

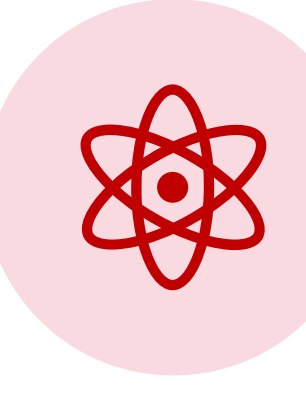
Urinary di(2-ethylhexyl) phthalate (DEHP) metabolites and breast cancer risk: a systematic review and meta-analysis

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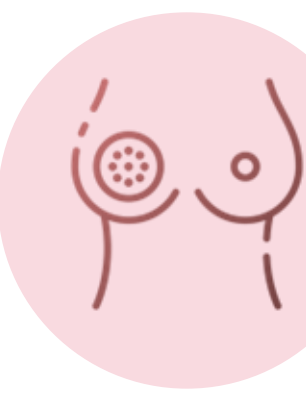
Background



Di(2-ethylhexyl) phthalate (DEHP) is a widely used plasticizer and endocrine-disrupting chemicals



Humans are commonly exposed through food packaging, plastics, personal products, and medical devices.



Experimental data suggest possible relevance to breast carcinogenesis, but epidemiological studies are inconsistent.



Aim



To systematically review and quantitatively synthesis the evidence on urinary DEHP metabolites and breast cancer risk



Methods



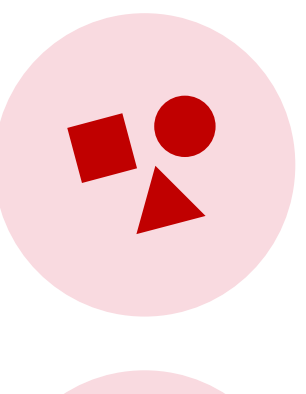
Databases searched: PubMed, Embase, and Web of Science.



Included study design: observational studies.



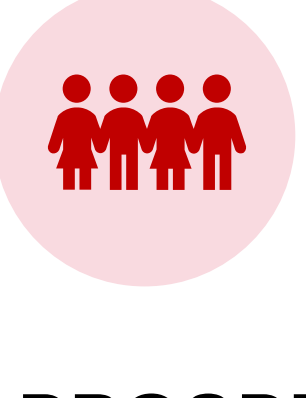
Statistical approach: random-effects meta-analysis using the most fully adjusted effect estimates.



Exposures analysed separately: ΣDEHP, MEHP, MEHHP, MEOHP, and MECPP.



Study quality assessed using the Newcastle-Ottawa Scale.



Study population: 6 studies, 2,588 breast cancer cases and 3,027 controls.

