Electronic Supplementary Material (ESI) for RSC Advances.

A 3D mixing-based portable magnetic device for fully automatic immunofluorescence staining of γ-H2AX in UVC-irradiated $CD4^+$ cells

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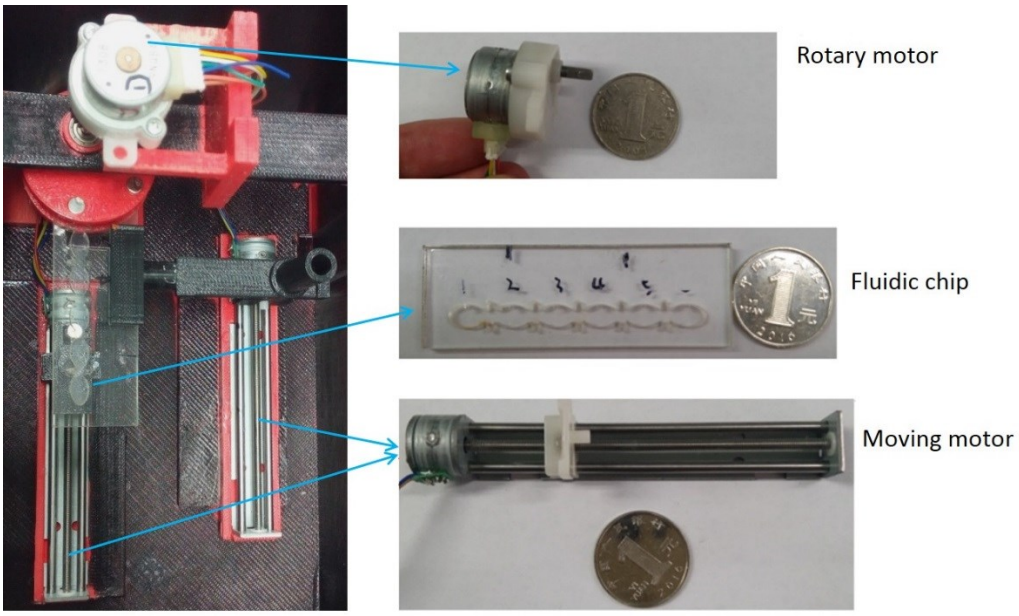

Fig. S1 Pictures of the main components inside the portable magnetic device.

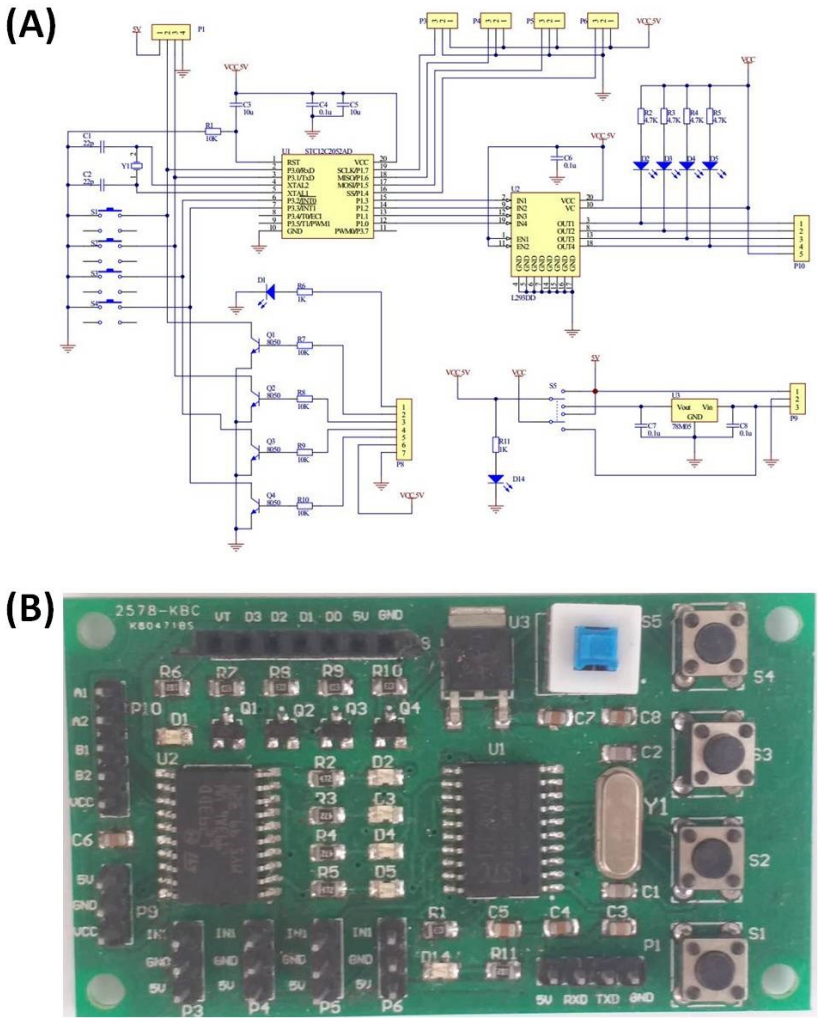

Fig. S2 The circuit diagram (A) and the driver board (B) for stepper motors used in this work.

