Supporting Information

Organ-Specific and Size-Dependent Ag Nanoparticle Toxicity in Gills and Intestines of Adult Zebrafish

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Table S1. Current market products containing AgNPs.

Category	Product
Appliances	Hair Straighter Iron Bidet
Cosmetics	Beauty Soap Toothpaste
Food & Beverages	Food box containers Kitchen utensils Health Supplement
Goods for children	Baby carriage Plush Toys
Health & Fitness	Wound Dressing Sports Socks
Home & Garden	Paint Humidifier

Source: PEN website accessed on March 2015

Table S2. AgNPs hydrodynamic diameter and zeta-potential in simulated fluid at 0 hr and 4 days.

Simulated intestinal fluid	**0 hr**			**4 days**		
NPs	d_H (nm)	PdI	ζ-potential (mV)	d_H (nm)	PdI	ζ-potential (mV)
AgC20	1112.5 ±40.5	0.297	-29.65±1.77	759.8±20.4	0.297	-27.72±2.32
AgC110	391.1±17.3	0.292	-40.07±4.94	326.7±10.2	0.328	-38.64±2.80

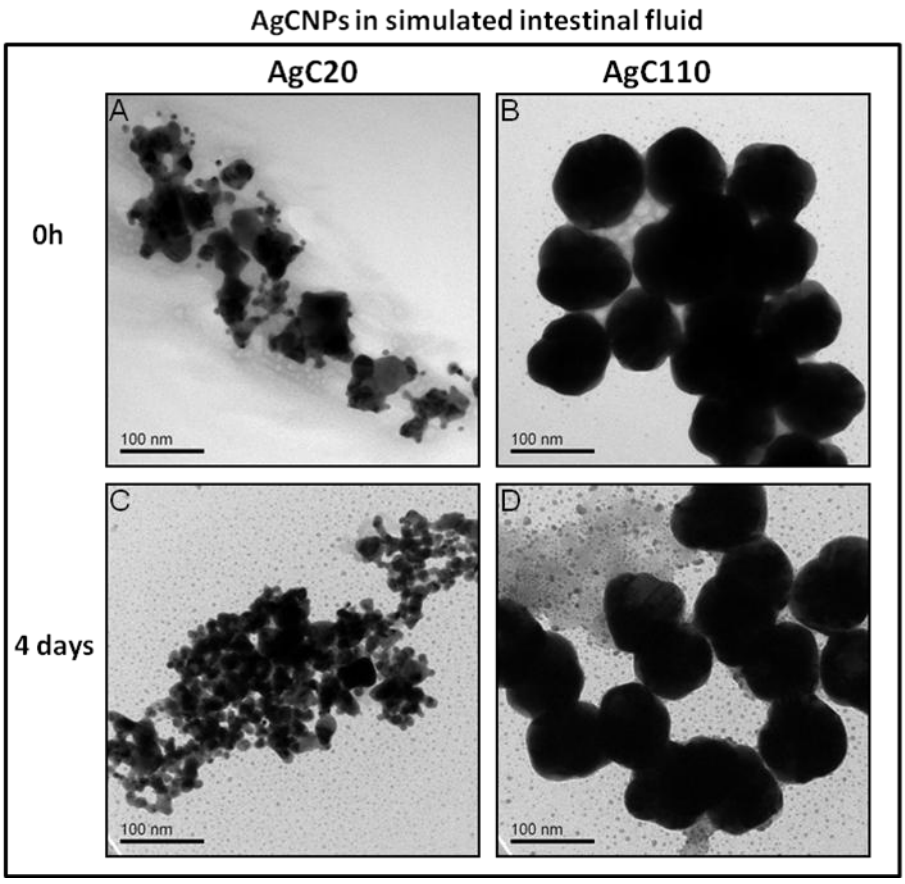

Figure S1. Representative TEM images of AgNPs characterization in simulated intestine fluid (monobasic potassium phosphate, sodium hydroxide and pancreatin mix) at t=0 or after 4 days, demonstrating the shrinking and morphological changes in the AgC20 particles over time (Panels A and C). In contrast the AgC110 particles remained quite uniform (Panels A and C).

