUA
- Redacción Convenio CSIC y CEBAS para estudio de efectos contaminantes emergentes en terreno



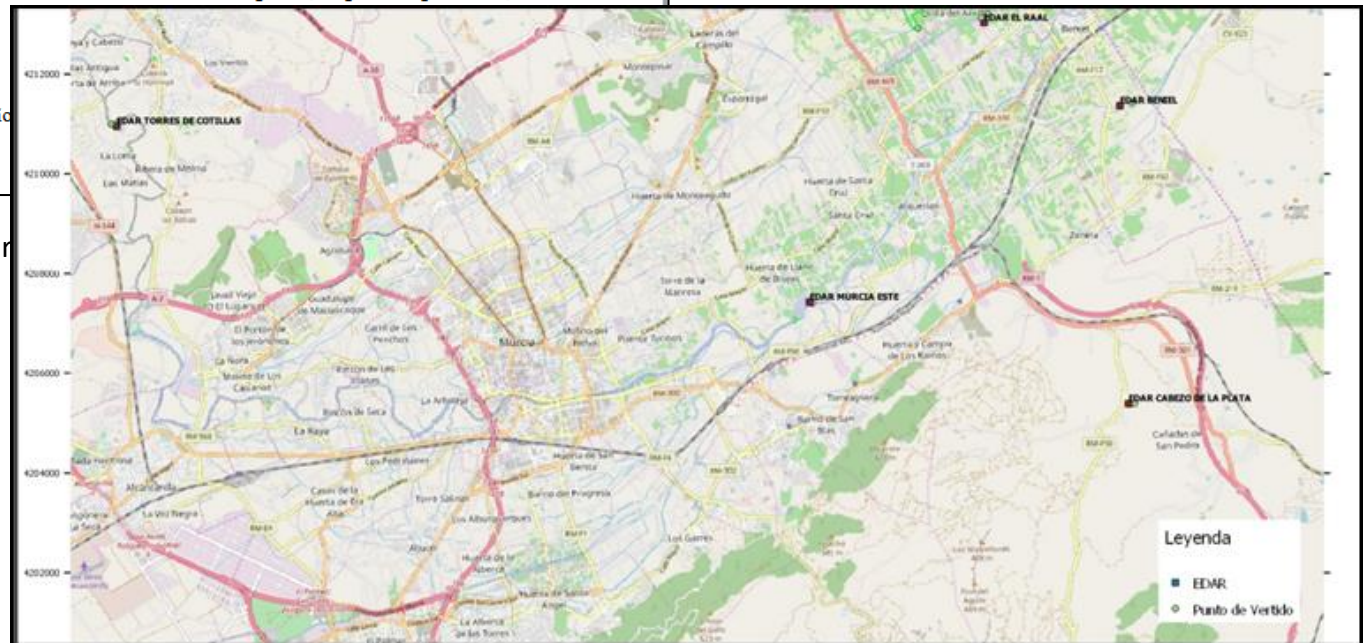
Informe intermedio CFE/ES/19-18

**TÍTULO DEL PROYECTO: EVALUACIÓN DE EFECTOS
DE CONTAMINANTES EMERGENTES DE AGUAS
REGENERADAS EN MICROCOSMOS.**

PALABRAS CLAVE: Contaminantes Emergentes, Aguas Regeneradas,
EDAR, Microcosmos.

DURACIÓN: 1 año

Efectos eco-toxicológicos sobre



Convenio con IGME y CSIC para estudio acuíferos

Compuesto		Lodo
PAH (µg/kg)	Naftaleno	<LC
	Acenaftileno	<LC
	Acenafteno	56
	Fluoreno	1,09
	Fenantreno	105
	Antraceno	2,66
	Fluoranteno	<LC
	Pireno	128
	Benzo[a]antraceno	16,5
	Criseno	3,92
	Benzo[b]fluoranteno	1,39
	Benzo[k]fluoranteno	0,42
	Benzo[a]pireno	1,00
	Dibenzo[ah]antraceno	<LC
	Benzo[ghi]perileno	4,08
Indeno[123cd]pireno	<LC	
ΣPAH (µg/kg)		320
LAS (mg/kg)	C10	0,46
	C11	2,24
	C12	1,80
	C13	1,40
ΣLAS (µg/kg)		5,91
NPE (mg/kg)	NP2EO	<LC
	NP1EO	0,01
	NP	0,18
ΣNEP (µg/kg)		0,19
DEPH (mg/kg)	DEHP	0,02
PCB (µg/kg)	PCB 101	<LC
	PCB 118	<LC
	PCB 138	<LC
	PCB 153	2,36
	PCB 18	<LC
	PCB 180	<LC
	PCB 28	<LC
	PCB 52	<LC
ΣPCB (µg/kg)		2,36