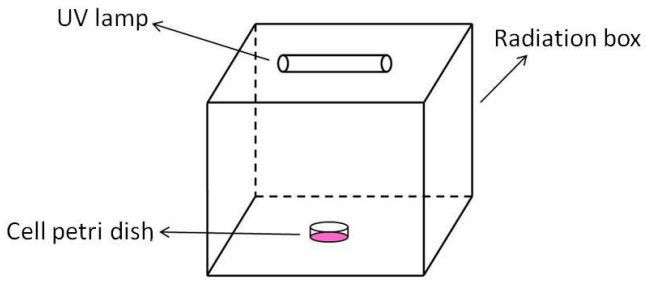

Fig. S3 Schematic diagram of the UVC radiation box for $CD4^+$ cell irradiation. The diameter of the cell culture dish is 60 mm.

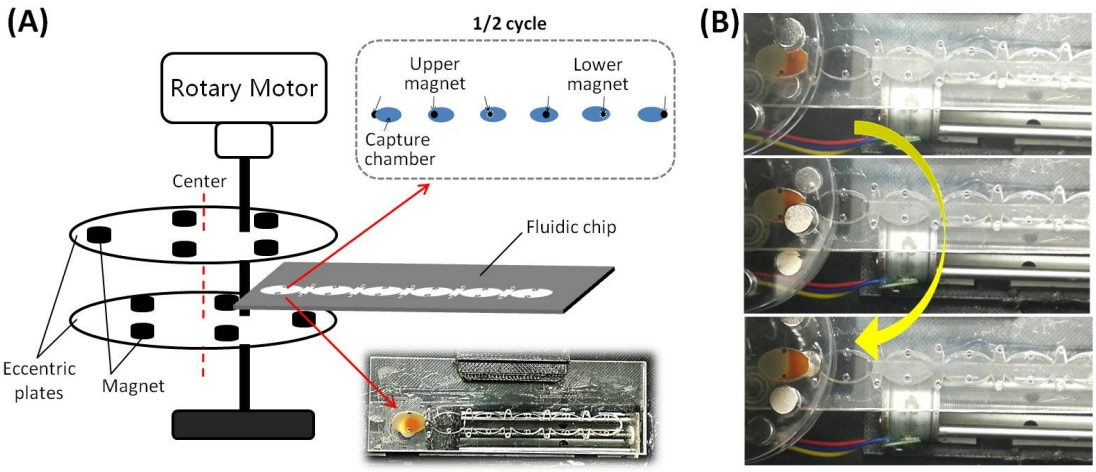

Fig. S4 Schematic illustration (A) and rotation images (B) of the magnetic 3D-mixing module based on the novel mechanism of ec-2MagRotors. Inset on the top right of (A): relative positions of the capture chamber and the magnets embedded in the circular plates at different periods within 1/2 cycle. Inset on the bottom right of (A): position of the capture chamber on a magnet without mixing, showing aggregation of MBs. In (B), two transparent circular plates were used to enable observation of MB movements within the capture chamber during rotation of magnets.

