11. Supplementary content

Figure S1 (previously Figure S3):

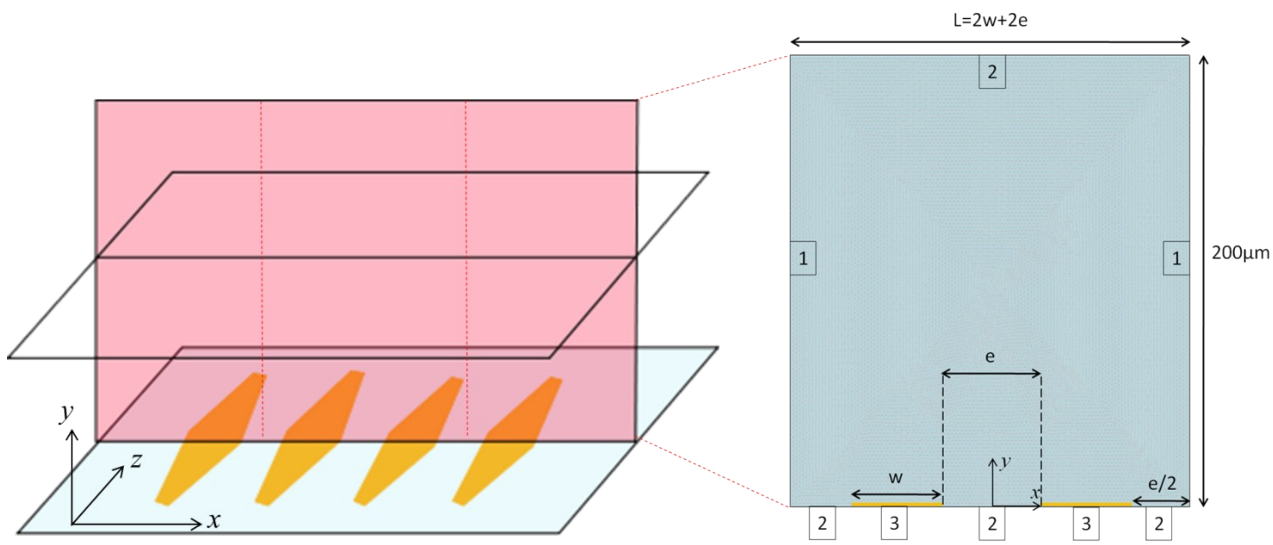

Figure S1: Definition of the 2D simulation domain including two linear (no thickness) electrodes with interspacing e and width w. The height of the domain is 200 microns and its width is two times the sum of e and w. The typical triangular mesh density is given in grey tone. Three different boundary conditions are applied depending on the location and multi-physics equations (see Tab S1).

Table S1 :

	Laplace Equation	**Fourier Equation**	**Stokes Equation**
1	periodicity	Normal flow $\vec{n}.(k_T \nabla T) = h_T(Text - T)$	Symmetry $\vec{n}.\vec{v} = 0$
2	No electrical charges $\vec{n}.\vec{D} = 0$	Thermal isolation $\vec{n}.(k_T \nabla T) = 0$	No slip $\vec{v} = \vec{0}$
3	Electrical potential $V = \pm Ve/2$	Given temperature $T = Text = 295K$	Slip velocity $v_{slip} = v_{eoo} *$ (electroosmotic)

Tab S1: Boundary conditions applied to the 2D simulation domain depending on the multiphysics equations.

Figure S2 (previously Figure S5):