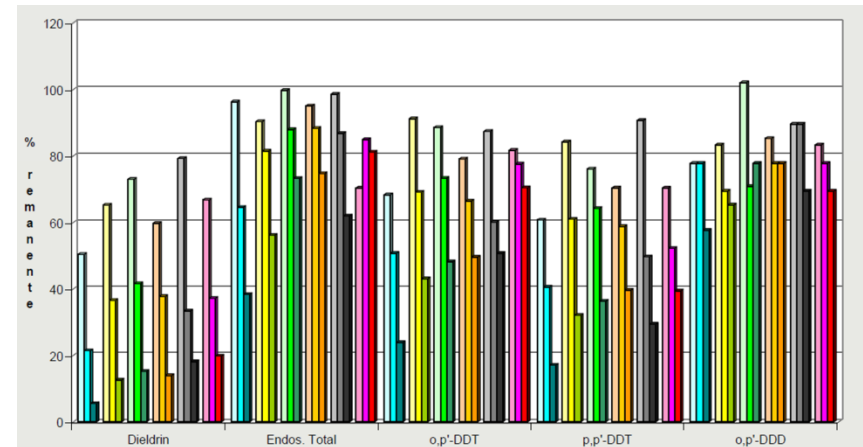
Compuesto	Suelo Control			Suelo con Lodo		
PAH (ng/kg)	Naftaleno	<LC	<LC	<LC	<LC	<LC
	Acenaftileno	<LC	<LC	<LC	<LC	<LC
	Acenafteno	<LC	<LC	<LC	<LC	<LC
	Fluoreno	<LC	<LC	<LC	<LC	366
	Fenantreno	663	895	1079	1167	1006
	Antraceno	<LC	<LC	<LC	<LC	<LC
	Fluoranteno	<LC	1508	798	1088	984
	Pireno	4731	4167	6291	10002	12123
	Benzo[a]antraceno	<LC	788	683	232	205
	Criseno	166	234	302	412	401
	Benzo[b]fluoranteno	582	<LC	896	<LC	994
	Benzo[k]fluoranteno	<LC	169	<LC	242	243
	Benzo[a]pireno	<LC	<LC	<LC	<LC	<LC
	Dibenzo[ah]antraceno	<LC	<LC	<LC	<LC	<LC
	Benzo[ghi]perileno	<LC	1006	<LC	<LC	2232
	Indeno[123cd]pireno	<LC	<LC	<LC	<LC	<LC
ΣPAH (ng/kg)		320	249	313	6142	8766
LAS (µg/kg)	C10	19,1	36,5	18,3	18,5	24,5
	C11	72,9	255	56,2	41,8	64,7
	C12	124	326	110	99,3	133
	C13	82,9	302	58,9	56,5	67,6
ΣLAS (µg/kg)		299	919	244	216	302
NPE (µg/kg)	NP2EO	<LC	<LC	<LC	<LC	<LC
	NP1EO	<LC	<LC	<LC	<LC	<LC
	NP	<LC	<LC	<LC	<LC	<LC
ΣNPE (µg/kg)		<LC	<LC	<LC	<LC	<LC
DEPH (µg/kg)	DEHP	0,80	17,9	20,0	3,25	3,88
PCB (µg/kg)	PCB 101	<LC	<LC	<LC	<LC	<LC
	PCB 118	<LC	<LC	<LC	<LC	<LC
	PCB 138	<LC	<LC	<LC	<LC	<LC
	PCB 153	<LC	<LC	<LC	<LC	<LC
	PCB 18	<LC	<LC	<LC	<LC	<LC
	PCB 180	<LC	<LC	<LC	<LC	<LC
	PCB 28	<LC	<LC	<LC	<LC	<LC
	PCB 52	<LC	<LC	<LC	<LC	<LC
ΣPCB (µg/kg)		<LC	<LC	<LC	<LC	<LC

De los compuestos orgánicos persistentes (LAS, PAH, AOX, NEP) que están en estudio dentro de la UE, no se han detectado valores elevados, aunque interesa tenerlos presentes en el futuro.

