EXPOSICION HUMANA A COMPUESTOS ORGANICOS PERSISTENTES Y NO PERSISTENTES

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Hospital Clínico. Universidad de Granada
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VIGILANCIA BIOLOGICA DE LA EXPOSICION A SUSTANCIAS QUIMICAS EN LA POBLACION ESPAÑOLA

ciberesp
Centro de Investigación Biomédica en Red
Epidemiología y Salud Pública

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Infancia y Medio Ambiente

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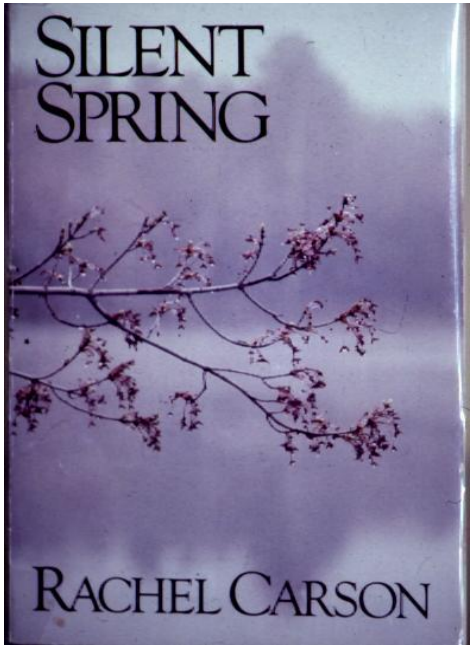
NECTAR

Contenido

- C. Orgánicos persistentes lipofílicos
- Alquilfenoles
- Bisfenol-A y otros bisfenoles
- Ftalatos
- Parabenes
- Benzofenonas
- Triclosán
- Filtros UV: canfenos y oxicinamatos
- PFOS y PFOA
- Y que mas?...

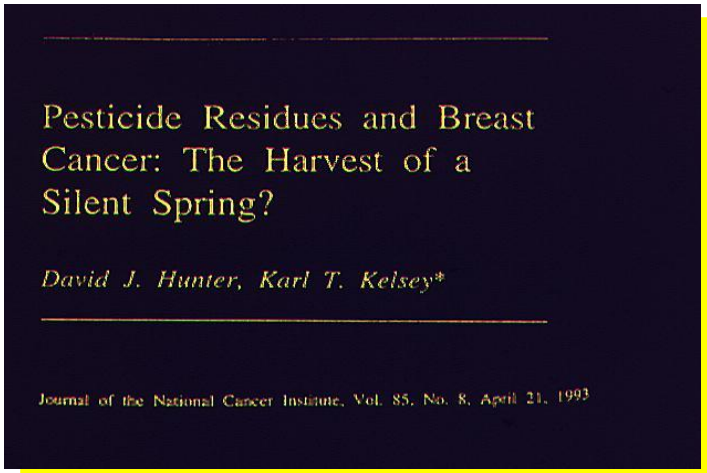
Organoclorados y cáncer de mama

Desde 1984 más de 40 estudios tratando de asociar los niveles en sangre y tejido adiposo de compuestos organoclorados (DDT y PCBs) y el riesgo de cáncer de mama



Resultados conflictivos

Cáncer es una enfermedad multifactorial
Largo periodo de incubación
Dificultades en la medida de exposición
¿Que compuesto químico?
Medida de exposición/Medida de Efecto


Pesticide Residues and Breast Cancer: The Harvest of a Silent Spring?

*David J. Hunter, Karl T. Kelsey**

Journal of the National Cancer Institute, Vol. 85, No. 8, April 21, 1993

Estimación del riesgo en cáncer de mama (OR)

Estudios universitarios	6.48 (2.09-19.07)*
Antecedentes familiares	5.02 (1.99-12.70)
Exposición química ambiental	**3.80 (1.37-10.56)**
Clase social elevada/CB	3.19 (1.49-6.85)
Consumo de tabaco	2.23 (1.21-4.14)
Cosumo alcohol	1.99 (1.16-3.43)
Estudios secundarios/NE	1.98 (1.11-3.51)
Edad de menarquia >12	1.88 (1.10-3.22)
Lactancia (>34meses)	0.43 (0.24-0.77)
Número hijos 4-5	0.40 (0.20-0.81)
Casada/soltera	0.31 (0.11-0.81)
Número hijos >6	0.23 (0.10-0.57)

*OR (IC 95%) para los factores de riesgo (protección) conocidos

Cancer Causes and Control **15**: 591–600, 2004.

Breast cancer risk and the combined effect of environmental estrogens

Jesús M. Ibarluzea[1], Mariana F. Fernández[2], Loreto Santa-Marina[1], Maria F. Olea-Serrano[2], Ana M. Rivas[2], Juan J. Aurrekoetxea[1], José Expósito[3], Miguel Lorenzo[4], Pablo Torné[5], Mercedes Villalobos[6], Vicente Pedraza[6], Annie J. Sasco[7] & Nicolas Olea[2,*]

Riesgo de cáncer de mama: Carga química (TEXB-alfa) en mujeres con BMI < 28.6 kg/m^2 (mediana) postmenopausicas

TEXB, Ibarluzea *et al.* (2004), CCC **13**, 591-600

Fernandez *et al.* (2007) Eur J Cancer

OR = 5.67 (95% CI 1.59-20.21)

.. cuando el cuarto cuartil (>197.51 pM Ee/g lipid) se compara con el primer cuartil(<0.25 pM Ee/g lipid)

p trend <0.01

¿Cuales son los contaminantes ambientales responsables de TEXB?:
Residuo de compuestos químicos en tejido mamario

Botella B, Environ Res 96: 34-40, 2004

Cerrillo I, Environ Res. 98: 233-239, 2005

Fernandez MF, Chemosphere. 66:377-383, 2006

Carreno J,Environ Res. 103(1):55-61 . 2007

Fernandez MF, Reproductive Toxicology 24(2):259-64, 2007

Lopez-Espinosa MJ, Environ Res 106(1):1-6., 2008

17 pesticidas organoclorados (OC)

37 bifenilos policlorados (PCB)

10 PCBs hidroxilados y dioxin-like PCB,

15 dioxinas y furanos,

8 bifenilos polibromados (PBB)

11esteres de PBBs (PBDE)

Exposure of women to organochlorine pesticides in Southern Spain☆

Begoña Botella, Jorge Crespo, Ana Rivas, Isabel Cerrillo, Maria Fátima Olea-Serrano, and Nicolás Olea*

Environmental Research 96 (2004) 34–40

Residues of studied pesticides in adipose tissue ($N = 458$)

Pesticide	Mean[a]	SD[a]	Median[a]	Percentage
o,p′-DDT	14.01	65.35	[b]	17.46
p,p′-DDT	13.74	32.92	[b]	22.27
o,p′-DDD	62.34	147.81	[b]	20.52
p,p′-DDE	501.14	496.63	392.31	97.38
∑ DDTs	659.98	744.35	496.06	98.25
Endosulfan I	1.82	10.14	[b]	21.39
Endosulfan II	7.82	28.65	[b]	11.13
Endosulfan-ether	1.79	7.06	0.31	50.43
Endosulfan-lactone	1.48	9.06	[b]	15.93
Endosulfan-diol	4.79	22.58	[b]	29.69
Endosulfan-sulfate	9.34	64.20	[b]	10.04
∑ Endosulfans	38.83	159.82	9.00	69.65
Aldrin	10.51	27.08	[b]	30.34
Dieldrin	6.52	31.04	[b]	22.49
Endrin	13.84	39.90	[b]	11.57
Lindane	17.91	60.57	[b]	39.30

[a] ng g^{-1} of lipid.
[b] Below detection limit.

Exposición a pesticidas Organoclorados: Tejido mamario

Chemosphere 62 (2006) 1917–1924

Environmental and lifestyle factors for organochlorine exposure among women living in Southern Spain

I. Cerrillo [a], M.F. Olea-Serrano [b], J. Ibarluzea [c], J. Exposito [d], P. Torne [e], J. Laguna [f], V. Pedraza [a], N. Olea [a,*]

Table 2
Concentrations of PCDD/F, $WHO_{PCDD/F}$-TEQ and $WHO_{PCDD/F}$-TEQ_{2005} as pg g^{-1} fat in adipose tissue samples (n= 20) from women living in Southern Spain

Congeners	Mean (SD) (pg g^{-1} fat)	G. Mean (GSD) (pg g^{-1} fat	⩾LOQ (%)	P5 (pg g^{-1} fat)	P25 (pg g^{-1} fat)	P50 (pg g^{-1} fat)	P75 (pg g^{-1} fat)	P95 (pg g^{-1} fat)	ΣCongeners (%)	$WHO_{PCDD/F}$TEQ (%)	$WHO_{PCDD/F}$ TEQ_{2005} (%)
2,3,7,8-TCDD	2.05(0.97)	1.87(1.53)	100	0.77	1.56	1.79	2.45	4.96	0.46	9.7	10.6
1,2,3,7,8-PeCDD	6.29(3.32)	5.59(1.64)	100	2.01	3.99	5.34	7.45	15.7	1.4	29	31.6
1,2,3,4,7,8-HxCDD	4.40(2.08)	3.99(1.57)	100	1.86	2.96	3.96	5.99	9.43	0.97	2.1	2.3
1,2,3,6,7,8-HxCDD	55.6(26.2)	49.3(1.72)	100	12.5	37.0	49.8	74.4	112	12.3	26	28.3
1,2,3,7,8,9-HxCDD	7.48(3.43)	6.78(1.64)	100	2.09	4.48	7.10	10.3	14.0	1.7	3.5	3.9
1,2,3,4,6,7,8-HpCDD	53.3(29.2)	45.2(1.84)	100	14.2	26.5	44.6	74.6	112	12	2.6	2.8
OCDD	292(148)	265(1.54)	100	150	186	235	369	723	66	0.15	0.47
2,3,7,8-TCDF	0.56(0.58)	0.45(2.01)	95	0.01	0.28	0.40	0.75	2.67	0.14	0.27	0.29
1,2,3,7,8-PeCDF	0.27(0.25)	0.27(1.93)	80	nq	0.1	0.23	0.37	0.94	0.07	0.06	0.04
2,3,4,7,8-PeCDF	9.52(5.28)	8.43(1.64)	100	3.51	5.98	8.26	10.7	24.6	2.1	22	14.6
1,2,3,4,7,8-HxCDF	4.67(2.69)	4.17(1.59)	100	2.11	2.98	4.00	4.94	13.2	1.0	2.2	2.4
1,2,3,6,7,8-HxCDF	3.72(2.31)	3.28(1.61)	100	1.47	2.48	3.15	3.80	11.2	0.80	1.7	1.9
2,3,4,6,7,8-HxCDF	1.14(0.50)	1.03(1.58)	100	0.50	0.73	1.01	1.46	2.11	0.26	0.55	0.61
1,2,3,7,8,9-HxCDF	nq	nq	0	nq	nq	nq	nq	nq	0	0	0
1,2,3,4,6,7,8-HpCDF	3.44(2.27)	2.96(1.70)	100	1.43	2.08	2.64	3.86	9.46	0.72	0.17	0.18
1,2,3,4,7,8,9-HpCDF	0.09(0.16)	0.34(1.27)	25	nq	nq	nq	0.18	0.42	0.08	0	0.005
OCDF	1.46(1.16)	1.63(1.58)	80	nq	0.97	1.29	1.69	4.19	0.4	0	0.002
ΣPCDD/F	446(206)	410(1.51)	100	254	287	360	563	1010			
$WHO_{PCDD/F}$-TEQ	21.5(9.27)	19.6(1.58)	100	7.12	14.0	20.0	27.9	42.0			
$WHO_{PCDD/F}$-TEQ_{2005}	19.6(8.43)	17.9(1.58)	100	6.49	12.8	18.0	26.3	37.3			