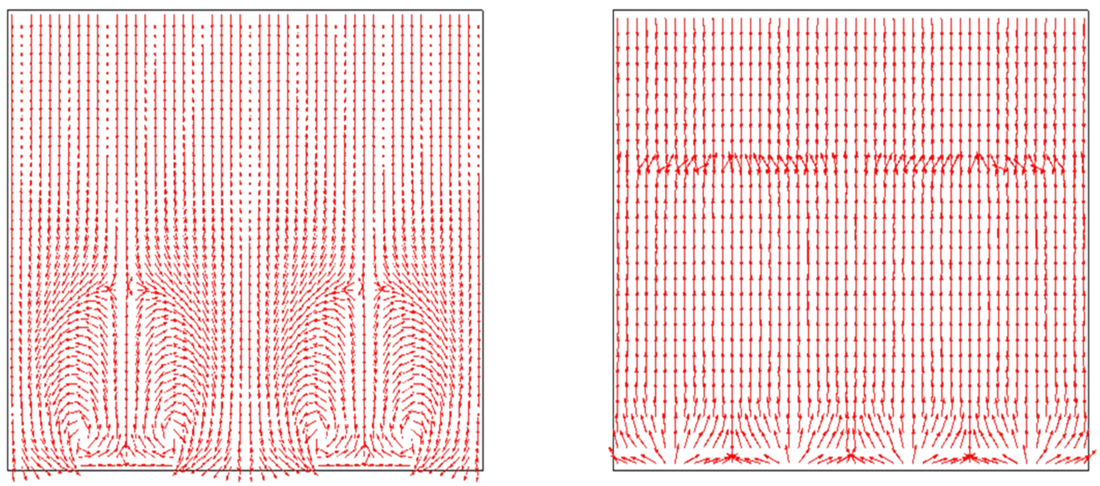

Figure S2: 2D simulations (X-Y vertical plane) of the total forces (dielectrophoresis, electro-osmosis, electrohydrodynamics, gravity, buoyancy) applied to colloidal particles (5 µm diameter, $\sigma_{bulk}=10^{-4}$ $S.m^{-1}$, $\varepsilon=2{,}5$ and $K_s=0{,}25$ nS) calculated by solving charge conservation (Laplace), energy conservation (Fourier), momentum conservation (Stoke) equations with COMSOL MULTIPHYSICS for two AC frequencies 100Hz (left) and 100 kHz (right) for a medium electrical conductivity equal to 10^{-4} $S.m^{-1}$ and electrical potential drop between the two electrodes equal to 10 volts, the electrodes width and interspacing are 60 µm for both.

Figure S3 (previously Figure S7):

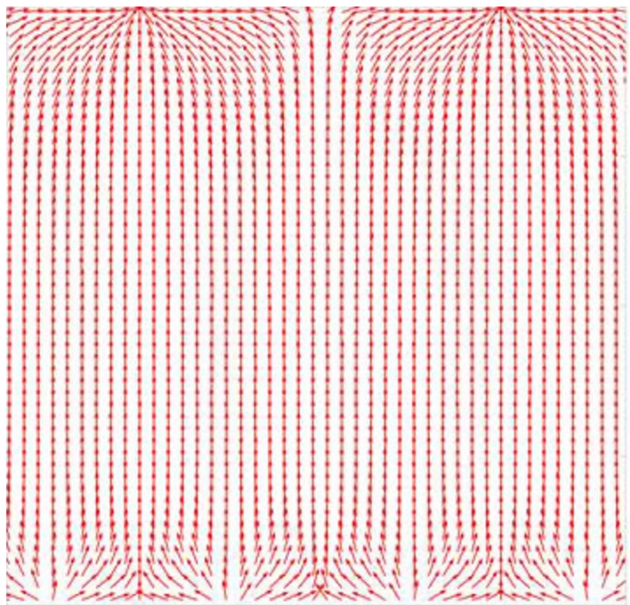

Figure S3: 2D distribution (X-Y vertical plan) of the dielectrophoretic force applied to colloidal particles (5 μm diameter, σ_{bulk}=10^{-4} $S.m^{-1}$, ε=2,5 and K_s=0,25 nS) calculated by solving charge conservation (Laplace), energy conservation (Fourier), momentum conservation (Stoke) equations with COMSOL MULTIPHYSICS for an AC frequency equal to 100 kHz and for a medium electrical conductivity equal to 10^{-4} $S.m^{-1}$ and electrical potential drop between two adjacent electrodes equal to 10 volts, the electrodes width and interspacing are 60 μm for both.