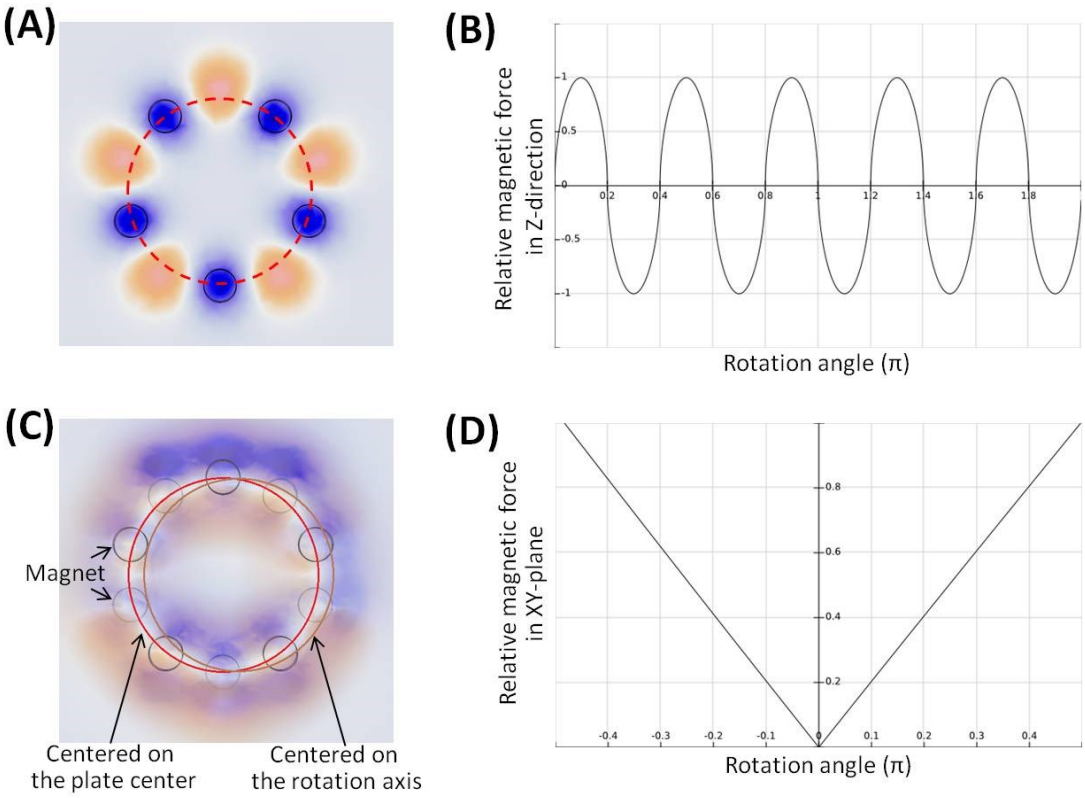

Fig. S5 Computational modeling of magnetic field intensity and relative magnetic forces for the 3D mixing module. Simulation results of magnetic flux density (contours) along the Z-direction (A) and the XY-plane (C) in the horizontal cross-section of XY-plane between the two circular plates when the magnets embedded in the plates rotate continuously. Assuming that the maximum magnetic force in the Z-direction (B) and the XY-plane (D) exerted on the magnetic beads in the capture chamber is normalized to 1. Using the rotation angle (the unit is π) as x-axis and the relative magnetic force as y-axis (the positive and negative represents the direction of the magnetic forces), it can be seen that the magnetic forces in the Z-direction (B) and the XY-plane (D) change periodically during the rotation of the two circular plates.

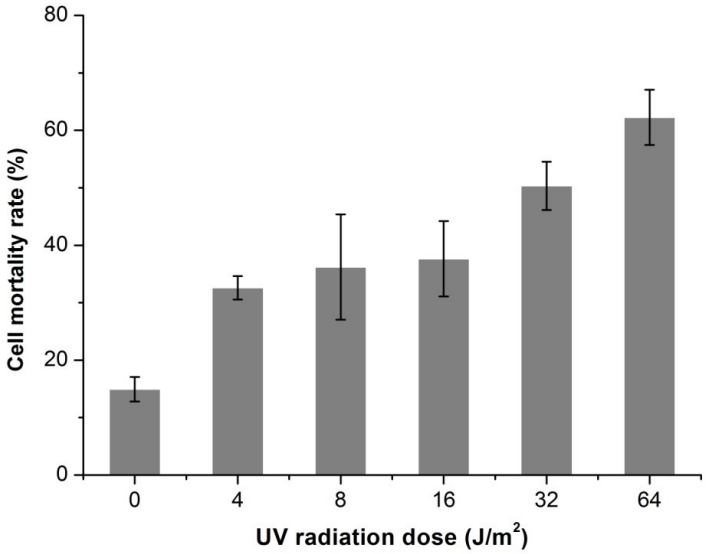

Fig. S6 Effect of UVC radiation dose on the mortality rate of $CD4^+$ cells.

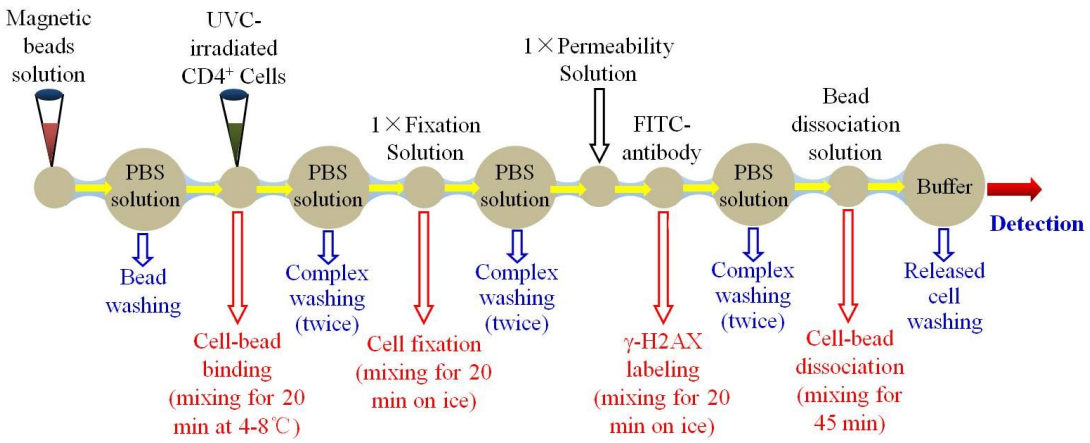

Fig. S7 Standard in-tube protocol for magnetic bead-$CD4^+$ cell binding and γ-H2AX immunofluorescence staining according to the manufacturer's instructions.