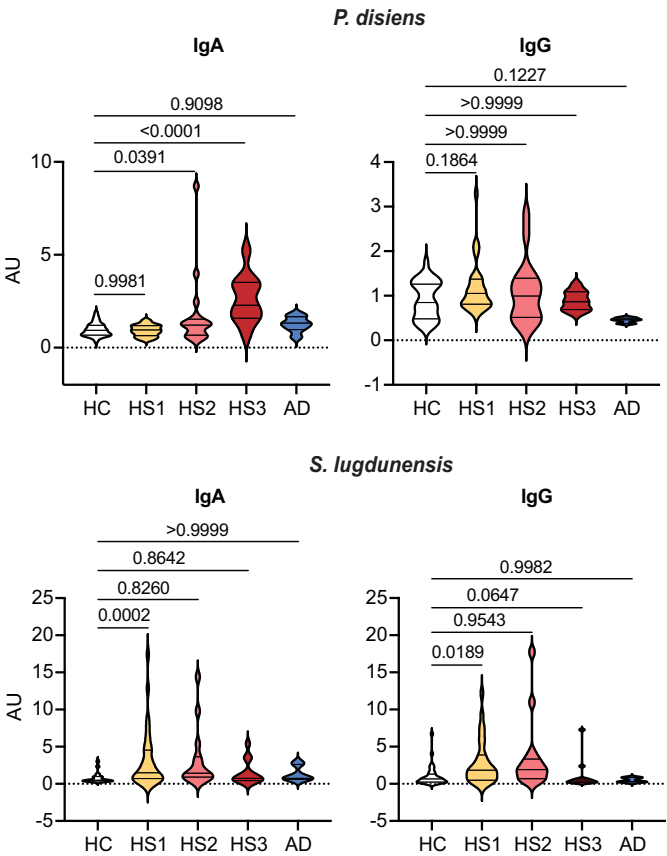


Expanded View Figures

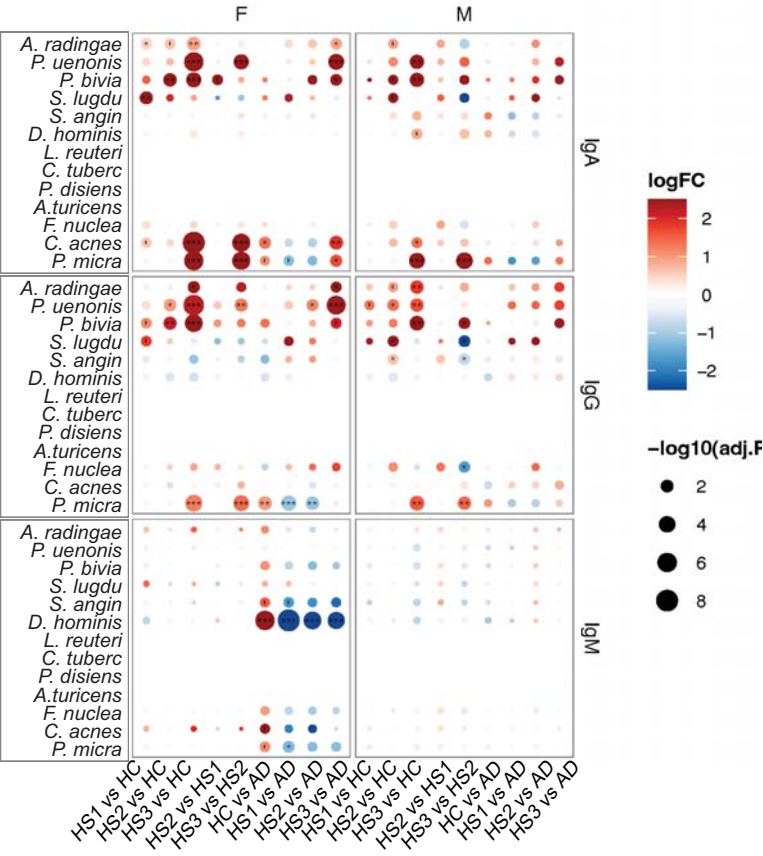
Figure EV1. Anti-*P. disiens* and *S. lugdunensis* Ig responses and sex effect on anti-bacterial Ig responses.

