

Integrated multi-omics analysis reveals *Lactobacillus*
anti-inflammatory process in vaginal tissue
A demonstration of Rmarkdown using Herman Bumpus' data

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1 Abstract

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2 Introduction

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Problem / question to answer

Joint analysis of vaginal microbiome reveals distinct patient subgroups

To be able to better understand the differences in microbiome profile across all datasets collected, we performed a joint graph-based clustering analysis in order to identify co-regulated bacterial communities (see “Methods” section for details). A total of 11 bacterial communities were identified.

Patients were thus subdivided into 6 groups,

[illegible]

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4 Discussion

I have analysed data collected by Herman Bumpus³ on the relationship between sparrow (*Passer domesticus*) total length and survival following an unusually severe storm. I found that sparrows that died in the storm were longer than sparrows that survived, which suggests that higher sparrow body length decreased survival. Of course, it is not possible to definitively conclude a causal relationship between any aspect of body size and sparrow survival, and even the available data collected by Bumpus would permit a more thoughtful analysis than that conducted in this study (see [Appendix Table 1](#)).

Overall, this document demonstrates how high quality, professional looking documents can be written using Rmarkdown. The [underlying code](#) for this manuscript is publicly available, along with [accompanying notes](#) to understand how it was written. By using Rmarkdown to write manuscripts, authors can more easily use version control (e.g., git) throughout the writing process. The ability to easily integrate citations through BibTeX, LaTeX tools, and dynamic R code can also make writing much more efficient and more enjoyable. Further, obtaining the benefits of using Rmarkdown does not need to come with the cost of isolating colleagues who prefer to work with Word or LaTeX because Rmarkdown can easily be converted to these formats (in the case of Word, with the push of a button). By learning all of the tools used in this manuscript, readers should have all of the necessary knowledge to get started writing and collaborating in Rmarkdown.

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5 Methods

6 References

1. Johnston, R. F., Niles, D. M. & Rohwer, S. A. Hermon bumpus and natural selection in the house sparrow *Passer domesticus*. *Evolution* **26**, 20–31 (1972).
2. Darwin, C. *The origin of species*. 495 (Penguin, 1859).
3. Bumpus, H. C. Eleventh lecture. The elimination of the unfit as illustrated by the introduced sparrow, *Passer domesticus*. (A fourth contribution to the study of variation.). *Biological Lectures: Woods Hole Marine Biological Laboratory* 209–225 (1898).

7 Appendix Table 1

An example table is shown below, which includes all of the variables collected by 3 for the first 10 measured sparrows. The full data set can be found online in [GitHub](#).

