

## The Impact of Testing Costs on the Regulation of Nanoparticles

Costs of testing the toxicity of nanoparticles are important for determining how nanoparticles might be regulated. Here we analyze whether testing costs might reasonably be borne by industry.

Based on publicly available information we estimate that there are 265 distinct nanoparticle types for sale in the US. Testing costs vary from \$70,000 (Level 1 – physical characterization) to \$4.48 million (Level IV – in-vivo animal models) depending on level of testing. Four scenarios assumed different proportions (“distribution”) of nanomaterials that are tested at different levels. In the optimistic scenario only 10% of nanoparticles will need the full range of tests, while in the precautionary approach all nanoparticles need testing at all levels. Costs of testing range from \$249 million (Optimistic) to \$ 1.18 billion (Precautionary) At current levels of R&D spending on nanomaterial toxicity this translates into between 11 and 43 years for testing currently existing nanoparticles.

Testing level		Level I	Level II	Level III	Level IV	Total
Testing cost per substance		\$0.07	\$0.83	\$2.15	\$4.48	
<b>Optimistic</b>	Distribution	0.60	0.15	0.15	0.10	1.00
	Number of materials	159	40	40	27	265
	Costs of testing (a)	\$11.4	\$33.0	\$85.6	\$118.8	\$249
<b>Neutral</b>	Distribution	0.25	0.25	0.25	0.25	1.00
	Number of materials	66	66	66	66	265
	Costs of testing	\$4.7	\$55.0	\$142.7	\$296.9	\$500
<b>Risk Averse</b>	Distribution	0.10	0.20	0.20	0.50	1.00
	Number of materials	27	53	53	133	265
	Costs of testing	\$1.9	\$44.0	\$114.1	\$593.9	\$754
<b>Precautionary</b>	Distribution	0.00	0.00	0.00	1.00	1.00
	Number of materials	0	0	0	265	265
	Costs of testing	\$0.0	\$0.0	\$0.0	\$1,187.7	\$1188

New approaches that increase the efficiency of testing are needed, especially as the numbers of nanoparticle types increase.

Jae-Young, C., Ramachandran, G. Kandlikar, M. 2009 "The Impact of Toxicity Testing Costs on Nanomaterial Regulation", Environmental Science and Technology 43(9):3030-3034.