

Statistical details

Figure 1

d (top), rank-sum test for each group, $N = 22155$, $P = 3.2 \times 10^{-8}$ (RF), $P = 4.1 \times 10^{-31}$ (ON), $P = 5.7 \times 10^{-26}$ (OFF), $P = 9.2 \times 10^{-12}$ (Same), $P = 8.5 \times 10^{-15}$ (Dif). **d** (bottom), Kruskal-Wallis test, $N = 8$, $P = 6.1 \times 10^{-21}$, *post hoc* using Dunn's method: except RF-Same comparison $P = 0.0725$, the largest P value among the rest of pairwise comparison is 7.9×10^{-3} . Data from 8 fields of view (7 animals).

Figure 2

d, linear regression, $N = 211$, $P = 1.4 \times 10^{-10}$ (RF), $P = 9.9 \times 10^{-24}$ (OFF), $P = 0.535$ (ON). **e** (left), Kruskal-Wallis test, $N = 16$, $P = 7.6 \times 10^{-12}$, *post hoc* using Dunn's method: $P = 1.4 \times 10^{-7}$ (ON-OFF), $P = 9.9 \times 10^{-5}$ (OFF-RF), $P = 3.9 \times 10^{-5}$ (ON-RF). **e** (right), Kruskal-Wallis test, $N = 16$, $P = 8.5 \times 10^{-15}$, *post hoc* using Dunn's method: $P = 9.5 \times 10^{-8}$ (ON-OFF), $P = 7.4 \times 10^{-5}$ (OFF-RF), $P = 4.5 \times 10^{-6}$ (ON-RF). Data from 8 fields of view (7 animals).

Figure 3

a, circular correlation, $N = 176$, $P = 1.7 \times 10^{-5}$. Data from 4 fields of view (2 animals). **c**, circular correlation, $N = 73$, $P = 6.9 \times 10^{-9}$. **e**, mean values: 180.2 for relative phase, 2.89 for numbers of half-cycles within Gaussian envelop, -0.35 for logarithmic aspect ratio. **f**, $N = 73$, $P = 1.2 \times 10^{-9}$ (top, circular correlation), $P = 3.3 \times 10^{-9}$ (middle, linear regression), $P = 6.6 \times 10^{-6}$ (bottom, linear regression). Data from 6 fields of view (5 animals).

Figure 4

d (top left), circular correlation, $N = 381$, $P = 2.1 \times 10^{-21}$. **d** (top right), circular correlation, $N = 18235$, $P = 3.1 \times 10^{-29}$. **d** (bottom), rank-sum test within group, $N = 16$, $P = 4.2 \times 10^{-13}$ (2P); $N = 12$, $P = 2.8 \times 10^{-10}$ (Epi). Data from 6 fields of view (4 animals). **E**, Rayleigh test, $N = 17389$, $P = 5.2 \times 10^{-16}$ (top); $N = 38232$, $P = 0.223$ (middle); $N = 37898$, $P = 0.643$ (bottom). Data from 6 fields of view (6 animals).

Extended figure 1

i-l, $N = 143$, Data from 3 fields of view (3 animals).

Extended figure 3

b (bottom), Wilcoxon rank-sum test, $N = 21$, $P = 9.6 \times 10^{-5}$. Data from 4 fields of view (4 animals).

Extended figure 4

b (bottom), Kruskal-Wallis test, $N = 8$, $P = 3.2 \times 10^{-17}$, *post hoc* using Dunn's method: the largest P value among pairwise comparison is 8.2×10^{-3} . **d** (left), linear regression, $N = 145$, $P = 0.057$ (ON); $N = 277$, $P = 2.4 \times 10^{-76}$ (OFF). **d** (middle), rank-sum test, $N = 16$, $P = 4.7 \times 10^{-9}$. **d** (right), rank-sum test, $N = 16$, $P = 8.1 \times 10^{-13}$. **e** (right), circular correlation, $N = 68$, $P = 9.51 \times 10^{-3}$ (ON); $N = 89$, $P = 0.586$ (OFF). Data from 8 fields of view (7 animals).

Extended figure 5

c (top), linear regression, $N = 1811$, $P = 0.082$; (bottom), linear regression, $N = 1811$, $P = 0.096$. Data from 8 fields of view (7 animals).

Extended figure 7

b, circular correlation, $N = 179$, $P = 1.8 \times 10^{-18}$. Data from 5 fields of view (2 animals). **c**, circular correlation, $N = 73$, $P = 1.7 \times 10^{-10}$. Data from 6 fields of view (5 animals). **e**, circular correlation, $N = 56521$, $P = 6.6 \times 10^{-36}$ (left), $P = 0.245$ (middle). **e** (right), rank-sum test, $N = 36$, $P = 8.2 \times 10^{-18}$. Data from 5 fields of view (2 animals). **g** (left top), Kruskal-Wallis test $N = 32$, $P = 1.2 \times 10^{-25}$, *post hoc* using Dunn's method: largest P value is 3.1×10^{-3} . **g** (left bottom), Kruskal-Wallis test $N = 32$, $P = 7.9 \times 10^{-15}$, *post hoc* using Dunn's method: largest P value is 0.023. Data from 6 fields of view (6 animals).