



Odors Perception and Odor Analysis of Latrines in Africa and India.

Charles Jean-François Chappuis, Yvan Niclass, Isabelle Cayeux, and Christian Starkenmann

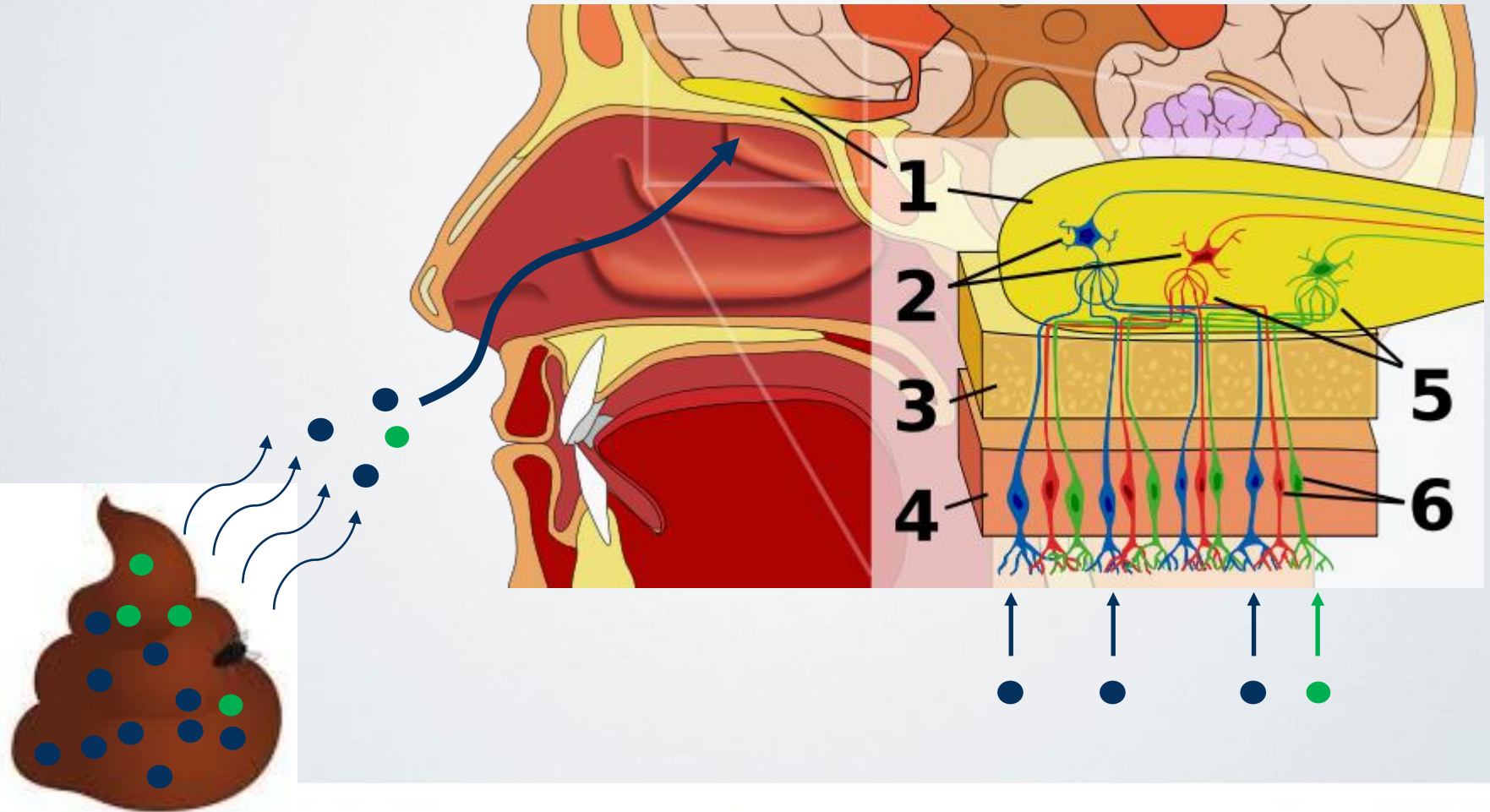
In Partnership with the Bill and Melinda Gates Foundation

Malodors, Sanitation & Hygiene

- › **Malodors** Drive the concept of lack of Hygiene, Sanitation, Respect & Dignity
- › **Fragrances** Ideal messenger to communicate on Hygiene, Sanitation, Respect & Dignity
- › *Firmenich* Creates **fragrances & delivery technologies**

What is an odor?