ELIMINACIÓN



Primeras experiencias :
Convenio con Universidad de
Murcia en el año 2007



Sistemas de eliminación probados



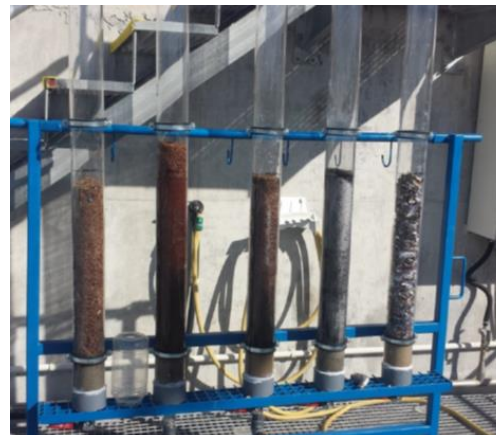
Eliminación en EDARs



Ozono



Ozono + US



Filtración con
diferentes materiales



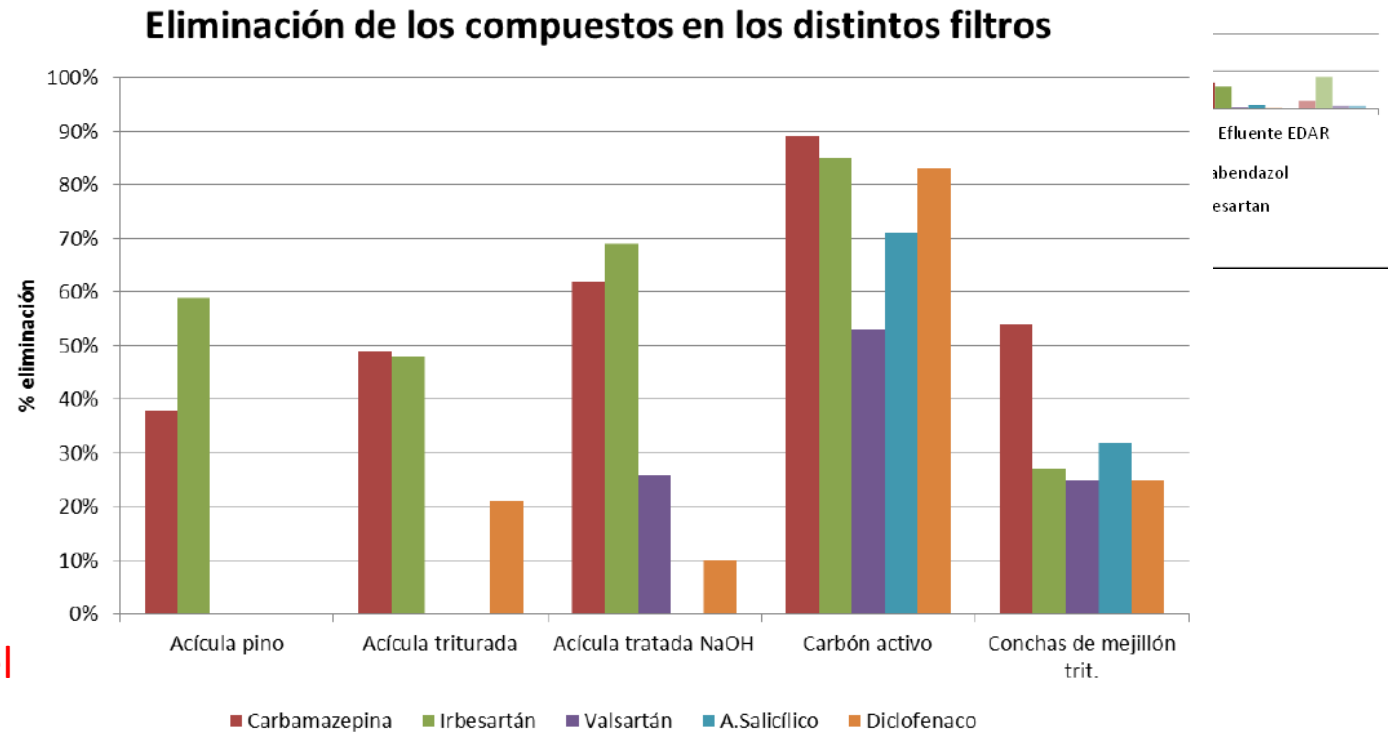
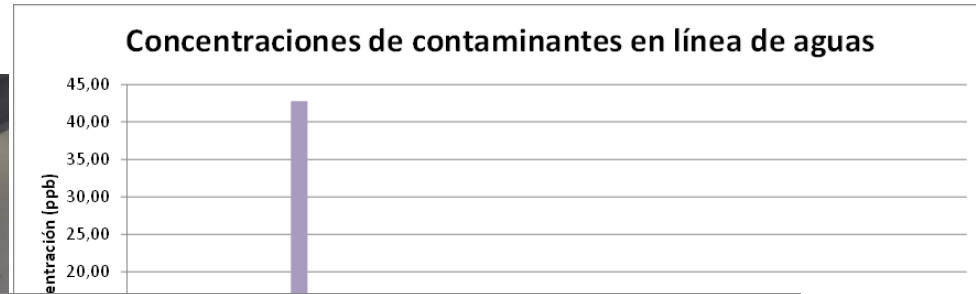
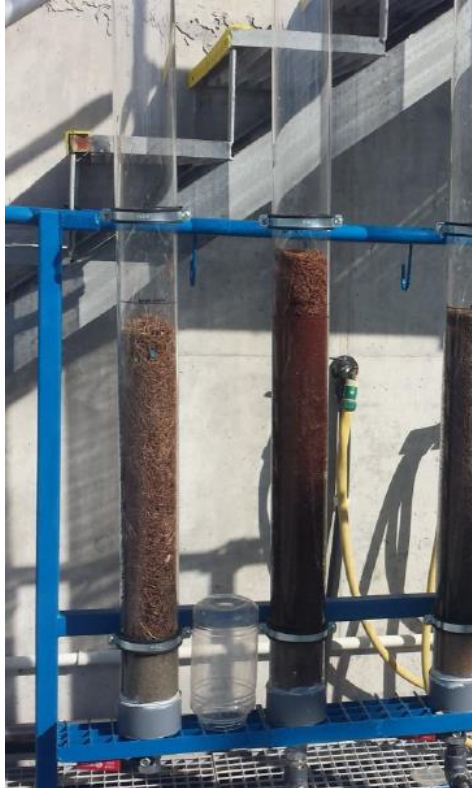
Membranas