(A) Relative level of serum IgA/Gs binding to *P. disiens* and *S. lugdunensis* in HS1 ($n = 29$), HS2 ($n = 17$), HS3 ($n = 11$), or AD patients ($n = 7$), compared to HC ($n = 32$).
(B) Heatmap comparing mean levels of anti-bacterial IgAs, IgGs, and IgMs in sera of male (M) or female (F) HS1/2/3 patients to those of HC (left), to each other (middle) or to those of AD patients (right). Statistical analyses used a moderated, FDR-corrected two-tailed t-test (limma). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, and **** $p < 0.0001$.

A



B



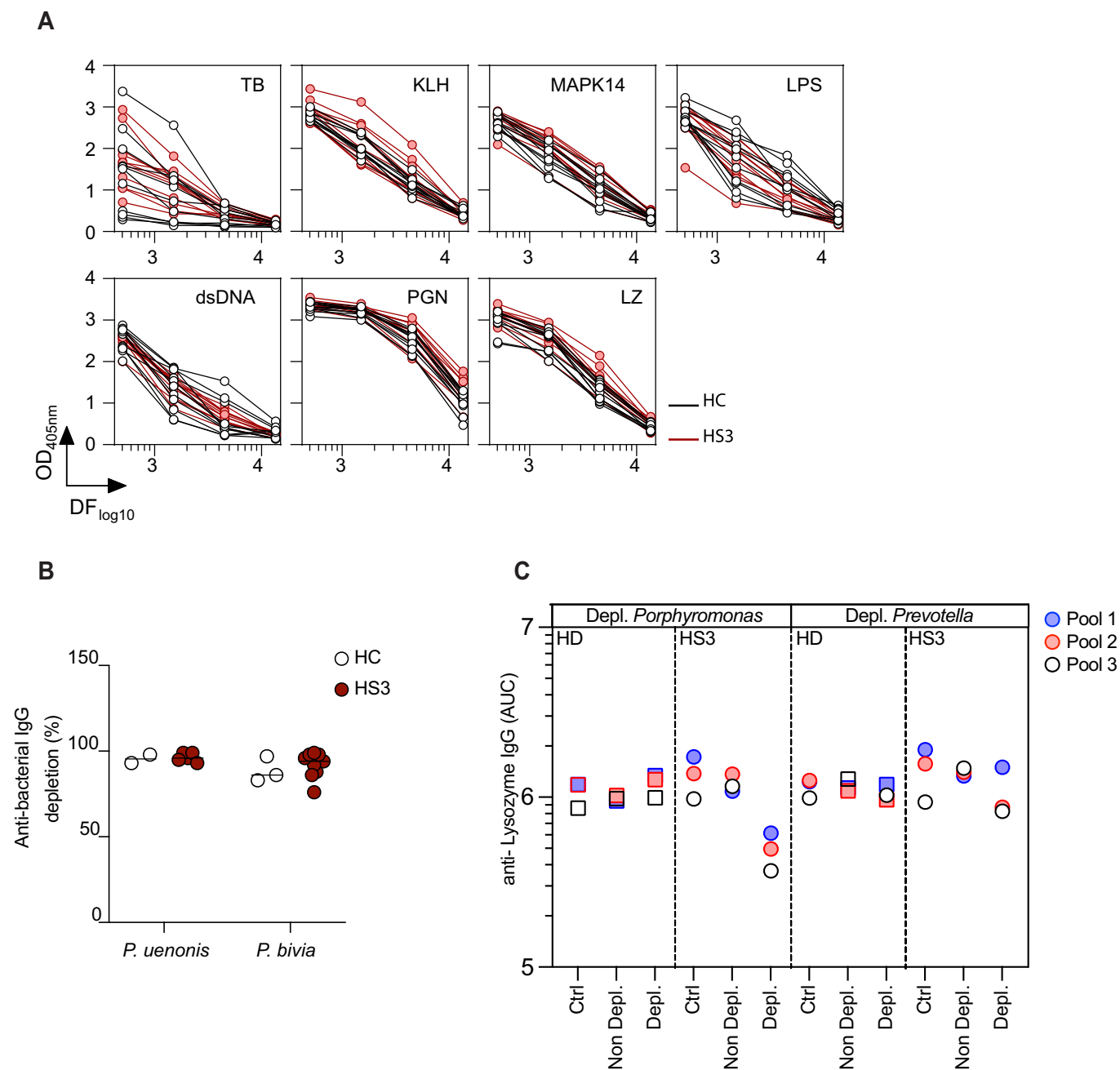


Figure EV2. IgG autoreactivity and efficacy of anti-bacterial IgG depletion.