- › Mixture of volatile substances that we can perceive



Analysis of Volatiles in the Latrines Sludge



ENVIRONMENTAL
Science & Technology


Article

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Qualitative and Quantitative Analysis of Volatile Constituents from Latrines

Jianming Lin, Jackline Aoll, Yvan Niclass, Maria Inés Velazco, Laurent Wünsche, Jana Pika,* and Christian Starkenmann*

Firmenich SA, Corporate R&D Division, P.O. Box 239, CH-1211 Geneva 8, Switzerland

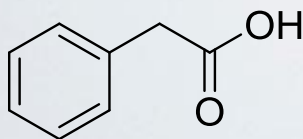
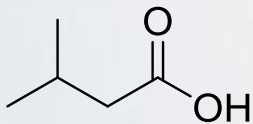
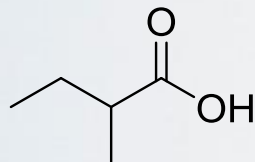
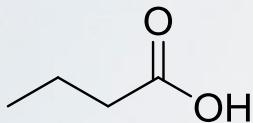
 Supporting Information

ABSTRACT: More than 2.5 billion people defecate in the open. The increased commitment of private and public organizations to improving this situation is driving the research and development of new technologies for toilets and latrines. Although key technical aspects are considered by researchers when designing new technologies for developing countries, the basic aspect of offending malodors from human waste is often neglected. With the objective of contributing to technical solutions that are acceptable to global consumers, we investigated the chemical composition of latrine malodors sampled in Africa and India. Field latrines in four countries were evaluated olfactively and the odors qualitatively and quantitatively characterized with three analytical techniques. Sulfur compounds including H_2S , methyl mercaptan, and dimethyl-mono-(di;tri) sulfide are important in sewage-like odors of pit latrines under anaerobic conditions. Under aerobic conditions, in Nairobi for example, paracresol and indole reached concentrations of 89 and 65 $\mu\text{g/g}$, respectively, which, along with short chain fatty acids such as butyric acid (13 mg/g) explained the strong rancid, manure and farm yard odor. This work represents the first qualitative and quantitative study of volatile compounds sampled from seven pit latrines in a variety of geographic, technical, and economic contexts in addition to three single stools from India and a pit latrine model system.

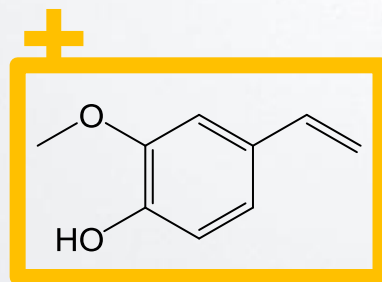
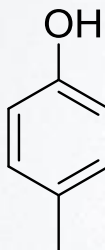


Results: Important Odorants in Fecal Odors

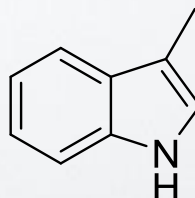
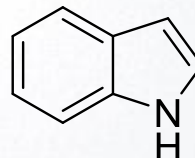
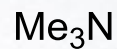
Acids



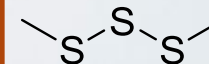
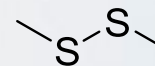
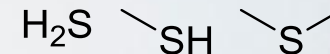
Phenols



