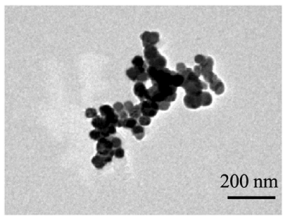
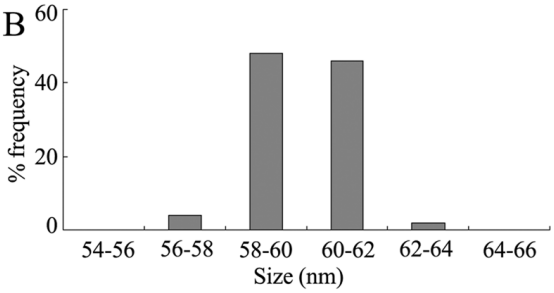
Electronic Supplementary Material (ESI) for Toxicology Research.

Supporting Information:

A



B



C

	Al_2O_3-NPs
Purity	>99.99%
Primary particle size	60 nm
Aggregation size	656 ± 78 nm
Specific surface area	186 ± 11 m^2/g
Zeta potential	34.6 ± 2.7 mV

Fig. S1 Physicochemical properties of Al_2O_3-NPs. (A) TEM picture of Al_2O_3-NPs in K-medium. (B) Size distribution of Al_2O_3-NPs in K-medium based on the TEM assay (n = 400). (C) Summary of physicochemical properties of Al_2O_3-NPs.

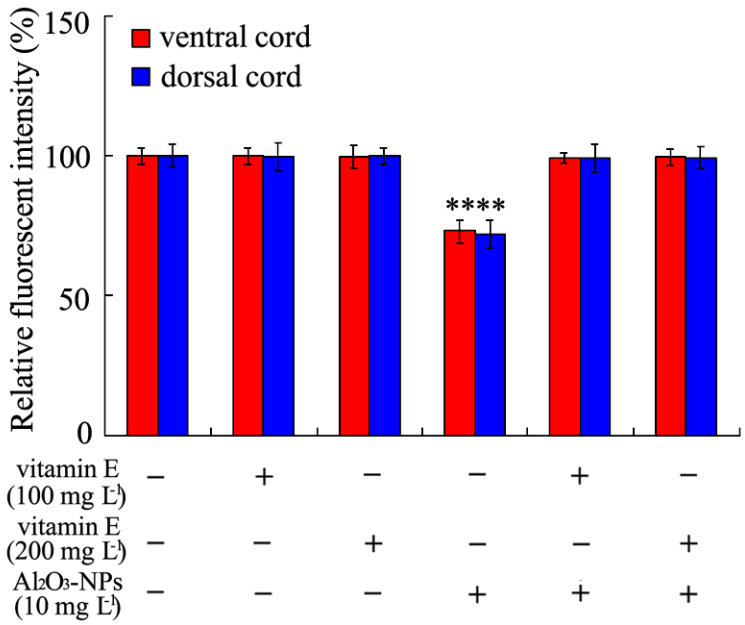


Fig. S2 Effects of vitamin E pretreatment on fluorescent intensity of nerve cords for D-type GABAergic nervous system in Al_2O_3-NPs exposed *oxIs12* transgenic nematodes. Vitamin E pretreatment was performed at the L2-larvae stage for 24-h. Al_2O_3-NPs exposure was performed from L4-larvae for 24-h. Five replicates were performed. Bars represent means ± SEM. $^{**}P < 0.01$ *vs* value of nematodes without vitamin E and Al_2O_3-NPs treatments.

