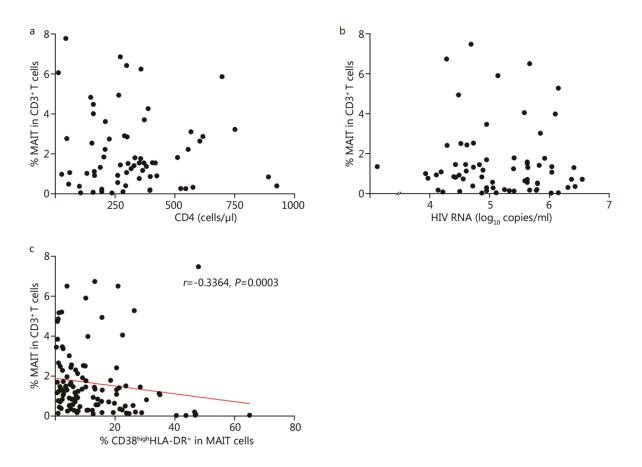


**Fig. S1** Gating strategy of mucosal-associated invariant T (MAIT) cells. MAIT cells were gated on  $CD3^+ CD161^{high} TCR V\alpha7.2^+$  cells. FSC-H forward scatter-height, FVS-A fixable viability stain-area, FSC-A forward scatter-area, TCR T-cell receptor, SSC-A side scatter-area



**Fig. S2** Correlation analysis of mucosal-associated invariant T (MAIT) cell frequencies with CD4<sup>+</sup> T-cell counts (**a**), plasma human immunodeficiency virus (HIV) viral load (**b**) and the frequencies of  $CD38^{high}HLA-DR^+$ -expressing MAIT cells (**c**). Each symbol represents a single individual. Associations were evaluated by using Spearman rank correlation test. *P*-value and Spearman's Rho value are shown

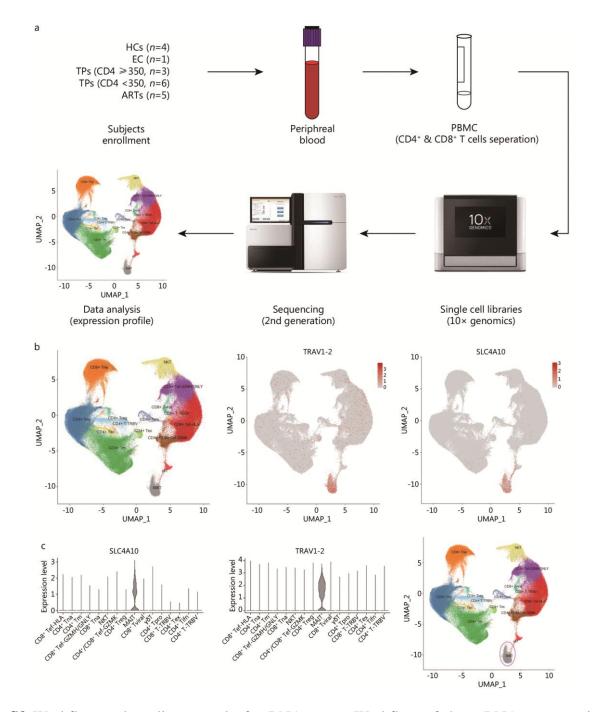
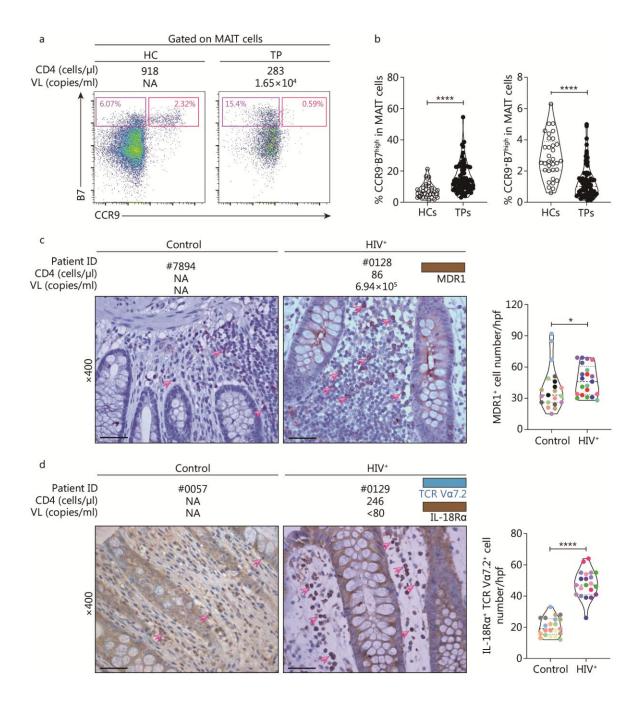


Fig. S3 Workflow and quality-control of scRNA-seq. a Workflow of the scRNA-seq experiment, including subjects grouping, sample collection, CD4<sup>+</sup> T cells and CD8<sup>+</sup> T cells purification, single cell cDNA libraries construction, second generation sequencing (performed by CapitalBioTechnology, Beijing, China) and bioinformatic analysis. b Clustering of 182,670 cells from all 19 samples in this study. Each dot corresponds to a single cell, colored according to cell types. c Violin plot of two canonical markers' expression levels (SLC4A10 and TRAV1-2) across cell clusters. Red circle in the UMAP highlights MAIT cell cluster. HCs healthy controls, EC elite controller, TPs treatment-na we patients, ART antiretroviral therapy, PBMC peripheral blood mononuclear cell



**Fig. S4** Increased mucosal-associated invariant T (MAIT) cells in colorectal mucosa tissues from human immunodeficiency virus type 1 (HIV-1) infected patients. **a** Representative FACS plots from one HC and one TP displaying CCR9 and integrin  $\beta$ 7 expression. **b** Pooled data showing the frequencies of CCR9<sup>-</sup>integrin  $\beta$ 7<sup>high</sup> and CCR9<sup>+</sup>integrin  $\beta$ 7<sup>high</sup> MAIT cells from HCs (hollow circles, n = 33) and TPs (solid circles, total n = 69). **c** Representative immunohistochemistry images (×400) and quantification of MAIT cells in colorectal mucosa tissues from HIV-negative controls (n = 7) and HIV<sup>+</sup> patients (n = 7) single-stained with anti-MDR1. Arrowheads highlight canonical MDR1 only positive cells. **d** Representative immunohistochemistry images (×400) and quantification of MAIT cells in colorectal mucosa tissues from HIV-negative (n = 7) and HIV<sup>+</sup> patients (n = 7)

co-stained with anti-IL-18R $\alpha$  and anti-TCR V $\alpha$ 7.2. Arrowheads highlight canonical IL-18R $\alpha$ <sup>+</sup>TCR V $\alpha$ 7.2<sup>+</sup> double-positive cells. Each color in the pooled data (**c** and **d**) of immune single or double stains represents one single subject, and each dot represents single or double-positive cell numbers counted in a single high-power field (hpf, ×400). Each symbol represents a single individual. Data are expressed as M ( $Q_1$ ,  $Q_3$ ). \*P < 0.05, \*\*\*\*P < 0.0001. Scale bar of hpf = 50 µm. Mann-Whitney U test (**b-d**). HC healthy control, TP treatment-na  $\ddot{v}e$  patient, VL viral load, NA not available, CCR9 C-C motif chemokine receptor 9, HIV human immunodeficiency virus, IL-18 interleukin-18, TCR T-cell receptor