Nitrogen derivatives



Sulfur derivatives



Fecal Stereocustitio nstitution

Sensory Survey

**Ahmedabad
(India)**



**RTI
SEWA
NEERMAN**

**Nairobi
(Kenya)**



**SANERGY
Milicent Kasaya**

**Durban
(South Africa)**



**Pr. Chris Buckley
Dr. Lungiswa Zuma
ETHEKWINI WATER**

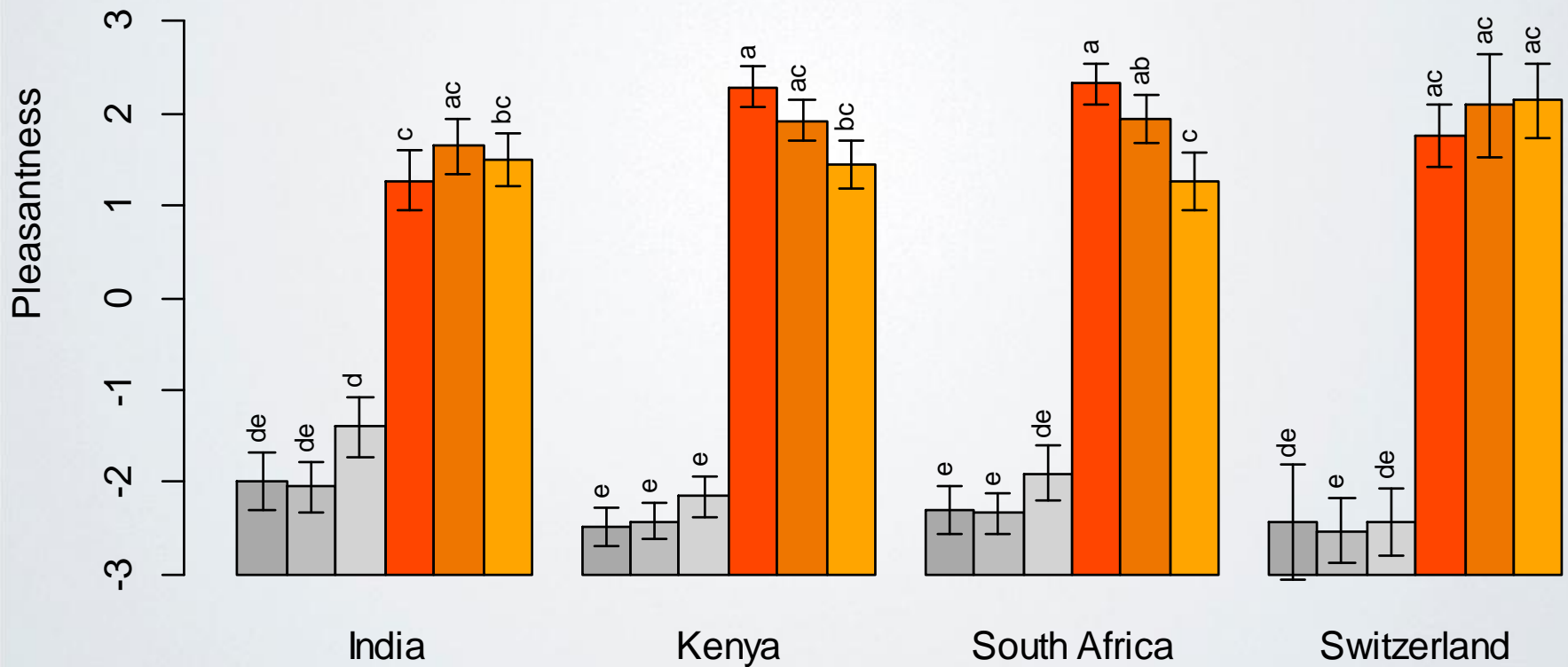
**Geneva
(Switzerland)**



Firmenich

Results: Pleasantness

■ Fecal ■ Latrine ■ Urine ■ Banana ■ Citrus ■ Lavender



Conclusions

- › The fecal reconstitution (4 molecules) produced similar results as the latrine reconstitution (same 4 molecules + 4 others found in latrines sludge) in every country.
- › A reconstitution with butyric acid, p-cresol, indole and dimethyl trisulfide can evoke an olfactory experience similar to the one during the use of latrines in three different continents.
- › This confirms and consolidates previous studies on fecal odors that butyric acid, p-cresol, indole and dimethyl trisulfide are strong contributors to the human fecal odor.
- › Stable synthetic reconstitution of pit-latrine malodor is essential for perfume creation, the development of odor control method and for a better understanding of the perception of the latrine malodor.

| Thank you for your attention

Firmenich
inspiring!



