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Hexachlorocyclohexane Contamination and Solutions: Brief History and Beyond. Emerging Model to Study Evolution of Catabolic Genes and Pathways

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Abstract

Recent revelation of the evolution of Hexachlorocyclohexane (HCH) degrading sphingomonads and their acquisition of lin genes for the degradation of HCH isomers at the HCH dumpsites and HCH contaminated sites has

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Property	**α-HCH**	**β-HCH**	**γ-HCH**	**-HCH**
Conformation	aaeeee	eeeeee	aaaeee	aeeeee
Molecular weight	290.83	290.83	290.83	290.83
Melting point	159-160 °C	314-315 °C	112.5 °C	141-142 °C
Boiling point	288 °C	60 °C	323.4 °C	60 °C
Water solubility	2.03 ppm	0.2 ppm	7.4 ppm	15.7 ppm
Vapour pressure	$(1.6 \pm 0.9) \times 10^{-2}$	$(4.2 \pm 0.3) \times 10^{-5}$	$(5.3 \pm 1.4) \times 0^{-3}$	2.1×10^{-3}
Log K_{ow}	3.9 ± 0.2	3.9 ± 0.1	3.7 ± 0.5	4.1 ± 0.02
Solubility in organic solvents				
Ethanol (in 100 g)	1.8 g	1.1 g	6.4 g	24.4 g
Ether (in 100 g)	6.2 g	1.8 g	20.8 g	35.4 g
Benzene (in 100 g)	-	1.9 g	28.9 g	41.4 g
BCF in human fat				

38,39 [illegible] 40 [illegible] 41 [illegible] 42 [illegible] C [illegible] 28 [illegible] 43 [illegible] 11 [illegible] ([illegible] 2).

[illegible] C [illegible] C [illegible] C [illegible] C [illegible]

[illegible] 4 [illegible] 2010. [illegible] 1999, [illegible] C [illegible] 25000 [illegible] 1990 [illegible] 15 [illegible] 7000 [illegible] 10000 [illegible] C [illegible] 90000 [illegible] 29 [illegible] C [illegible] C [illegible]

A HCH

B [illegible] A [illegible] C [illegible] C [illegible] 65 [illegible] C [illegible] C [illegible] A [illegible] 1990 [illegible] 26 [illegible] B90A [illegible] 10 [illegible] C [illegible] B [illegible] 24 [illegible] 26 [illegible] C [illegible] C [illegible] C [illegible] 30,31,44-46,53,54 [illegible] 24 [illegible] 26 [illegible] 43 [illegible] C [illegible] 36,47,48 [illegible] C [illegible] 27 [illegible] C [illegible] 11 [illegible] C [illegible]

[illegible]

HCH *lin* : A HCH

[illegible] C [illegible] 26. [illegible]

A A1 A2 58 C: (+)- (-)- C -1,3( ),4( ),5( ),6( )- CC -1,3( ),4( ),5( ),6( )- CC 59.

26 65. 66. 156. C 53%. 1,2- C 67,68.

26 68. - C C 1,2- - C $_2$- -73 A -25 -20 A -129

69. 16.5 (+ (+ 73- 25 20 129- 115 20 129 C

Figure 3: ε-HCH is hydroxylated by *LinB* to E1 and E2 compunds whereas *LinA* dehydrochlorinatesε-HCH to TCBs. At times, *LinA and LinB* seem to compete with each other for this single substrate.

1,2,5,6,9,10 ... 1,2,3,4,5,6 ... 89 ... 1,2,5,6,9 ... 10 (...) ... 1,5,9- ... C ...

Figure 4a: Similarity in the activity of *LinA* and *LinB* on HCH and HBCD's; Activity of *LinA* on 1,2,3,4,5,5-hexachlorocyclohexane leads to the production of 1,3,4,5,6- pentachlorocyclohexane and activity of *LinB* on 1,2,3,4,5,5-hexachlorocyclohexane leads to the production of 2,3,4,5,6-pentachlorocyclohexanol.

(C) ... C ... BC ... BC ' ...

BC ' ... 16 ... BC ' ... C ... C ' ... BC ', ... BC ' ... 82 ... BC ... B90A. 2014, ... BC ' 90 .

A ... C , ... 91 ... 82 ... (BC). ... B ... B90A, ... C ... BC ' ... B ... C ...

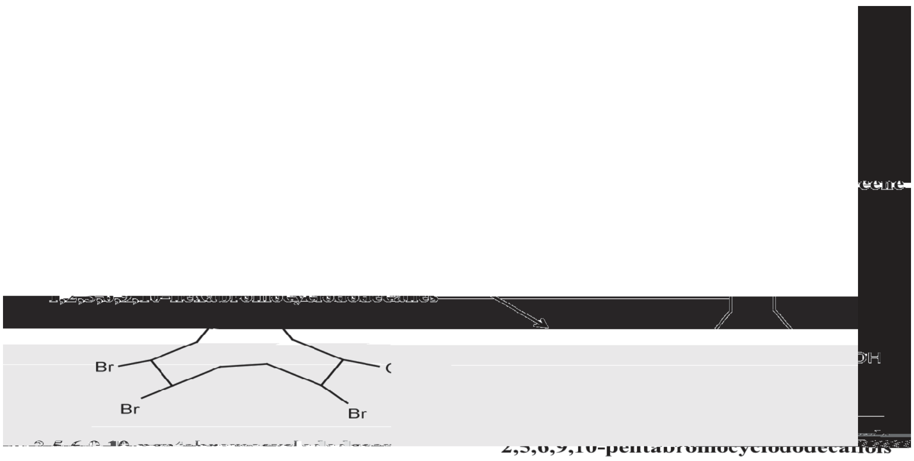

Figure 4b: Similarity in the activity of *LinA and LinB* on HCH and HBCD's; Activity of *LinA* on 1,2,5,6,9,10 hexabromocyclododecan leads to the production of 1,5,6,9,10-pentabromocyclododecene and activity of *LinB* on 1,2,5,6,9,10 hexabromocyclododecan leads to the production of 2,5,6,9,10 pentabromocyclododecanol.

92,93 . C , , BC ’ -
(BC)
(BC) (4).
BC
- BC ’ . , B ,

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