Abbreviations: mean (SD): arithmetic mean (standard deviation); G. mean (GSD): geometric mean (geometric standard deviation); ⩾LOQ: limit of quantification; P5: percentile 5; P25: percentile 25; P50: percentile 50; P75: percentile 75. P95: percentile 95. TCDD: tetrachlorodibenzo-*p*-dioxin; PeCDD: pentachlorodibenzo-*p*-dioxin; HxCDD: hexachlorodibenzo-*p*-dioxin; HpCDD: heptachlorodibenzo-*p*-dioxin; OCDD: octachlorodibenzo-*p*-dioxin; TCDF: tetrachlorodibenzofuran; PeCDF: pentachlorodibenzofuran; HxCDF: hexachlorodibenzofuran; HpCDF: heptachlorodibenzofuran; OCDF: octachlorodibenzofuran; ∑PCDD/Fs: sum of polychlorinated dibenzo-*p*-dioxins and dibenzofurans; $WHO_{PCDD/F}$-TEQ and $WHO_{PCDD/F}$-TEQ_{2005}: Based on World Health Organization toxic equivalency factors for dibenzo-*p*-dioxins and dibenzofurans in 1997 (Van den Berg et al., 1998) and 2005 (Van den Berg et al., 2006), respectively.; nq: below limit of quantification.

Exposición a dioxinas: Tejido mamario

Contents lists available at ScienceDirect

Chemosphere

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

Dioxins in adipose tissue of women in Southern Spain

M.J. Lopez-Espinosa [a], H. Kiviranta [b], P. Araque [a], P. Ruokojärvi [b], J.M. Molina-Molina [a], M.F. Fernandez [a], T. Vartiainen [b,c], N. Olea [a,*]

Table 3
Concentration and frequency (%) of OH-PCB congeners in adipose tissue samples of women from Southeast Spain

Congeners	Mean	SD	Median	%	P5	P25	P75	P95
OH-PCB 107/118	0.3	0.72	<LOQ	20	<LOQ	<LOQ	<LOQ	1.57
OH-PCB 138	5.31	8.88	3.3	70	<LOQ	<LOQ	5.08	14.8
OH-PCB 180	1.96	3.84	<LOQ	25	<LOQ	<LOQ	0.78	10.4
∑OH-PCB	7.79	12.1	4.05	–	<LOQ	2.78	6.05	20.3

Concentrations in pg/ g of lipid. OH-PCB: hydroxy-polychlorinated biphenyl. P5, P25, P75, P95 percentiles.

Exposición a PCBs: Tejido mamario

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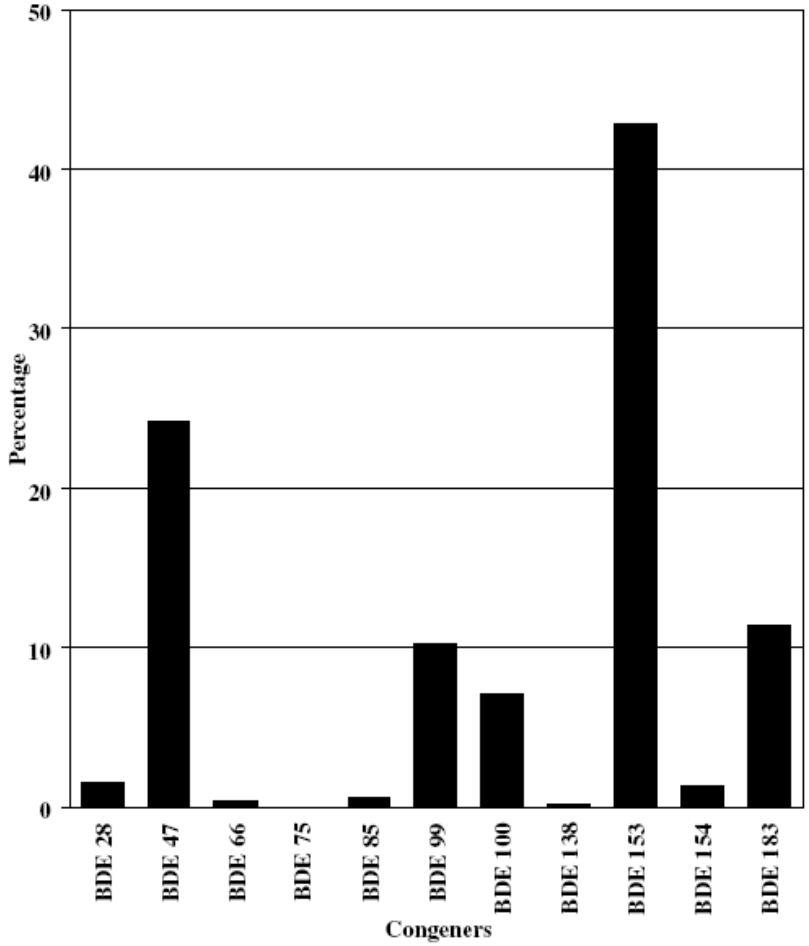
ScienceDirect
Chemosphere 71 (2008) 1196–1205

CHEMOSPHERE
www.elsevier.com/locate/chemosphere

Polychlorinated biphenyls (PCBs) and hydroxy-PCBs in adipose tissue of women in Southeast Spain

M.F. Fernandez [a,*], H. Kiviranta [b], J.M. Molina-Molina [a], O. Laine [b], M.J. Lopez-Espinosa [a], T. Vartiainen [b,c], N. Olea [a]



Exposición a PBBs y PBDEs: Tejido mamario

nosphere xxx (2006) xxx–xxx

CHEMOSPHERE

www.elsevier.com/locate/chemosphere

PBDEs and PBBs in the adipose tissue of women from Spain

M.F. Fernandez [a], P. Araque [a], H. Kiviranta [b], J.M. Molina-Molina [a], P. Rantakokko [b], O. Laine [b], T. Vartiainen [b,c], N. Olea [a,*]

[a] *Laboratory of Medical Investigations, Clínico University Hospital, University of Granada, 18071 Granada, Spain*
[b] *Department of Environmental Health, National Public Health Institute, P.O. Box 95, FI-70701 Kuopio, Finland*
[c] *Department of Environmental Sciences, University of Kuopio, P.O. Box 1627, FI-70211 Kuopio, Finland*

¿Cuales son los xenoestrógenos responsables de TEXB?:
Residuo de compuestos químicos en tejido mamario

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Fernandez MF, Reproductive Toxicology 24(2):259-64, 2007

11esteres de PBBs (PBDE)

2 alquilfenoles

Lopez-Espinosa MJ, Environ Res 106(1):1-6., 2008

5 bisfenol-A y derivados clorados

Table 1

Concentrations of 4-nonylphenol and 4-octylphenol (ng g^{-1} adipose tissue) in adipose tissue samples from women living in Southern Spain.

	n (%)	>LOD			
		Mean (SD)	25th	Median	75th
4-Nonylphenol	20/20 (100)	82 (127)	40	57	69
4-Octylphenol	4/20 (23.5)	5.5 (2.1)	4.2	4.5	7.7

n (%) = Number of subjects (percentage of detection); LOD = limit of detection; SD = standard deviation

Exposición a Alquilfenoles: Tejido mamario

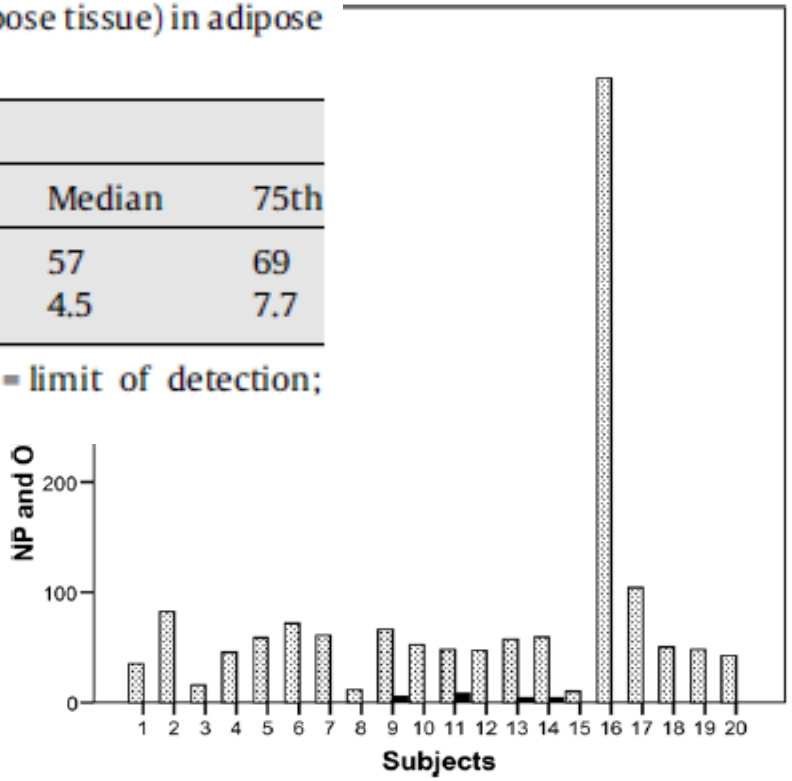

Fig. 2. Individual concentrations (ng g^{-1} adipose tissue) of 4-nonylphenol (NP) and 4-octylphenol (OP) in adipose tissue samples.

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Nonylphenol and octylphenol in adipose tissue of women in Southern Spain

M.J. Lopez-Espinosa [a,b], C. Freire [a], J.P. Arrebola [a], N. Navea [a,c], J. Taoufiki [c,a], M.F. Fernandez [a], O. Ballesteros [c], R. Prada [a], N. Olea [a,*]

Alquilfenoles

Nonil y octilfenol
Alquilfenol etoxilados:
mono, di,tri... etoxilados

Detergentes
Anti-oxidantes
Anti-amarilleantes del plástico
Nonoxynol: espermicida
Inertes en pesticidas

Exposición a bisfenoles: tejido mamario

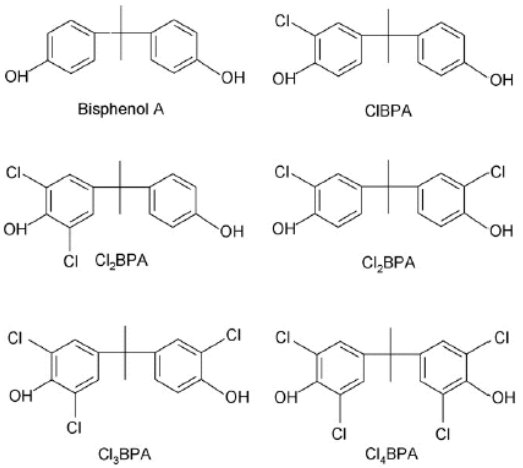

Fig. 1. Structural formula of bisphenol-A and chlorinated derivatives.

