SUPPLEMENTARY INFORMATION

Toxicity of Ag, CuO and ZnO nanoparticles to selected environmentally relevant test organisms and mammalian cells in vitro: a critical review

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Supplementary Information contains the following data:

Table S1 Total number of publications in Thomson Reuters ISI Web of Science for different applications of Ag, ZnO and CuO nanoparticles. Search was performed combining the keywords "silver" or "CuO" or "ZnO" and "nano*" and "application category". The search was done on 22.03.2013

Table S2 The test species that were used the most often for determining the L(E)C50 and MIC values (Tables S3-S7) in the analysed literature

Table S3 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for silver nanoparticles for various organisms.

Table S4 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for silver salt for various organisms

Table S5 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for CuO nanoparticles for various organisms

Table S6 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for copper salt for various organisms

Table S7 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for ZnO nanoparticles for various organisms

Table S8 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for zinc salt for various organisms

Table S1 Total number of publications in Thomson Reuters ISI Web of Science for different applications of Ag, ZnO and CuO nanoparticles. Search was performed combining the keywords "silver" or "CuO" or "ZnO" and "nano*" and "application category". The search was done on 22.03.2013

Application area	**Ag NPs**	**CuO NPs**	**ZnO NPs**
Hydrogen storage	63	24	65
Environmental remediation	38	9	18
Catalysis	1012	138	406
Drug delivery	379	10	92
Medical imaging	51	1	8
Photovoltaic	103	1	176
Textiles	297	9	129
Therapeutics	55	0	4
Reinforced composites	50	23	48
Electronics	514	13	323
Optics	631	5	171
Coatings and pigments	10	2	23
Cosmetics	65	5	57
Ceramics applications	85	12	111
Anti-oxidants	5	0	0
Lubrication	36	5	12
Sensors	1915	341	2395
Absorbents	20	2	16
Energetics	48	3	37
Magnetics	53	3	30
Water purification	125	10	57
Air emissions reduction	10	4	12
Natural and green products	10	1	0
Quantum computing	17	2	8
Masonry and building materials	0	0	0
Photonics	183	2	105
Surfactants	447	45	217
Antimicrobials	1477	25	120

Table S2 The test species that were used the most often for determining the L(E)C50 and MIC values (Tables S3-S7) in the analysed literature

Organisms	Ag NPs	CuO NPs	ZnO NPs
Crustaceans	***17 LC50 values*** *Daphnia magna (13); D. pulex (2); Ceriodaphnia dubia (2)*	***8 LC50 values*** *Daphnia magna (6); D. pulex (1); Thamnocephalus platyurus (1)*	***10 LC50 values*** *Daphnia magna (10)*
Algae	***17 EC50 values*** *Pseudokirchneriella subcapitata (8); Chlamydomonas reinhardtii (5); Chlorella vulgaris (1); Chattonella marina (1); Dunaliella tertiolecta (1); Ochromonas danica (1)*	***5 EC50 values*** *Pseudokirchneriella subcapitata (8); Chlamydomonas reinhardtii (5); Chlorella vulgaris (1); Chattonella marina (1); Dunaliella tertiolecta (1); Ochromonas danica (1)*	***5 EC50 values*** *Pseudokirchneriella subcapitata (3); Thalassiosira pseudonana (1); Skeletonema costatum (1)*
Fish	***17 LC50 values*** *Oryzias latipes (8); Pimephales promelas (5); Danio rerio embryos (3); Oreochromis mossambicus (1)*	***1 LC50 values*** *Cyprinus carpio (1)*	***4 LC50 values*** *Danio rerio (adult)(2); D. rerio embryo (2)*
Nematodes	***21 (L(E)C50 values*** *Caenorhabditis elegans (21)*	***0 (L(E)C50 values***	***6 (L(E)C50 values*** *Caenorhabditis elegans (6)*
Bacteria	***46 MIC (minimal inhibitory concentration) values*** *Escherichia coli (12); Staphylococcus aureus (12); Bacillus subtilis (4); Pseudomonas aeruginosa (4); Shewanella oneidensis (2); Aggregatibacter actinomycetemcomitans (1); Enterococcus faecalis (1); E. faecium (1); Fusobacterium nucleatum (1); Klebsiella aerogenes (1); K. pneumoniae (1); Salmonella abony (1); S. typhimurium (1); Porphyromonas gingivalis (1); Prevotella intermedia (1); Proteus vulgaris (1); Streprococcus mutans (1)*	***13 MIC values*** *Escherichia coli (5); Staphylococcus aureus (3); Aggregatibacter actinomycetemcomitans (1); Bacillus subtilis (1); Fusobacterium nucleatum (1); Porphyromonas gingivalis (1); Prevotella intermedia (1)*	***15 MIC values*** *Escherichia coli (5); Campylobacter jejuni (2); Staphylococcus aureus (2); Aggregatibacter actinomycetemcomitans (1); Fusobacterium nucleatum (1); Klebsiella pneumoniae (1); Streptococcus mutans (1); Porphyromonas gingivalis (1); Prevotella intermedia (1)*
Yeast/ fungi	***14 L(E)C50 values*** *Saccharomyces cerevisiae (4); Candida albicans (3); C. krusei (1); C. parapsilosis (1); C. tropicalis (1); Malassezia sympodialis (1); T. mentagrophytes (1)*	***4 L(E)C50 values*** *Saccharomyces cerevisiae (4)*	***7 L(E)C50 values*** *Aspergillus niger (1); Fusarium oxysporum (1); Penicillium expansum (1); Botrytis cinerea (1); Candida albicans (1); Saccharomyces cerevisiae (2)*
Mammalian cells in vitro	***29 EC50 values*** *THP-1 (9); HepG2 (7); A549 (4); MCF-7 (3); SGC-7901 (3); murine osteoblasts (2)*	***21 EC50 values*** *A549 (11); Caco-2 (4); Hep G2 (2); human keratinocytes (1); human sebocytes (1); RAW 264.7 (1)*	***25 EC50 values*** *A549 cells (6); Ana-1 (4); MH-S (4); BEAS-2B (2); Neuro.2A (2); rat alveolar epithelial cells (2); RAW 264.7 (2); HeLa (1); HEK296 (1); human skin fibroblasts (1); rat liver mitochondria (1)*
Vibrio fischeri	***2 EC50 values*** *Vibrio fischeri (2)*	***4 EC50 values*** *Vibrio fischeri (4)*	***4 EC50 values*** *Vibrio fischeri (4)*
Protozoa	***7 EC50 values*** *Paramecium caudatum (4); Tetrahymena thermophila (3)*	***6 EC50 values*** *Paramecium caudatum (4); Tetrahymena thermophila (3)*	***9 EC50 values*** *Tetrahymena thermophila (8); Paramecium multimicronucleatum (1)*

Table S3 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for **silver nanoparticles** for various organisms. Data in Tables S3-S8 are arranged according to the decreasing sensitivity (increasing median L(E)C50 values) of test organisms to silver nanoparticles

Species	**Exposure time and endpoint**	**EC50 on compound basis, mg/L**	**EC50 on metal basis, mg Ag/L**	**Primary size (method used for determination), coating**	**Test medium***	**Reference**
Crustaceans: Median (min-max) L(E)C50		0.01 (0.001-0.04)	0.01 (0.001-0.04)			
Daphnia magna	48 h LC50	0.007	0.007	10 nm (provider), uncoated	mineral medium	Hoheisel et al. 2012
Daphnia magna	48 h LC50	0.01	0.01	20 nm (provider), uncoated	mineral medium	Hoheisel et al. 2012
Daphnia magna	48 h LC50	0.02	0.02	30 nm (provider), uncoated	mineral medium	Hoheisel et al. 2012
Daphnia magna	48 h LC50	0.03	0.03	50 nm (provider), uncoated	mineral medium	Hoheisel et al. 2012
Ceriodaphnia dubia	48 h LC50	0.005	0.005	21 ± 4 nm (TEM), citrate	mineral medium	Kennedy et al. 2012
Ceriodaphnia dubia	48 h LC50	0.03	0.03	102 ± 6 nm (TEM), citrate	mineral medium	Kennedy et al. 2012
Daphnia magna	24 h EC50	0.01	0.01	<100 nm (provider), uncoated	mineral medium	Jo et al. 2012
Daphnia magna	24 h LC50	0.01	0.01	35-50 (TEM), PVP	mineral medium	Poynton et al. 2012
Daphnia magna	24 h LC50	0.004	0.004	35 (TEM), citrate	mineral medium	Poynton et al. 2012
Daphnia magna	48 h LC50	0.03	0.03	< 100 nm (TEM), lactate	mineral medium	Zhao and Wang 2012
Daphnia magna	48 h LC50	0.002	0.002	10-20 nm (TEM), PVP	mineral medium	Zhao and Wang 2012
Daphnia magna	48 h LC50	0.001	0.001	10-20 nm (TEM), sodium dodecylbenzene sulfonate	mineral medium	Zhao and Wang 2012

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
Daphnia magna	48 h EC50	0.001	0.001	60 nm (provider), uncoated	mineral medium	Kim et al. 2011
Daphnia magna	48 h EC50	0.002	0.002	300 nm (provider), uncoated	mineral medium	Kim et al. 2011
Daphnia pulex	48 h, LC50	0.04	0.04	26.6 ± 8.8 (SEM)	mineral medium	Griffitt et al. 2008
Daphnia magna	48 h EC50	0.02	0.02	8.4 ± 2.8 (TEM), PVP	mineral medium	Blinova et al. 2012
Daphnia magna	48 h EC50	0.04	0.04	12.5 ± 4.0 (TEM), protein	mineral medium	Blinova et al. 2012
Algae: Median (min-max) L(E)C50		0.36 (0.005-21.20)	0.36 (0.005-21.20)			
Raphidocelis subcapitata (Pseudokirchneriella subcapitata)	4.5 h EC50	21.20	21.20	35 nm (provider), uncoated	mineral medium	Wang et al. 2012a
Raphidocelis subcapitata (Pseudokirchneriella subcapitata)	4.5 h EC50	4.01	4.01	80 nm (provider), PVP	mineral medium	Wang et al. 2012a
Raphidocelis subcapitata (Pseudokirchneriella subcapitata)	4.5 h EC50	0.90	0.90	15 nm (provider), with a dispersant	mineral medium	Wang et al. 2012a
Chlamydomonas reinhardtii	1 h EC50	0.36	0.36	25 ± 13 nm (DLS, TEM), carbonate	mineral medium	Navarro et al. 2008
Chlamydomonas reinhardtii	2 h EC50	0.11	0.11	25 ± 13 nm (DLS, TEM), carbonate	mineral medium	Navarro et al. 2008
Chlamydomonas reinhardtii	3 h EC50	0.095	0.095	25 ± 13 nm (DLS, TEM), carbonate	mineral medium	Navarro et al. 2008
Chlamydomonas reinhardtii	4 h EC50	0.086	0.086	25 ± 13 nm (DLS, TEM), carbonate	mineral medium	Navarro et al. 2008
Chlamydomonas reinhardtii	5 h EC50	0.089	0.089	25 ± 13 nm (DLS, TEM), carbonate	mineral medium	Navarro et al. 2008
Pseudokirchneriella subcapitata	96 h IC50	1.60	1.60	25.4 nm (provider), uncoated	natural water	McLaughlin and Bonzongo 2011

