BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL TRIBUNAL
PRINCIPAL BENCH AT NEW DELHI
O.A. NO. 717 OF 2024

IN THE MATTER OF:

News Item titled "People Are Breathing in Cancer-Causing Chemicals in their cars study find Appearing in NDTV.com Dated 22.07.2025 .... *SUO-MOTO*

VERSUS

UNION OF INDIA & ANR. .... RESPONDENTS

N.D.O.H: 27-09-2025

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(SIKRI & COMPANY)
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NEW DELHI 110003
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PLACE: NEW DELHI
DATED: 22.07.2025

BEFORE THE NATIONAL GREEN TRIBUNAL,

PRINCIPAL BENCH AT NEW DELHI

O.A.No.717of 2024

INTHEMATTER OF:

News Item titled "People Are Breathing In Cancer-Causing Chemicals in their cars study find"appearing in NDTV.com dated08.05.2024 ...*SUO-MOTO*

Versus

UNIONOFINDIA&ORS. ... RESPONDENTS

ADDITIONAL AFFIDAVIT ON BEHALF OF RESPONDENT No. 3 -INDIAN COUNCIL OF MEDICAL RESEARCH (ICMR) TO THE *SUO-MOTO* ORIGINAL APPLICATION UNDER THE NATIONAL GREEN TRIBUNAL ACT, 2010 IN TERMS OF ORDER DATED 23.05.2025:

Most Respectfully Showeth:

I, Jagdish Rajesh, S/o, R. Jagdish, aged about 58 years, presently working as Deputy Director General (Admn.) with Indian Council of Medical Research (ICMR), V. Ramalingaswami Bhawan, Ansari Nagar, New Delhi-110029, do hereby solemnly affirm and state as under:

1. That I am presently working as Deputy Director General (Admn.) Indian Council of Medical Research (ICMR) and authorized to file this Reply Affidavit on behalf of Respondent No. 3.

2. That liberty is further craved in making such other and further submissions/filing Additional Affidavits as may be required in the facts of the case subsequently or as may be directed by this Hon'ble Tribunal.

जगदीश राजेश / JAGDISH RAJESH
उपमहानिदेशक (प्रशा.) / Deputy Director General (Admn.)
भारतीय आयुर्विज्ञान अनुसंधान परिषद / Indian Council of Medical Research
स्वास्थ्य अनुसंधान विभाग (स्वास्थ्य एवं परिवार कल्याण मंत्रालय)
Department of Health Research (Ministry of Health & Family Welfare)
वी. रामलिंगस्वामी भवन, अंसारी नगर, नई दिल्ली-110029
V. Ramalingaswami Bhawan, Ansari Road, New Delhi-110029

NOTARY ALAKA NAYAK Advocate Reg. Area : Delhi Period 26/06/2024 to 27/06/2029 GOVT. OF INDIA

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3. That this Hon'ble Tribunal has taken cognizance of the present matter, keeping inview the *News Item titled" People Are Breathing In Cancer- Causing Chemicals in their cars study find" appearing in NDTV.com dated 08.05.2024* and *vide* order dated 02.07.2024,was pleased to implead the answering Respondent in the instant Original Application on the issue involved in the present matter.

4. That this Hon'ble Tribunal *vide* order dated 24.04.2025 had directed the answering Respondent to file a detailed affidavit in terms of order dated 12.09.2024 whereby, the answering Respondent had to submit a report in respect of availability of the testing facility qua the chemicals/compound involved. That pursuant to the directions passed *vide* Order dated 24.04.2025, a detailed Affidavit was duly filed.

NOTARY ★ ALAKA NAYAK Advocate Reg. 10639 Area: Delhi Period 28/06/2024 to 27/06/2029 ★ GOVT. OF INDIA

5. That taking into consideration the averments made in the said Additional Affidavit and the statement made by the Director General, Indian Council of Medical Research during the course of hearing dated 23.05.2025 before the Hon'ble Tribunal, the Hon'ble Tribunal was pleased to direct the answering Respondent to file another affidavit within eight (8) weeks disclosing the timelines for conducting the blood and urine tests to ascertain presence of the three compounds/chemicals namely, TDCIPP, TCIPP, TCEP in the human body as well as for the procurement of the standards (Certified Reference Material)to carry out such tests. That the instant Affidavit is being filed in compliance of the directions passed *vide* order dated 23.05.2025 on the basis of the information received.