(A) ELISA titration curves of individual HC (black) and HS3 (red) sera for each antigen tested. (B) Loss of anti-bacterial IgG (%), as measured by flow cytometry, in independent pools of HC ($n = 2, 3$) and HS3 sera ($n = 5, 9$) sera following depletion on *P. uenonis* or *P. bivia*, respectively. (C) ELISA titration curves of pooled HC (black) and HS3 (red) sera against LZ following depletion on *P. uenonis* or *P. bivia*.

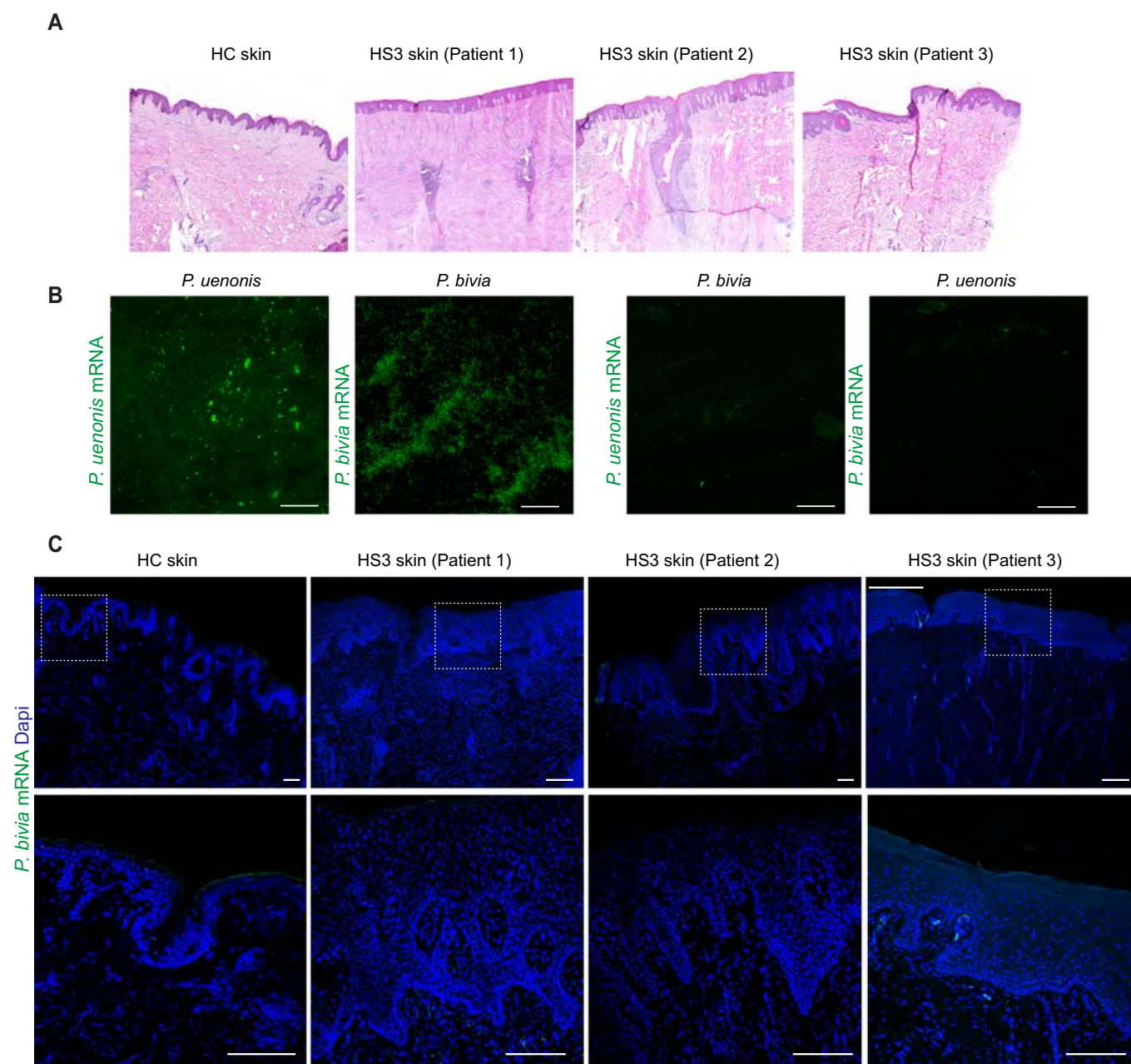


Figure EV3. *Prevotella bivia* does not invade the epidermis in severe HS.

(A) Representative images of skin samples from HC and 3 HS3 patients stained by H&E. (B) Validation of mRNA probes targeting *P. uenonis* and *P. bivia* on their