

Additional file 1. Structural modifications of the mouse marginal VSE during natural and pathological aging. **A)** Schematics depicting the VNO divisions into marginal (M), intermediate (I) and central (C). **B)** Dispersion plots of the number of OMP⁺ cells in the marginal zone of the VSE combining anterior, medial and posterior sections. Thick lines indicate the mean $\pm$ SEM. Data were obtained from 10-16 slices from at least three animals per condition. Statistical comparisons were calculated by two-way ANOVA with Tukey's test. $P \leq 0.05$ was considered statistically significant.

Additional file 2. Social odor exploration time during natural aging. Dispersion plots represent the raw sniffing time of 2-, 6-, 12- and 24-months-old animals for the various serial dilutions tested in **Fig. 3**. Thick grey lines indicate mean $\pm$ SEM. Data were analyzed by a one-way ANOVA with Tukey's test to test multiple comparisons with more than one variable. P and n values are indicated in the tables. $P \leq 0.05$ was considered statistically significant.

Additional file 3. Statistical comparison between different urine dilutions for each age tested (2-, 6-, 12-, 24-months-old). Dispersion plots represent the sniffing time and trend curves of 2-, 6-, 12- and 24-months-old animals. Thick dots indicate mean $\pm$ SEM. P values for each statistical comparison are indicated in the tables on the right. Data were analyzed by a one-way ANOVA with Tukey's test to test multiple comparisons with more than one variable. $P \leq 0.05$ was considered statistically significant.

Additional files 4. Aged-related deficits in social odor exploration exhibit no sex differences. **A)** Average sniffing time of urine serial dilutions of adult and aged female wild type mice. **B)** Average exploration (sniffing) time of urine serial dilutions of adult and aged male wild type mice. **C)** Dispersion plots of the sniffing time of urine dilutions that show the dilutions with significant impairments in female mice (nd, non-diluted; 1:10; 1:500; 1:1000). **D)** Dispersion plots of the sniffing time of the urine dilutions that show significant changes in male mice (nd, non-diluted; 1:250; 1:500; 1:1000). Plots indicate mean $\pm$ SEM. Number of mice:

adult females: n = 13; adult males: n = 11; aged females: n = 14; aged males: n = 11. Data were analyzed by a one-way ANOVA with Tukey's test to test multiple comparisons with more than one variable. $P \leq 0.05$ was considered statistically significant.

Additional file 5. Social odor exploration of APP^{WT} and APP^{Het} mice. Dispersion plots represent the raw sniffing time of middle age APP^{WT} and APP^{Het} mice for the various serial dilutions tested. Thick grey lines indicate mean $\pm$ SEM. Number of mice for each condition is indicated in the table below. Data were analyzed by a one-way ANOVA with Tukey's test to test multiple comparisons with more than one variable. $P \leq 0.05$ was considered statistically significant.

Additional file 6. Statistical comparison between different urine dilutions of APP/PS1^{WT} and APP/PS1^{Het} mice. Dispersion plots represent the sniffing time and trend curves of middle age APP^{WT} and APP^{Het} mice for the various serial dilutions. Thick dots indicate mean $\pm$ SEM. P values for each statistical comparison are indicated in the tables on the right. Data were analyzed by a one-way ANOVA with Tukey's test to test multiple comparisons with more than one variable. $P \leq 0.05$ was considered statistically significant.

Additional file 7. Latency to approach the first stranger (M1^A) in the three chamber sociability test is increased in naturally aged animals. A) The sociability phase of the three chamber test involves exposing the test animal to a stranger mouse (M1^A) for the first time, which elicits an increase in the exploration time in that side of the chamber. **B)** Dispersion plots of the latency to approach M1^A during the first encounter of the sociability phase. Thick lines indicate mean $\pm$ SEM. Data were analyzed by one way-ANOVA with Tukey's test. $P \leq 0.05$ was considered statistically significant.