जगदीश राजेश / JAGDISH RAJESH
उपमहानिदेशक (प्रभा) / Deputy Director General (Admn.)
भारतीय आयुर्विज्ञान अनुसंधान परिषद / Indian Council of Medical Research
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Department of Health Research (Ministry of Health & Family Welfare)
वी. रामलिंगस्वामी भवन, अंसारी नगर, नई दिल्ली-110029
V. Ramalingaswami Bhawan, Ansari Road, New Delhi-110029

6. That it is humbly submitted, that the answering Respondent (ICMR-NIOH, Ahmedabad) after due deliberations has formulated a detailed proposal in respect of carrying out a study involving collection and analysis of biological samples with an aim to evaluate the health risks of flame retardant exposure to drivers. The said proposal details the study objectives, methodology, budget requirements as well as

timelines for conducting the research as aforesaid. A copy of the said proposal is annexed herewith and marked as **ANNXURE R-1.**

7. That it is humbly submitted that as per the proposal, the abovementioned research study would involve a zone stratified bio-monitoring. That in terms of the proposal, completing laboratory analysis of bio- logical samples, data processing, statistical valuation, exposure modelling and reporting would require approximately eighteen (18) months. That a detailed chart providing comprehensive time lines for the respective phases is placed hereunder for ready reference:

NOTARY GOVT. OF INDIA ALAKA NAYAK Advocate Reg. [illegible]639 Area : Delhi Period 28/06/2024 to 27/06/2029

B. Phase2timeline:

Targetinmonths	**0-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**
Recruitment, Pro-curement of analytical standards and consumables.						
Preparation of SOP & Method validation.						
Sample collection						
Analysis of results obtained & inter-pretation.						
Report preparation, submission & dis-semination.						

8. That it is humbly submitted that apart from the time period as espoused/mentioned above, since a budgetary requirement of approximately Rs. 85,32,800/- (Rupees Eighty-Five Lakhs Thirty Two Thousand Eight Hundred Only) is involved to conduct the

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proposed research study, due sanction and approval has to be obtained from the concerned authorities and therefore, additionally a period of nine months approximately would be required in obtaining the said requisite approvals/sanctions.

9. That in light of the above submissions, it is most respectfully submitted that the answering Respondent shall be complying with the directions of the Hon'ble Tribunal as and when passed by this Hon'ble Tribunal.

10. **PRAYER:**

That therefore, in view of the above submissions, it is humbly prayed that this Hon'ble Tribunal may be pleased to take on record the instant Additional Affidavit and consider the submissions made therein.

NOTARY ALAKA NAYAK Advocate Reg. 639 Area : Delhi Period 28/06/2024 to 27/06/2029 GOVT. OF INDIA

DEPONENT

जगदीश राजेश / JAGDISH RAJESH
उपमहानिदेशक (प्रशा.) / Deputy Director General (Admn.)
भारतीय आयुर्विज्ञान अनुसंधान परिषद / Indian Council of Medical Research
स्वास्थ्य अनुसंधान विभाग (स्वास्थ्य एवं परिवार कल्याण मंत्रालय)
Department of Health Research (Ministry of Health & Family Welfare)
वी. रामालिंगस्वामी भवन, अंसारी नगर, नई दिल्ली – 110029
V. Ramalingaswami Bhawan, Ansari Road, New Delhi-110029

VERIFICATION:

I, Jagdish Rajesh, S/o, R. Jagdish, aged about 58 years, presently working as Deputy Director General (Admn.) with Indian Council of Medical Research (ICMR), V. Ramalingaswami Bhawan, Ansari Nagar, New Delhi-110029, do hereby solemnly affirmed and declare, that the above Reply has been drafted by our counsel as per instructions and the contents of the reply are true and correct as per official record and the best of my knowledge and belief. No part of it is false and nothing material has been concealed there from.