respective live bacterial culture (left). Each probe was also tested on the other species (right) as a negative control to assess specificity. (C) Representative images of skin samples from HC and 3 HS3 patients hybridized with anti-*P. bivia* mRNA probes, with nuclei counterstained with Dapi. Dotted square indicates the magnified area (bottom panel, Scale bars: 500 μ m).

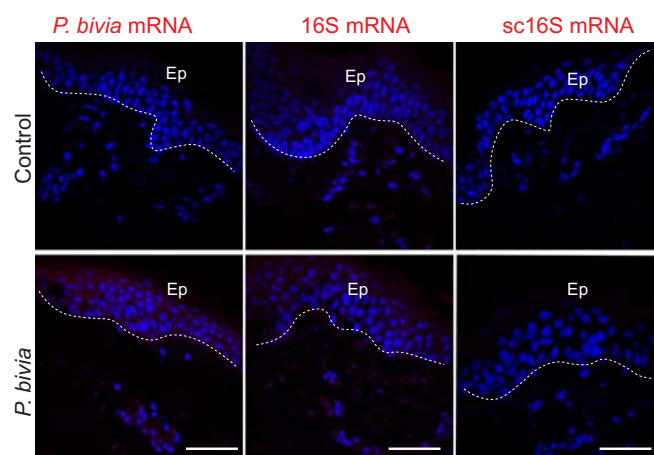


Figure EV4. Lack of bacterial invasion in *P. bivia*-coated skin explants.

Representative images of skin explant sections hybridized with an anti-*P. bivia* mRNA probe, pan-bacteria 16S mRNA, or scrambled 16S mRNA probes as controls. Nuclei were stained in DAPI (blue). Scale bars: 50 μ m.