INNOVATIVE CRAFTSMANSHIP IN FRAGRANCES AND FLAVORS SINCE 1895

Ingredients and Perfumes



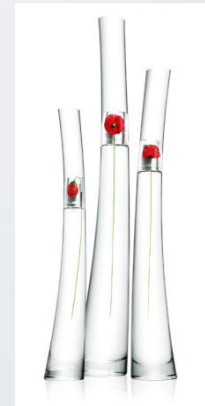
Ingredients



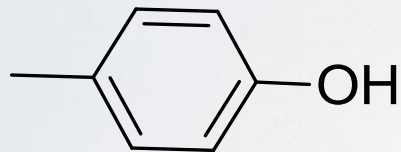
Artist



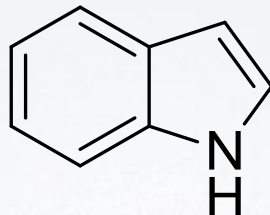
Creation



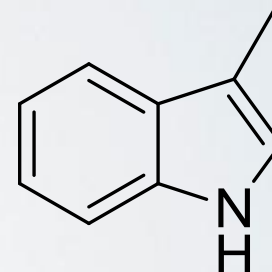
What is a Malodor?



P-cresol



Indole



Skatole



Vanda tessellata

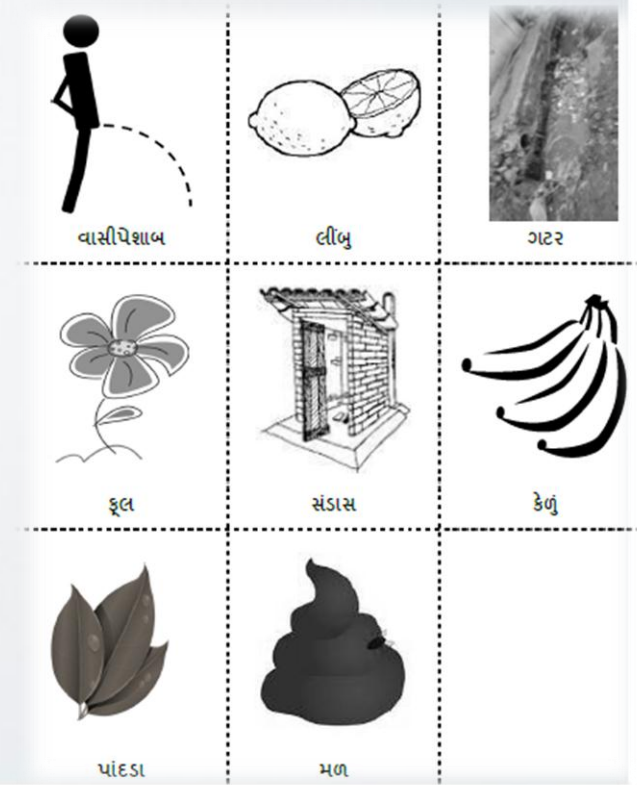
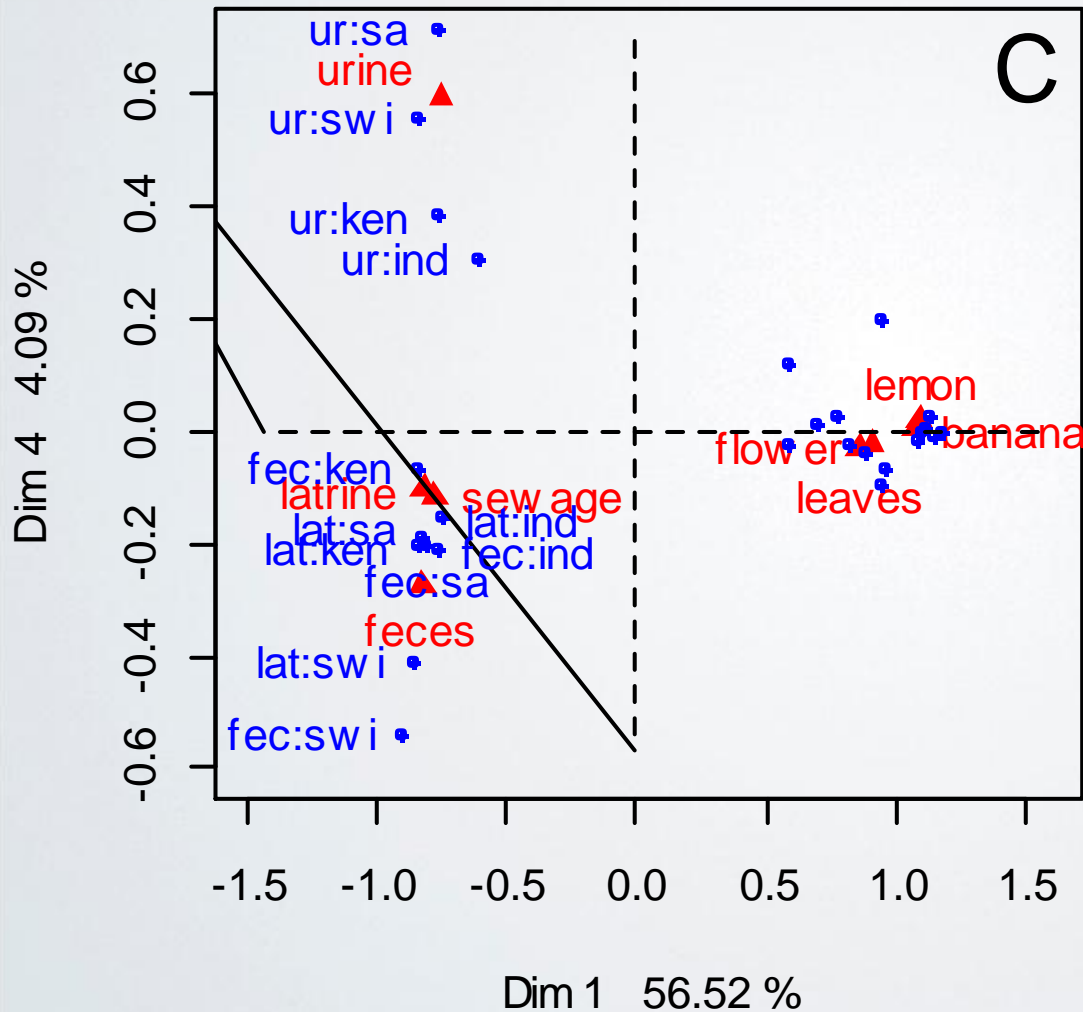