IER

Table 2
Concentrations of BPA (ng/g) and chlorinated derivatives in adipose tissue samples

	n (%)	>LOD					
		Mean (±S.D.)	Median	5th	25th	75th	95th
BPA	11/20 (55)	5.83 (3.48)	4.79	2.07	3.54	7.12	11.88
Cl-BPA	3/20 (15)	3.05 (0.28)	3.14	2.82	2.94	3.21	3.26
Cl_2-BPA	16/20 (80)	9.21 (9.26)	7.77	2.61	5.62	8.83	21.49
Cl_3-BPA	2/20 (10)	0.74 (0.15)	0.74	0.66	0.69	0.80	0.84
Cl_4-BPA	0/20 (0)	<LOD	<LOD	–	–	–	–
∑BPA	16/20 (80)	9.00 (9.22)	8.12	0	1.93	9.60	28.25

n (%), number of subjects (percentage of detection); LOD, Limit of detection.

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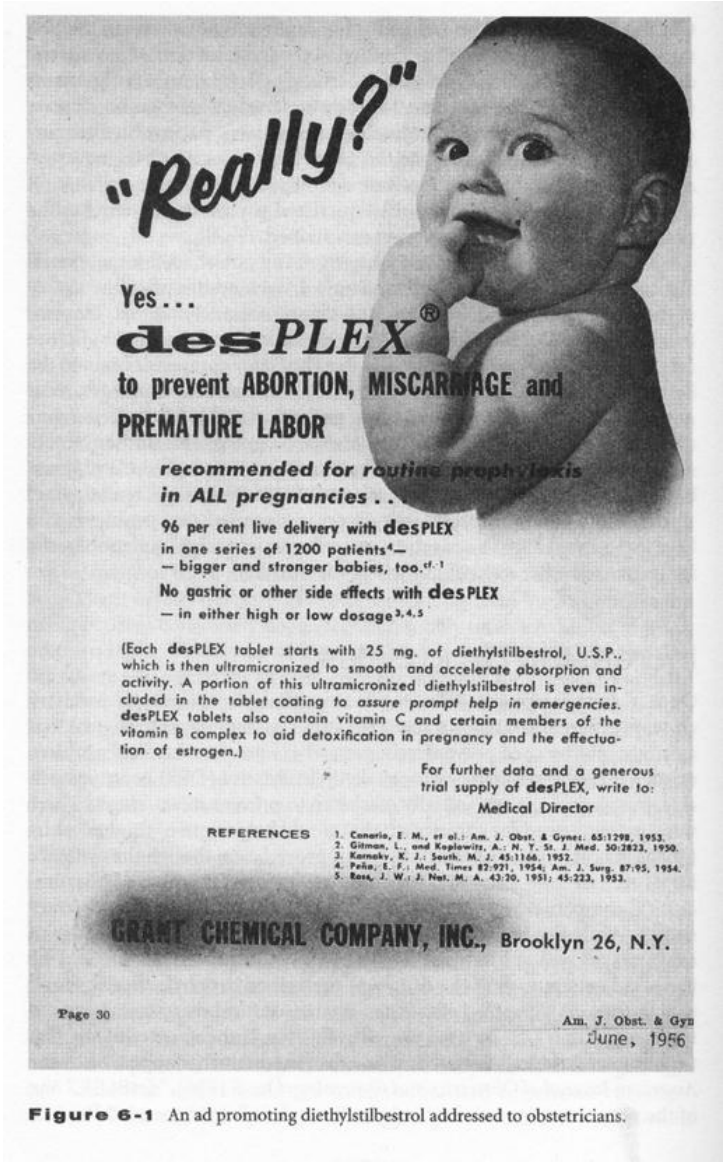
ScienceDirect
Reproductive Toxicology xxx (2007) xxx–xxx
Reproductive Toxicology
www.elsevier.com/locate/reprotox

Bisphenol-A and chlorinated derivatives in adipose tissue of women

M.F. Fernandez[a,*], J.P. Arrebola[a], J. Taoufiki[b], A. Navalón[b], O. Ballesteros[b], R. Pulgar[a], J.L. Vilchez[b], N. Olea[a]

[a] *Laboratory of Medical Investigations, San Cecilio University Hospital, University of Granada, 18071 Granada, Spain*
[b] *Research Group of Analytical Chemistry and Life Sciences, Department of Analytical Chemistry, University of Granada, 18071 Granada, Spain*

BPA (como DES) es estrogénico



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Medical Director

REFERENCES
1. Canario, E. M., et al.: Am. J. Obst. & Gynec. 65:1298, 1953.
2. Gitman, L., and Koplowitz, A.: N. Y. St. J. Med. 50:2823, 1950.
3. Kornsky, K. J.: South. M. J. 45:1166, 1952.
4. Peña, E. F.: Med. Times 82:971, 1954; Am. J. Surg. 87:95, 1954.
5. Rose, J. W.: J. Nat. M. A. 43:30, 1951; 45:223, 1953.

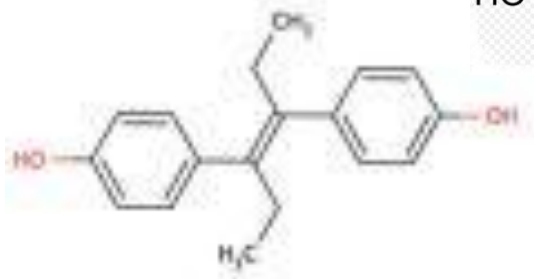
GRANT CHEMICAL COMPANY, INC., Brooklyn 26, N.Y.

Page 30 Am. J. Obst. & Gyn June, 1956

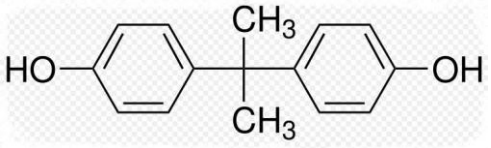
Figure 6-1 An ad promoting diethylstilbestrol addressed to obstetricians.

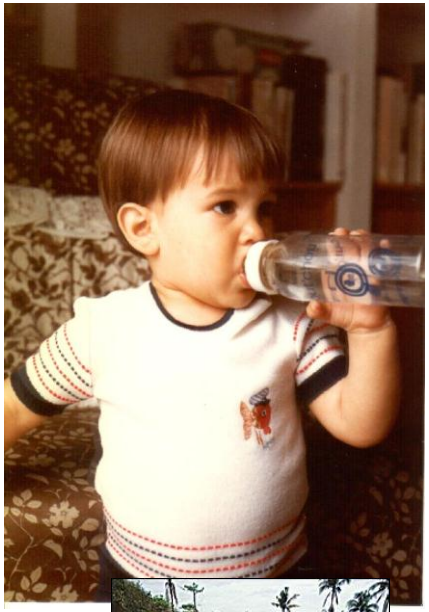
E. C. Dodds y W. Lawson, "Synthetic Œstrogenic Agents without the Phenanthrene Nucleus", *Nature*, 137 (1936), 996.

DES

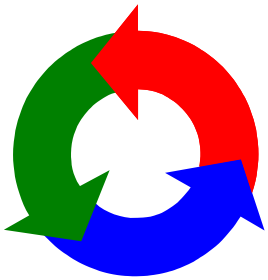


BPA






SARDINES




BISPHENOL-A
NET WEIGHT 25 KGS
MANUFACTURER
TAIWAN PROSPERITY CHEMICAL CORP.
MADE IN TAIWAN


DELTON
LIGHT CURING
PIT & FISSURE
SEALANT
DIRECT
DELIVERY
SYSTEM
Johnson & Johnson

MARTES 22 DE MAYO DE 2007

General Electric vende su filial de Cartagena al grupo Saudi Basic Indiustries Coorporation (SABIC) por 11.600 millones de dólares

Producción anual de BPA en Cartagena:250.000 Tm/año (Lexam y Ultem)

OR (IC 95%) para los factores de riesgo (protección) conocidos y TEXB

Antecedentes familiares	5.02 (1.99-12.70)	TEXB
Clase social elevada/CB	3.19 (1.49-6.85)	
Consumo de tabaco	2.23 (1.21-4.14)	TEXB
Consumo alcohol	1.99 (1.16-3.43)	TEXB
Estudios secundarios/NE	1.98 (1.11-3.51)	
Edad de menarquia >11	1.88 (1.10-3.22)	
Lactancia (>34meses)	0.43 (0.24-0.77)	TEXB
Número hijos 4-5	0.40 (0.20-0.81)	TEXB
Casada/soltera	0.31 (0.11-0.81)	
Número hijos >6	0.23 (0.10-0.57)	TEXB

Analysis of population characteristics related to the total effective xenoestrogen burden: A biomarker of xenoestrogen exposure in breast cancer ☆

Mariana F. Fernandez[a,], Loreto Santa-Marina[b], Jesus M. Ibarluzea[b], Jose Exposito[c], Juan J. Aurrekoetxea[b], Pablo Torne[d], Juan Laguna[e], Ana I. Rueda[d], Vicente Pedraza[f], Nicolas Olea[a,f]*

INMA

Infancia y Medio Ambiente

Seguimiento de 3.500 mujeres embarazadas y sus hijos.

Cohortes ya establecidas y de nueva creación en 6 Comunidades Autónomas.

Seguimiento durante al menos dos décadas.

ciberesp

Centro de Investigación Biomédica en Red

Epidemiología y Salud Pública

Table 2
Residues of DDTs in placenta extracts

Pesticide	Mean[a]	±SD	Median[a]	Maximum[a]	Frequency (%)
p,p′-DDT	1.02	1.47	0.50	8.66	59.00
o,p′ DDT	0.60	0.78	0.50	3.55	58.94
p,p′-DDE	2.37	2.80	1.78	28.29	96.03
o,p′-DDD	1.42	2.47	0.50	19.01	56.70
∑DDTs	5.23	5.28	3.69	31.50	99.33

[a] ng/g of placenta.

Table 3
Residues of endosulphan in placenta extracts

Pesticide	Mean[a]	±SD	Median[a]	Maximum[a]	Frequency (%)
E-I	0.67	1.37	0.28	11.16	58.95
E-II	0.40	1.30	–	12.90	24.50
E-ether	0.12	0.19	0.10	1.39	52.32
E-diol	5.11	5.23	4.46	26.23	76.86
E-lactone	0.81	2.43	–	27.31	43.30
E-sulphate	0.68	1.44	–	8.29	47.70
∑Endosulphans	8.79	8.42	7.06	49.78	98.30

E = endosulphan; – = <LOD.
[a] ng/g of placenta.

Table 4
Residues of aldrin, endrin and dieldrin in placenta extracts

Pesticide	Mean[a]	±SD	Median[a]	Maximum[a]	Frequency (%)
Aldrin	0.24	0.60	–	4.79	26.49
Endrin	0.70	1.32	–	8.83	33.11
Dieldrin	0.25	0.59	–	3.68	22.51

– = <LOD.
[a] ng/g of placenta.