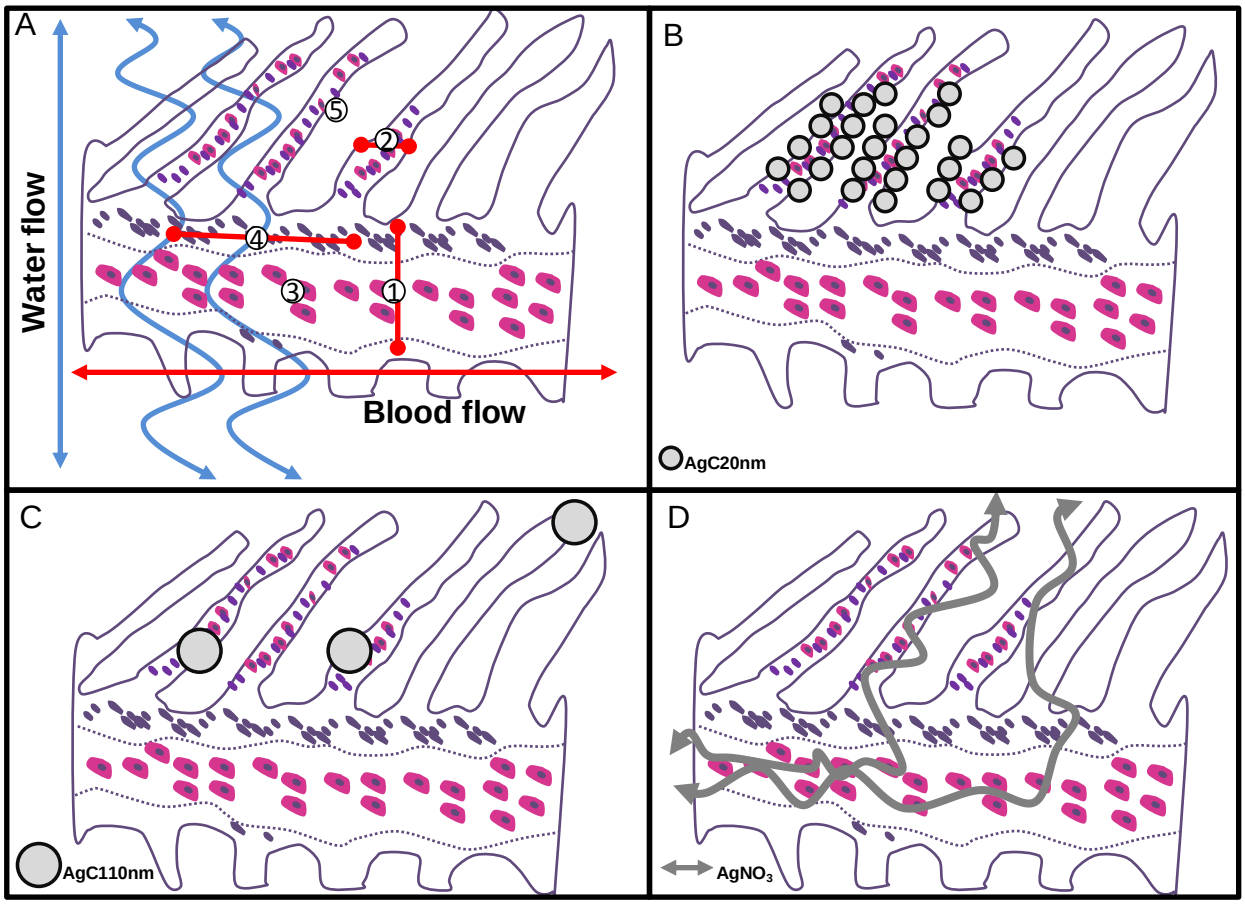

Figure S2. Idealize diagrams of the zebrafish gill to illustrate the key features of a normal gill, as well as explaining gill pathology after exposure to Ag nanoparticles or ionic Ag. **(A)** Diagram depicting the key features of a normal gill: (1) primary filament; (2) secondary filament; (3) erythrocyte; (4) basal cells; (5) mucous cells. **(B)** Diagram illustrating AgC20 adherence to the secondary filaments, causing them to fuse. **(C)** Diagram illustrating adherence of AgC110 particles adherence to the secondary filaments, causing them to fuse. **(D)** Diagram illustrating free flow of ionic $AgNO_3$ through the primary and secondary filaments without adherence.