Fotocatálisis Solar

Habitualmente se dopa

Tratamientos de adsorción y filtración



Dopando para hacer el estudio

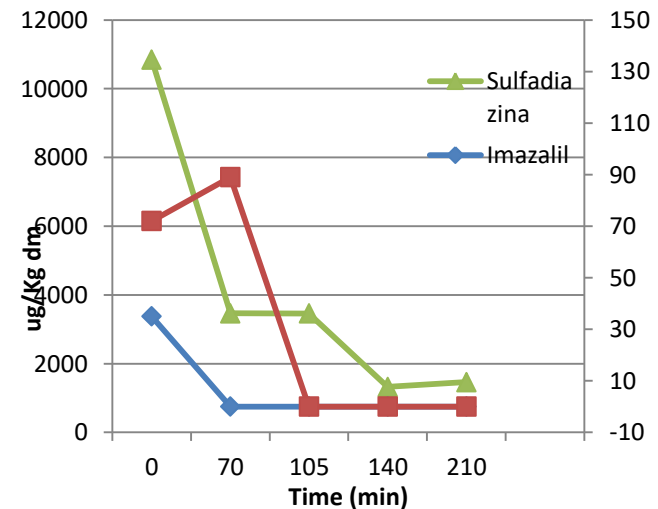
Proyecto LIFE STORE



Co-digestión anaerobia con
cavitación y ozonización para
eliminación de contaminantes
emergentes en fango.