Identified Jagdish Rajesh Dabla. identified the deponent who has signed in my presence

CERTIFIED THAT THE DEPONENT
S/o, W/o R/o
Identified by
Has solemnly affirmed before me at Delhi on
That the contents of the affidavit which have been read & explained to him/her are true & correct to his/her knowledge

NOTARY

Verified at New Delhi on 22nd day of July, 2025.

22 JUL 2025

DEPONENT

जगदीश राजेश / JAGDISH RAJESH
उपमहानिदेशक (प्रशा.) / Deputy Director General (Admn.)
भारतीय आयुर्विज्ञान अनुसंधान परिषद / Indian Council of Medical Research
स्वास्थ्य अनुसंधान विभाग (स्वास्थ्य एवं परिवार कल्याण मंत्रालय)
Department of Health Research (Ministry of Health & Family Welfare)
वी. रामालिंगस्वामी भवन, अंसारी नगर, नई दिल्ली – 110029
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Annexure R-I Colly.
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SUMMARY

1. Title of the Proposed Research Project:

Human bio-monitoring of Flame retardants among Indian professional drivers: A cross sectional comparative study.

2. Background Information:

India's fast-growing passenger vehicle industry increasingly uses synthetic interior materials like polyurethane foams and plastics, many of which contain organophosphate flame retardants (OPFRs) such as Tris(1-chloro-2-propyl) phosphate (TCIPP), Tris(1,3-dichloro-2-propyl) phosphate (TDCIPP), and Tris(2-carboxyethyl)phosphine (TCEP). These semi-volatile compounds can off-gas into the cabin especially under India's high temperaturesleading to exposure risks for occupants.

Evidence from various studies indicates that exposure to certain OPFRs is associated with detrimental health impacts, including altered birth outcomes, reproductive toxicity, and carcinogenicity.Recent studies have linked these compoundsto reduced fertility, disrupted thyroid hormone function, and cancer as well.

Despite India being the world's third-largest auto market with extensive synthetic material usage and no national interior emission regulations, this persistent chemical exposure is a critical concern.

Hence, this study aims to assess health risks of OPFR in drivers through biological monitoring, using GC-MS/MS and LC-MS/MS techniques with respect to exposure from car cabins.

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3.Study Objectives:

1. To assess exposure of flame retardants and their metabolites among professional drivers;
2. To compare biological level of flame-retardants/their metabolites in variable climatic conditions and vehicular stratification.

4. Methodology:

With a cross sectional comparative study design, study will enrol total 180 professional drivers working in three different climatic zones(hot and arid, cold, hot and humid) such that from each zone 60 professional drivers will be selected. These will be stratified based on the type of cars being used such that they are distributed amongst SUVs, sedans, and hatchbacksequally.With adhering inclusion and exclusion criteria, biological samples of apparently healthy drivers will be collected. Each driver participant will provide blood (post shift) and urine (pre and post shift) after vehicle operation.As a comparison group, age and gender matched 90 relatively unexposed subjects(30 from each zone)would also be enrolled and their biological samples collected. Analysis of the biological samples would be carried outas per established protocols. With statistical analysis inter/intra group comparison for levels of OPFRs and their metabolites will be carried out.

5.Timelines:

Approximately eighteen (18) months will be required for the detailed laboratory analysis of the biological samples, data processing, statistical evaluation, exposure modelling, policy analysis, and final reporting.

6.Expected Outcome:

This project is anticipated to generate the first comprehensive dataset on the presence and health risk to organophosphate flame retardants (OPFRs)—

specifically TCIPP, TDCIPP, and TCEP—in Indian car cabin environments through biological monitoring across diverse climatic zones and vehicle categories.