ELSEVIER

Available online at www.sciencedirect.com
ScienceDirect
Placenta xx (2006) 1–8

PLACENTA

Exposición a Pesticidas OC: Placenta

Organochlorine Pesticides in Placentas from Southern Spain and Some Related Factors☆

M.-J. Lopez-Espinosa [a], A. Granada [a], J. Carreno [a], M. Salvatierra [b], F. Olea-Serrano [c], N. Olea [a,*]

[a] Laboratory of Medical Investigations, San Cecilio University Hospital of Granada, 18071-Granadaa, Spain
[b] Department of Pediatrics, San Cecilio University Hospital of Granada, 18071-Granada, Spain
[c] Department of Food Sciences and Nutrition, University of Granada, 18071-Granada, Spain

Accepted 27 September 2006

Determination of Bisphenol A and its chlorinated derivatives in placental tissue samples by liquid chromatography–tandem mass spectrometry

I. Jiménez-Díaz[a,b], A. Zafra-Gómez[a], O. Ballesteros[a,*], N. Navea[b], A. Navalón[a], M.F. Fernández[b], N. Olea[b], J.L. Vílchez[a]

Journal of Chromatography B 2010

Exposición a Bisfenol-A y otros bisfenoles: Placenta

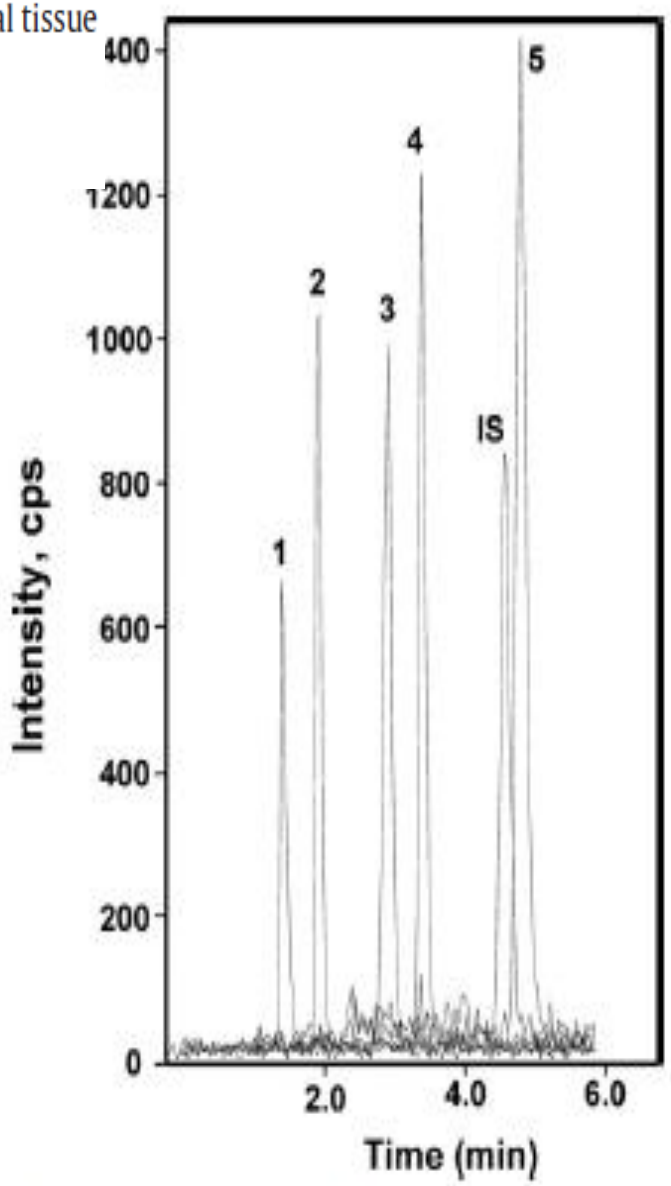


Fig. 1. MRM mode chromatogram of a standard mixture of the target compounds in a spiked placental tissue sample in MRM mode (10.0 ng g^{-1} of each compound). Peak identification: (IS) Internal Standard (1) Cl_4-BPA; (2) Cl_3-BPA; (3) Cl_2-BPA; (4) Cl-BPA; (5) BPA.

Urinary concentrations of phthalates and phenols in a population of Spanish pregnant women and children

Casas L, Fernández MF, Llop S, Guxens M, Ballester F, Olea N, Basterrechea Irurzun M, Santa Marina L, Riaño I, Tardón A, Vrijheid M, Calafat AM, Sunyer J on behalf of the INMA Project. Environ Inter, 2011 (In press)

	Pregnant women			Children		
	3rd trimester			4 years old		
	n	% <LOD	Median	n	% <LOD	Median
BPA	120	9.0	2.2	30	3.3	4.2

Exposición a bisfenol-A: Orina

News Release
2008-59
April 18, 2008
For immediate release

Government of Canada Takes Action on Another Chemical of Concern: Bisphenol A

OTTAWA - The Honourable Tony Clement, Minister of Health, and the Honourable John Baird, Minister of the Environment, today announced that the Government is taking action to protectthe health of Canadians and the environment from another chemical of concern.

European Commission: EU Ban on Bisphenol A in Baby Bottles Next Year

Friday, 26 November 2010

Exposición a bisfenoles
Latas con recubrimiento interior (envases alimentarios)

Xenoestrogens Released from Lacquer Coatings in Food Cans

José Antonio Brotons, María Fátima Olea-Serrano, Mercedes Villalobos, Vicente Pedraza, and Nicolás Olea

Laboratorio de Investigaciones Médicas, Universidad de Granada, 18071 Granada, Spain

to human exposure to xenoestrogens. *Key words*: bisphenol-A, food containers, lacquer coating, xenoestrogens. *Environ Health Perspect* 103:608–612 (1995)

Exposición a BPA: Origen sanitario

Estrogenicity of Resin-based Composites and Sealants Used in Dentistry

Nicolás Olea,[1] Rosa Pulgar,[2] Pilar Pérez,[1] Fátima Olea-Serrano,[3] Ana Rivas,[3] Arantzazu Novillo-Fertrell,[3] Vicente Pedraza,[1] Ana M. Soto,[4] and Carlos Sonnenschein[4]

[1]Laboratory of Medical Investigation, Department of Radiology, School of Medicine, [2]Department of Medical Odontology, School of Dentistry, and [3]Department of Nutrition, School of Pharmacy, University of Granada, 18071 Granada, Spain; [4]Department of Anatomy and Cellular Biology, Tufts University, School of Medicine, Boston, MA 02111 USA

Environ Health Perspect 104:298–305 (1996)

Exposición a BPA y ftalatos: Medioambiente hospitalario

Table 1. Distribution of the urinary concentrations of phenols (μg/L)[a] in hospitalized premature infants.

Compound	Species	No. of infants	No. < LOD	Geometric mean (SD)	Median	Range		NHANES 2003–2004[b]	
						Minimum	Maximum	Median	95th percentile
BP-3	Total	42	2	3.4 (4.8)	2.4	< LOD (0.4)	176	17.2	227
	Free	36	17	NA	NA	< LOD (0.4)	4.1		
BPA	Total	41	0	30.3 (5.2)	28.6	1.6	946	3.7	16.0
	Free	37	3	1.8 (3.2)	1.7	< LOD (0.4)	17.3		
MePB	Total	41	0	203 (4.7)	243	10.1	4,010	43.9[c]	680[c]
	Free	34	0	32 (4.9)	23	2.2	515		
PrPB	Total	42	0	16.8 (4.9)	17.0	1.3	1,360	9.1[c]	279[c]
	Free	37	0	2.6 (5.2)	1.7	0.3	171		
TCS	Total	42	34	NA	NA	< LOD (2.3)	16.7	5.9	148
	Free	37	36	NA	NA	< LOD (2.3)	3.4		

[a]The total concentrations are the sum of the free plus conjugated species of each phenol. We calculated geometric means and medians if the frequency of detection was > 60%. The estimated concentrations of free species must be interpreted with caution because at the time of the collection of the urine specimens, we did not prescreen the sampling materials for the presence of these phenols. [b]Data from 314 children 6–11 years of age from NHANES (National Health and Nutrition Examination Survey) 2003–2004 for BP-3 (Calafat et al. 2008a), BPA (Calafat et al. 2008c), and TCS (Calafat et al. 2008b). [c]Data from a group of 100 dults (Ye et al. 206).

Exposure to Bisphenol A and Other Phenols in Neonatal Intensive Care Unit Premature Infants

Antonia M. Calafat,[1] Jennifer Weuve,[2,3] Xiaoyun Ye,[1] Lily T. Jia,[1] Howard Hu,[4] Steven Ringer,[5] Ken Huttner,[6] and Russ Hauser[3,7]

[1]Centers for Disease Control and Prevention, Atlanta, Georgia, USA; [2]Rush Institute for Healthy Aging, Rush University Medical Center, Chicago, Illinois, USA; [3]Department of Environmental Health, Harvard School of Public Health, Boston, Massachusetts, USA; [4]Schools of Public Health and Medicine, University of Michigan, Ann Arbor, Michigan, USA; [5]Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts, USA; [6]Neonatology Unit, and [7]Vincent Memorial Obstetrics and Gynecology Service, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts, USA

Exposición a bisfenoles ftalatos
Papel y cartón reciclados (envases alimentarios)

Food Additives and Contaminants, January 2007; 24(1): 95–102

Taylor & Francis
Taylor & Francis Group

Oestrogenicity of paper and cardboard extracts used as food containers

M.-J. LOPEZ-ESPINOSA[1], A. GRANADA[1], P. ARAQUE[1], J.-M. MOLINA-MOLINA[1], M.-C. PUERTOLLANO[1], A. RIVAS[2], M. FERNÁNDEZ[1], I. CERRILLO[1], M.-F. OLEA-SERRANO[2], C. LÓPEZ[3] & N. OLEA[1]

[1]*Laboratory of Medical Investigations, San Cecilio University Hospital, University of Granada, E-18071 Granada, Spain,* [2]*Department of Nutrition and Food Sciences and* [3]*Department of Physical Chemistry, University of Granada, E-18071 Granada, Spain*

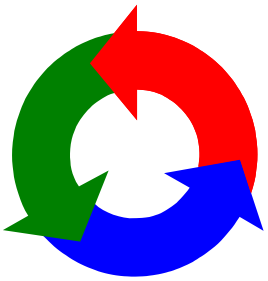
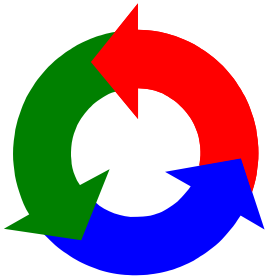


Table I. Estimated values of oestrogenicity (pM oestradiol equivalents Eeq g^{-1} of cardboard or paper) and the frequency of positive samples in the E-Screen assay of paper and cardboard extracts.

	Total samples ($n=40$)	Cardboard ($n=32$)	Paper ($n=8$)
Arithmetic mean	60.52	64.24	45.61
Geometric mean	11.97	13.33	7.78
Median	18.69	21.51	16.80
Standard deviation	12.55	13.02	12.09
Range	0.01–355.50	0.01–355.50	0.08–280.90
Frequency (%)	90.00	90.63	87.50

Table II. Levels and frequency of BPA, DBP and DEHP (ng g^{-1} of cardboard or paper) in samples.