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
Pseudokirchneriella subcapitata	96 h IC50	0.023	0.023	25.4 nm (provider), uncoated	natural water	McLaughlin and Bonzongo 2011
Pseudokirchneriella subcapitata	96 h IC50	0.0046	0.0046	25.4 nm (provider), uncoated	mineral medium	McLaughlin and Bonzongo 2011
Pseudokirchneriella subcapitata	96 h EC50	0.020	0.020	41 nm (TEM), PVP	mineral medium	Kennedy et al. 2010
Chlorella vulgaris	24 h EC50	8.9**	8.9**	50 nm (provider), uncoated	mineral medium	Oukarroum et al. 2012
Dunaliella tertiolecta	24 h EC50	2.0**	2.0**	50 nm (provider), uncoated	complex medium	Oukarroum et al. 2012
Ochromonas danica	48 h EC50	20.8**	20.8**	90% of the particles were in the 1-10 nm range (provider), carboxy-functionalized	complex medium	Miao et al. 2010
Chattonella marina	1 h EC50	1.7**	1.7**	56 ± 5 nm (DLS), citrate stabilized	complex medium	He et al. 2012
Pseudokirchneriella subcapitata	96 h EC50	0.19	0.19	20-30 nm (provider), sodium citrate stabilized	mineral medium	Griffitt et al. 2008
Fish: Median (min-max) L(E)C50		1.36 (0.03-12.6)	1.36 (0.03-12.6)			
Oryzias latipes	48 h LC50	1.38	1.38	29.9 nm (TEM), PVP	water	Wu and Zhou 2013
Oryzias latipes	72 h LC50	1.12	1.12	29.9 nm (TEM), PVP	water	Wu and Zhou 2013
Oryzias latipes	96 h LC50	0.87	0.87	29.9 nm (TEM), PVP	water	Wu and Zhou 2013
Pimephales promelas	96 h LC50	0.09	0.09	10 nm (provider)	water	Hoheisel et al. 2012
Danio rerio	96 h EC50	1.61	1.61	35 nm (provider)	water	Wang et al. 2012a
Danio rerio	96 h EC50	1.36	1.36	80 nm (provider), PVP	water	Wang et al. 2012a

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
Danio rerio	96 h EC50	0.78	0.78	15 nm (provider)	water	Wang et al. 2012a
Oryzias latipes	72 h LC50	10.0**	10.0**	10 nm (provider), PVP	water	Kwok et al. 2012
Oryzias latipes	72 h LC50	2.50**	2.50**	50 nm (provider), PVP	water	Kwok et al. 2012
Oryzias latipes	72 hLC50	10.0**	10.0**	7 nm (provider), citrate	water	Kwok et al. 2012
Oryzias latipes	96 h LC50	1.39	1.39	3.6 nm (provider)	water	Kashiwada et al. 2012
Oreochromis mossambicus	8 d LC50	12.6	12.6	<100 nm (TEM), citrate	water	Govindasamy and Rahuman 2012
Pimephales promelas	96 h LC50	9.40	9.40	35 nm (provider)	water	Laban et al. 2010
Pimephales promelas	96 h LC50	1.25	1.25	35 nm (provider)	water	Laban et al. 2010
Pimephales promelas	96 h LC50	10.6	10.6	>100 nm (provider)	water	Laban et al. 2010
Pimephales promelas	96 h LC50	1.36	1.36	>100 nm (provider)	water	Laban et al. 2010
Oryzias latipes	96 h LC50	0.03	0.03	49.6 (TEM)	water	Chae et al. 2009
Nematode: Median (min-max) L(E)C50		3.34 (0.1-55)	3.34 (0.1-55)			
Caenorhabditis elegans	72 h EC50	13.4	13.4	1 nm	mineral medium	Ellegaard-Jensen et al. 2012
Caenorhabditis elegans	72 h EC50	2.80	2.80	28 nm, PVP	mineral medium	Ellegaard-Jensen et al. 2012
Caenorhabditis elegans	72 h EC50	0.10**	0.10**	<100 nm	mineral medium	Lim et al. 2012

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
Caenorhabditis elegans	72 h EC50	55.0	55.0	50.6 nm (TEM), citrate	complex medium	Kim et al. 2012
Caenorhabditis elegans	72 h EC50	1.40	1.40	8 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	0.86	0.86	8 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	1.83	1.83	38 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	0.38	0.38	38 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	49.9	49.9	21 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	4.31	4.31	21 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	45.0	45.0	75 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	11.6	11.6	75 nm, PVP	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	39.8	39.8	7 nm, citrate	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	3.34	3.34	7 nm, citrate	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	0.86	0.86	5 nm, GA	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	0.10	0.10	5 nm, GA	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	1.51	1.51	5 nm, GA	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	0.29	0.29	5 nm, GA	mineral medium	Yang et al. 2012

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
Caenorhabditis elegans	72 h EC50	~25.0	25.0**	25 nm, PVP	mineral medium	Meyer et al. 2010
Caenorhabditis elegans	72 h EC50	~25.0	25.0**	50 nm, PVP	mineral medium	Meyer et al. 2010
Caenorhabditis elegans	72 h EC50	~25.0	25.0**	5 nm, citrate	mineral medium	Meyer et al. 2010
Bacteria: Median (min-max) minimal inhibitory concentration (MIC)		7.1 (0.5-250)	7.1 (0.5-250)			
Prevotella intermedia	48 h MIC	100	100	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Porphyromonas gingivalis	48 h MIC	250	250	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Fusobacterium nucleatum	48 h MIC	100	100	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Aggregatibacter actinomycetemcomitans	48 h MIC	100	100	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Streptococcus mutants	24 h MIC	4.9	4.9	25 nm (TEM), PVP	complex medium	Hernández-Sierra et al. 2008
Staphylococcus aureus	24 h MIC	10	10	10 nm (TEM), PVP	complex medium	Cho et al. 2005
Escherichia coli	24 h MIC	10	10	10 nm (TEM), PVP	complex medium	Cho et al. 2005
Escherichia coli	24 h MIC	6.3	6.3	7 nm (TEM)	complex medium	Martínez-Castanón et al. 2008
Escherichia coli	24 h MIC	13	13	29 nm (TEM)	complex medium	Martínez-Castanón et al. 2008
Escherichia coli	24 h MIC	11.8	11.8	89 nm (TEM)	complex medium	Martínez-Castanón et al. 2008
Staphylococcus aureus	24 h MIC	7.5	7.5	7 nm (TEM)	complex medium	Martínez-Castanón et al. 2008

Species	**Exposure time and endpoint**	**EC50 on compound basis, mg/L**	**EC50 on metal basis, mg Ag/L**	**Primary size (method used for determination), coating**	**Test medium***	**Reference**
Staphylococcus aureus	24 h MIC	16.7	16.7	29 nm (TEM)	complex medium	Martínez-Castanón et al. 2008
Staphylococcus aureus	24 h MIC	33.7	33.7	89 nm (TEM)	complex medium	Martínez-Castanón et al. 2008
Pseudomonas aeruginosa, Bacillus subtilis, Salmonella abony, Salmonella typhimurium, Klebsiella aerogenes, Proteus vulgaris, Bacillus subtilis, Staphylococcus epidermidis, Escherichia coli	24 h MIC	6.3	6.3	7-20 nm, biostabilized	complex medium	Jain et al. 2009
Staphylococcus aureus,	24 h MIC	12.5	12.5	7-20 nm, biostabilized	complex medium	Jain et al. 2009
Escherichia coli (4 different strains)	MIC	40-180	40-180	3.3 nm (TEM)	complex medium	Ruparelia et al. 2008
Bacillus subtilis	MIC	40	40	3.3 nm (TEM)	complex medium	Ruparelia et al. 2008
Staphylococcus aureus (3 different strains)	MIC	120	120	3.3 nm (TEM)	complex medium	Ruparelia et al. 2008
Escherichia coli	8 h MIC	2	2	4 nm (TEM), biogenic	complex medium	Suresh et al. 2010
Bacillus subtilis	8 h MIC	0.5	0.5	4 nm (TEM), biogenic	complex medium	Suresh et al. 2010
Shewanella oneidensis	8 h MIC	3	3	4 nm (TEM), biogenic	complex medium	Suresh et al. 2010
Escherichia coli	8 h MIC	6	6	<20 nm	complex medium	Suresh et al. 2010
Bacillus subtilis	8 h MIC	2	2	<20 nm	complex medium	Suresh et al. 2010
Shewanella oneidensis	8 h MIC	6.5	6.5	<20 nm	complex medium	Suresh et al. 2010
Enterococcus faecalis	24 h MIC	13.5	13.5	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
Staphylococcus aureus	24 h MIC	6.8	6.8	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006
Escherichia coli	24 h MIC	3.4	3.4	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006
Pseudomonas aeruginosa (2 different strains)	24 h MIC	3.4-6.8	3.4-6.8	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006
Staphylococcus epidermidis	24 h MIC	1.6	1.6	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006
Staphylococcus aureus	24 h MIC	6.8	6.8	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006
Enterococcus faecium	24 h MIC	13.5	13.5	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006
Klebsiella pneumoniae	24 h MIC	6.8	6.8	25 nm (TEM), mono and disaccharides	complex medium	Panáček et al. 2006
Yeast/fungi: Median (min-max) L(E)C50		7.90 (0.88-48.5)	7.90 (0.88-48.5)			
Saccharomyces cerevisiae	MIC	48.5	48.5	8.6 nm (TEM)	complex medium	Debabrata and Giasuddin 2013
Candida albicans, Candida glabrata	48 h MIC	0.88**	0.88**	50 nm (provider)	complex medium	Brandt et al. 2012
Malassezia sympodialis	48 h MIC	8.80**	8.80**	50 nm (provider)	complex medium	Brandt et al. 2012
Saccharomyces cerevisiae	IC30	15.1	15.1	5-10 nm	complex medium	Niazi et al. 2011
Saccharomyces cerevisiae	MIC	20.0**	20.0**	5-10 nm	complex medium	Niazi et al. 2011
Candida glabrata	24 h IC50	13.5**	13.5**	5-60 nm	complex medium	Monteiro et al. 2012
Saccharomyces cerevisiae	48 h MIC	2.0	2.0	3 nm (TEM)	complex medium	Kim et al. 2009a