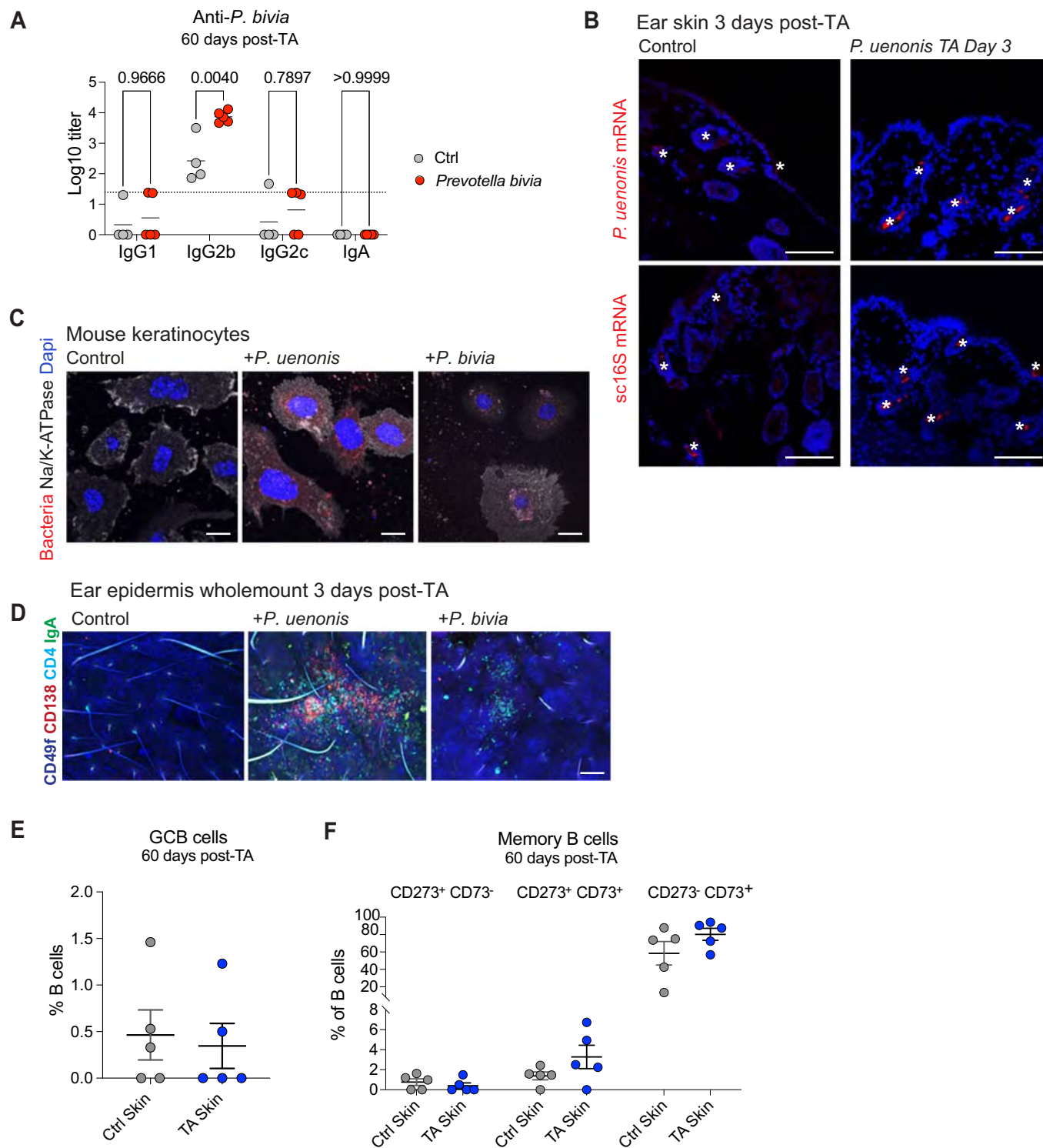




Figure EV5. Topical association with *P. uenonis* triggers PC recruitment in vivo.

(A) Serum levels of anti-*P. Bivia* IgG1, IgG2b, IgG2c, and IgA were measured in control and TA groups at 60-days post-TA. Each dot represents an individual mouse. Data were mean Log₁₀ Ig titers in each individual mouse ($n = 5$) $\pm$ SD. Statistical significance was assessed using two-way ANOVA with Bonferroni's multiple comparisons test. (B) Confocal images of ear skin sections from control and *P. uenonis*-associated mice 3 days post-TA, hybridized with an anti-*P. uenonis* mRNA or scrambled 16S mRNA probe as control (red), with nuclei counterstained with DAPI (blue). White stars indicate non-specific labeling of hair follicles. Scale bars: 100 μ m. (C) KCs isolated from wild-type mice were exposed to fluorescently labeled *P. uenonis*, *P. bivia*, or broth (Ctrl) for 48 h under anaerobic conditions. Confocal images show KCs infected with bacteria, Dapi-stained nuclei, and membrane marker Na, K-ATPase. Scale bar: 10 μ m. (D) Representative confocal images of mouse ears 3 days post-TA. Control (left), *P. uenonis*-associated (middle), and *P. bivia*-associated (right) mice are shown. Ears were stained for CD49f (KCs), CD138 (PCs), CD4 (helper T cells) and IgA-expressing cells. Scale bars: 80 μ m. (E) FACS analysis of germinal center B cells (GCBs) in ear skin 60 days post-TA with *P. uenonis*. Data were mean % in each individual mouse ($n = 5$) $\pm$ SD. (F) FACS analysis of memory B cell subsets (defined by their expression of CD273 and/or CD73 markers) in ear skin 60 days post-TA with *P. uenonis*. Data were mean % in each individual mouse ($n = 5$) $\pm$ SD.