Residues	Total samples ($n=40$)	Cardboard ($n=32$)	Paper ($n=8$)
BPA			
Arithmetic mean	97.34	115.32	25.43
Geometric mean	2.38	2.74	1.35
Median	0.52	0.52	0.49
Standard deviation	16.33	17.68	12.72
Range	0.05–1817.00	0.05–1817.00	0.08–188.00
Frequency (%)	45.00	46.88	37.50
DBP			
Arithmetic mean	713.17	706.32	740.49
Geometric mean	37.39	20.97	377.63
Median	121.84	75.62	548.55
Standard deviation	35.61	41.65	3.95
Range	0.10–10774.00	0.10–10774.00	29.10–3049.00
Frequency (%)	67.50	59.38	100
DEHP			
Arithmetic mean	3901.56	706.32	740.49
Geometric mean	341.74	302.11	559.54
Median	893.48	814.44	2751.84
Standard deviation	23.27	22.53	31.36
Range	0.52–61013.00	0.52–61013.00	1.53–10198.00
Frequency (%)	77.50	78.13	75.00



Exposición a bisfenoles y ftalatos: Agua embotellada

PET = Riesgo de presencia de ftalatos

Endocrine disruptors in bottled mineral water: total estrogenic burden and migration from plastic bottles

Martin Wagner · Jörg Oehlmann

3 & 7

Environ Sci Pollut Res (2009) 16:278–286
DOI 10.1007/s11356-009-0107-7

Endocrine disruptors in bottled mineral water: Estrogenic activity in the E-Screen☆

Martin Wagner*, Jörg Oehlmann 2011

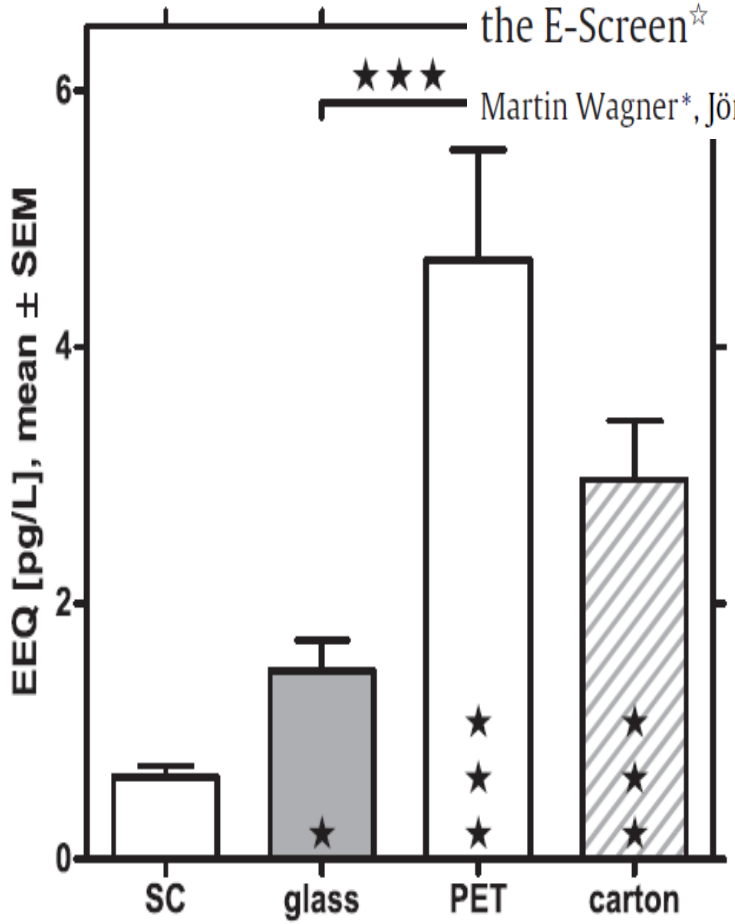


Fig. 4. Influence of the packaging material on the estrogenic activity of bottled water. Pooled analysis of products from the same springs bottled either in glass (sample 1, 3, 5, 7, 9) or plastic (PET, samples 2, 4, 6, 8, 10). Water bottled in PET contains significantly higher estrogenicity compared to water from glass (***$p < 0.001$). Significant differences compared to the solvent control (SC, *$p < 0.05$, ***$p < 0.001$).

Bottled mineral water was purchased at local retailer stores. In total, the analyzed water samples comprised 18 products (coded as samples 1 to 18) from 13 different companies, including water from five bottlers that was packed in glass and plastic bottles made of PET (samples 1+2, 3+4, 5+6, 7+8, 9+10). With the exception of one so-called table water (bottled tap water), the products are marketed as so-called mineral water. These products originate from natural springs and are not processed or altered beyond deferrization. The springs of the products are located in different geographic regions in France, Germany, and Italy. Of each product, a sufficient number of bottles from the same lot (n = 10–12) was purchased and stored at 4 °C prior to analysis.

1

CLASIFICACION PLASTICOS

Poli-etileno tereftalato

Poli-etileno de alta densidad

Cloruro de polivinilo

Poli-etileno de baja densidad

Polipropileno

Poliestireno

Otros

Los materiales y objetos plásticos pueden estar compuestos de diferentes capas de materias plásticas unidas entre sí por medio de adhesivos. Los materiales y objetos plásticos pueden también estar impresos o recubiertos con un revestimiento orgánico o inorgánico. Los materiales y objetos plásticos impresos o recubiertos, al igual que los unidos entre sí por medio de adhesivos, deben quedar incluidos en el ámbito de aplicación del presente Reglamento. Los adhe-

REGLAMENTO (UE) Nº 10/2011 DE LA COMISIÓN

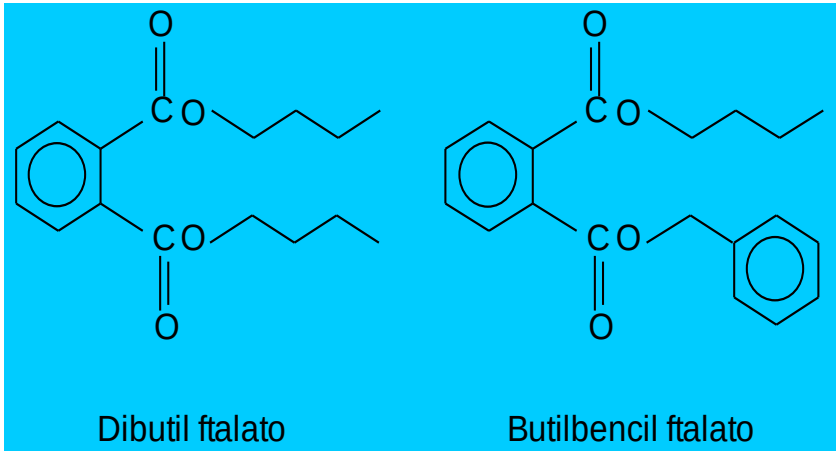
de 14 de enero de 2011

sobre materiales y objetos plásticos destinados a entrar en contacto con alimentos

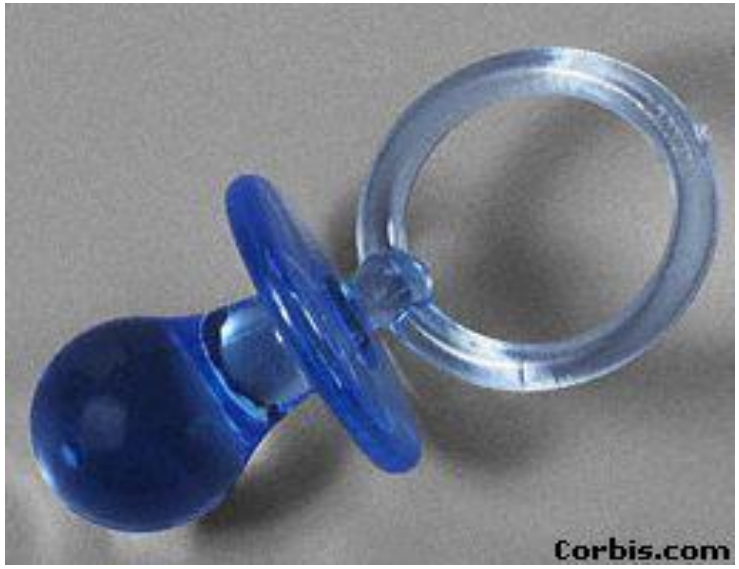
(Texto pertinente a efectos del EEE)

Exposición a ftalatos

Butilbencilftalato (BBP)
Dibutilftalato (DBP)
Dietilhexilftalto (DEHP)



Plastificantes desde 1930
Tintas para plástico
Tratamiento de suelos
Antioxidantes alimentación (Lácteos)
Envases alimentarios
Tetinas y mordedores infantiles



Ciclismo | Deportes | elmundo.es

'CASO CONTADOR' | Acusaciones

La batalla de los plásticos

Contador, ahora con 'plásticos'

En la orina del ciclista se ha detectado una sustancia plástica, muy común en las trasfusiones de sangre

di-(2-ethylhexyl)phthalate (DEHP)

	Pregnant women			Children		
	3rd trimester			4 years old		
	n	% <LOD	Median	n	% <LOD	Median
Phthalates						
MCNP	118	3.4	2.8	19	0	4.0
MCOP	118	2.5	4.0	19	0	7.5
MECPP	118	0	32.2	19	0	115.0
MEHHP	118	0	17.3	19	0	57.4
MEOHP	118	0	15.7	19	0	44.6
MEHP	118	15.1	4.4	19	0	6.2
MCPP	118	2.5	1.5	19	0	6.1
MiBP	118	0	29.9	19	0	41.9
MBP	118	0	27.5	19	0	30.2
MBzP	118	0.8	10.5	19	0	33
MEP	118	0	324	19	0	755

Exposición a ftalatos: Orina

Urinary concentrations of phthalates and phenols in a population of Spanish pregnant women and children Casas L, et al. on behalf of the INMA Project.Environ Inter, 2011 (In press)

Sorpresa!!