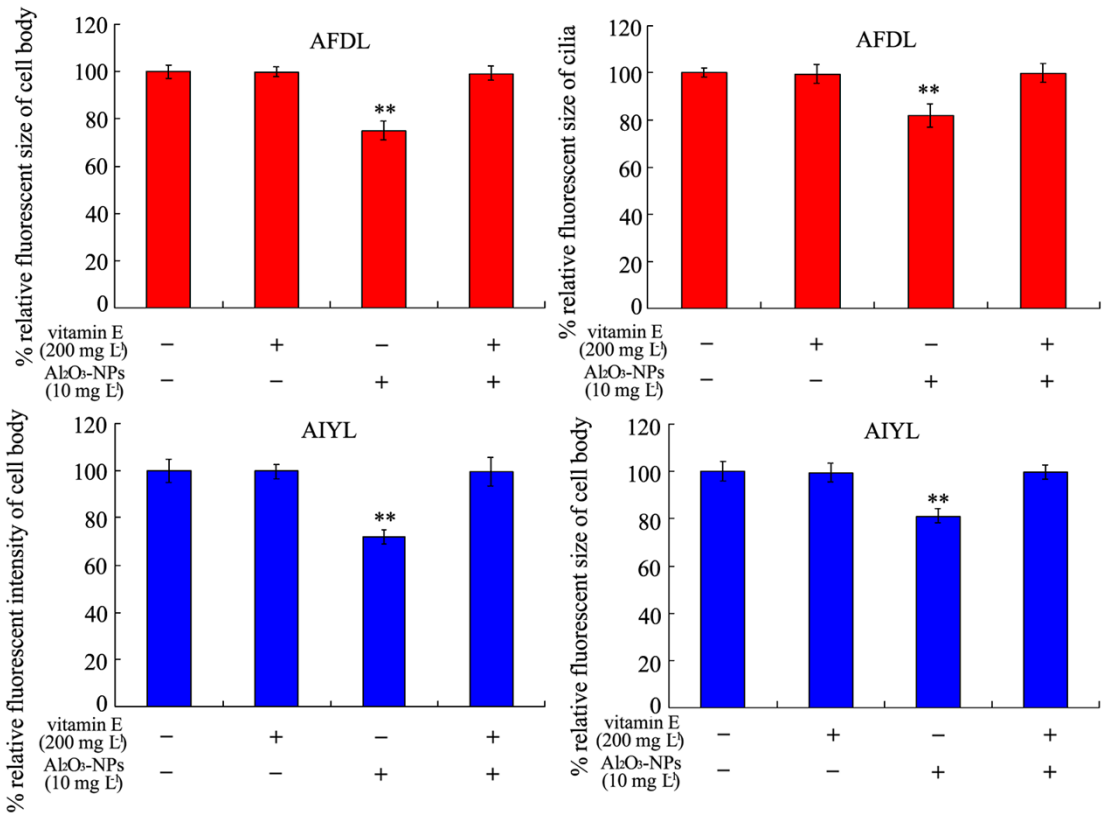


Fig. S3 Quantification analysis on the effects of pretreatment with vitamin E on development of AFD and AIY neurons of Al_2O_3-NPs exposed nematodes. Vitamin E pretreatment was performed at the L2-larvae stage for 24-h. Al_2O_3-NPs exposure was performed from L4-larvae for 24-h. Five replicates were performed. Bars represent means ± SEM. $^{**}P < 0.01$ *vs* value of nematodes without vitamin E and Al_2O_3-NPs treatments.