7. References:

1. Faust, J. B.; August, Laura M.; Evidence of the Carcinogenicity of Tris (1,3-Dichloro-2-propyl) phosphate; California EPA Office of Environmental Health and Hazard Assessment; OEHHA, 2011. https://oehha.ca.gov/media/downloads/proposition-65/chemicals/tdcpp070811.pdf.
2. NTP; TR-602: Isomeric Mixture of Tris(chloropropyl) Phosphate Administered in Feed to Sprague Dawley (Hsd:Sprague Dawley SD) Rats and B6C3F1/N Mice, 2023.
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Annexure-I Sl.No. 8

PROJECT DETAILS

1. Title of the Proposed Research Project:

Human bio-monitoring of Flame retardants among Indian professional drivers: A cross sectional comparative study.

2. Summary:

India's rapidly expanding automotive industry particularly in the passenger vehicle segment has brought about a major transformation in how people commute and interact with transportation systems. As vehicles become more modern and comfort-driven, their interiors increasingly rely on synthetic materials like polyurethane foams, plastic composites, and textiles. While these materials enhance aesthetics and performance, they often contain substances inadvertently introduced during production. Basically classified under the organophosphate flame retardants (OPFRs) family, these chiefly comprisetris (1-chloro-2-propyl) phosphate (TCIPP), Tris (1,3-dichloro-2-propyl) phosphate (TDCIPP), and Tris(2-chloroethyl) phosphate (TCEP). These compounds being semi-volatile in nature are not permanently bonded and slowly release into the vehicle's cabin over time, a process that is also further accelerated by heat. This is of particular concern in India, where high ambient temperatures especially in parked cars can often exceed 50°C, thereby significantly increasing the rate of chemical off-gassing. As a result, both drivers and passengers may be unknowingly exposed to these chemicals.

In response to this growing concern, the proposed research aims to evaluate the health risk of flame retardant exposure to Drivers. This proposed study will therefore involve collection and analysis of biological samples, utilizing advanced analytical techniques such as gas chromatography–tandem mass spectrometry (GC-MS/MS) and liquid chromatography–tandem mass

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spectrometry (LC-MS/MS). It will also include human biomonitoring and exposure modelling to assess health risks more accurately.

3. Background:

India stands as the world's third-largest automobile market, with passenger vehicle production surpassing 2.3 million units annually. This growth is driven largely by consumer demand for compact and versatile vehicles, with recent data (IBEF, 2024) indicating that SUVs account for the largest share—approximately 45–52% of production—followed by hatchbacks at 26–30%, sedans at 10–15%, and MUVs/MPVs around 10–13%. As vehicles become more sophisticated, consumer expectations around comfort and aesthetics have increased. There has in turn led to a noticeable rise in the use of advanced synthetic materials in car interiors. These materials often include polymeric compounds, plastic composites, and especially polyurethane foams which are used in seats, armrests, dashboards, and ceiling panels. While these materials enhance durability and comfort, they also introduce a chemical complexity to the vehicle.

A particular concern arises from the use of additive flame retardants especially organophosphate flame retardants (OPFRs) like TCIPP, TDCIPP, and TCEP incorporated into these materials to prevent ignition and spread of fires. Unlike reactive chemicals that bind to the material, these additive flame retardants are loosely attached and tend to migrate over time. In India's hot and humid climate, where parked cars can reach internal temperatures exceeding 50°C, this migration is significantly accelerated. As a result, these chemicals can volatilize into the cabin, creating a persistent and often invisible layer of chemical exposure. This is particularly concerning for vulnerable groups such as infants, children, pregnant women, and individuals who spend prolonged hours in vehicles like professional drivers or daily commuters. The absence of

national regulatory standards for interior emissions in Indian vehicles only amplifies the risk, highlighting the urgent need for evidence-based interventions and policy reform.

4. Literature Review:

A brief summary of the regulations of the above compounds, representation of sample concentrations of OPFRs in vehicles are summarized below as Table 1 and Table2 respectively.