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
Candida albicans	48 h MIC	2.0	2.0	3 nm (TEM)	complex medium	Kim et al. 2009a
Candida albicans	24 h IC80	2-4	2-4	3 nm (TEM)	complex medium	Kim et al. 2008
Candida tropicalis	24 h IC80	7.0	7.0	3 nm (TEM)	complex medium	Kim et al. 2008
Candida glabrata	24 h IC80	1-7	1-7	3 nm (TEM)	complex medium	Kim et al. 2008
Candida parapsilosis	24 h IC80	4-25	4-25	3 nm (TEM)	complex medium	Kim et al. 2008
Candida krusei	24 h IC50	13.0	13.0	3 nm (TEM)	complex medium	Kim et al. 2008
Trichophyton mentagrophytes	24 h IC50	1-4	1-4	3 nm (TEM)	complex medium	Kim et al. 2008
Mammalian cells in vitro: Median (min-max) L(E)C50		11.3 (0.5-140)	11.3 (0.5-140)			
Murine osteoclasts	IC50 (time not specified)	14	14	50 nm	not specified	Albers et al. 2012
Murine osteoblasts	IC50 (time not specified)	1	1	50 nm	not specified	Albers et al. 2012
A549 cells	24 h IC50	11.25	11.25	30-50 nm (provider), PVP	complex medium	Foldbjerg et al. 2011
A549 cells	24 h IC50	7.50	7.50	30-50 nm (provider), PVP	complex medium	Foldbjerg et al. 2011
THP-1 cells	24 h EC50	2.44	2.44	69 ± 3 nm (TEM), PVP	complex medium	Foldbjerg et al. 2009
HepG2 cells	28 h IC50	3.38	3.38	<10 nm (TEM), uncoated	complex medium	Kim et al. 2009b
HepG2 cells	28 h IC50	1.95	1.95	<10 nm (TEM), uncoated	complex medium	Kim et al. 2009b

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
HepG2 cells	28 h IC50	0.53	0.53	<10 nm (TEM), uncoated	complex medium	Kim et al. 2009b
THP-1 cells- derived macrophages	24 h IC50	110	110	20 nm (TEM), peptides	complex medium	Haase et al. 2012
THP-1 cells- derived macrophages	48 h IC50	18	18	20 nm (TEM), peptides	complex medium	Haase et al. 2012
THP-1 cells- derived macrophages	24 h IC50	140	140	40 nm (TEM), peptides	complex medium	Haase et al. 2012
THP-1 cells- derived macrophages	48 h IC50	30	30	40 nm (TEM), peptides	complex medium	Haase et al. 2012
A549 cells	24 h EC50	1.0	1.0	5 nm (TEM), PVP	complex medium	Liu et al. 2010
A549 cells	24 h EC50	10.0	10.0	20 nm (TEM), PVP	complex medium	Liu et al. 2010
A549 cells	24 h EC50	13.3	13.3	50 nm (TEM), PVP	complex medium	Liu et al. 2010
HepG2 cells	24 h EC50	0.59	0.59	5 nm (TEM), PVP	complex medium	Liu et al. 2010
HepG2 cells	24 h EC50	25.5	25.5	20 nm (TEM), PVP	complex medium	Liu et al. 2010
HepG2 cells	24 h EC50	33.6	33.6	50 nm (TEM), PVP	complex medium	Liu et al. 2010
MCF-7 cells	24 h EC50	0.5	0.5	5 nm (TEM), PVP	complex medium	Liu et al. 2010
MCF-7 cells	24 h EC50	14.3	14.3	20 nm (TEM), PVP	complex medium	Liu et al. 2010
MCF-7 cells	24 h EC50	47.6	47.6	50 nm (TEM), PVP	complex medium	Liu et al. 2010
SGC-7901 cells	24 h EC50	9.9	9.9	5 nm (TEM), PVP	complex medium	Liu et al. 2010

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Ag/L	Primary size (method used for determination), coating	Test medium*	Reference
SGC-7901 cells	24 h EC50	50.9	50.9	20 nm (TEM), PVP	complex medium	Liu et al. 2010
SGC-7901 cells	24 h EC50	112.0	112.0	50 nm (TEM), PVP	complex medium	Liu et al. 2010
HepG2 cells	24 h IC50	2.9	2.9	5-10 nm (provider)	complex medium	Nowrouzi et al. 2010
Vibrio fischeri: Median (min-max) L(E)C50		32 (29-35)	32 (29-35)			
Vibrio fischeri	30 min EC50	35	35	10-25 nm (TEM), uncoated	mineral medium	Binaeian et al. 2012
Vibrio fischeri	30 min EC50	29	29	50-100 nm (TEM), uncoated	mineral medium	Binaeian et al. 2012
Protozoa: Median (min-max) L(E)C50		38.0 (1.46-286)	38.0 (1.46-286)			
Tetrahymena thermophila	24 h EC50	205.0	205.0	<100 nm (provider), uncoated	water	Juganson et al. 2013
Tetrahymena thermophila	2 h EC50	286.0	286.0	<100 nm (provider), uncoated	water	Juganson et al. 2013
Tetrahymena pyriformis	24 h IC50	1.46	1.46	9 ± 1.6 nm (TEM), ATP stabilized	complex medium	Shi et al. 2012
Paramecium caudatum	1 h LC50	39.0	39.0	40 nm (DLS), uncoated	aqueous medium	Kvitek et al. 2009
Paramecium caudatum	1 h LC50	16.0	16.0	40 nm (DLS), Tween 80 (1% w/w)	aqueous medium	Kvitek et al. 2009
Paramecium caudatum	1 h LC50	38.0	38.0	40 nm (DLS), PEG 35000 (1% w/w)	aqueous medium	Kvitek et al. 2009
Paramecium caudatum	1 h LC50	36.0	36.0	40 nm (DLS), PVP 360 (1% w/w)	aqueous medium	Kvitek et al. 2009

DLS – dynamic light scattering; GA – gum arabic; PVP – polyvinylpyrrolidone; SEM – scanning electron microscopy; TEM – transmission electron microscopy

*Mineral medium - without organic components; Complex medium - with organic components; ** estimated value

Table S4 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for **silver salt** for various organisms

Species	Exposure time and endpoint	EC50 on metal basis, mg Ag/L	Tested as (compound)	Test medium*	Reference
Crustaceans: Median (min-max) L(E)C50		0.0009 (0.0005-0.008)			
Daphnia magna	48 h LC50	0.001	$AgNO_3$	mineral medium	Hoheisel et al. 2012
Ceriodaphnia dubia	48 h LC50	0.0007	$AgNO_3$	mineral medium	Kennedy et al. 2012
Daphnia magna	24 h EC50	0.002	$AgNO_3$	mineral medium	Jo et al. 2012
Daphnia magna	24 h LC50	0.0007	$AgNO_3$	mineral medium	Poynton et al. 2012
Daphnia magna	48 h LC50	0.0006	$AgNO_3$	mineral medium	Zhao and Wang 2012
Daphnia magna	48 h EC50	0.0005	$AgNO_3$	mineral medium	Kim et al. 2011
Daphnia pulex	48 h LC50	0.008	$AgNO_3$	mineral medium	Griffitt et al. 2008
Daphnia magna	48 h EC50	0.002	$AgNO_3$	mineral medium	Blinova et al. 2012
Algae: Median (min-max) L(E)C50		0.008 (0.0013-0.59)			
Raphidocelis subcapitata (Pseudokirchneriella subcapitata)	4.5 h EC50	0.031	$AgNO_3$	mineral medium	Wang et al. 2012a
Chlamydomonas reinhardtii	1 h EC50	0.020	$AgNO_3$	mineral medium	Navarro et al. 2008
Chlamydomonas reinhardtii	2 h EC50	0.020	$AgNO_3$	mineral medium	Navarro et al. 2008
Pseudokirchneriella subcapitata	96 h EC50	0.010	$AgNO_3$	mineral medium	Kennedy et al. 2010

Species	Exposure time and endpoint	EC50 on metal basis, mg Ag/L	Tested as (compound)	Test medium*	Reference
Ochromonas danica	48 h EC50	0.005	not specified	complex medium	Miao et al. 2010
Chattonella marina	1 h EC50	0.59**	$AgNO_3$	complex medium	He et al. 2012
Chlamydomonas reinhardtii	24 h EC50	0.0016	$AgNO_3$	mineral medium	Hiriart-Baer et al. 2006
Pseudokirchneriella subcapitata	24 h EC50	0.0024	$AgNO_3$	mineral medium	Hiriart-Baer et al. 2006
Chlamydomonas reinhardtii	6 h EC50	0.0013	$AgNO_3$	mineral medium	Lee et al. 2005
Pseudokirchneriella subcapitata	6 h EC50	0.0028	$AgNO_3$	mineral medium	Lee et al. 2005
Fish: Median (min-max) L(E)C50		0.058 (0.005-0.15)			
Pimephales promelas	96 h LC50	0.005	$AgNO_3$	water	Hoheisel et al. 2012
Danio rerio	96 h LC50	0.08	$AgNO_3$	water	Wang et al. 2012a
Oryzias latipes	72 h LC50	0.15	$AgNO_3$	water	Kwok et al. 2012
Oryzias latipes	96 h LC50	0.04	$AgNO_3$	water	Chae et al. 2009
Nematode: Median (min-max) L(E)C50		4.77 (0.06-22)			
Caenorhabditis elegans	24 h LC50	22.0	$AgNO_3$	complex medium	Kim et al. 2012
Caenorhabditis elegans	72 h EC50	6.36	$AgNO_3$	mineral medium	Yang et al. 2012
Caenorhabditis elegans	72 h EC50	0.06	$AgNO_3$	mineral medium	Yang et al. 2012