Table S2:

	Laplace Equation	**Fourier Equation**	**Stokes Equation**
Lateral walls	No charges $\vec{n}.\vec{D} = 0$	Normal flow $\vec{n}.(k\nabla T) = h(Text - T)$	No slip $\vec{v} = \vec{0}$
Top and bottom faces	No charges $\vec{n}.\vec{D} = 0$	Thermal insulation $\vec{n}.(k\nabla T) = 0$	No slip $\vec{v} = \vec{0}$
Electrodes	Given potential drop $V = \pm Ve$	Thermal insulation $\vec{n}.(k\nabla T) = 0$	No slip $\vec{v} = \vec{0}$

Tab S2: Boundary conditions applied to the 3D simulation domain depending on the multiphysics equations. Electro-osmotic force is not implemented in 3D.

Table S3 (added Table):

Initial Oocysts Number (Ni)	Initial concentration (Ci)	Final Oocysts number (Nf)	Final volume (µL) were oocysts are concentrated (Vf)	% recovery Nf/Ni*100	Final concentration (Noocysts/µL) Cf= Nf/Vf	Concentration increase value = Cf/Ci
2300	430	1794	0.350	78	5125	11.9
2300	430	1679	0.360	73	4664	10.8
2300	430	1403	0.275	61	5101	11.8
2300	430	1564	0.289	68	5411	12.5
2300	430	1656	0.274	72	6043	14

Tab S3: Details of the experimental data used for the calculation of the recovery rate and concentration increase. The 70% recovery rate and 12 fold concentration increase are average value over 5 experiments. The final volume (Vf) is estimated from the surface of the two concentration zones with an approximate footprint of ~600x200 µm.

Figure S4 (previously Figure S9):

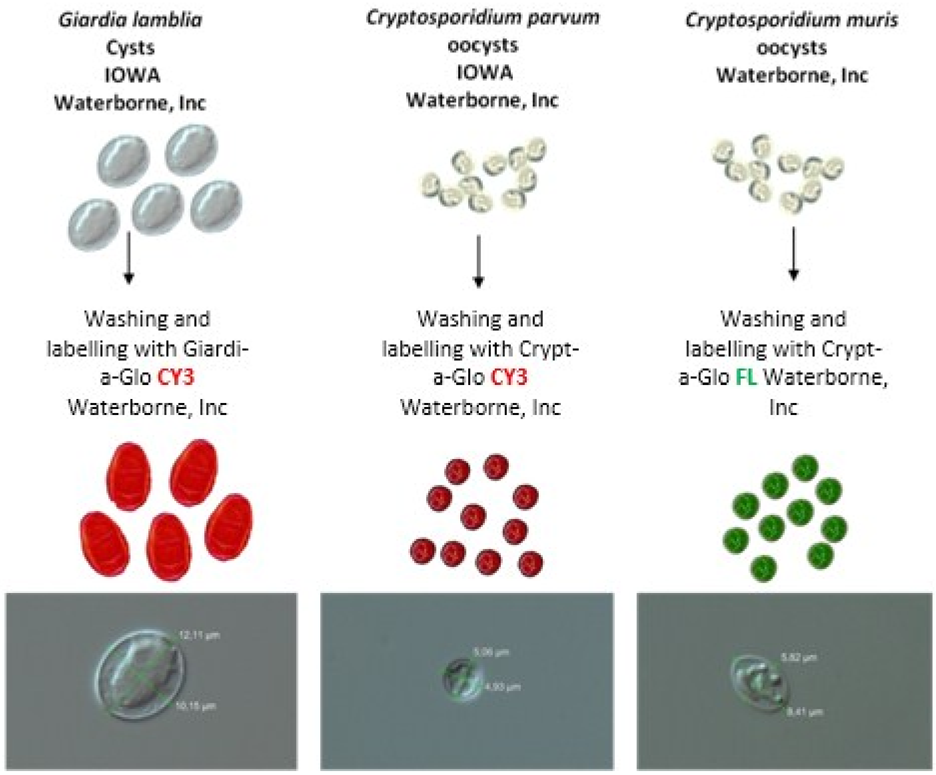

Figure S4: Various sizes and shapes of the three parasites analyzed with the micro-device : (*Giardia lambia*: ellipsoidal shape, 13 µm*7-9 µm, *Cryptosporidium parvum*: spheroidal shape, 4-6 µm, *Cryptosporidium muris*: ellipsoidal shape, 7.5-9.8*5.5-7 µm.