Table1: Summary of Worldwide Regulatory Guidelines for OPFRs:

Country/Standard	Regulation/Limit	Compound Covered	Remarks
USA (CPSC)	Reference dose (RfD): 5 µg/kg/day (non-cancer)	TDCIPP	For children's exposure risk (Hoffman et al., 2017)
EU (REACH)	Restricted for use in consumer articles	TCEP	Listed as SVHC (Substance of Very High Concern)
California Prop 65	Listed as carcinogen	TDCIPP	Mandatory labelling if present above limit
China (GB 8410-2006)	Flammability but no OPFR-specific restriction	–	Surface material burn rate control only
India	No specific VOC or OPFR limits in vehicles	–	-

Table2: Representation of sample OPFR Concentrations in Vehicles:

Study	Region	Compound	Max Concentration	Notes
Svobodová et al. (2025)	Europe	TDCIPP	1,430,000	Skoda Vehicles 1996–2021
Brandsma et al. (2014)	Netherlands	TCIPP	1,100,000	Private cars
Rudel et al. (2014)	USA	All OPFRs	~870,000 (aggregate)	Personal vehicle study
Hoehn et al. (2024)	USA	TCIPP	99% detection in passive samplers	Summer emissions 2–5× higher

These data collectively underscore the relevance of studying OPFR exposure in Indian vehicles where tropical climate conditions and growing vehicle occupancy could amplify health risks. Yet, the regulatory framework remains nascent, necessitating targeted research to inform national policy.

5. Novelty and Innovation:

This proposal represents a pioneering effort in India, addressing a significant yet largely overlooked gap in automotive chemical safety. While international studies have measured flame retardants in vehicle interiors, none have examined this issue through the lens of India's unique climate, vehicle usage patterns, or market structure. By conducting the first comprehensive and data-driven assessment of TCIPP, TDCIPP, and TCEP levels in Indian vehicles using GC-MS/MS—an internationally recognized gold standard—this study will generate robust evidence on in-cabin chemical exposures through human

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biomonitoring. Moreover, the inclusion of zone-wise sampling across India's varied climate regions allows for a nuanced understanding of how seasonal temperature changes influence emission intensity. This is especially important in a tropical country like India, where vehicle cabin temperatures can soar, increasing the risk of chemical off-gassing and occupant exposure.

6. Study Objectives:

1. To assess exposure of flame retardants and their metabolites among professional drivers.
2. To compare biological level of flame-retardants/their metabolites in variable climatic conditions and vehicular stratification.

7.Methodology:

7.1 Study Design (Biological monitoring):

This study adopts a zone-stratified biomonitoring approach to assess human exposure to organophosphate flame retardants (OPFRs) specifically TCIPP, TDCIPP, and TCEP with respect to exposure from interior of cars. The design considers India's climatic diversity and targets professional drivers with prolonged and routine exposure.

7.1.1 Climatic Zone Stratification:

Three major climatic zones will be selected to represent thermal and geographic diversity influencing chemical emission patterns:

- Hot and arid zones
- Cold Zone
- Hot and humid zones

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7.1.2 Participant Selection and Vehicle Types:

In each zone, a total of 60 drivers will be included in study. These will be stratified based on the type of vehicle they operate:

- 20 participants driving SUVs
- 20 participants driving Sedans
- 20 participants driving Hatchbacks

This structure enables comparison across vehicle categories within each climate zone.

7.1.3 Selection criteria for subjects:

Inclusion criteria:

- An apparently healthy male subjects with age 23-50 years driving car since a minimum of 5 years.
- Driver should have average at least 15 days of usage of car in a month.

Exclusion criteria:

- Drivers with diabetes and hypertension.
- Drivers with known hepato-renal dysfunction in last six month.

7.1.4 Selection criteria for control:

Inclusion criteria:

- Apparently healthy age-gender matching subjects who are not commuting in cars more than 5 days in a month with average duration in less than 30 minute.

Exclusion Criteria:

- Person with diabetes and hypertension.

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- Person with known hepato-renal dysfunction in last six month.