Species	Exposure time and endpoint	EC50 on metal basis, mg Ag/L	Tested as (compound)	Test medium*	Reference
Caenorhabditis elegans	72 h EC50	3.17	$AgNO_3$	mineral medium	Meyer et al. 2010
Bacteria: Median (min-max) minimal inhibitory concentration (MIC)		3.3 (0.004-108)			
Escherichia coli	Overnight MIC	0.5	$AgNO_3$	complex medium	Greulich et al. 2012
Escherichia coli	Overnight MIC	3.3	$AgNO_3$	complex medium	Greulich et al. 2012
Staphyloccus aureus (2 different isolates)	Overnight MIC	0.5-2.5	$AgNO_3$	complex medium	Greulich et al. 2012
Escherichia coli	8 h MIC	4.9	$AgNO_3$	complex medium	Suresh et al. 2010
Bacillus subtilis	8 h MIC	3.2	$AgNO_3$	complex medium	Suresh et al. 2010
Shewanella oneidensis	8 h MIC	5.2	$AgNO_3$	complex medium	Suresh et al. 2010
Pseudomonas aeruginosa (2 different isolates)	Overnight MIC	1.1-110	$AgNO_3$	complex medium	Shakibaie and Harati 2004
Legionella pneumophila	12 h MIC	0.04	AgCl	not specified	Lin et al. 1996
Enterococcus faecalis	24 h MIC	6.8	$AgNO_3$	complex medium	Panáček et al. 2006
Staphylococcus aureus	24 h MIC	6.8	$AgNO_3$	complex medium	Panáček et al. 2006
Escherichia coli	24 h MIC	1.7	$AgNO_3$	complex medium	Panáček et al. 2006
Pseudomonas aeruginosa	24 h MIC	0.9	$AgNO_3$	complex medium	Panáček et al. 2006
Pseudomonas aeruginosa	24 h MIC	0.8	$AgNO_3$	complex medium	Panáček et al. 2006

Species	Exposure time and endpoint	EC50 on metal basis, mg Ag/L	Tested as (compound)	Test medium*	Reference
Staphylococcus epidermidis	24 h MIC	0.8	$AgNO_3$	complex medium	Panáček et al. 2006
Staphylococcus aureus	24 h MIC	6.8	$AgNO_3$	complex medium	Panáček et al. 2006
Enterococcus faecium	24 h MIC	3.4	$AgNO_3$	complex medium	Panáček et al. 2006
Klebsiella pneumonia	24 h MIC	3.4	$AgNO_3$	complex medium	Panáček et al. 2006
Legionella pneumophila	24 h MIC	0.06	$AgNO_3$	water	Unger and Lück 2012
Staphylococcus aureus	24 h MIC	0.06	$AgNO_3$	water	Unger and Lück 2012
Pseudomonas aeruginosa	24 h MIC	0.02	$AgNO_3$	water	Unger and Lück 2012
Escherichia coli	24 h MIC	0.004	$AgNO_3$	water	Unger and Lück 2012
Staphylococcus aureus (2 different isolates)	20 h MIC	12.5	$AgNO_3$	complex medium	Zhao et al. 1998
Escherichia coli	20 h MIC	12.5	$AgNO_3$	complex medium	Zhao et al. 1998
Pseudomonas aeruginosa	20 h MIC	12.5	$AgNO_3$	complex medium	Zhao et al. 1998
Yeast/fungi: Median (min-max) L(E)C50		2.16 (0.22-10.0)			
Saccharomyces cerevisiae	IC30	5.04	$AgNO_3$	complex medium	Niazi et al. 2011
Saccharomyces cerevisiae	MIC	10.0**	$AgNO_3$	complex medium	Niazi et al. 2011
Saccharomyces cerevisiae	24 h IC50	2.16	$AgNO_3$	complex medium	Jin et al. 2008

Species	Exposure time and endpoint	EC50 on metal basis, mg Ag/L	Tested as (compound)	Test medium*	Reference
Saccharomyces cerevisiae	96 h IC50	0.22	$AgNO_3$	complex medium	Ershov et al. 1997
Saccharomyces cerevisiae	96 h MIC	0.54	$AgNO_3$	complex medium	Ershov et al. 1997
Mammalian cells in vitro: Median (min-max) L(E)C50		2.0 (0.62-14)			
Human mesenchymal stem cells	24 h IC50	2.0	$AgC_2H_3O_2$	complex medium	Greulich et al. 2012
human peripheral blood mononuclear cells	24 h IC50	2.0	$AgC_2H_3O_2$	complex medium	Greulich et al. 2012
Murine osteoblasts	IC50 (time not specified)	1	$AgNO_3$	not specified	Albers et al. 2012
Murine osteoclasts	IC50 (time not specified)	14	$AgNO_3$	not specified	Albers et al. 2012
A549 cells	24 h IC50	5.5	$AgNO_3$	complex medium	Foldbjerg et al. 2011
THP-1 cells	24 h EC50	0.62	$AgNO_3$	complex medium	Foldbjerg et al. 2009
HepG2 cells	28 h IC50	1.4	$AgNO_3$	complex medium	Kim et al. 2009b
HepG2 cells	28 h IC50	1.8	$AgNO_3$	complex medium	Kim et al. 2009b
HepG2 cells	28 h IC50	0.8	$AgNO_3$	complex medium	Kim et al. 2009b
A549 cells	24 h EC50	2.3	$AgNO_3$	complex medium	Liu et al. 2010
HepG2 cells	24 h EC50	0.7	$AgNO_3$	complex medium	Liu et al. 2010
MCF-7 cells	24 h EC50	1.2	$AgNO_3$	complex medium	Liu et al. 2010

Species	Exposure time and endpoint	EC50 on metal basis, mg Ag/L	Tested as (compound)	Test medium*	Reference
SGC-7901 cells	24 h EC50	2.1	$AgNO_3$	complex medium	Liu et al. 2010
primary human endometrial epithelial cells	24 h TC50	3.9	Ag_2SO_4	complex medium	Wu et al. 2012
Caco-2 cells (proliferating)	24 h IC50	1.5**	$AgNO_3$	complex medium	Böhmert et al. 2012
Caco-2 cells (proliferating)	48 h IC50	1.5**	$AgNO_3$	complex medium	Böhmert et al. 2012
Caco-2 cells (differentiated)	24 h IC50	7.5**	$AgNO_3$	complex medium	Böhmert et al. 2012
Caco-2 cells (differentiated)	48 h IC50	3.5**	$AgNO_3$	complex medium	Böhmert et al. 2012
Vibrio fischeri: Median (min-max) EC50		5.7 (1.9-9.5)			
Vibrio fischeri	30 min EC50	1.9	$AgNO_3$	mineral medium	Binaeian et al. 2012
Vibrio fischeri	5 min EC50	9.5	$AgNO_3$	mineral medium	Hsieh et al. 2004
Protozoa: Median (min-max) L(E)C50		1.50 (1.46-1.8)			
Tetrahymena thermophila	24 h EC50	1.5	$AgNO_3$	water	Juganson et al. 2013
Tetrahymena thermophila	2 h EC50	1.8	$AgNO_3$	water	Juganson et al. 2013
Tetrahymena pyriformis	24 h IC60	1.46**	$AgNO_3$	complex medium	Shi et al. 2012

*Mineral medium - without organic components; Complex medium - with organic components; ** estimated value

Table S5 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for **CuO nanoparticles** for various organisms

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Cu/L	Primary size (method used for determination), coating	Test medium*	Reference
Crustaceans: Median (min-max) L(E)C50		2.1 (0.08-12.3)	1.7 (0.06-9.8)			
Daphnia magna	24 h EC50	0.10	0.078	<100 nm (provider), uncoated	mineral medium	Jo et al. 2012
Daphnia magna	48 h LC50	3.2	2.56	30 nm (provider), uncoated	mineral medium	Heinlaan et al. 2008
Daphnia magna	48 h EC50	3.3	2.6	30 nm (provider), uncoated	mineral medium	Blinova et al. 2010
Thamnocephalus platyurus	24 h LC50	12.3	9.80	30 nm (provider), uncoated	mineral medium	Manusadžianas et al. 2012
Daphnia magna	48 h EC50	5.9	4.72	<50 nm (provider), uncoated	mineral medium	Sovova et al. 2009
Daphnia pulex	48 h LC50	0.08	0.06	15-45 nm (provider), uncoated	mineral medium	Griffitt et al. 2008
Daphnia magna	48 h LC50	0.99	0.79	40 nm (provider), uncoated	mineral medium	Zhao et al. 2012
Daphnia magna	48 h EC50	0.46	0.37	40 nm (provider), uncoated	mineral medium	Zhao et al. 2012
Algae: Median (min-max) L(E)C50		2.80 (0.68-47.0)	2.24 (0.54-37.55)			
Pseudokirchneriella subcapitata	96 h EC50	0.68	0.54	15-45 nm (provider), uncoated	mineral medium	Griffitt et al. 2008
Nitellopsis obtusa	96 h LC50	2.80	2.24	< 50 nm (mean ~30 nm) (provider), uncoated	mineral medium	Manusadžianas et al. 2012
Chlorella spp.	30 min IC50	47.0	37.55	< 50 nm (mean ~30 nm) (provider), uncoated	mineral medium	Manusadžianas et al. 2012
Pseudokirchneriella subcapitata	72 h EC50	0.89	0.71	mean 30 nm (provider), uncoated	complex medium	Aruoja et al. 2009