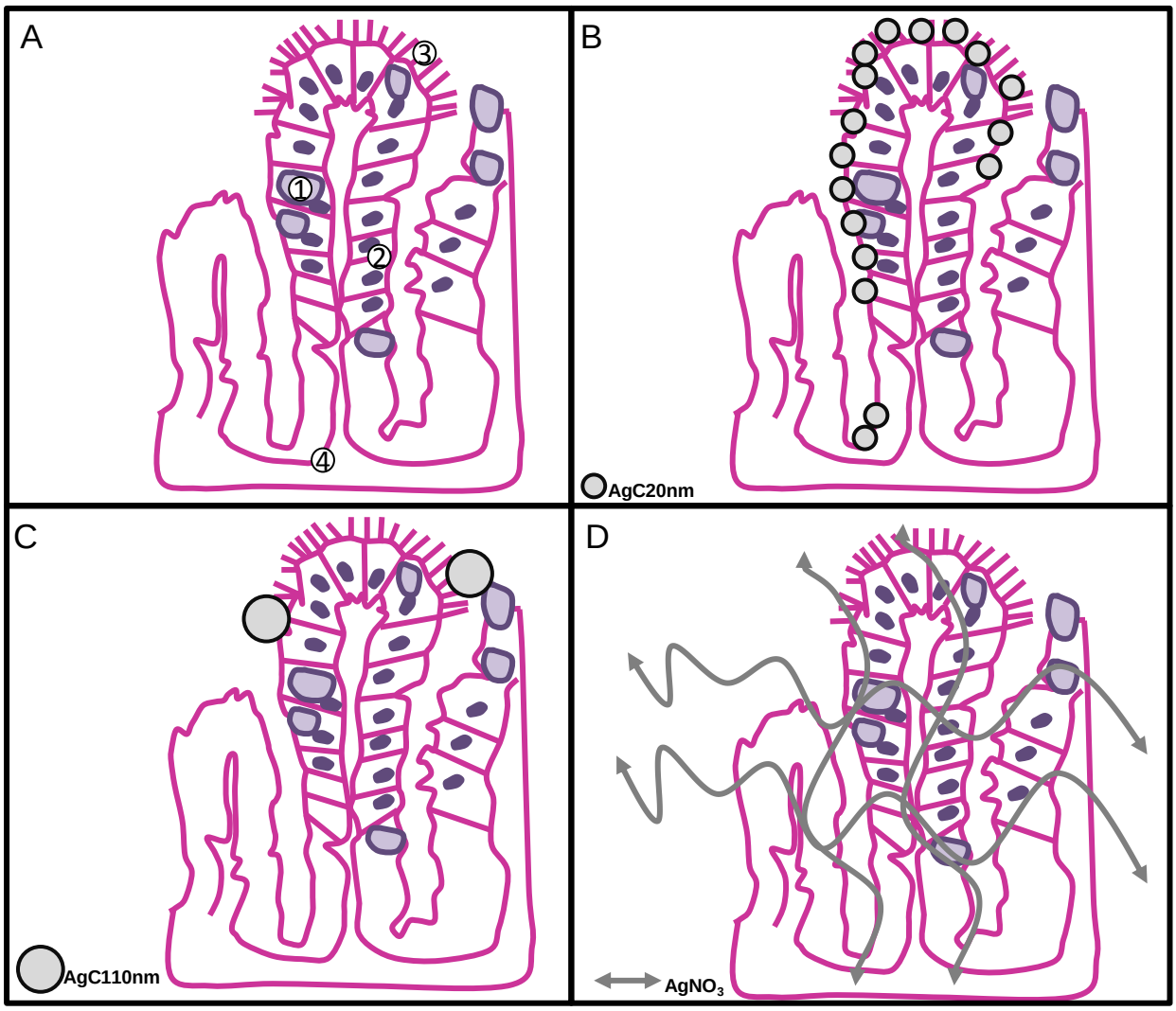

Figure S3. Idealize diagrams of the zebrafish intestine to explain the key features of a normal intestine, as well as the pathology that results to particulate and ionic Ag exposure. **(A)** Diagram illustrating the key features of a normal intestine: (1) goblet cells; (2) enterocytes; (3) microvilli; (4) basolateral membrane. **(B)** Diagram illustrating adherence of AgC20 particles to the