PROSPERO registration: CRD420261390993

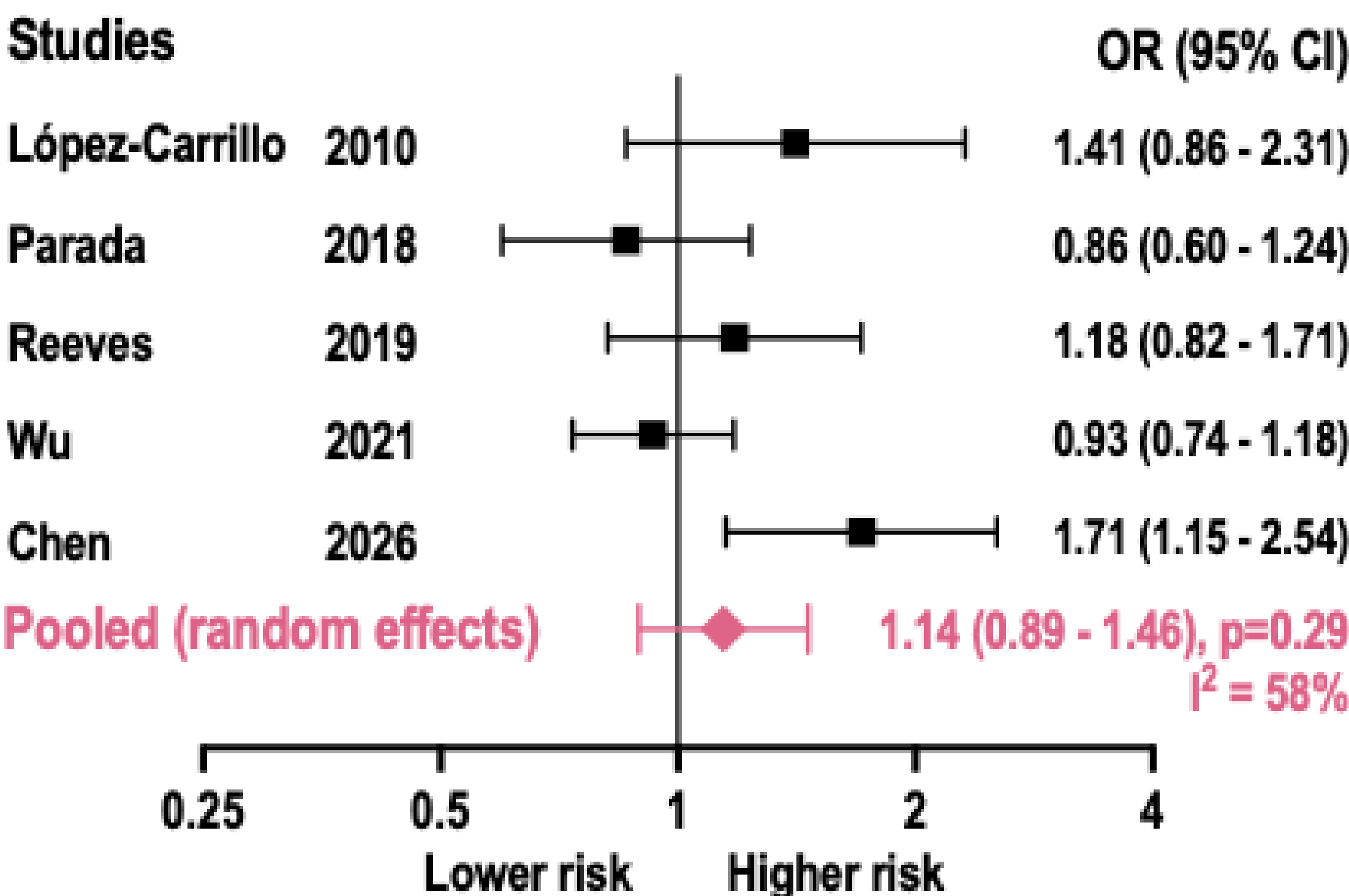


Key findings



Main finding:
Higher urinary ΣDEHP concentrations were not significantly associated with breast cancer risk

Primary outcome: ΣDEHP and breast cancer risk



OR, odds ratio; CI, confidence interval. ORs compare highest vs lowest urinary ΣDEHP categories. Random-effects model.

Pooled association between urinary DEHP metabolites and breast cancer risk

Exposure	Studies, n	Pooled OR (95% CI)	I ² , %
ΣDEHP	5	1.14 (0.89-1.46)	58
MEHP	5	1.22 (0.87-1.71)	64.9
MEHHP	5	1.04 (0.87-1.25)	6.9
MEOHP	5	0.94 (0.80-1.11)	0
MECPP	4	1.13 (0.83-1.54)	62.4

ΣDEHP, total DEHP metabolites; MEHP, mono(2-ethylhexyl) phthalate; MEHHP, mono(2-ethyl-5-hydroxyhexyl) phthalate; MEOHP, mono(2-ethyl-5-oxohexyl) phthalate; MECPP, mono(2-ethyl-5-carboxypentyl) phthalate. ORs compare highest vs lowest exposure categories.



Conclusion

Current evidence does not demonstrate a consistent association between higher urinary DEHP metabolite concentrations and breast cancer risk.

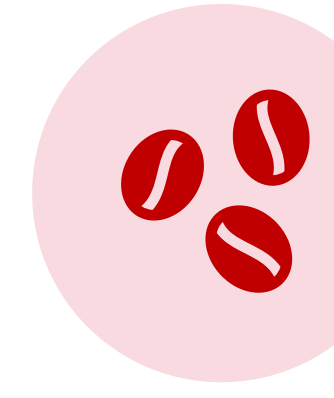
Larger prospective studies with repeated exposure measurements are required



Interpretation



No individual DEHP metabolite showed a statistically significant association with breast cancer risk



Heterogeneity was low for MEHHP and MEOHP, but moderate to substantial for ΣDEHP, MEHP, and MECPP



Five studies were rated as good quality and one as fair quality



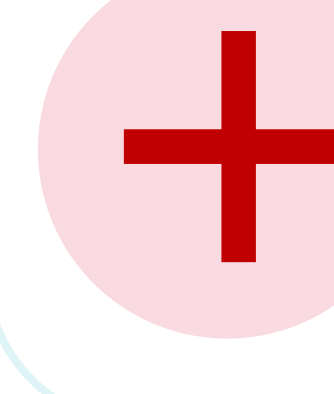
What this study adds



First meta-analysis focused only on DEHP metabolites



Each metabolite analysed separately, so correlated measurements from the same women weren't double-counted



Includes new prospective data, including a 20-year Taiwanese cohort (2026)



Limitations



Limited number of studies.



Post-diagnosis urine sampling may introduce reverse causation and treatment-related exposure.



Within-person variability in urinary phthalate measurements.



Possible differences in individual DEHP metabolism.



Take home message

Biological concern persists, but current epidemiological evidence does not establish DEHP exposure as a breast cancer risk factor

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