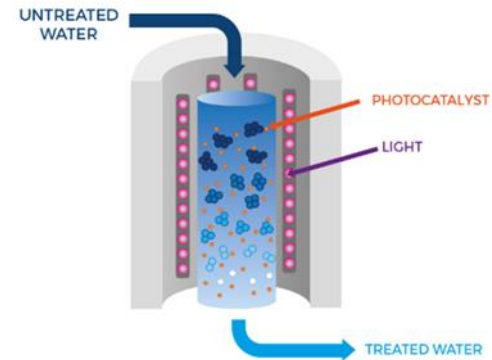


POST-STO3RE OZONATION



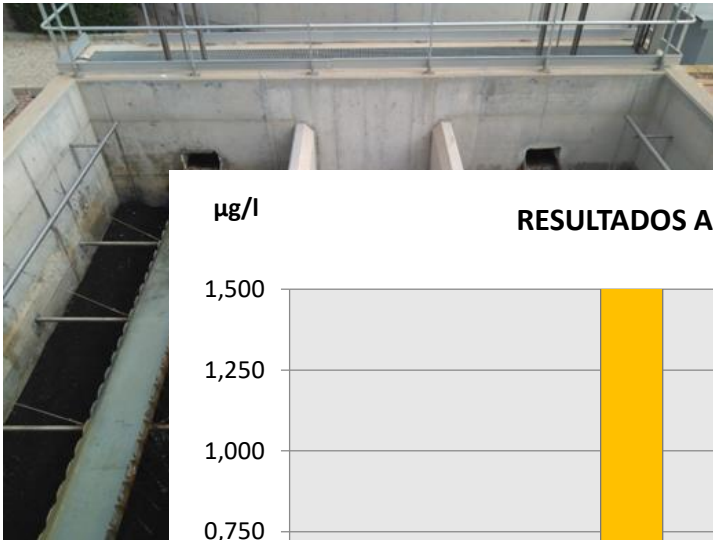


Wetlands experimentales : Grava, grava +
tierra acondic., grava + biochar



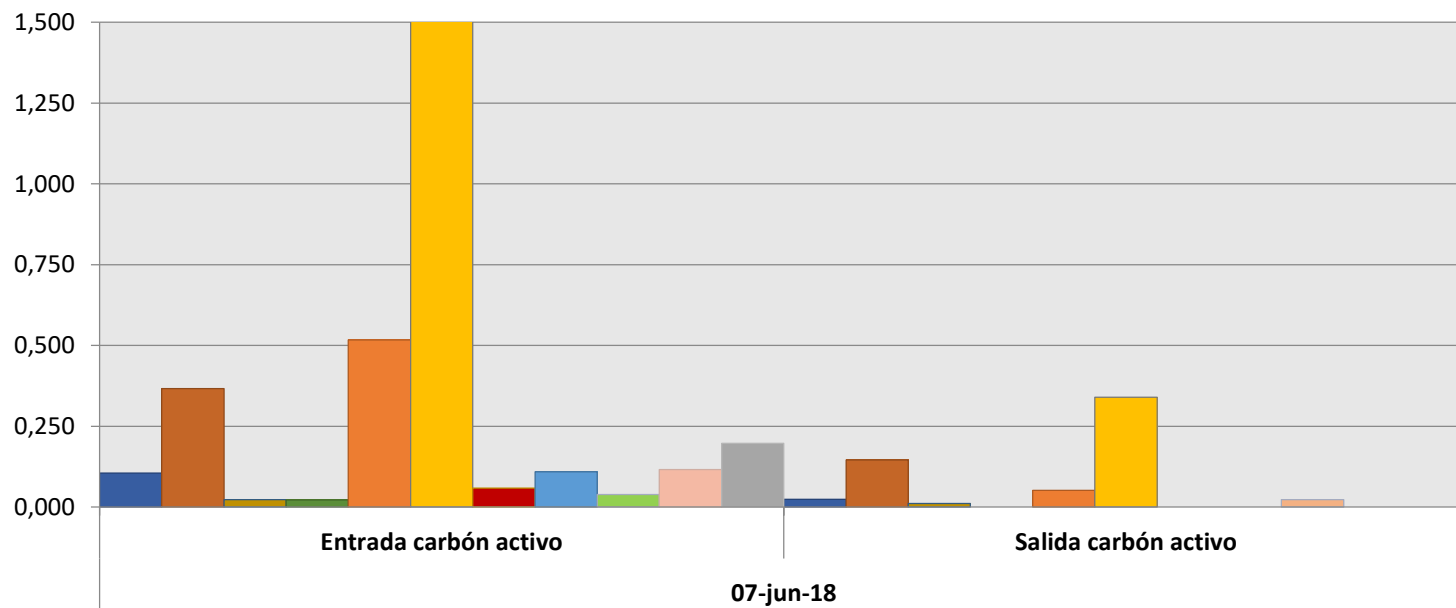
Fotocatálisis solar y con UV-led





µg/l

RESULTADOS ANALÍTICO ESTUDIO EMERGENTES FILTRO DE CARBÓN ACTIVO



■ Carbamazepina
 ■ Diclofenac
 ■ Eritromicina
 ■ Estrone (E1)
 ■ Ibuprofeno
 ■ Imazalil
■ Isoproturon
 ■ Ketorprofeno
 ■ Sulfamethoxazol
 ■ Terbutrina
 ■ Tiabendazol

Entidad de Saneamiento y Depuración de la Región de Murcia		PROMEDIO	
Fecha de muestra			
Denominación muestra		Entrada carbón activo	Salida carbón activo
Código informe de ensayo			
Parámetro	Ud.		
17a-Ethinylestradiol	µg/l	0,0	0,0
17β-Estradiol	µg/l	0,0	0,0
Ametrina	µg/l	0,0	0,0
Atrazina	µg/l	0,0	0,0
Bromacilo	µg/l	0,0	0,0
Carbamazepina	µg/l	0,171	0,096
Cloranfenicol	µg/l	0,0	0,0
Desetilatrazina	µg/l	0,0	0,0
Desispropilatrazina	µg/l	0,0	0,0
Diclofenac	µg/l	0,557	0,281
Dimetoato	µg/l	0,014	0,007
Diuron	µg/l	0,013	0,0
Eritromicina	µg/l	0,014	0,007