intestinal epithelium. **(C)** Diagram illustrating adherence of AgC110 particles to the surface of the intestinal epithelium in smaller quantities. **(D)** Intestinal diagram to explain dousing of the intestine by $AgNO_3$.

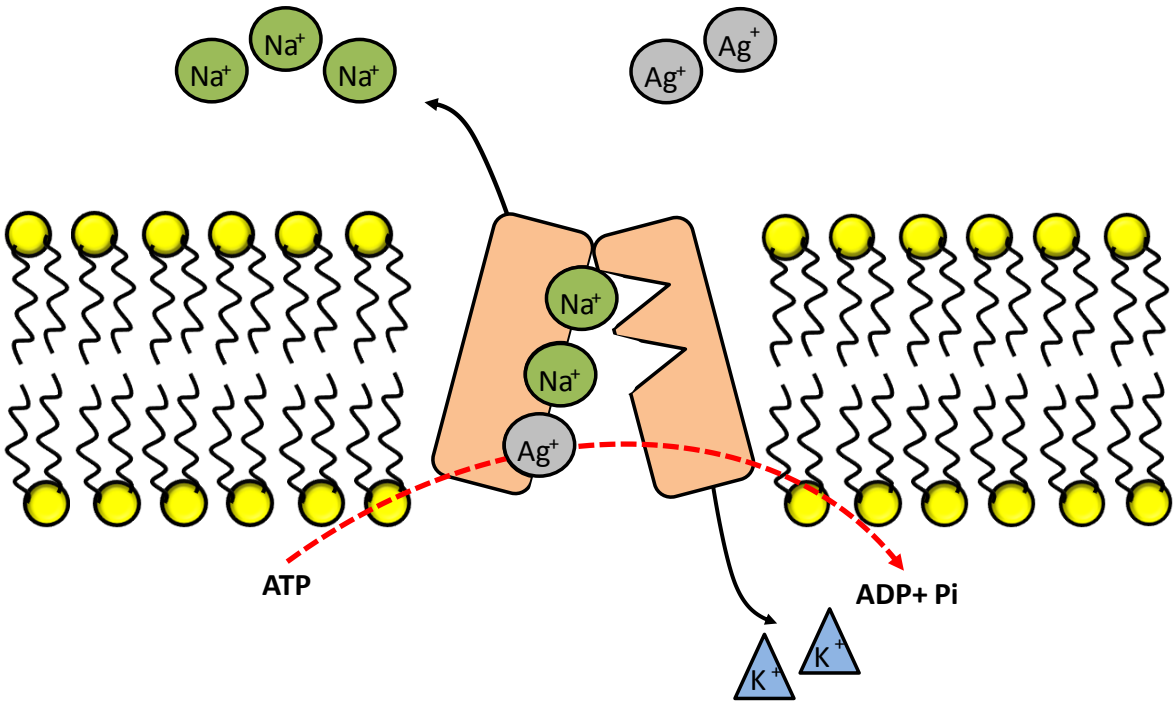

Figure S4. Schematic to explain the structure and function of the Na/K ATPase pump. The diagram also depicts Ag^+ competing for Na^+ in binding to the pump components.