Jasmine

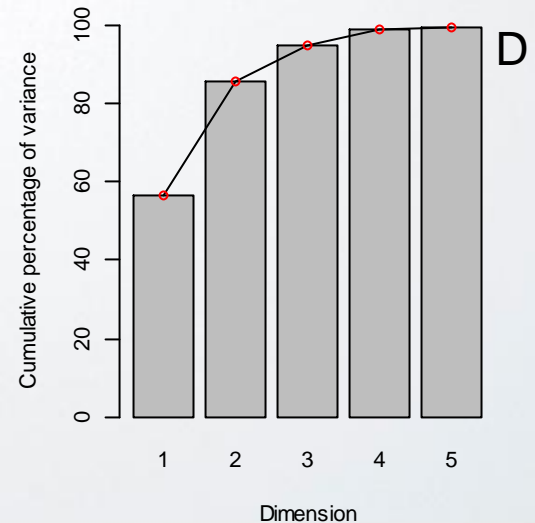
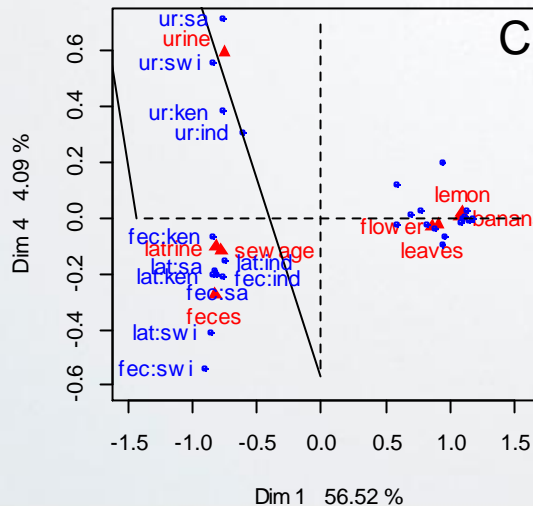
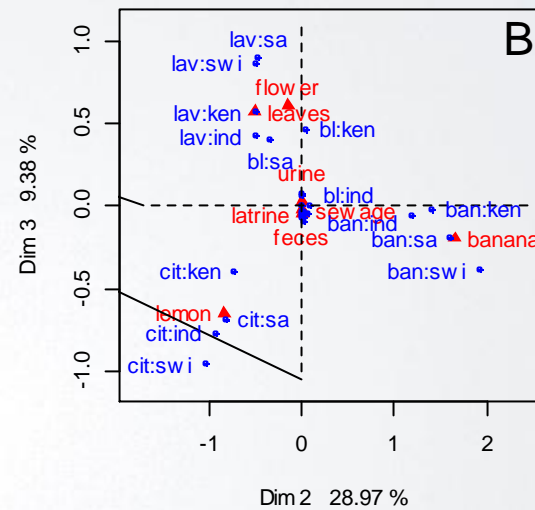
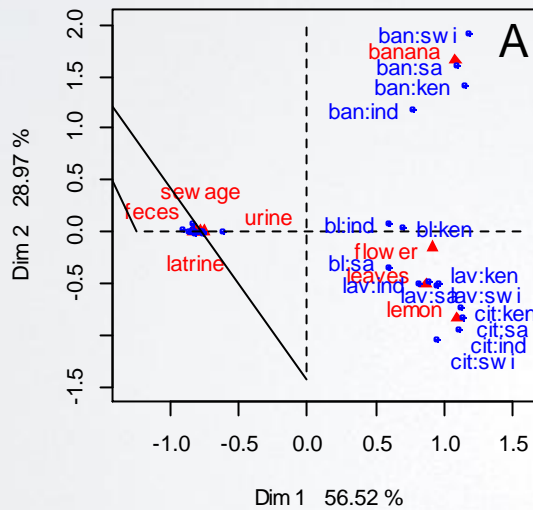