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Cu/L	Primary size (method used for determination), coating	Test medium*	Reference
Chlamydomonas reinhardtii	6 h EC50	19.0**	15.18**	30-40 nm (DLS), poly(styrene-co-butyl acrylate)	mineral medium	Perreault et al. 2012
Fish: Median (min-max) L(E)C50		100	79.9			
Cyprinus carpio	96 h EC50	100**	79.9**	20-40 nm (TEM)	water	Zhao et al. 2011
Nematode: Median (min-max) L(E)C50		not analyzed				
not analyzed	not analyzed	not analyzed	not analyzed	not analyzed	not analyzed	not analyzed
Bacteria: Median (min-max) minimal inhibitory concentration (MIC)		200 (20-280)	160 (16-224)			
Escherichia coli (4 different strains)	MIC	140-280	112-224	9.2 nm (TEM)	complex medium	Ruparelia et al. 2008
Bacillus subtilis	MIC	20	16	9.2 nm (TEM)	complex medium	Ruparelia et al. 2008
Staphylococcus aureus (3 different strains)	MIC	140	112	9.2 nm (TEM)	complex medium	Ruparelia et al. 2008
Prevotella intermedia, Fusobacterium nucleatum, Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans	48 h MIC	250	200	12-50 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Escherichia coli	20 h MIC	25	20	6 nm (TEM)	complex medium	Hassan et al. 2012
Yeast/fungi: Median (min-max) L(E)C50		17.1 (4.80-643)	13.6 (3.83-514)			
Saccharomyces cerevisiae	24 h IC50	643	514	30 nm (provider)	complex medium	Kasemets et al. 2013
Saccharomyces cerevisiae	24 h IC50	4.80	3.83	30 nm (provider)	water	Kasemets et al. 2013
Saccharomyces cerevisiae	8 h EC50	20.7	16.5	30 nm (provider)	complex medium	Kasemets et al. 2009

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Cu/L	Primary size (method used for determination), coating	Test medium*	Reference
Saccharomyces cerevisiae	24 h EC50	13.4	10.7	30 nm (provider)	complex medium	Kasemets et al. 2009
Mammalian cells in vitro: Median (min-max) L(E)C50		25 (13-100)	20 (10.4-80)			
A549 cells	24 h IC50	15	12	<50 nm (TEM)	complex medium	Seiffert et al. 2012
A549 cells	24 h IC50	13	10.4	<50 nm (TEM)	complex medium	Seiffert et al. 2012
A549 cells	24 h IC50	17	13.6	<50 nm (TEM)	complex medium	Seiffert et al. 2012
A549 cells	24 h IC50	20	16	<50 nm (TEM)	complex medium	Seiffert et al. 2012
A549 cells	18 h IC50	25	20	20-40 nm (TEM)	complex medium	Karlsson et al. 2008
RAW 264.7	24 h IC50	16.5	13.2	12.8±3.4 nm (TEM)	complex medium	Zhang et al. 2012a
RAW 264.7	24 h IC50	18	14.5	12.8±3.4 nm (TEM)	complex medium	Zhang et al. 2012a
BEAS-2B cells	24 h IC50	30	24	12.8±3.4 nm (TEM)	complex medium	Zhang et al. 2012a
BEAS-2B cells	24 h IC50	30	24	12.8±3.4 nm (TEM)	complex medium	Zhang et al. 2012a
HepG2 cells	24 h IC50	25	20	Rod-shaped: 10±3 nm × 74±17 nm (TEM)	complex medium	Piret et al. 2012a
HepG2 cells	24 h IC50	25	20	40±16 nm (TEM)	complex medium	Piret et al. 2012a
Caco-2 cells	24 h IC50	37.5	30	Rod-shaped: 10±3 nm × 74±17 nm (TEM)	complex medium	Piret et al. 2012b
Caco-2 cells	24 h IC50	75	60	40±16 nm (TEM)	complex medium	Piret et al. 2012b

Species	Exposure time and endpoint	EC50 on compound basis, mg/L	EC50 on metal basis, mg Cu/L	Primary size (method used for determination), coating	Test medium*	Reference
immortalized human keratinocytes	24 h IC50	17.5	14	Rod-shaped: 10±3 nm × 74±17 nm (TEM)	complex medium	Piret et al. 2012b
immortalized human sebocytes	24 h IC50	37.5	30	Rod-shaped: 10±3 nm × 74±17 nm (TEM)	complex medium	Piret et al. 2012b
A549 cells	24 h IC50	75	60	Rod-shaped: 10±3 nm × 74±17 nm (TEM)	complex medium	Piret et al. 2012b
A549 cells	24 h IC50	100	80	40±16 nm (TEM)	complex medium	Piret et al. 2012b
A549 cells	24 h IC50	37.5	30	50-60 nm (TEM)	complex medium	Ahamed et al. 2010
A549 cells	24 h IC50	37.5	30	50-60 nm (TEM)	complex medium	Ahamed et al. 2010
A549 cells	24 h IC50	15	12	50-60 nm (TEM)	complex medium	Ahamed et al. 2010
A549 cells	24 h IC50	15	12	20-40 nm (TEM)	complex medium	Wang et al. 2012b
Vibrio fischeri: Median (min-max) L(E)C50		73.6 (12-204)	58.8 (9.8-163)			
Vibrio fischeri	30 min EC50	79	63	30 nm (provider), uncoated	mineral medium	Heinlaan et al. 2008
Vibrio fischeri	30 min EC50	68	54	30 nm (provider), uncoated	mineral medium	Mortimer et al. 2008
Vibrio fischeri	30 min EC50	204	163	30 nm (provider), uncoated	mineral medium	Mortimer et al. 2008
Vibrio fischeri	30 min EC50	12	9.8	<50 nm (provider), uncoated	mineral medium	Sovova et al. 2009
Protozoa: Median (min-max) L(E)C50		124.5 (0.98-161.5)	99.5 (0.78-129.0)			
Paramecium multimicronucleatum	48 h LC50	0.98	0.78	13.3 ± 3.9 nm (TEM), uncoated	mineral medium	Li et al. 2012a

Species	**Exposure time and endpoint**	**EC50 on compound basis, mg/L**	**EC50 on metal basis, mg Cu/L**	**Primary size (method used for determination), coating**	**Test medium***	**Reference**
Tetrahymena thermophila	24 h EC50	80.0	63.9	mean 30 nm (provider), uncoated	mineral medium	Mortimer et al. 2011
Tetrahymena thermophila	4 h EC50	159.0	127.0	mean 30 nm (provider), uncoated	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	4 h EC50	161.5	129.0	mean 30 nm (provider), uncoated	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	122.5	97.9	mean 30 nm (provider), uncoated	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	126.4	101.0	mean 30 nm (provider), uncoated	mineral medium	Mortimer et al. 2010

DLS – dynamic light scattering; TEM – transmission electron microscopy

*Mineral medium - without organic components; Complex medium - with organic components; ** estimated value

Table S6 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for **copper salt** for various organisms

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Crustaceans: Median (min-max) L(E)C50		0.02 (0.004-0.07)			
Daphnia magna	24 h EC50	0.03	$CuCl_2*2H_2O$	mineral medium	Jo et al. 2012
Daphnia magna	48 h LC50	0.07	$CuSO_4$	mineral medium	Heinlaan et al. 2008
Daphnia magna	48 h EC50	0.07	$CuSO_4$	mineral medium	Blinova et al. 2010
Daphnia similis	48 h EC50	0.04	$CuSO_4$	mineral medium	de Oliveira-Filho et al. 2004
Daphnia pulex	48 h LC50	0.01	$CuCl_2$	mineral medium	Griffitt et al. 2008
Ceriodaphnia dubia	48 h LC50	0.004	$CuSO_4$	mineral medium	Harmon et al. 2003
Daphnia ambigua	48 h LC50	0.007	$CuSO_4$	mineral medium	Harmon et al. 2003
Daphnia magna	48 h LC50	0.019	$CuSO_4$	mineral medium	Mastin and Rodgers 2000
Algae: Median (min-max) L(E)C50		0.075 (0.0044-13.0)			
Nitellopsis obtusa	96 h LC50	0.11	$Cu(NO_3)_2$	mineral medium	Manusadžianas et al. 2012
Chlorella spp.	30 min IC50	13.0	$CuSO_4$	mineral medium	Manusadžianas et al. 2012
Pseudokirchneriella subcapitata	72 h EC50	0.020	$CuSO_4$	complex medium	Aruoja et al. 2009
Pseudokirchneriella subcapitata	72 h EC50	0.017	$CuSO_4$	complex medium	Heijerick et al. 2005

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Pseudokirchneriella subcapitata	72 h EC50	0.25	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.16	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.15	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.097	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.084	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.11	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.065	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.11	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.053	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.034	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.037	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.19	$CuSO_4$	natural water	Heijerick et al. 2005
Pseudokirchneriella subcapitata	72 h EC50	0.032	$CuSO_4$	natural water	Heijerick et al. 2005
Chlorella sp.	48 h IC50	0.0044	$CuNO_3$	mineral medium	Apte et al. 2005
Chlorella sp.	48 h EC50	0.0057	$CuSO_4$*5H_2O	mineral medium	Franklin et al. 2002

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Chlorella sp.	72 h EC50	0.0070	$CuSO_4*5H_2O$	mineral medium	Franklin et al. 2002
Fish: Median (min-max) L(E)C50		0.28 (0.01-7.50)			
Oncorhynchus mykiss	72 h LC50	0.10	$CuSO_4*5H_2O$	water	Shaw et al. 2012
Oncorhynchus mykiss	96 h LC50	0.04	$CuSO_4*5H_2O$	water	Little et al. 2012
Oncorhynchus mykiss	96 h LC50	0.03	$CuSO_4*5H_2O$	water	Little et al. 2012
Danio rerio	96 h LC50	0.15	$CuSO_4*5H_2O$	water	Alsop and Wood 2011
Danio rerio	96 h LC50	0.21	$CuSO_4*5H_2O$	water	Alsop and Wood 2011
Danio rerio	96 h LC50	0.01	$CuSO_4*5H_2O$	water	Alsop and Wood 2011
Oryzias melastigma	96 h LC50	7.30	$CuSO_4*5H_2O$	water	Bao et al. 2011
Synechogobius hasta	96 h LC50	0.77	$CuSO_4$	water	Chen et al. 2010
Capoeta fusca	96 h LC50	1.10	$CuCl_2$	water	Ebrahimpour et al. 2010
Capoeta fusca	96 h LC50	5.40	$CuCl_2$	water	Ebrahimpour et al. 2010
Capoeta fusca	96 h LC50	7.50	$CuCl_2$	water	Ebrahimpour et al. 2010
Pimephales promelas	96 h LC50	0.28	$CuSO_4$	water	Lewis and Keller 2009
Solea senegalensis	96 h LC50	0.32	$CuSO_4*5H_2O$	water	Oliva et al. 2009

