



## Entgifter aus der Deponie

18. Juni 2021 | Annette Ryser

Themen: Abwasser | Schadstoffe | Gesellschaft

**Bakterien aus einer indischen Mülldeponie könnten helfen, chemische Altlasten zu beseitigen. Im Fokus stehen Pestizide wie Lindan oder bromierte Flammschutzmittel, die sich in der Natur und in Nahrungsketten anreichern. Forscher der Eawag und der Empa erzeugten mit Hilfe dieser Bakterien Enzyme, die solche Chemikalien zerlegen können.**

Können wir den Chemie-Müll vergangener Generationen wieder einsammeln oder unschädlich machen? Der Mikrobiologe Hans Peter Kohler vom Wasserforschungsinstitut Eawag und der Empa-Chemiker Norbert Heeb machten gemeinsam mit Forschenden der Zürcher Hochschule für Angewandte Wissenschaften (ZHAW) und zweier indischer Institute die Probe aufs Exempel.

Lesen Sie den ausführlichen Artikel dazu auf der Seite der Empa: [Entgifter aus der Deponie](#)

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### Kooperationen

Empa Zürcher Hochschule für Angewandte Wissenschaften (ZHAW)

### Originalpublikation

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pid=124) originalId => protected22027 (integer) authors => protected'Heeb,&nbsp;N.&nbsp;V.; Hubeli,&nbsp;J.; Fleischmann,&nbsp;T.; Lienemann,&nbsp;P.; Nayyar,&nbsp;N.; Lal,&nbsp;R.; Kohler,&nbsp;H.&nbsp;P.&nbsp;E.' (144 chars)  
 title => protected'Transformation of  $\gamma$ -HBCD with the *Sphingobium Indicum* enzymes LinA

1, LinA2 and LinATM, a triple mutant of LinA2' (121 chars) journal => protected'Chemosphere' (11 chars) year => protected2021 (integer) volume => protected267 (integer) issue => protected'' (0 chars) startpage => protected'129217 (12 pp.)' (15 chars) otherpage => protected'' (0 chars) categories => protected'' (0 chars) description => protected'Hexabromocyclododecanes (HBCDs) were used as flame-retardants until their ban in 2013. Among the 16 stereoisomers known,  $\gamma$ -HBCD has the highest symmetry. This makes  $\gamma$ -HBCD an interesting substrate to study the selectivity of biotransformations. We expressed three LinA dehydrohalogenase enzymes in *E. coli* bacteria, two wild-type, originating from *Sphingobium indicum* B90A bacteria and LinATM, a triple mutant of LinA2, with mutations of L96C, F113Y and T133 M. These enzymes are involved in the hexachlorocyclohexane (HCH) metabolism, specifically of the insecticide  $\gamma$ -HCH (Lindane). We studied the reactivity of those eight HBCD stereoisomers found in technical HBCD. Furthermore, we compared kinetics and selectivity of these LinA variants with respect to  $\gamma$ -HBCD. LC-MS data indicate that all enzymes converted  $\gamma$ -HBCD to pentabromocyclododecanes (PBCDens). Transformations followed Michaelis-Menten kinetics. Rate constants  $k_{cat}$  and enzyme specificities  $k_{cat}/K_M$  indicate that  $\gamma$ -HBCD conversion was fastest and most specific with LinA2. Only one PBCD enantiomer was formed by LinA2, while LinA1 and LinATM produced mixtures of two PBCD enantiomers at t

assume that 1E,5S,6R,9S,10R-PBCD en is the  $\gamma$ -HBCD transformation product from LinA2. Implementing three amino acids of the LinA1 substrate-binding site into LinA2 resulted in a triple mutant with similar kinetics and product specificity like LinA1. Thus, point-directed mutagenesis is an interesting tool to modify the substrate- and product-specificity of LinA enzymes and enlarge their scope to metabolize other halogenated persistent organic pollutants regulated under the Stockholm Convention.' (1866 chars) serialnumber => protected'0045-6535' (9 chars) doi => protected'10.1016/j.chemosphere.2020.129217' (33 chars) uid => protected22027 (integer) \_localizedUid => protected22027 (integer) modified \_languageUid => protectedNULL \_versionedUid => protected22027 (integer) modified pid => protected124 (integer) Heeb, N. V.; Hubeli, J.; Fleischmann, T.; Lienemann, P.; Nayyar, N.; Lal, R.; Kohler, H. P. E. (2021) Transformation of  $\gamma$ -HBCD with the *Sphingobium Indicum* enzymes LinA1, LinA2 and LinATM, a triple mutant of LinA2, *Chemosphere*, 267, 129217 (12 pp.), doi:10.1016/j.chemosphere.2020.129217, Institutional Repository

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