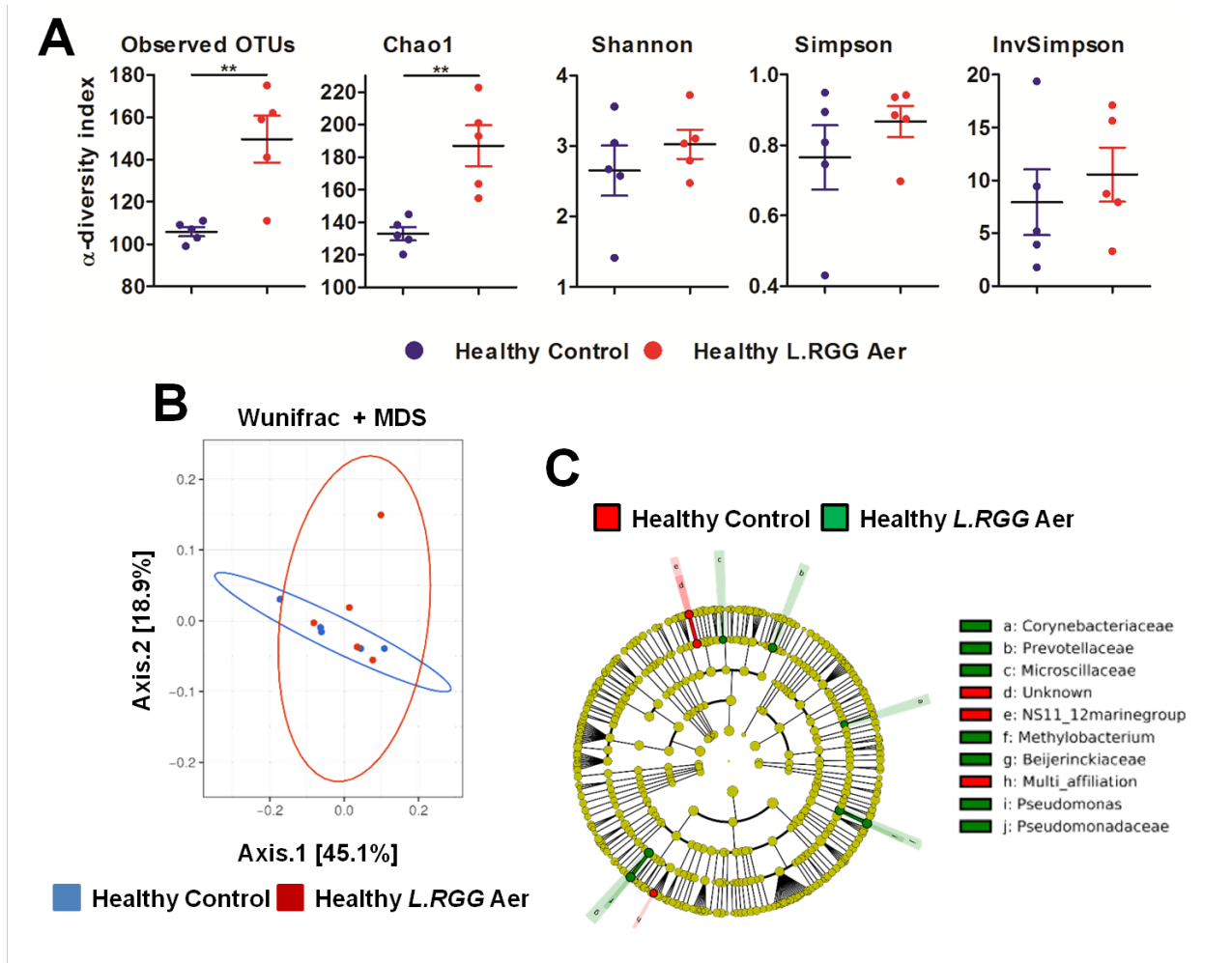


**Figure S1. Histopathological evaluation of urethane-induced lung lesions.**

Representative examples of lung lesions induced by urethane treatment. (A) Atypical adenomatous hyperplasia, (B) adenoma. (C) adenoma with areas of atypia and (D) well differentiated adenocarcinoma. Hematoxylin and Eosin, 10x. Inset 40x.



**Figure S2. Metagenomic analysis of healthy lung after *L.RGG* aerosol treatment.**

16S rRNA gene profiling was used to compare the bacterial community in healthy lung samples from mice not treated or treated with live *L.RGG* aerosolization. **(A)** Intra-subject bacterial richness and evenness ( $\alpha$ -diversity) analyzed using observed OTUs, Chao1, Shannon, Simpson, and inverse Simpson algorithms (5 samples/group) (mean  $\pm$  SEM). **(B)** Inter-sample ( $\beta$ -) diversity analysis carried out with the WUniFrac algorithms plus multidimensional scaling (MDS) (5 samples/group). **(C)** Cladogram representation derived from linear discriminant analysis score computed for differentially abundant taxa in the lung bacteria of untreated compared with live *L.RGG* treated healthy mice. Regions in red indicate taxa enriched in healthy control mice, whereas regions in green indicate taxa enriched in healthy *L.RGG* treated mice. \*\* $p < 0.01$  by unpaired student t-test.

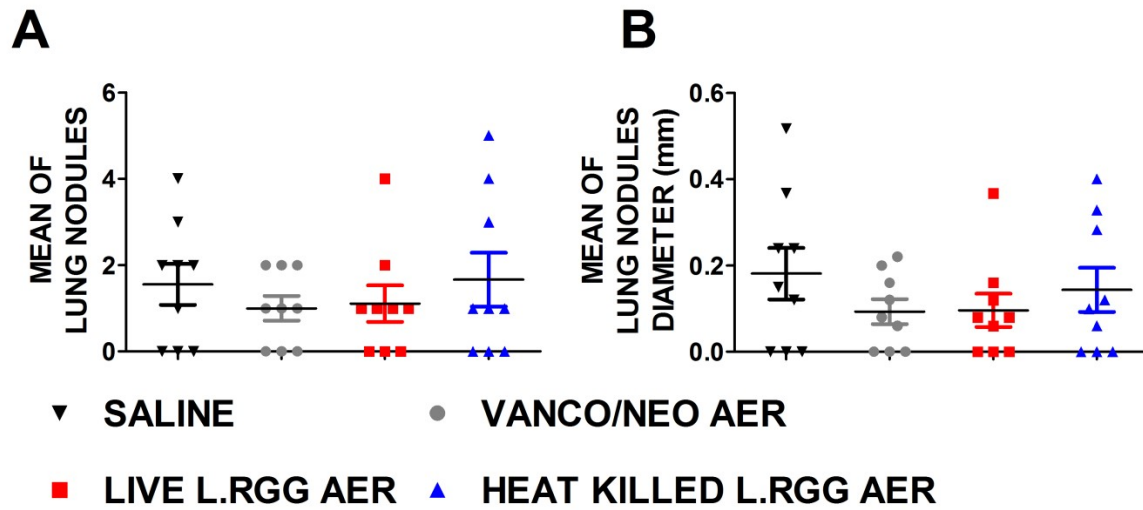


Figure S3. Impact of aerosol treatment with vancomycin/neomicin or *L.RGG* on adenocarcinoma development induced by urethane in low sensitive BALB/c mice model. Mean number (A) and mean diameter (B) of lung tumor nodules in BALB/c mice i.p. injected with urethane and aerosolized with saline, vanco/neo, live *L.RGG* and killed *L.RGG* (9 mice/group) (mean  $\pm$  SEM).