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Poecilia reticulata	24 h LC50	1.17	$CuSO_4*5H_2O$	water	Park and Heo 2009
Oncorhynchus mykiss	96 h LC50	0.21	$Cu(NO_3)_2*2H_2O$	water	De Boeck et al. 2004
Cyprinus carpio	96 h LC50	0.66	$Cu(NO_3)_2*2H_2O$	water	De Boeck et al. 2004
Carassius auratus gibelio	96 h LC50	1.40	$Cu(NO_3)_2*2H_2O$	water	De Boeck et al. 2004
Danio rerio	72 h LC50	0.13	$CuSO_4$	water	de Oliveira-Filho et al. 2004
Danio rerio	96 h LC50	0.09	$CuSO_4$	water	de Oliveira-Filho et al. 2004
Nematode: Median (min-max) L(E)C50		19.4 (1.27-101)			
Caenorhabditis elegans	48 h EC50	20.3	$CuCl_2*2H_2O$	mineral medium	Harrington et al. 2012
Caenorhabditis elegans	24 h EC50	101	$CuSO_4$	complex medium	Calafato et al. 2008
Caenorhabditis elegans	48 h EC50	29.9	$CuSO_4$	complex medium	Calafato et al. 2008
Caenorhabditis elegans	72 h EC50	18.4	$CuSO_4$	complex medium	Calafato et al. 2008
Caenorhabditis elegans	96 h EC50	1.27	$CuSO_4$	complex medium	Calafato et al. 2008
Caenorhabditis elegans	120 h EC50	11.7	$CuCl_2*2H_2O$	complex medium	Jonker et al. 2004
Bacteria: Median (min-max) minimal inhibitory concentration (MIC)		32 (0.4-640)			
Pseudomonas aeruginosa (2 different isolates)	MIC	64-640	$CuSO_4$	complex medium	Shakibaie and Harati 2004

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Legionella pneumophila	12 h MIC	0.4	$CuCl_2$	not specified	Lin et al. 1996
Pseudomonas aeruginosa	56 h MIC	128	$CuSO_4$	complex medium	Teitzel and Parsek 2003
Staphylococcus aureus	24 h MIC	12.8	$CuSO_4$	complex medium	Baker et al. 2010
Escherichia coli	16 h MIC	83.2	$CuSO_4$	complex medium	Grass and Rensing 2001
Pseudomonas putida	MIC	192	not specified	not specified	Chen et al. 2006
Bacillus circulans	72 h MIC	160	$CuSO_4$	complex medium	Yilmaz 2003
Streptomyces sp.	MIC	32	$Cu(NO_3)_2$	mineral medium	Majzlik et al. 2011
Staphylococcus aureus (2 different isolates)	20 h MIC	12.5	$Cu(NO_3)_2$	complex medium	Zhao et al. 1998
Escherichia coli	20 h MIC	25	$Cu(NO_3)_2$	complex medium	Zhao et al. 1998
Pseudomonas aeruginosa	20 h MIC	12.5	$Cu(NO_3)_2$	complex medium	Zhao et al. 1998
Yeast/fungi: Median (min-max) L(E)C50		11.1 (0.82-516)			
Saccharomyces cerevisiae	8 h EC50	11.4	$CuSO_4$	complex medium	Kasemets et al. 2009
Saccharomyces cerevisiae	24 h EC50	10.9	$CuSO_4$	complex medium	Kasemets et al. 2009
Saccharomyces cerevisiae	24 h IC50	516	$CuSO_4$	complex medium	Kasemets et al. 2013
Saccharomyces cerevisiae	24 h IC50	0.82	$CuSO_4$	water	Kasemets et al. 2013

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Mammalian cells in vitro: Median (min-max) L(E)C50		53 (5.6-80)			
primary human endometrial epithelial cells	24 h TC50	10.8	$CuCl_2$	complex medium	Wu et al. 2012
L929 cells	24 h IC50	46	$CuCl_2$	complex medium	Cao et al. 2012
A549	24 h IC50	>40	$CuCl_2$	complex medium	Karlsson et al. 2008
HGF cells	24 h IC50	71	$CuCl_2$	complex medium	Contreras et al. 2010
MC3T3-E1	24 h IC50	71	$CuCl_2$	complex medium	Contreras et al. 2010
Bel-7402 cells	24 h IC50	5.6	$CuCl_2$	complex medium	Zhang et al. 2007
HK-2 cells	24 h IC50	24	$CuCl_2$	complex medium	Zhang et al. 2007
HepG2 cells	24 h IC50	80	$CuCl_2$	complex medium	Piret et al. 2012a
Caco-2 cells	24 h IC50	60	$CuCl_2$	complex medium	Piret et al. 2012b
MDA-MB468 cells	48 h IC50	63.5	$CuCl_2$	complex medium	Panjehpour et al. 2010
Vibrio fischeri: Median (min-max) L(E)C50		0.8 (0.2-0.8)			
Vibrio fischeri	30 min EC50	0.6	$CuSO_4$	mineral medium	Heinlaan et al. 2008
Vibrio fischeri	30 min EC50	0.8	$CuSO_4$	mineral medium	Mortimer et al. 2008
Vibrio fischeri	30 min EC50	0.8	$CuSO_4$	mineral medium	Mortimer et al. 2008

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Vibrio fischeri	15 min EC50	0.78	not specified	mineral medium	McCloskey et al. 1996
Vibrio fischeri	30 min EC50	0.30	$CuSO_4$	mineral medium	Kurvet et al. 2011
Vibrio fischeri	15 min EC50	0.8	$Cu(NO_3)_2$	mineral medium	Hsieh et al. 2004
Vibrio fischeri	15 min EC50	0.20	$CuCl_2*2H_2O$	mineral medium	Kungolos et al. 2006
Protozoa: Median (min-max) L(E)C50		0.43 (0.010-1.70)			
Paramecium multimicronucleatum	48 h LC50	0.020	$CuCl_2$	mineral medium	Li et al. 2012a
Tetrahymena thermophila	24 h EC50	1.60	$CuSO_4$	mineral medium	Mortimer et al. 2011
Tetrahymena thermophila	4 h EC50	1.10	$CuSO_4$	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	4 h EC50	1.10	$CuSO_4$	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	1.40	$CuSO_4$	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	1.70	$CuSO_4$	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	0.40	$CuSO_4$	complex medium	Blinova et al. 2010
Tetrahymena thermophila	24 h EC50	0.46	$CuSO_4$	natural water	Blinova et al. 2010
Tetrahymena thermophila	24 h EC50	0.27	$CuSO_4$	natural water	Blinova et al. 2010
Tetrahymena thermophila	24 h LC50	0.47	$CuSO_4*5H_2O$	mineral medium	Gallego et al. 2007

Species	Exposure time and endpoint	EC50 on metal basis, mg Cu/L	Tested as (compound)	Test medium*	Reference
Dexiotricha granulosa	24 h LC50	0.17	$CuCl_2*2H_2O$	mineral medium	Madoni and Romeo 2006
Colpidium colpoda	24 h LC50	0.050	$CuCl_2*2H_2O$	mineral medium	Madoni and Romeo 2006
Euplotes aediculatus	24 h LC50	0.010	$CuCl_2*2H_2O$	mineral medium	Madoni and Romeo 2006
Halteria grandinella	24 h LC50	0.010	$CuCl_2*2H_2O$	mineral medium	Madoni and Romeo 2006

*Mineral medium - without organic components; Complex medium - with organic components

Table S7 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for **ZnO nanoparticles** for various organisms

Species	Exposure time and endpoint	EC50 on compound basis, mg ZnO/L	EC50 on metal basis, mg Zn/L	Primary size (method used for determination), coating	Test medium*	Reference
Crustaceans: Median (min-max) L(E)C50		2.3 (0.62-22)	1.9 (0.5-17.7)			
Daphnia magna	48 h LC50	8.8	7.1	50-70 nm (provider), uncoated	mineral medium	Heinlaan et al. 2008
Daphnia magna	48 h EC50	0.6	0.5	20 nm (provider), uncoated	mineral medium	Zhu et al. 2009
Daphnia magna	48 h LC50	1.5	1.2	20 nm (provider), uncoated	mineral medium	Zhu et al. 2009
Daphnia magna	48 h EC50	3.2	2.6	50-70 nm (provider), uncoated	mineral medium	Blinova et al. 2010
Daphnia magna	48 h EC50	2.6	2.1	<100 nm (provider), uncoated	mineral medium	Sovova et al. 2009
Daphnia magna	48 h, LC50	1.5	1.2	40 nm (provider), uncoated	mineral medium	Zhao et al. 2012
Daphnia magna	48 h EC50	0.8	0.6	40 nm (provider), uncoated	mineral medium	Zhao et al. 2012
Daphnia magna	24 h LC50	22.0	17.7	20 nm (provider), uncoated	mineral medium	Poynton et al. 2011
Daphnia magna	24 h EC50	2.6	2.1	50-70 nm (provider), uncoated	mineral medium	Naddafi et al. 2011
Daphnia magna	48 h EC50	2.1	1.7	50-70 nm (provider), uncoated	mineral medium	Naddafi et al. 2011
Algae: Median (min-max) L(E)C50		0.085 (0.052-4.56)	0.068 (0.042-3.66)			
Pseudokirchneriella subcapitata	72 h EC50	0.052	0.042	50-70 nm (provider), uncoated	mineral medium	Aruoja et al. 2009