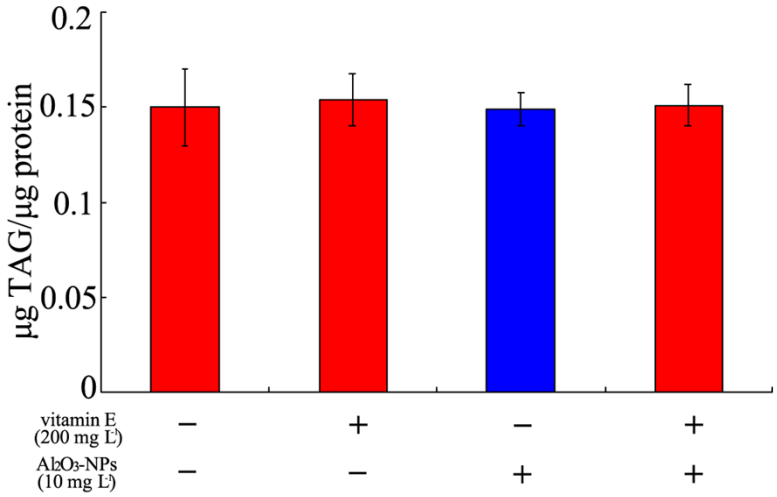
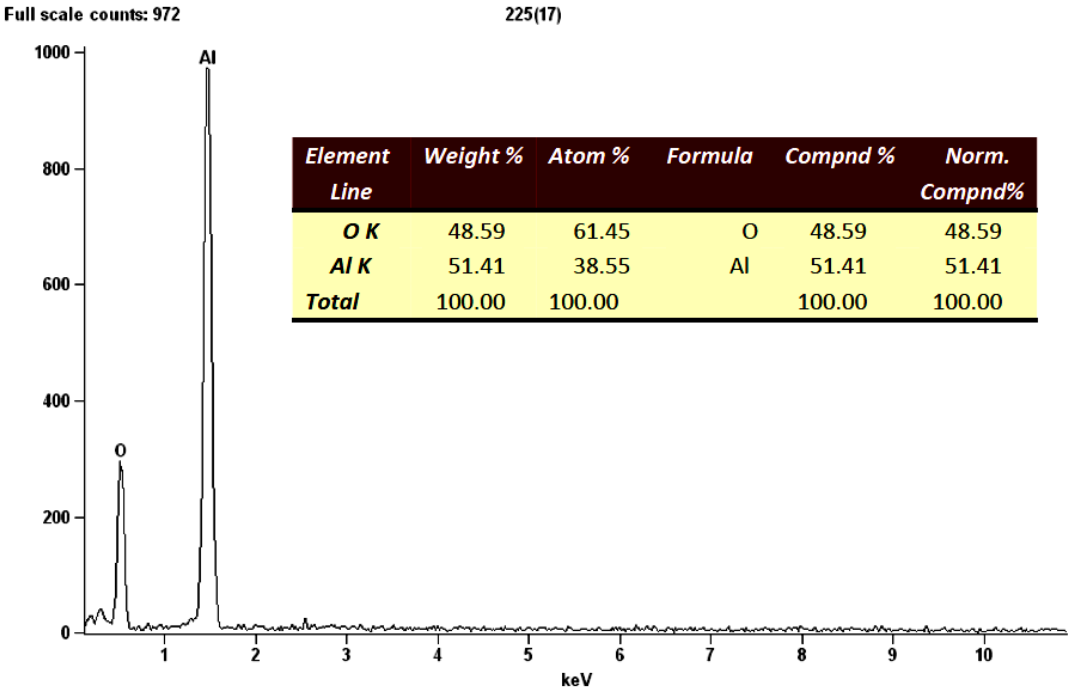


Fig. S4 Effects of vitamin E pretreatment on triglyceride amount in Al_2O_3-NPs exposed wild-type N2 nematodes. Vitamin E pretreatment was performed at the L2-larvae stage for 24-h. Al_2O_3-NPs exposure was performed from L4-larvae for 24-h. Ten replicates were performed. Bars represent means ± SEM.



Element Line	Weight %	Atom %	Formula	Compnd %	Norm. Compnd%
O K	48.59	61.45	O	48.59	48.59
Al K	51.41	38.55	Al	51.41	51.41
Total	100.00	100.00		100.00	100.00

Fig. S5 EDX assay result for Al_2O_3-NPs particles in intestinal cell on TEM section.