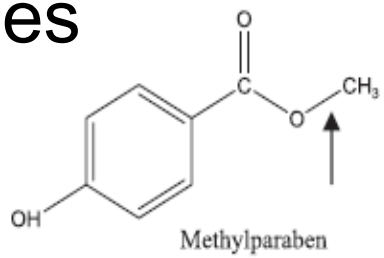
Exposición a ftalatos:
No solo plásticos.
Perfumería
y Cosmética

Exposición a Ftalatos y parabenes

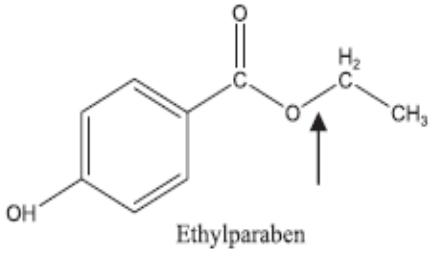
algunos parece que ya se han enterado

Exposición a parabenes

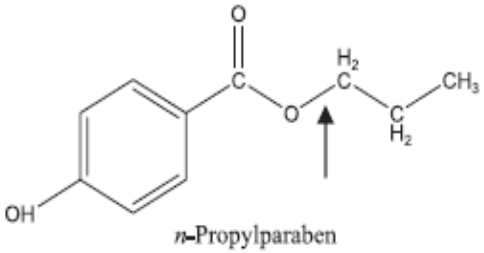
Benzylparaben
Butylparaben
Ethylparaben (E214)
iso-Butylparaben.
Iso-Propylparaben.
Methylparaben (E218)
Propylparaben (E216)



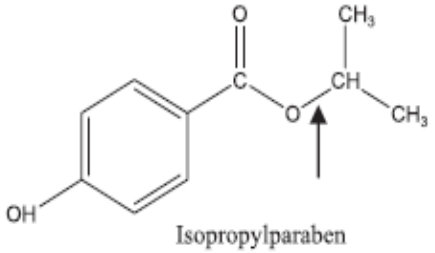
Methylparaben



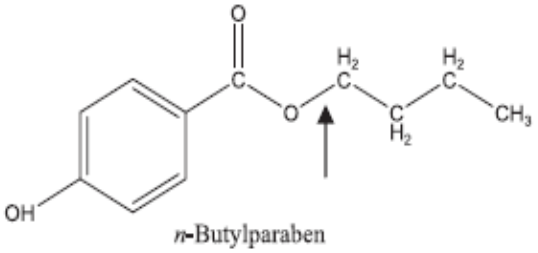
Ethylparaben



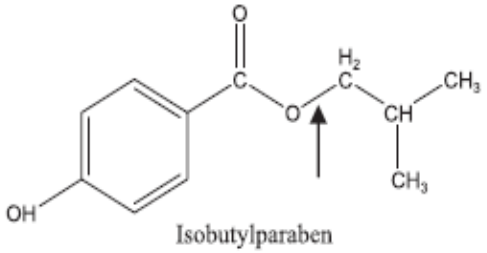
n-Propylparaben



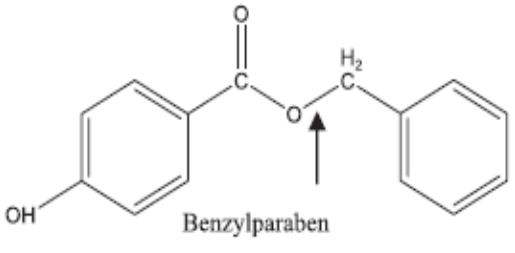
Isopropylparaben



n-Butylparaben



Isobutylparaben



Benzylparaben

JOURNAL OF APPLIED TOXICOLOGY
J. Appl. Toxicol. 2008; **28**: 561–578

Review

Paraben esters: review of recent studies of endocrine toxicity, absorption, esterase and human exposure, and discussion of potential human health risks

Philippa D. Darbre[1] and Philip W. Harvey[2]

Exposición a parabenes: Placenta

Producto	Frecuencia	Concentración (ng/g)
Butiparaben (BPB)	16% (8/50)	0.2 - 0.6
Etilparaben (EPB)	66% (33/50)	0.2 - 5.3
Metilparaben (MPB)	96% (48/50)	0.1 - 10.0
Propilparaben (PPB)	90% (45/50)	0.2 - 2.2

A new liquid chromatography–tandem mass spectrometry method for determination of parabens in human placental tissue samples

I. Jiménez-Díaz[a,b], F. Vela-Soria[a], A. Zafra-Gómez[a,*], A. Navalón[a], O. Ballesteros[a], N. Navea[b], M.F. Fernández[b], N. Olea[b], J.L. Vílchez[a]

Talanta 2011 (In press)

Exposición a parabenes: Orina

	Embarazadas			Niños		
	3r Trimestre			4 años old		
	n	% <LOD	Median ng/g	n	% <LOD	Median ng/g
Producto						
B-PB	120	9.9	2.4	30	16.7	1.2
E-PB	120	12.4	8.8	30	20	8.1
M-PB	120	0	191	30	0	150.0
P-PB	120	1.7	29.8	30	0	21.5

Urinary concentrations of phthalates and phenols in a population of Spanish pregnant women and children Casas L, et al. on behalf of the INMA Project.Environ Inter, 2011 (In press)

Exposición a triclosán (TCS)

HOW TO AVOID TRICLOSAN

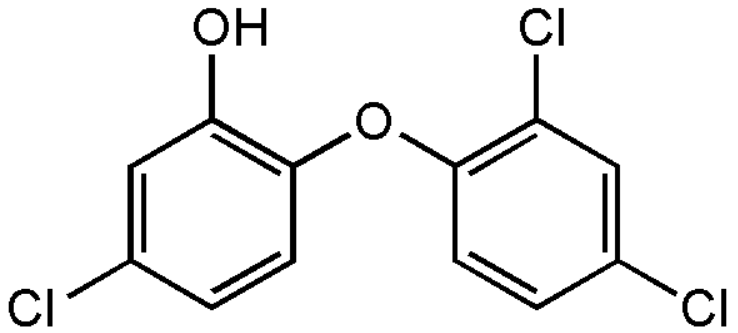
Forgo antibacterial soap.
The American Medical Association says not to use it at home.

Watch for triclosan (and triclocarban) in personal care products.
Read ingredient labels or use Skin Deep to find products free of triclosan and triclocarban, its chemical cousin.

Avoid "antibacterial" products.
Triclosan is used in everyday products like toothbrushes, toys, and cutting boards that may be labeled "antibacterial," or make claims such as "odor-fighting" or "keeps food fresher, longer."

Triclosan may be in these products:

- soap and dishwashing liquid
- towels
- mattresses
- sponges
- personal care products
- shower curtains
- toothbrushes
- phones
- kitchenware and plastic food containers
- shoes
- flooring and carpets
- cutting boards
- clothing and fabrics
- toys



Exposición a TCS y Clorofenoles: Orina

	Pregnant women 3rd trimester			Children 4 years old		
	n	% <LOD	Median	n	% <LOD	Median
Phenols						
TCS	120	40.5	6.1	30	63.3	1.2

	Pregnant women 3rd trimester			Children 4 years old		
	n	% <LOD	Median	n	% <LOD	Median
Phenols						
2.4-DCP	120	9.1	1.1	30	0	3.1
2.5-DCP	120	0	16.5	30	0	55.6

Urinary concentrations of phthalates and phenols in a population of Spanish pregnant women and children Casas L, et al. on behalf of the INMA Project.Environ Inter, 2011 (In press)

¿Que mas compuestos químicos investigar?
¿Qué se debería añadir a la lista?

- Filtros UV: benzofenonas, canfenos y oxicinamatos

- PFOS y PFOA

- Aromas sintéticos

- Residuos de fármacos

- entre otros…..

Exposición a filtros UV

Benzophenone-3 (BP-3)
Octyl-methoxycinnamate (OMC)
3-(4-methylbenzylidene) camphor (4-MBC)

….se absorben por la piel y modifican los niveles hormonales

Journal of Investigative Dermatology (2004) **123**, 57–61

Systemic Absorption of the Sunscreens Benzophenone-3, Octyl-Methoxycinnamate, and 3-(4-Methyl-Benzylidene) Camphor After Whole-Body Topical Application and Reproductive Hormone Levels in Humans

Nadeem Rezaq Janjua[*], Brian Mogensen[*], Anna-Maria Andersson[‡], Jørgen Holm Petersen[‡], Mette Henriksen[*], Niels E Skakkebæk[‡] and Hans Christian Wulf[*]

Exposición a filtros UV

Table 3
Reported use of UV filters in cosmetic products and detection in human milk.

	Reported use ($n = 53$)[a]						Detection in milk ($n = 54$)[a]		Correlation of reported use and detection ($n = 53$)
	Sunscreens		Other cosmetics		All products				
	Number of women reporting use	% of total	Number of women reporting use	% of total	Number of women reporting use	% of total	Number of positive milk samples	% of total	
All UV filters[b]	29	54.72	32	60.38	41	77.36	46	85.19	$p = 0.0104$
Ethylhexyl-methoxycinnamate (EHMC)	25	47.17	26	49.06	35	66.04	42	77.78	$p = 0.0799$
Octocrylene (OCT)	21	39.62	2	3.77	23	43.40	36	66.67	$p = 0.0401$
4-Methylbenzylidene camphor (4-MBC)	14	26.42	0	0	14	26.42	11	20.37	$p = 0.0488$
Homosalate (HMS)	8	15.09	0	0	8	15.09	3	5.56	$p = 0.3943$
Benzophenone-3 (Bp-3)	1	1.89	6	11.32	7	13.21	7	12.96	$p = 1.0000$
Benzophenone-2 (Bp-2)	0	0	10	18.87	10	18.87	0	0	nca
Octyl-dimethyl-PABA (OD-PABA)	0	0	1	1.89	1	1.89	1	1.85	nca
3-Benzylidene camphor (3-BC)	0	0	0	0	0	0	0	0	nca

[a] One woman did not complete the questionnaire. Her milk data were excluded from correlation statistics.
[b] Reported use (questionnaire) or detection (chemical analysis), respectively, of any of the eight UV filters. nca: no correlation analysis.

Exposure patterns of UV filters, fragrances, parabens, phthalates, organochlor pesticides, PBDEs, and PCBs in human milk: Correlation of UV filters with use of cosmetics

Margret Schlumpf[a,*], Karin Kypke[b], Matthias Wittassek[c], Juergen Angerer[c,1], Hermann Mascher[d], Daniel Mascher[d], Cora Vökt[e], Monika Birchler[e], Walter Lichtensteiger[a]

Chemosphere 81 (2010) 1171–1183

Table 4
Concentrations of UV filters, musk fragrances, parabens and phthalate metabolites in human milk.