Species	Exposure time and endpoint	EC50 on compound basis, mg ZnO/L	EC50 on metal basis, mg Zn/L	Primary size (method used for determination), coating	Test medium*	Reference
Pseudokirchneriella subcapitata	72 h IC50	0.085	0.068	30 nm (provider), uncoated	complex medium	Franklin et al. 2007
Pseudokirchneriella subcapitata	72 h IC50	0.061	0.049	30 nm (provider), dispersed with Teric N30 (nonylphenol ethoxylate)	complex medium	Franklin et al. 2007
Thalassiosira pseudonana	96 h IC50	4.56	3.66	26.2 ± 5.1 nm (TEM), uncoated	mineral medium	Wong et al. 2010
Skeletonema costatum	96 h IC50	2.36	1.90	26.2 ± 5.1 nm (TEM), uncoated	mineral medium	Wong et al. 2010
Fish: Median (min-max) L(E)C50		3.02 (1.79-4.92)	2.42 (1.44-3.95)			
Danio rerio	96 h LC50	4.92	3.95	30 nm	water	Xiong et al. 2011
Danio rerio	96 h LC50	3.97	3.19	30 nm	water	Yu et al. 2011
Danio rerio	96 h LC50	1.79	1.44	20 nm	water	Zhu et al. 2008
Danio rerio	84 h EC50	2.07	1.66	20 nm	water	Zhu et al. 2008
Nematode: Median (min-max) L(E)C50		39.2 (2.20-982)	31.5 (1.77-789)			
Caenorhabditis elegans	24 h LC50	21.2	17.0	40-100 nm	mineral medium	Ma et al. 2011
Caenorhabditis elegans	4 h EC50	982	789	2-6 nm	mineral medium	Ma et al. 2009
Caenorhabditis elegans	24 h LC50	790	635	2-6 nm	mineral medium	Ma et al. 2009
Caenorhabditis elegans	72 h EC50	57.3	46.0	2-6 nm	mineral medium	Ma et al. 2009
Caenorhabditis elegans	24 h LC50	2.20	1.77	20 nm	water	Wang et al. 2009

Species	Exposure time and endpoint	EC50 on compound basis, mg ZnO/L	EC50 on metal basis, mg Zn/L	Primary size (method used for determination), coating	Test medium*	Reference
Caenorhabditis elegans	24 h LC50	4.90	3.94	20 nm	mineral medium	Wang et al. 2009
Bacteria: Median (min-max) minimal inhibitory concentration (MIC)		500 (50-1000)	400 (40-800)			
Campylobacter jejuni	16 h MIC	50	40	30 nm (TEM)	complex medium	Xie et al. 2011
Escherichia coli	16 h MIC	800	640	30 nm (TEM)	complex medium	Xie et al. 2011
Escherichia coli	16-20 h MIC	400	320	47 nm (TEM)	complex medium	Padmavathy and Vijayaraghavan 2008
Staphylococcus auerus	24 h MIC	500	400	3 nm (TEM)	complex medium	Emami-Karvani and Chehrazi 2011
Escherichia coli	24 h MIC	1000	800	3 nm (TEM)	complex medium	Emami-Karvani and Chehrazi 2011
Campylobacter jejuni	24 h MIC	50	40	30 nm (TEM)	complex medium	Xie et al. 2011
Prevotella intermedia	48 h MIC	1000	800	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Porphyromonas gingivalis	48 h MIC	250	200	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Fusobacterium nucleatum	48 h MIC	250	200	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Aggregatibacter actinomycetemcomitans	48 h MIC	250	200	20 nm (TEM)	complex medium	Vargas-Reus et al. 2012
Staphylococcus aureus	Overnight MIC	1000	800	19 nm (TEM)	complex medium	Ansari et al. 2012
Escherichia coli	Overnight MIC	500	400	19 nm (TEM)	complex medium	Ansari et al. 2012
Klebisella pneumoniae	Overnight MIC	500	400	19 nm (TEM)	complex medium	Ansari et al. 2012

Species	Exposure time and endpoint	EC50 on compound basis, mg ZnO/L	EC50 on metal basis, mg Zn/L	Primary size (method used for determination), coating	Test medium*	Reference
Escherichia coli	Overnight MIC	972	777	70 nm (TEM)	complex medium	Liu et al. 2009
Streptococcus mutants	24 h MIC	500	400	>50 nm (TEM)	not specified	Hernández-Sierra et al. 2008
Yeast/fungi: Median (min-max) L(E)C50		121 (40.0-488)	97.2 (32.1-392)			
Aspergillus niger	24 h EC50	50.0	40.2	30-40 nm	complex medium	Patra et al. 2012
Fusarium oxysporum	120 h EC50	50.0	40.2	30-40 nm	complex medium	Patra et al. 2012
Penicillium expansum	12 d EC50	244	196	70 nm	complex medium	He et al. 2011
Botrytis cinerea	12 d EC50	488	392	70 nm	complex medium	He et al. 2011
Candida albicans	24 h EC50	40.0	32.1	6.8 -11.6 nm	mineral medium	Lipovsky et al. 2011
Saccharomyces cerevisiae	8 h EC50	121	97.2	50-70nm (provider)	complex medium	Kasemets et al. 2009
Saccharomyces cerevisiae	24 h EC50	131	105	50-70 nm (provider)	complex medium	Kasemets et al. 2009
Mammalian cells in vitro: Median (min-max) L(E)C50		43.4 (4.5-75)	34.9 (3.6-60.2)			
HeLa cells	72 h IC50	45.7	36.7	100 nm (TEM)	not specified	Li et al. 2012b
A549 cells	24 h IC50	52	41.8	<50 nm (TEM)	complex medium	Seiffert et al. 2012
A549 cells	24 h IC50	54	43.4	<50 nm (TEM)	complex medium	Seiffert et al. 2012
A549 cells	24 h IC50	45	36.1	<50 nm (TEM)	complex medium	Seiffert et al. 2012

Species	Exposure time and endpoint	EC50 on compound basis, mg ZnO/L	EC50 on metal basis, mg Zn/L	Primary size (method used for determination), coating	Test medium*	Reference
A549 cells	24 h IC50	56	45	<50 nm (TEM)	complex medium	Seiffert et al. 2012
CCL-131 cells	24 h IC50	75	60.2	50-70 nm (provider)	complex medium	Jeng and Swanson 2006
CCL-131 cells	24 h IC50	13.5	10.8	50-70 nm (provider)	complex medium	Jeng and Swanson 2006
skin fibroblasts	24 h IC50	49	39.4	50-70 nm (provider)	complex medium	Dechsakulthorn et al. 2007
cultured rat alveolar epithelial cell monolayers	24 h IC50	13.7	17	20 nm (provider)	serum-free	Kim et al. 2010
cultured rat alveolar epithelial cell monolayers	24 h IC50	22.5	28	20 nm (provider)	complex medium	Kim et al. 2010
Ana-1 cells	24 h IC50	44.6	35.8	342 nm (TEM)	complex medium	Song et al. 2010
Ana-1 cells	24 h IC50	44.0	35.3	108 nm (TEM)	complex medium	Song et al. 2010
Ana-1 cells	24 h IC50	40.3	32.4	70.89 nm (TEM)	complex medium	Song et al. 2010
Ana-1 cells	24 h IC50	30.9	24.8	19 nm (TEM)	complex medium	Song et al. 2010
RAW 264.7 cells	24 h IC50	21.7	17.4	22.6 ± 5.1 nm (TEM)	complex medium	Rallo et al. 2012
RAW 264.7 cells	24 h IC50	10.1	8.1	22.6 ± 5.1 nm (TEM)	complex medium	Rallo et al. 2012
BEAS-2B cells	24 h IC50	6.5	5.2	22.6 ± 5.1 nm (TEM)	complex medium	Rallo et al. 2012
BEAS-2B cells	24 h IC50	4.5	3.6	22.6 ± 5.1 nm (TEM)	complex medium	Rallo et al. 2012
MH-S cells	24 h IC50	48.5	39.0	342 nm (TEM)	complex medium	Zhang et al. 2012b

Species	Exposure time and endpoint	EC50 on compound basis, mg ZnO/L	EC50 on metal basis, mg Zn/L	Primary size (method used for determination), coating	Test medium*	Reference
MH-S cells	24 h IC50	47.4	38.0	108 nm (TEM)	complex medium	Zhang et al. 2012b
MH-S cells	24 h IC50	45.4	36.5	71 nm (TEM)	complex medium	Zhang et al. 2012b
MH-S cells	24 h IC50	26.7	21.5	19 nm (TEM)	complex medium	Zhang et al. 2012b
A549 cells	24 h IC50	13.6	10.9	70 ± 13 nm (TEM)	complex medium	Lin et al. 2009
A549 cells	24 h IC50	14.2	11.4	420 ± 269 nm (TEM)	complex medium	Lin et al. 2009
HEK293 cells	24 h IC50	21.47	17.2	n.a.	complex medium	Dua et al. 2011
***Vibrio fischeri*: Median (min-max) L(E)C50**		4.3 (1.8-7.3)	3.5 (1.4-5.8)			
Vibrio fischeri	30 min EC50	1.8	1.4	50-70 nm (provider), uncoated	mineral medium	Heinlaan et al. 2008
Vibrio fischeri	30 min EC50	4.8	3.9	50-70 nm (provider), uncoated	mineral medium	Mortimer et al. 2008
Vibrio fischeri	30 min EC50	3.8	3.0	50-70 nm (provider), uncoated	mineral medium	Mortimer et al. 2008
Vibrio fischeri	30 min EC50	7.3	5.8	<100 nm (provider), uncoated	mineral medium	Sovova et al. 2009
Protozoa: Median (min-max) L(E)C50		11.70 (5.35-573.8)	9.40 (4.30-461.0)			
Paramecium multimicronucleatum	48 h LC50	573.8	461.0	9.8 ± 5.0 nm (TEM), uncoated	mineral medium	Li et al. 2012a
Tetrahymena thermophila	4 h EC50	5.35	4.30	50-70 nm (provider), uncoated	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	4 h EC50	6.22	5.00	50-70 nm (provider), uncoated	mineral medium	Mortimer et al. 2010