8 FIGURES (MAIN)

8.1 Figure 1

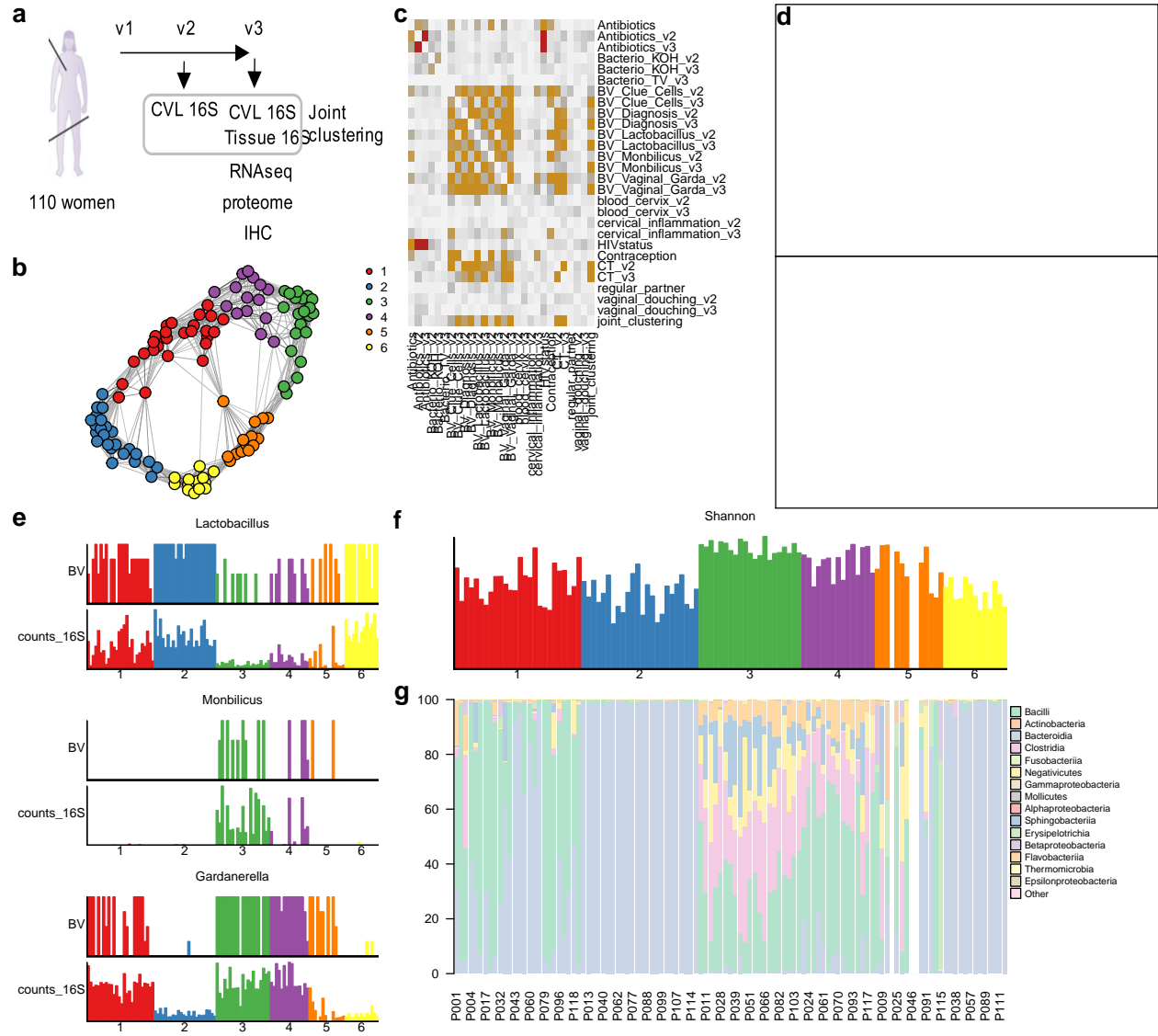


Figure 1. Identification of patient groups. (a) Schematic representation of patient data flow. (b) Network diagram showing clusters of patients. (c) Heatmap of clinical and microbiological data. (d) Empty box. (e) Bar charts showing counts of Lactobacillus, Monililicis, and Gardanerella across six clusters (1 to 6). (f) Bar chart showing Shannon diversity index across six clusters (1 to 6). (g) Stacked bar chart showing the relative abundance of bacterial phyla across six clusters (1 to 6).

8.2 Figure 2

Figure 2. Identification and characterization of vaginal bacterial communities. (a) Schematic representation of #####. (b) Schematic representation of #####. (c) Schematic representation of #####. (d) Schematic representation of #####.

8.3 Figure 3

Figure 1. Identification of patient groups. (a) Schematic representation of #####. (b) Schematic representation of #####. (c) Schematic representation of #####. (d) Schematic representation of #####.

187 **9 FIGURES (SUPPL)**

188 **9.1 Figure S1**

189 **9.2 Figure S2**

190 **9.3 Figure S3**

191 **9.4 Figure S4**

192 **10 TABLES (MAIN)**

193 **10.1 Table 1**

194 **10.2 Table 2**

195 **10.3 Table 3**

196 **11 TABLES (SUPPL)**

197 **11.1 Table S1**

198 **11.2 Table S2**

199 **11.3 Table S3**