	Cohort 2004[a] Total $N = 13$		Cohort 2005[a] Total $N = 21$		Cohort 2006[a] Total $N = 20$		All Cohorts[a] Total $N = 54$				
	Mean ± SD	*N* pos.	Mean ± SD	*N* pos.	Mean ± SD	*N* pos.	Mean ± SD	*N* pos.	Median	95%	Range
UV filters	ng g^{-1} lipid		ng g^{-1} lipid		ng g^{-1} lipid		ng g^{-1} lipid				
Ethylhexyl-methoxy cinnamate	35.31 ± 17.22	13	19.60 ± 25.05	9	25.98 ± 23.09	20	27.50 ± 22.15	42	18.41	73.31	2.10–79.85
Octocrylene	22.57 ± 25.46	7	15.08 ± 10.08	9	39.63 ± 25.21	20	30.18 ± 24.51	36	28.32	70.64	4.70–134.95
4-Methyl-benzylidene camphor	19.00	1	14.50 ± 6.76	3	25.84 ± 14.53	7	22.12 ± 12.80	11	18.70	43.15	6.70–48.37
3- Benzylidene camphor	0	0	0	0	0	0	0	0			
Homosalate	0	0	0	0	29.37 ± 27.64	3	29.37 ± 27.64	3	15.50	56.63	11.40–61.20
Benzophenone-3	117.00	1	35.48 ± 48.63	5	71.18	1	52.23 ± 50.69	7	26.70	120.08	7.30–121.40
Benzophenone-2	0	0	0	0	0	0	0.00	0			
Octyldimethyl-PABA	49.00	1	0	0	0	0	49.00	1			
Musk fragrances[b]	ng g^{-1} lipid		ng g^{-1} lipid		ng g^{-1} lipid		ng g^{-1} lipid				
Musk xylene	4.01 ± 8.42	13	1.67 ± 1.34	20	3.72 ± 7.89	14	2.93 ± 6.17	47	1.34	5.67	0.25–31.60
Musk ketone	2.26 ± 3.25	12	0.83 ± 1.00	16	2.34 ± 4.54	6	1.60 ± 2.77	34	0.64	6.47	0.25–12.00
Galaxolide (HHCB)	35.83 ± 24.51	10	55.40 ± 67.33	21	68.15 ± 58.94	14	55.02 ± 57.87	45	36.13	165.57	6.09–309.66
Tonalide (AHTN)	16.25 ± 16.19	2	14.09 ± 9.96	4	8.96	1	13.97 ± 9.96	7	10.23	28.47	4.80–28.80
Phantolide (AHDI)	15.30	1	0	0	0	0	15.30	1			
Habanolide					15.00 ± 0.00	2	15.00 ± 0.00	2	15.00	15.00	15.00–15.00
Parabens[c]			ng mL^{-1}		ng mL^{-1}		ng mL^{-1}				
Methyl-paraben			2.69 ± 2.52	8	1.50 ± 0.84	6	2.18 ± 2.02	14	1.00	5.40	1.00–8.00
Ethyl-paraben			1.33 ± 0.24	4	1.20 ± 0.24	4	1.26 ± 0.23	8	1,30	1.50	1.00–1.50
Propyl-paraben			1.50 ± 0.41	4	1.25 ± 0.35	2	1.42 ± 0.38	6	1.50	1.88	1.00–2.00
Butyl-paraben			0	0	0	0	0	0			
Phthalate metabolites[d]					ng mL^{-1}		ng mL^{-1}				
MEHP (DEHP)					34.05 ± 26.00	20	34.05 ± 26.00	20	26.20	74.98	9.60–122.00
MnBP (DnBP)					7.88 ± 6.21	20	7.88 ± 6.21	20	5.95	15.27	1.20–29.80
MiBP (DiBP)					26.61 ± 18.03	20	26.61 ± 18.03	20	24.25	55.28	2.60–66.20
7OH-MMeOP (DiNP)					1.12 ± 0.30	6	1.12 ± 0.30	6	1.20	1.43	0.60–1.50

[a] Mean, standard deviation (SD), median, 95 percentile (95%) and range represent values from positive samples, with number (*N* pos.) of positive samples. The total number of samples analyzed (*N*) is shown on top of each cohort. Values < LOD = 0.

[b] Synthetic musks analyzed but <LOD: (a) In all cohorts: polycyclic musks: Cashmeran (DPMI), Celestolide (ADBI), Traseolide (ATII). (b) In cohort 2006: macrocyclic musks: musk MC4, musk NN, Exalton, Exaltolid, Muscon, Ambrettolid, Civetton.

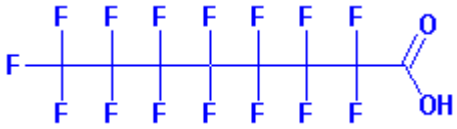
[c] Total $N = 41$ (cohort 2005 + cohort 2006).

[d] Total $N = 20$ (cohort 2006). Phthalate metabolites analyzed but <LOD: 5OH-MEHP, 5oxo-MEHP, 5cx-MEPP, 2cx-MMHP, MBzP (BBzP), 7oxo-MMeOP (DiNP), 7cx-MMeHP (DiNP).

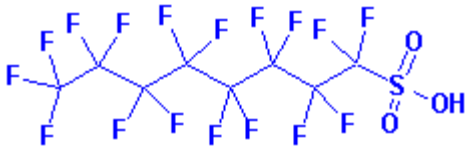
Exposición alquilos perfluorados (PFOS)

Tejidos aislantes: Goretex
Utensilios de cocina: Tefal

Perfluorooctanoic acid (PFOA or C8)
CAS No: 335-67-1. Molecular formula:



Perfluorooctane sulphonic acid (CAS No. 1763-23-1)



Exposición a residuos de fármacos: Presencia medioambiental

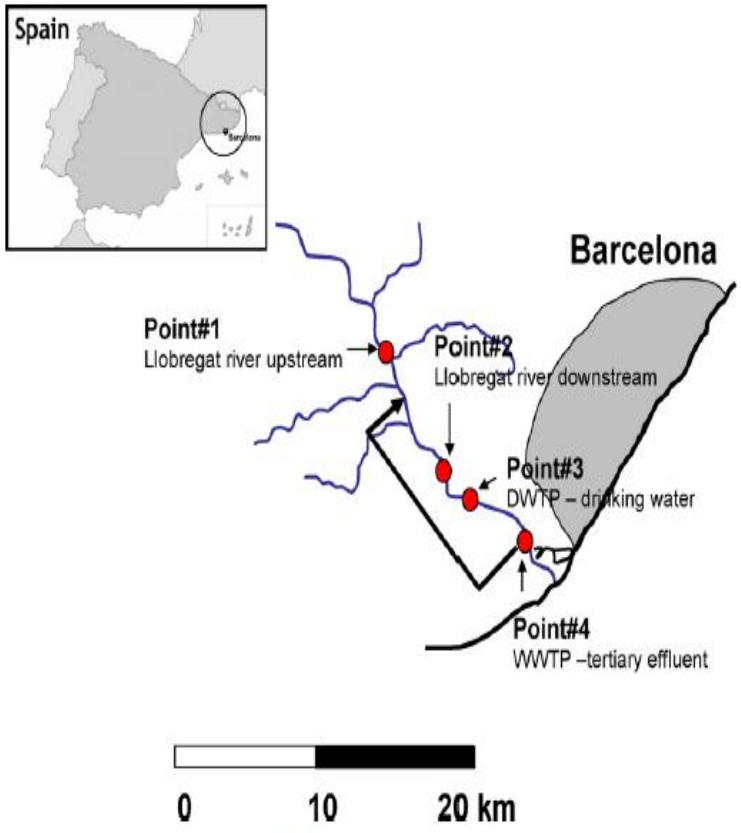


Fig. 8. Sampling location.

Talanta 83 (2010) 410–424

Fully automated determination of 74 pharmaceuticals in [illegible] waste waters by online solid phase extraction–liquid chromatography-electrospray–tandem mass spectrometry

Rebeca López-Serna[a], Sandra Pérez[a], Antoni Ginebreda[a], Mira Petrović[a,b,*], Damià Barceló[a,c]

Table 3
Average concentrations and relative standard deviation (expressed in brackets) for target pharmaceuticals in drinking water, superficial water (2 points) and effluent wastewater in the Llobregat River basin (NE Spain).

Therapeutic groups	Compounds	Concentration (ng L^{-1})[a]			
		Point #1 – Llobregat River upstream to the spill point	**Point #2** – Llobregat River downstream to the spill point	**Point #3** – drinking water	**Point #4** – WWE tertiary treatment
Analgesics and antiinflammatories	**Ketoprofen**	*n.d.*	*3.18 (1.56)*	*n.d.*	*57.73 (0.55)*
	Naproxen	**81.05 (0.27)**	**67.38 (0.27)**	**n.d.**	**72.17 (0.33)**
	Ibuprofen	**186.68 (0.33)**	**134.75 (0.32)**	**3.71 (0.15)**	**43.57 (0.60)**
	Indomethacin	**16.27 (0.18)**	**37.75 (0.29)**	**n.d.**	**93.88 (0.52)**
	Diclofenac	**89.53 (0.25)**	**176.78 (0.31)**	**n.d.**	**421.50 (0.26)**
	Mefenamic acid	*n.d.*	*6.76 (0.30)*	*12.82 (2.24)*	*17.38 (0.63)*
	Acetaminophen	**307.00 (0.59)**	**146.67 (0.91)**	**n.d.**	**77.83 (1.77)**
	Salicylic acid	**208.17 (0.07)**	**333.17 (0.61)**	**201.20 (0.23)**	**674.33 (0.26)**
	Propyphenazone	*3.25 (1.11)*	*11.10 (0.68)*	*n.d.*	*22.55 (0.88)*
	Phenylbutazone	n.d.	n.d.	n.d.	n.d.
	Phenazone	*5.90 (1.57)*	*40.27 (0.58)*	*n.d.*	*56.30 (0.28)*
	Codeine	**45.85 (0.8)**	**109.68 (0.41)**	**n.d.**	**350.12 (0.45)**
Lipid regulators	**Clofibric acid**	8.40 (0.36)	24.25 (1.10)	n.d.	22.43 (0.16)
	Bezafibrate	**15.89 (0.34)**	**67.32 (0.47)**	**0.11 (2.24)**	**217.50 (0.50)**
	Fenofibrate	23.85 (0.36)	82.08 (0.49)	n.d.	293.67 (0.64)
	Gemfibrozil	**1.90 (0.39)**	**2.14 (0.57)**	**n.d.**	**8.58 (0.54)**
	Mevastatin	n.d.	n.d.	n.d.	n.d.
	Pravastatin	n.d.	n.d.	n.d.	n.d.
	Atorvastatin	*2.99 (1.19)*	*2.39 (1.10)*	*27.60 (2.24)*	*2.71 (1.32)*
Psiquiatric drugs	**Paroxetine**	*n.d.*	*n.d.*	*n.d.*	*7.30 (0.91)*
	Fluoxetine	*n.d.*	*<LOQ*	*2.74 (2.24)*	*15.87 (0.25)*
	Diazepam	*n.d.*	*6.52 (0.64)*	*n.d.*	*18.92 (0.23)*
	Lorazepam	**22.58 (0.14)**	**41.27 (0.23)**	**n.d.**	**114.92 (0.26)**
	Carbamazepine	**31.28 (0.29)**	**58.43 (0.30)**	**n.d.**	**156.83 (0.24)**
Histamine H2 receptor antagonists	**Loratadine**	*3.68 (1.68)*	*2.51 (0.80)*	*10.48 (1.14)*	*6.99 (1.08)*
	Famotidine	n.d.	n.d.	n.d.	n.d.
	Ranitidine	**33.87 (0.40)**	**61.23 (0.70)**	**n.d.**	**197.67 (1.20)**
	Cimetidine	*17.33 (2.45)*	*n.d.*	*n.d.*	*32.05 (1.17)*
Tetracycline antibiotics	**Tetracycline**	*n.d.*	*29.00 (0.91)*	*n.d.*	*171.47 (1.06)*
	Doxycycline	n.d.	n.d.	n.d.	n.d.
	Oxytetracycline	*n.d.*	*n.d.*	*n.d.*	*42.12 (0.86)*
	Chlorotetracycline	n.d.	n.d.	n.d.	n.d.
Macrolide antibiotics	**Erythromycin**	**50.38 (0.55)**	**174.73 (0.42)**	**n.d.**	**677.00 (0.28)**
	Azithromycin	**14.73 (0.34)**	**71.67 (0.70)**	**17.00 (0.58)**	**1031.67 (0.53)**
	Tilmicosin	n.d.	n.d.	n.d.	n.d.
	Roxythromycin	*n.d.*	*n.d.*	*n.d.*	*3.90 (0.43)*
	Clarithromycin	**42.60 (0.27)**	**88.83 (0.35)**	**3.67 (0.22)**	**237.83 (0.23)**
	Josamycin	*1.82 (0.60)*	*0.81 (1.56)*	*1.41 (0.77)*	*3.03 (0.58)*
	Tylosin	*n.d.*	*n.d.*	*n.d.*	*7.17 (0.57)*
	Spiramycin	**39.90 (0.44)**	**68.32 (0.44)**	**20.54 (0.92)**	**141.58 (0.33)**
Sulfonamide antibiotics	**Sulfamethoxazol**	**39.70 (0.23)**	**78.38 (0.37)**	**n.d.**	**140.48 (0.46)**
	Sulfadiazine	*n.d.*	*13.40 (1.17)*	*n.d.*	*20.38 (0.56)*
	Sulfamethazine	*1.68 (2.45)*	*112.27 (1.55)*	*4.08 (2.24)*	*373.84 (1.92)*
Fluoroquinolones	**Danofloxacin**	n.d.	n.d.	n.d.	n.d.
	Enoxacin	*4.83 (1.56)*	*4.65 (1.57)*	*16.04 (0.96)*	*8.27 (1.13)*
	Ofloxacin	**23.28 (0.24)**	**75.017 (0.48)**	**15.30 (0.73)**	**276.67 (0.46)**
	Ciprofloxacin	**8.32 (0.79)**	**28.02 (0.90)**	**13.28 (0.68)**	**151.25 (1.43)**
	Enrofloxacin	**5.82 (0.56)**	**40.12 (0.84)**	**18.93 (0.79)**	**255.67 (0.35)**
	Norfloxacin	**15.83 (0.31)**	**15.17 (0.86)**	**32.88 (0.94)**	**63.72 (1.02)**
	Flumequine	n.d.	n.d.	n.d.	n.d.
Other antibiotics	**Trimethoprim**	**16.43 (0.24)**	**33.53 (0.34)**	**0.51 (2.24)**	**65.92 (0.37)**
	Nifuroxazide	n.d.	n.d.	n.d.	n.d.
	Chloroamphenicol	n.d.	n.d.	n.d.	n.d.
	Metronidazole	*n.d.*	*44.88 (0.92)*	*n.d.*	*211.83 (0.74)*
Beta blockers	**Atenolol**	**38.40 (0.43)**	**63.17 (0.48)**	**n.d.**	**117.82 (0.56)**
	Betaxolol	n.d.	n.d.	n.d.	n.d.
	Carazolol	n.d.	n.d.	n.d.	n.d.
	Pindolol	n.d.	n.d.	n.d.	n.d.
	Nadolol	n.d.	n.d.	n.d.	n.d.
	Timolol	n.d.	n.d.	n.d.	n.d.
	Sotalol	**15.28 (0.30)**	**44.32 (0.94)**	**n.d.**	**91.98 (0.30)**
	Metoprolol	**54.47 (0.15)**	**327.40 (1.91)**	**38.48 (0.30)**	**96.8 (0.25)**
	Propranolol	*n.d.*	*14.94 (0.39)*	*n.d.*	*51.60 (0.30)*
Beta agonists	**Salbutamol**	*n.d.*	*4.87 (1.70)*	*n.d.*	*27.05 (0.30)*
	Clenbuterol	n.d.	n.d.	n.d.	n.d.
Barbiturates	**Butalbital**	n.d.	n.d.	n.d.	n.d.
	Pentobarbital	n.d.	n.d.	n.d.	n.d.
	Phenobarbital	n.d.	n.d.	n.d.	n.d.