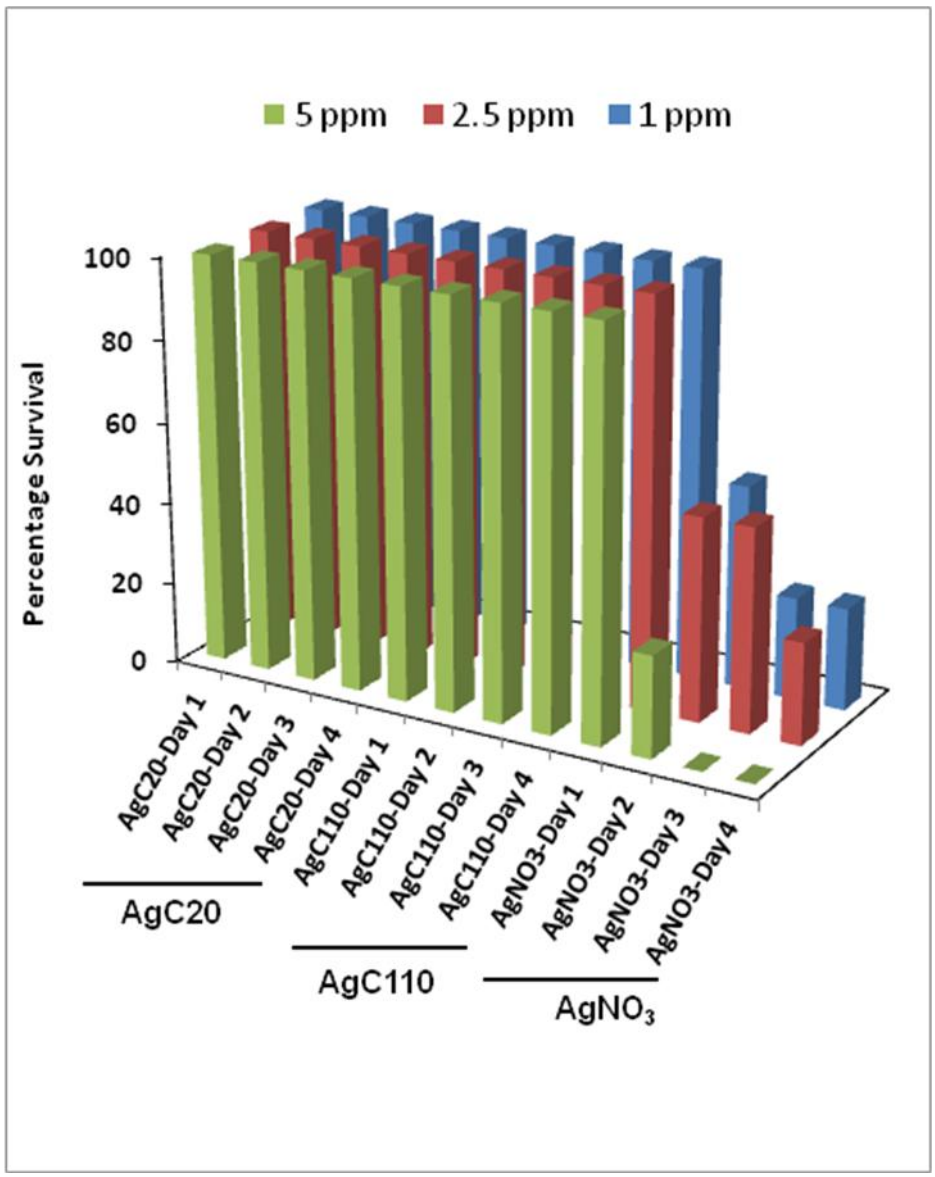

Figure S5. A dosimetry graph showing percentage survival in adult zebrafish over the course of 4 days post exposure of AgC20, AgC110 and $AgNO_3$ at 1 ppm, 2.5 ppm and 5 ppm.