Passiflora gilbertiana

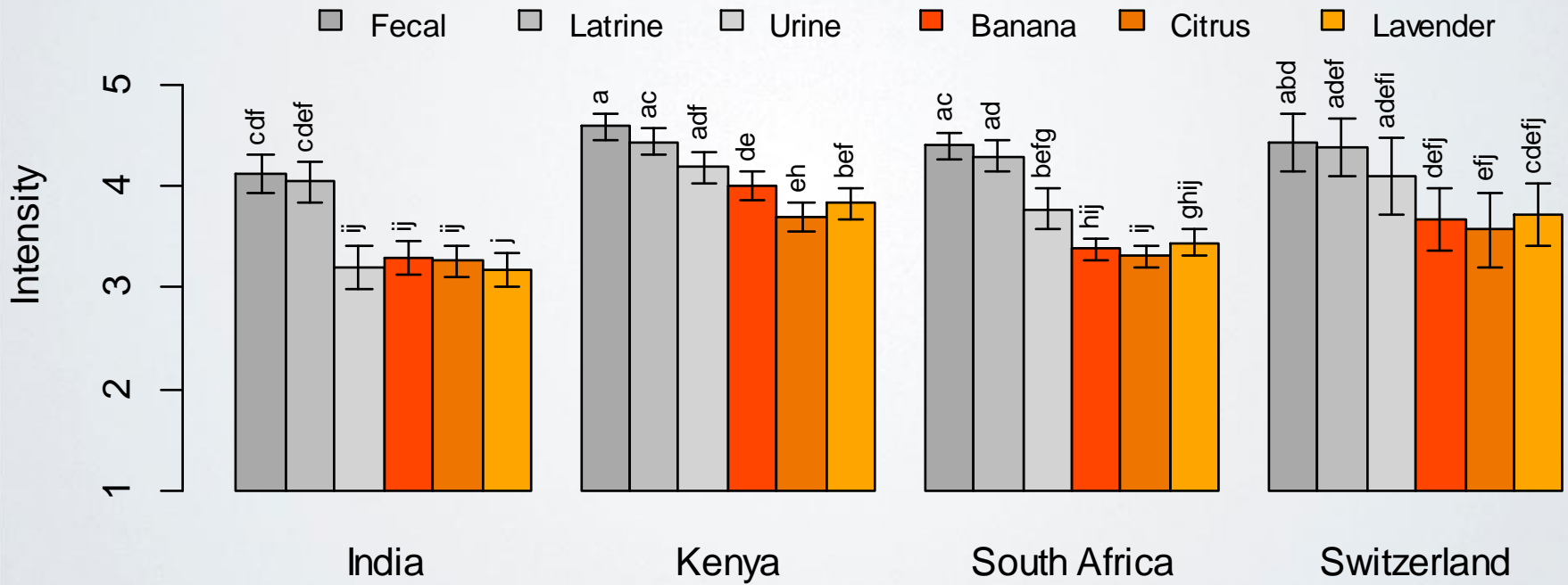
Results: Association with Images



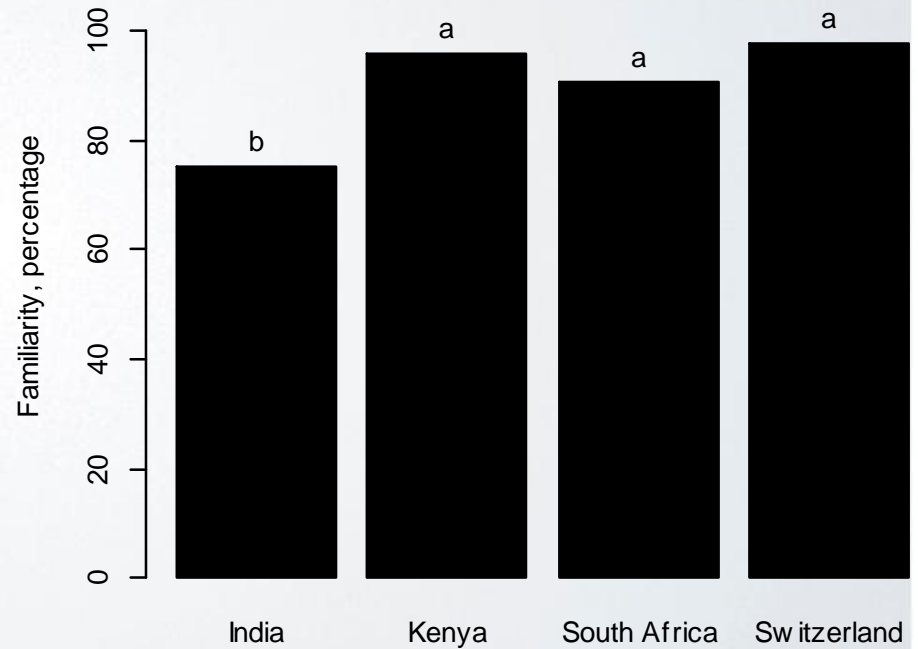