Estriol	µg/l	0,0	0,0
Estrone (E1)	µg/l	0,002	0,0
Fluoxetina	µg/l	0,016	0,0
Ibuprofeno	µg/l	0,176	0,090
Imazalil	µg/l	1,118	0,263
Isoproturon	µg/l	0,005	0,0
Ketorprofeno	µg/l	0,369	0,159
Linuron	µg/l	0,0	0,0
Metribuzina	µg/l	0,0	0,0
Ofloxacina	µg/l	0,064	0,021
Pirimicarb	µg/l	0,0	0,0
Prometon	µg/l	0,0	0,0
Prometrina	µg/l	0,0	0,0
Propazina	µg/l	0,0	0,0
Propizamida	µg/l	0,0	0,0
Secbumeton	µg/l	0,0	0,0
Simazina	µg/l	0,0	0,0
Sulfamethoxazol	µg/l	0,070	0,057
Terbutilazina	µg/l	0,0	0,0
Terbutrina	µg/l	0,057	0,018
Tiabendazol	µg/l	0,131	1,129
Trietazina	µg/l	0,0	0,0

Variable	Valor
Nº semanas agotamiento	20
Nº reposiciones / año	2,60
c€/ m3 operación	2,67

Sin filtración arena previa

Mejora significativa de transmitancia



Instalación Ozono para 750 m³/día

Aspectos relativos al análisis de riesgos

- Un punto aún indefinido : No se sabe el alcance requerido de este estudio de riesgos
- Aspectos que se deben contemplar según normativa :

The following requirements and obligations shall, as a minimum, be taken into account in the risk assessment:

- (e) the requirement to reduce and prevent water pollution from nitrates in accordance with Council Directive 91/676/EEC²;
- (f) the obligation for drinking water protected areas to meet the requirements of Council Directive 98/83/EC³;
- (g) the requirement to meet the environmental objectives set out in Directive 2000/60/EC of the European Parliament and of the Council⁴;
- (h) the requirement to prevent groundwater pollution in accordance with Directive 2006/118/EC of the European Parliament and of the Council⁵;
- (i) the requirement to meet the environmental quality standards for priority substances and certain other pollutants laid down in Directive 2008/105/EC of the European Parliament and of the Council⁶;
- (j) the requirement to meet the environmental quality standards for pollutants of national concern (i.e. river basin specific pollutants) laid down in Directive 2000/60/EC;
- (k) the requirement to meet the bathing water quality standards laid down in Directive 2006/7/EC of the European Parliament and of the Council⁷;
- (l) the requirements concerning the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture under Council Directive 86/278/EEC⁸;
- (m) the requirements regarding hygiene of foodstuffs as laid down in Regulation (EC) No 853/2004 of the European Parliament and of the Council⁹ and the guidance provided in the Commission Notice on guidance document on addressing microbiological risks in fresh fruits and vegetables at primary production through good hygiene;

- (n) the requirements for feed hygiene laid down in Regulation (EC) No 1831/2005 of the European Parliament and the Council¹⁰;
- (o) the requirement to comply with the relevant microbiological criteria set out in Commission Regulation (EC) No 2073/2005¹¹;
- (p) the requirements regarding maximum levels for certain contaminants in foodstuffs set out in Commission Regulation (EC) No 1831/2006¹²;
- (q) the requirements regarding maximum residue levels of pesticides in or on food and feed set out in Regulation (EC) No 396/2005 of the European Parliament and of the Council¹³;
- (r) the requirements regarding animal health in Regulation (EC) 1069/2009 of the European Parliament and of the Council¹⁴ and Commission Regulation (EC) 142/2011 of the European Parliament and of the Council¹⁵.

5. When necessary and appropriate to ensure sufficient protection of the environment and human health, **specify requirements for water quality and monitoring that are additional to and/or stricter than those specified in Annex I.**

Depending on the outcome of the risk assessment referred to in point 4, such additional requirements may in particular concern:

- (a) heavy metals;
- (b) pesticides;
- (c) disinfection by-products;
- (d) pharmaceuticals;
- (e) other substances of emerging concern;
- (f) anti-microbial resistance.

EVALUATION ROADMAP

Roadmaps aim to inform citizens and stakeholders about the Commission's work to allow them to provide feedback and to participate effectively in future consultation activities. Citizens and stakeholders are in particular invited to provide views on the Commission's understanding of the problem and possible solutions and to share any relevant information that they may have.

TITLE OF THE EVALUATION	EVALUATION OF THE URBAN WASTE WATER TREATMENT DIRECTIVE 91/271/EEC (UWWTD)
LEAD DG – RESPONSIBLE UNIT	DG ENV UNIT C.2
INDICATIVE PLANNING	PLANNED START: Q4 2017
(PLANNED START DATE AND COMPLETION DATE)	PLANNED COMPLETION DATE: Q1 2019
ADDITIONAL INFORMATION	http://ec.europa.eu/environment/water/water-urbanwaste/index_en.html

The Roadmap is provided for information purposes only. It does not prejudice the final decision of the Commission on whether this initiative will be pursued or on its final content. All elements of the initiative described by the document, including its timing, are subject to change.

A. Context, Purpose and Scope of the evaluation

Context

The main objective of the [Urban Waste Water Treatment Directive](#) (UWWTD) 91/271/EEC is to protect the environment from the adverse effects of waste water discharges from urban areas and certain industrial sectors by setting requirements for the collection and treatment of urban waste

The **relevance** aspect of the evaluation will focus on the following aspects: To what extent is the UWWTD still relevant to achieve its objectives of the protection of the environment from the adverse effects of waste water discharges? To what extent are the limit values for pollutants still valid? To what extent does the directive encourage/facilitate innovation and adaptation? How are emerging pollutants covered by the Directive? To what extent is the Directive relevant to achieve a circular economy in the EU? How relevant is the Directive in the light of the changing international contexts, such as the Sustainable Development Goals in 2030?⁶

The evaluation of coherence focuses on questions such as: How coherent is the Directive – internally (across its articles); with related EU water legislation; with downstream legislation such as the [Sewage Sludge Directive](#) (86/278/EEC) and/or the Bathing water Directive (76/160EEC)?

The **EU-added value** will be evaluated by investigating the extent to which an EU-level approach is needed to reach the objectives of the Directive and whether the issues addressed by the Directive continue to require action at EU level.