Species	Exposure time and endpoint	EC50 on compound basis, mg ZnO/L	EC50 on metal basis, mg Zn/L	Primary size (method used for determination), coating	Test medium*	Reference
Tetrahymena thermophila	24 h EC50	8.46	6.80	50-70 nm (provider), uncoated	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	10.3	8.30	50-70 nm (provider), uncoated	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	11.7	9.40	50-70 nm (provider), uncoated	complex medium	Blinova et al. 2010
Tetrahymena thermophila	24 h EC50	20.4	16.4	50-70 nm (provider), uncoated	natural water	Blinova et al. 2010
Tetrahymena thermophila	24 h EC50	15.4	12.4	50-70 nm (provider), uncoated	natural water	Blinova et al. 2010
Tetrahymena thermophila	24 h EC50	33.0	26.5	50-70 nm (provider), uncoated	natural water	Blinova et al. 2010

n.a.-not analysed; TEM – transmission electron microscopy

*Mineral medium - without organic components; Complex medium - with organic components

Table S8 The L(E)C50 values from individual studies and median L(E)C50 values (minimum-maximum value) for **zinc salt** for various organisms

Species	Exposure time and endpoint	EC50 on metal basis, mg Zn/L	Tested as (compound)	Test medium*	Reference
Crustaceans: Median (min-max) L(E)C50		1.3 (0.4-1.8)			
Daphnia magna	48 h LC50	1.38	$ZnSO_4$*$7H_2O$	mineral medium	Heinlaan et al. 2008
Daphnia magna	48 h EC50	1.40	$ZnSO_4$*$7H_2O$	mineral medium	Blinova et al. 2010
Daphnia magna	24 h LC50	1.28	$ZnSO_4$*$7H_2O$	mineral medium	Poynton et al. 2011
Daphnia magna	48 h LC50	0.87	$ZnCl_2$	mineral medium	Wang and Guan 2010
Daphnia magna	24 h LC50	1.80	$ZnSO_4$*$7H_2O$	mineral medium	Teodorovic et al. 2009
Daphnia magna	48 h LC50	0.41	$ZnSO_4$*$7H_2O$	mineral medium	Teodorovic et al. 2009
Algae: Median (min-max) L(E)C50		0.088 (0.042-3.48)			
Pseudokirchneriella subcapitata	72 h EC50	0.042	$ZnSO_4$*$7H_2O$	mineral medium	Aruoja et al. 2009
Pseudokirchneriella subcapitata	72 h IC50	0.061	$ZnCl_2$	complex medium	Franklin et al. 2007
Thalassiosira pseudonana	96 h IC50	3.48	$ZnSO_4$*$7H_2O$	complex medium	Wong et al. 2010
Skeletonema costatum	96 h IC50	1.23	$ZnSO_4$*$7H_2O$	complex medium	Wong et al. 2010
Pseudokirchneriella subcapitata	72 h EC50	0.056	$ZnSO_4$*$7H_2O$	complex medium	Graff et al. 2003
Pseudokirchneriella subcapitata	72 h EC50	0.20	$ZnSO_4$*$7H_2O$	natural water	Graff et al. 2003

Species	Exposure time and endpoint	EC50 on metal basis, mg Zn/L	Tested as (compound)	Test medium*	Reference
Chlorella sp.	48 h EC50	0.085	$ZnSO_4*7H_2O$	mineral medium	Franklin et al. 2002
Chlorella sp.	72 h EC50	0.092	$ZnSO_4*7H_2O$	mineral medium	Franklin et al. 2002
Fish: Median (min-max) L(E)C50		7.48 (2.54-8.06)			
Danio rerio	96 h LC50	8.06	$ZnSO_4*7H_2O$	water	Xiong et al. 2011
Danio rerio	96 h LC50	7.48	$ZnSO_4*7H_2O$	water	Yu et al. 2011
Danio rerio	96 h LC50	2.54	$ZnSO_4*7H_2O$	water	Alsop and Wood 2011
Nematode: Median (min-max) L(E)C50		49.1 (1.39-884)			
Caenorhabditis elegans	48 h EC50	39.2	$ZnCl_2$	mineral medium	Harrington et al. 2012
Caenorhabditis elegans	7 d EC50	10.5	$ZnCl_2$	mineral medium	Murphy et al. 2011
Caenorhabditis elegans	24 h LC50	884	$ZnCl_2$	mineral medium	Ma et al. 2009
Caenorhabditis elegans	4 h EC50	546	$ZnCl_2$	mineral medium	Ma et al. 2009
Caenorhabditis elegans	72 h EC50	59.0	$ZnCl_2$	mineral medium	Ma et al. 2009
Caenorhabditis elegans	24 h LC50	1.39	$ZnCl_2$	water	Wang et al. 2009
Bacteria: Median (min-max) minimal inhibitory concentration (MIC)		30 (12.5-1430)			
Pseudomonas aeruginosa	56 h MIC	520	$ZnSO_4$	complex medium	Teitzel and Parsek 2003

Species	Exposure time and endpoint	EC50 on metal basis, mg Zn/L	Tested as (compound)	Test medium*	Reference
Pseudomonas putida	MIC	325	not reported	not reported	Chen et al. 2006
Bacillus circulans	72 h MIC	1430	$ZnCl_2$	complex medium	Yilmaz 2003
Helicobacter pylori	16 h MIC	100	$ZnCl_2$	complex medium	Mobley et al. 1999
Streptomyces sp.	MIC	30	$ZnCl_2$	mineral medium	Majzlik et al. 2011
Staphylococcus aureus (2 different isolates)	20 h MIC	12.5	$Zn(NO_3)_2$	complex medium	Zhao et al. 1998
Escherichia coli	20 h MIC	25	$Zn(NO_3)_2$	complex medium	Zhao et al. 1998
Pseudomonas aeruginosa	20 h MIC	12.5	$Zn(NO_3)_2$	complex medium	Zhao et al. 1998
Yeast/fungi: Median (min-max) L(E)C50		78.2 (75.3-81.2)			
Saccharomyces cerevisiae	8 h EC50	75.3	$ZnSO_4*7H_2O$	complex medium	Kasemets et al. 2009
Saccharomyces cerevisiae	24 h EC50	81.2	$ZnSO_4*7H_2O$	complex medium	Kasemets et al. 2009
Mammalian cells in vitro: Median (min-max) L(E)C50		9.8 (5.9-15.7)			
Ana-1 cells	24 h IC50	13.33	$ZnCl_2$	complex medium	Song et al. 2010
primary human endometrial epithelial cells	24 h TC50	14.1	$ZnCl_2$	complex medium	Wu et al. 2012
PC12 cells	24 h IC50	8.2	$ZnSO_4*7H_2O$	first 2 h without serum	Pavlica et al. 2009
PC12 cells	24 h IC50	9.5	$ZnSO_4*7H_2O$	first 2 h without serum	Pavlica et al. 2009

Species	Exposure time and endpoint	EC50 on metal basis, mg Zn/L	Tested as (compound)	Test medium*	Reference
PC12 cells	24 h IC50	5.9	$ZnSO_4$*$7H_2O$	first 2 h without serum	Pavlica et al. 2009
PC12 cells	24 h IC50	12.1	$ZnSO_4$	first 2 h without serum	Pavlica et al. 2009
PC12 cells	24 h IC50	15.7	$ZnSO_4$	first 2 h without serum	Pavlica et al. 2009
PC12 cells	24 h IC50	12.1	$ZnSO_4$	first 2 h without serum	Pavlica et al. 2009
B16 mouse melanoma cells	24 h IC50	8.2	$ZnCl_2$	complex medium	Borovanský and Riley 1989
HeLa cells	24 h IC50	9.8	$ZnCl_2$	complex medium	Borovanský and Riley 1989
I-221 epithelial cells	24 h IC50	9.8	$ZnCl_2$	complex medium	Borovanský and Riley 1989
Vibrio fischeri: Median (min-max) L(E)C50		3.2 (0.25-9.3)			
Vibrio fischeri	30 min EC50	0.25	$ZnSO_4$*$7H_2O$	mineral medium	Heinlaan et al. 2008
Vibrio fischeri	30 min EC50	3.8	$ZnSO_4$*$7H_2O$	mineral medium	Mortimer et al. 2008
Vibrio fischeri	30 min EC50	3.2	$ZnSO_4$*$7H_2O$	mineral medium	Mortimer et al. 2008
Vibrio fischeri	15 min EC50	2.28	not specified	mineral medium	McCloskey et al. 1996
Vibrio fischeri	30 min EC50	4.64	$ZnSO_4$*$7H_2O$	mineral medium	Teodorovic et al. 2009
Vibrio fischeri	30 min EC50	9.27	$ZnSO_4$*$7H_2O$	mineral medium	Kurvet et al. 2011
Vibrio fischeri	15 min EC50	1.49	$ZnCl_2$	mineral medium	Kungolos et al., 2006

Species	**Exposure time and endpoint**	**EC50 on metal basis, mg Zn/L**	**Tested as (compound)**	**Test medium***	**Reference**
Protozoa: Median (min-max) L(E)C50:		7.00 (3.58-175.2)			
Paramecium multimicronucleatum	48 h LC50	175.2	$ZnCl_2$	mineral medium	Li et al. 2012a
Tetrahymena thermophila	4 h EC50	4.50	$ZnSO_4$*7H_2O	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	4 h EC50	5.20	$ZnSO_4$*7H_2O	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	6.70	$ZnSO_4$*7H_2O	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	7.00	$ZnSO_4$*7H_2O	mineral medium	Mortimer et al. 2010
Tetrahymena thermophila	24 h EC50	7.10	$ZnSO_4$*7H_2O	complex medium	Blinova et al. 2010
Tetrahymena thermophila	24 h EC50	21.1	$ZnSO_4$*7H_2O	natural water	Blinova et al. 2010
Tetrahymena thermophila	24 h EC50	18.6	$ZnSO_4$*7H_2O	natural water	Blinova et al. 2010
Tetrahymena thermophila	24 h LC50	3.58	$ZnSO_4$*7H_2O	mineral medium	Gallego et al. 2007

*Mineral medium - without organic components; Complex medium - with organic components

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