Exposición a residuos de fármacos: Presencia medioambiental

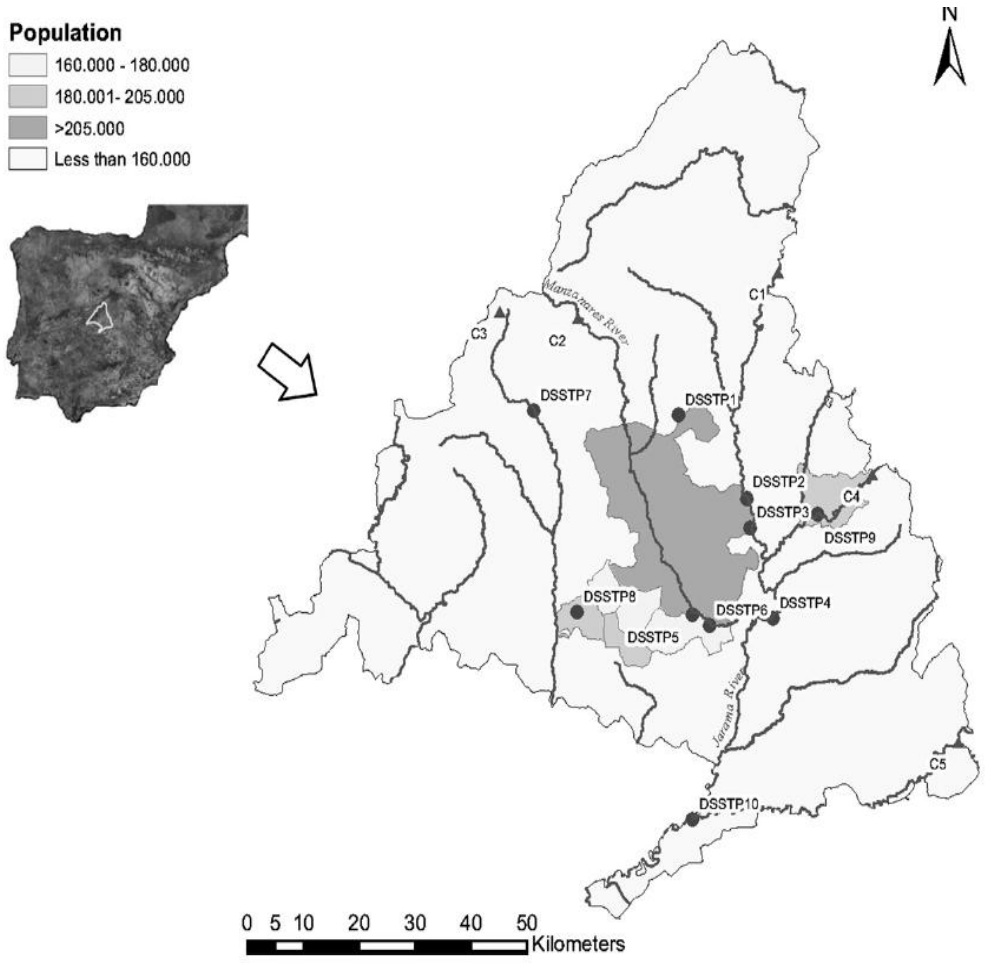


Fig. 1. Map of the study area and sample site locations (DSSTP and C) in the Community of Madrid.

Environment International 36 (2010) 195–201

Pollution by psychoactive pharmaceuticals in the Rivers of Madrid metropolitan area (Spain)

Silvia González Alonso [a,*], Myriam Catalá [b], Raúl Romo Maroto [a], José Luis Rodríguez Gil [b], Ángel Gil de Miguel [a], Yolanda Valcárcel [a]

Table 4

Psychoactive pharmaceutical and metabolite concentrations (ng/L) downstream STPs (bold: maximum, underlined: minimum).

			Jarama			Manzanares		Guadarrama		Henares	Tajo	
		DSSTP1[a]	DSSTP2	DSSTP3	DSSTP4	DSSTP5	DSSTP6	DSSTP7	DSSTP8[a]	DSSTP9	DSSTP10	Median values
Antidepressives	Citalopram	43	[3]	32	b.D.L.	58	b.D.L.	13	**120**	b.D.L.	b.D.L.	43
	Fluoxetine	16	b.D.L.	13	18	22	b.D.L.	8	**44**	11	12	14
	Venlafaxine	225	68	43	68	**387**	40	46	347	43	22	57
Anxiolytics	Nordiazepam	34	24	21	26	52	20	b.D.L.	**76**	19	26	26
	Oxazepam	30	17	45	28	108	12	b.D.L.	**129**	[6]	b.D.L.	30
	7-aminoflunitrazepam	b.D.L.	b.D.L.	**55**	b.D.L.	b.D.L.	b.D.L.	b.D.L.	b.D.L.	b.D.L.	b.D.L.	55
Anticonvulsants	Carbamazepine	**1160**	b.D.L.	184	273	b.D.L.	82	35	b.D.L.	20	45	82

b.D.L.: below detection limit.

[a] Waste-dominated streams.

The data presented here demonstrate that current sewage treatment technologies of the STPs of Madrid rivers cannot effectively remove fluoxetine, citalopram, venlafaxine, nordazepam, oxazepam or carbamazepine, thus discharging them into rivers. We have not

pharmaceuticals in the rivers of Madrid are higher than the contamination found in other geographical areas. Two factors can be responsible for this: the high population density of the Madrid metropolitan area (average >2000 inhabitants/km^2, Madrid Institute of Statistics, 2007) and the low flow rate of our Mediterranean rivers.

Table 5

Results obtained from the two developed methods for the effluent samples analysed during the performed monitoring campaign ($n = 5$).

Compound	SRM			IDA		
	Range (ng/L)	Mean (ng/L)	Median (ng/L)	Range (ng/L)	Mean (ng/L)	Median (ng/L)
Furosemide	729–1132	884	830	783–1192	983	987
Clofibric acid	37–44	39	41	36–51	42	39
Bezafibrate	40–110	80	97	50–130	97	105
Hydrochlorothiazide	2262–3988	3324	3788	2346–3893	3373	3810
Ketoprofen	120–260	177	162	140–275	218	239
Naproxen	140–1380	780	693	140–1150	717	910
Diclofenac	890–1440	1097	950	1160–1440	1293	1251
Fenoprofen	<MQL	<MQL	<MQL	<MQL	<MQL	<MQL
Indomethacine	160–390	275	241	170–330	235	297
Mefenamic acid	40–60	50	51	50–60	53	52
Ibuprofen	–	–	–	100–340	180	119
Diuron	140–290	203	207	110–260	203	219
Chlorophene	<MQL	<MQL	<MQL	<MQL	<MQL	<MQL
Gemfibrozil	580–3550	2323	2640	470–3090	2123	2710

Evaluation of various liquid chromatography-quadrupole-linear ion trap-mass spectrometry operation modes applied to the analysis of organic pollutants in wastewaters

María Jesús Martínez Bueno, Ana Agüera*, María Dolores Hernando, María José Gómez, Amadeo R. Fernández-Alba (Almería, Spain)

Journal of Chromatography A, 1216 (2009) 5995–6002

Conclusión

Un nuevo escenario en la **exposición ambiental**

- Niveles bajos de exposición, pero múltiples residuos químicos
- Interacciones sinérgicas, aditivas y/o antagónicas entre ellos y los sistemas de homeostasis interna (por ejemplo, hormonas)
- Necesidad de ir mas allá de la cuantificación de uno, o unos pocos residuos: Cuantificar la actividad biológica y las consecuencias de la exposición combinada
- Mientras tanto: PRECAUCION