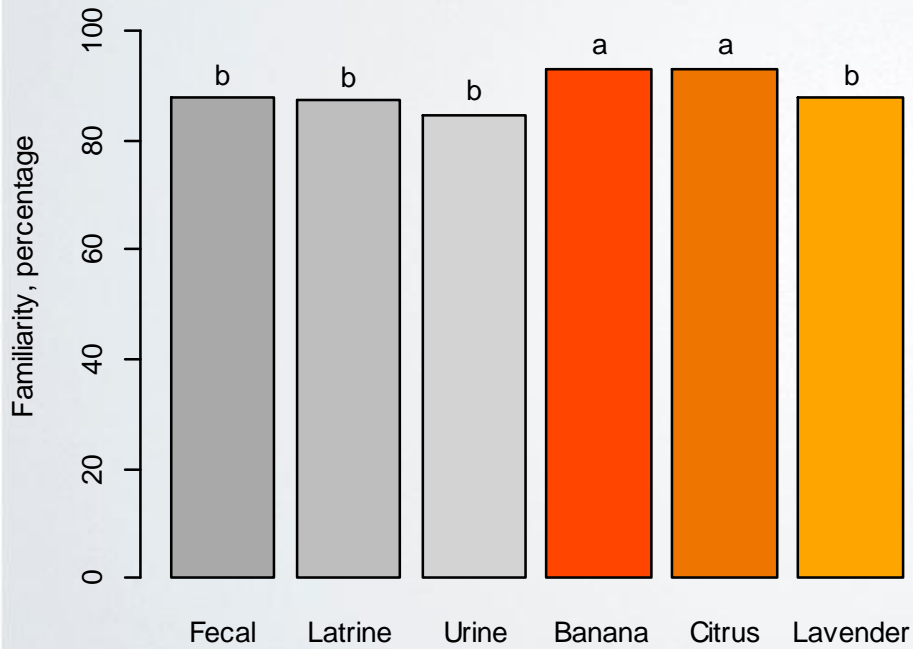
Results: Association with Images



Results: Intensity



Results: Familiarity



Results: Use of Latrines