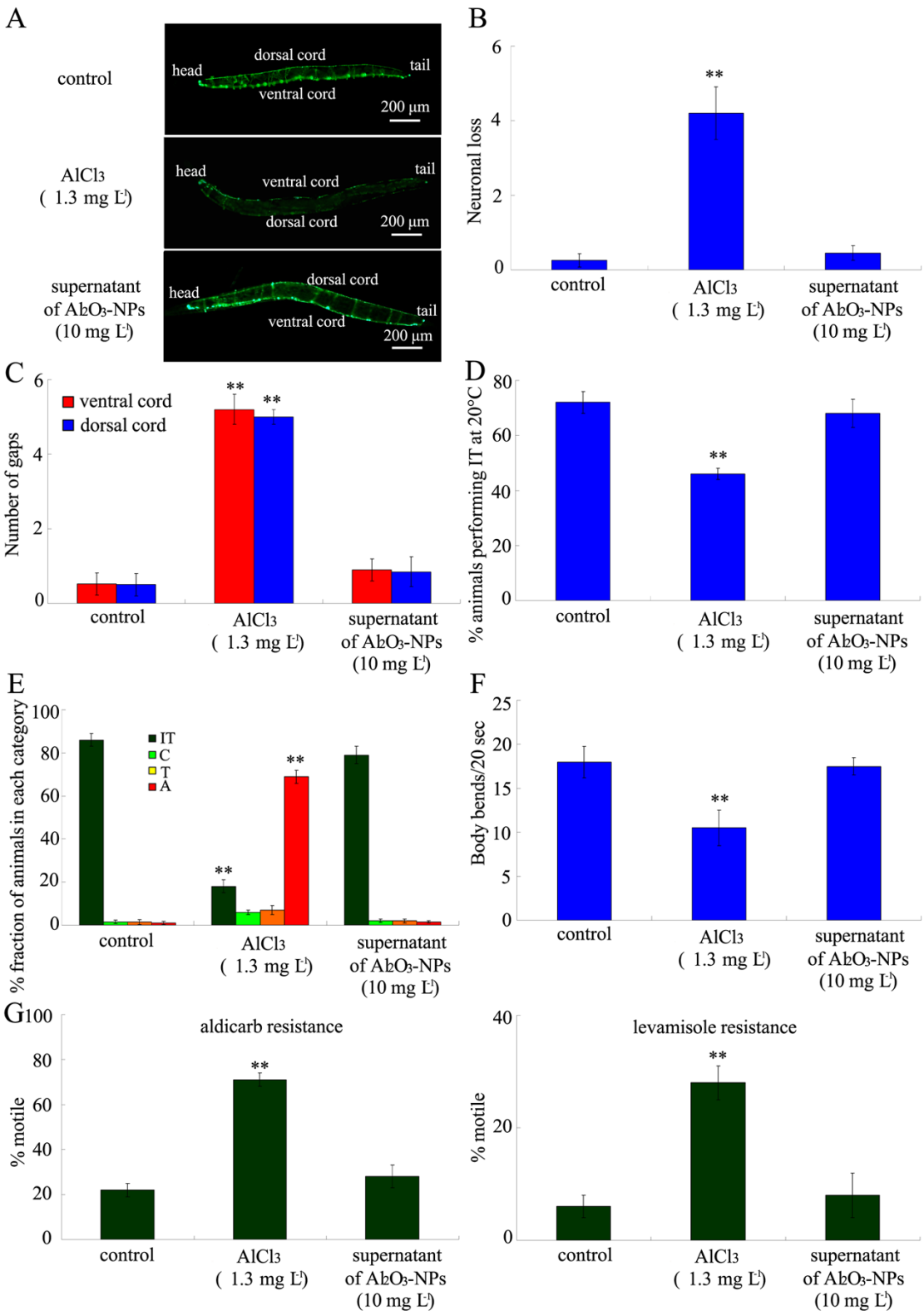


Fig. S6 Effects of $AlCl_3$ or supernatant of Al_2O_3-NPs on development and function of neurons. (A) Effects of $AlCl_3$ or supernatant of Al_2O_3-NPs on development of D-type GABAergic neurons. (B) Effects of $AlCl_3$ or supernatant of Al_2O_3-NPs in inducing neuronal loss in D-type GABAergic neurons. (C) Effects of $AlCl_3$ or supernatant of Al_2O_3-NPs in inducing

gaps on nerve cords. (D) Comparison of thermotaxis learning between control and $AlCl_3$ or supernatant of Al_2O_3-NPs exposed nematodes at 12-h in the assay system. (E) Comparison of thermotaxis perception between control and $AlCl_3$ or supernatant of Al_2O_3-NPs exposed nematodes. T, thermophilic; C, movement to 17°C; A, movement across the thermal gradient (17°C/25°C); IT, movement at 20°C. (F) Comparison of body bend between control and $AlCl_3$ or supernatant of Al_2O_3-NPs exposed nematodes. (G) Effects of $AlCl_3$ or supernatant of Al_2O_3-NPs on neurotransmission of nematodes. The presynaptic function was evaluated by aldicarb resistance, and the postsynaptic function was evaluated by levamisole resistance. Exposure was performed from L4-larvae for 24-h. Five replicates were performed. Bars represent means ± SEM. $^{**}P < 0.01$.

Table S 1 Primers used for quantitative real-time polymerase chain reaction (PCR)

Gene	Forward primer	Reverse primer
tba-1	TCAACACTGCCATCGCCGCC	TCCAAGCGAGACCAGGCTTCAG
unc-30	TCTACCAACAGCCCAAGC	TAAGGTTGGCCGAGCGAT
ttx-1	TGGACCCGAGTTCACTTTAT	GTTGGTTAGCATTCCACGAC
ttx-3	GACGACAACAACAGCACCAC	GTTTCGATCGTTGGCTTCCG

Table S 2 Information for targeted genes

Gene	Products of the genes	Function
unc-30	Pitx family of homeodomain transcription factors	specify cell fate of GABAergic neurons
ttx-1	OTD/OTX subclass of homeodomain transcription factor	specify cell fate of AFD neurons
ttx-3	LIM homeodomain protein	specify t cell fate of AIY neurons