7.1.5 Sampling Scheme and Biological Collection for drivers:

Each driver will contribute 2 biological samples, split across two time points:

- Pre-Shift Sampling
    - Urine sample (before shift)
- Post-Shift Sampling
    - Urine sample (after shift)
    - 5 ml Blood sample (after shift)

Therefore, per Driver= 3 biological samples

Per zone = 60 drivers× 3 samples = 180 biological samples

Total across 3 zones = 3 × 180 = 540 biological samples

This design allows for intra-individual pre/post comparison as well as inter-vehicle and inter-zone exposure profiling.

Sampling Framework by Zone:

Zone	Vehicle Type	Participants	Samples per Participant	Total Samples per Vehicle Type	Total Samples per Zone
Hot and arid Zones	SUV	20	3 (1 pre + 2 post)	60	180
	Sedan	20		60	
	Hatchback	20		60	
Cold Zone	SUV	20	3 (1 pre + 2	60	180

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Zone	Vehicle Type	Participants	Samples per Participant	Total Samples per Vehicle Type	Total Samples per Zone
	Sedan	20	post)	60	
	Hatchback	20		60	
Hot and Humid Zone	SUV	20	3 (1 pre + 2 post)	60	180
	Sedan	20		60	
	Hatchback	20		60	
Total	–		–	–	540 Biological Samples

7.1.6 Sampling Scheme for Controls:

A control group comprising 50% of the total number of selected subjects will be included for comparative analysis. 5 ml of blood samples will also be drawn from these control participants. Accordingly the total number of controls selected would be

Per zone: 50% of 60 subjects = 30

Total number of controls: 30 x 3 = 90

No. of samples for control and their duration:

Urine sample: 1

Blood sample: 1 16

Therefore, per participant = 2 biological samples

Per zone = 30 participants × 2 samples = 60 biological samples

Total across 3 zones = 3 × 60 = 180 biological samples

Type of samples	Driver group	Control group	Total samples
Urine samples	360	90	450
Blood samples	180	90	270
Total Samples	540	180	720

7.1.7 Analysis:

Urine samples will be extracted in appropriate solvent and will be analysed in LC-MS/MS using previously published method for respective metabolites viz. BDCIPP (bis(1,3-dichloro-2-propyl) phosphate), BCIPHIPP, or bis (1-chloro-2-propyl) 1-hydroxy-2-propyl phosphate and BCEP bis (2-chloroethyl) phosphate (BCEP) is a metabolite of tris (2-chloroethyl) phosphate (TCEP) (Van den Eede et al., 2013a). The blood samples collected under aseptic conditions would be transported to the lab for analysis of creatinine and other respective compounds.

8. Expected Outcome:

This project is anticipated to generate the first comprehensive dataset on the presence and human exposure to organophosphate flame retardants (OPFRs) specifically TCIPP, TDCIPP, and TCEP within Indian passenger vehicle through biological monitoring.

9. Timelines:

Target in months	**0-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**
Recruitment, Procurement of analytical standards and consumables						

Preparation of SOP & Method validation						
Sample collection						
Analysis of results obtained & interpretation						
Report preparation, submission & dissemination						

10. Budget:

Budget, ICMR-NIOH				
No	**Head**	**12 months**	**06months**	**Total**
1	**Staff**			
1.1	Project Technical Support III -02	873600	436800	1310400
1.2	Office Helper (Field Attendent-1)	321600	160800	482400
	Total	**1195200**	**597600**	**1792800**
2	**Recurring Contingency (RC)**			
2.1	Isotopic label/ without label analytical standard	500000	0	500000
2.2	Flame retardants and their metabolite, kits for routine blood and biochemistry tests; and consumables for LC-MS and GC-MS	3200000	1840000	5040000
2.3	Incidental Expenses	200000	0	**200000**
	Total	**3900000**	**1840000**	**5740000**
3	**Transport Allowances**			

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3	**Transport Allowances**			
3.1	Travel (Hiring different type of vehicles along with driver including three zones and travel expenses for the officials)	600000	400000	1000000
	GRAND TOTAL	**5695200**	**2837600**	**8532800**

11.References:

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car: Implications for human exposure. *Chemosphere*, 116, 3–9. https://doi.org/10.1016/j.chemosphere.2014.03.037

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