Global Census of Rumen Microbial Diversity

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GLOBAL RUMEN CENSUS

RMG NETWORK
RUMEN MICROBIAL GENOMICS NETWORK

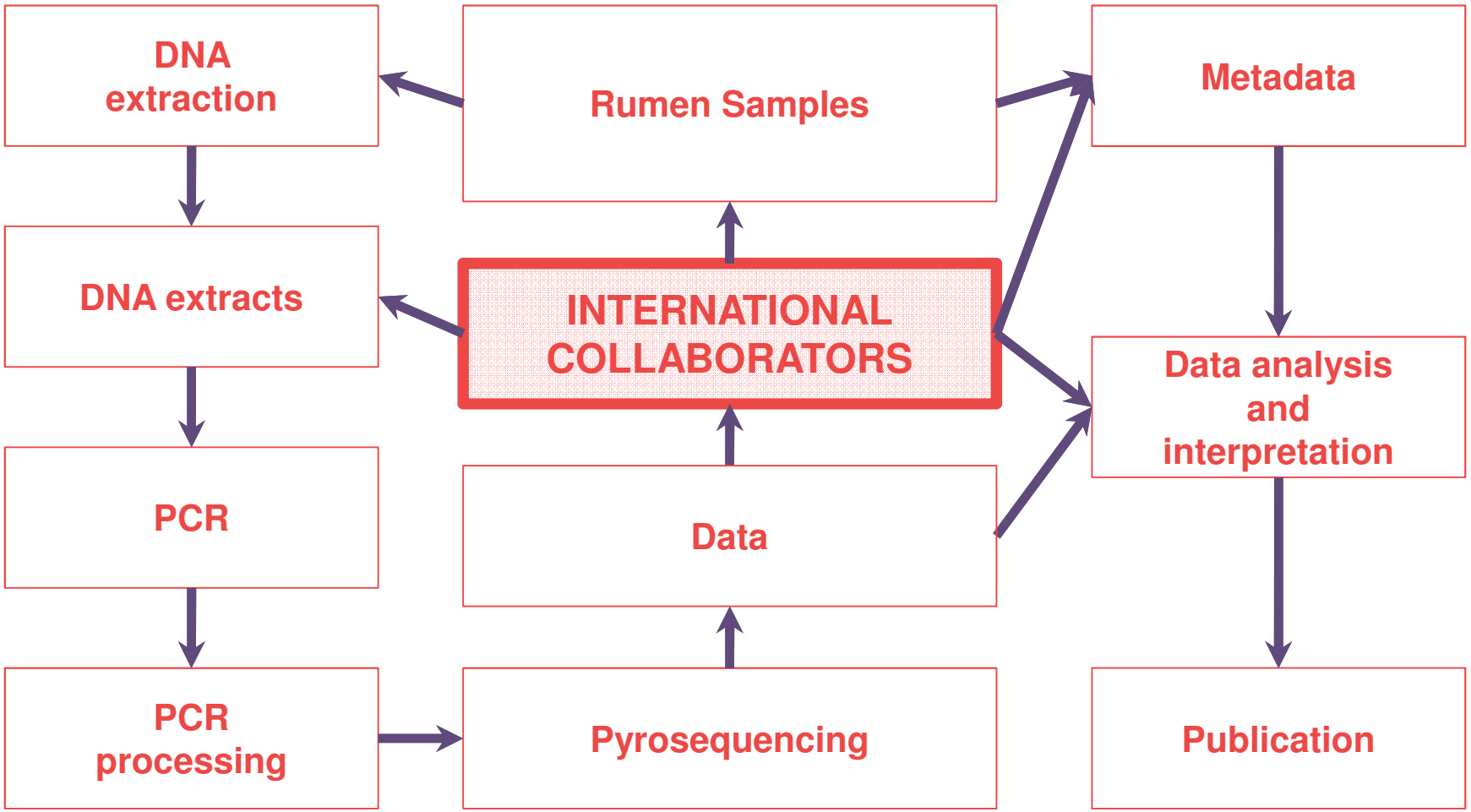
Research Questions

1. How much **variation** is there in rumen microbial communities?
2. What is the extent of **diversity** in each microbial group?
3. What **novel groups** are present?
4. Is there a **core microbial community**?

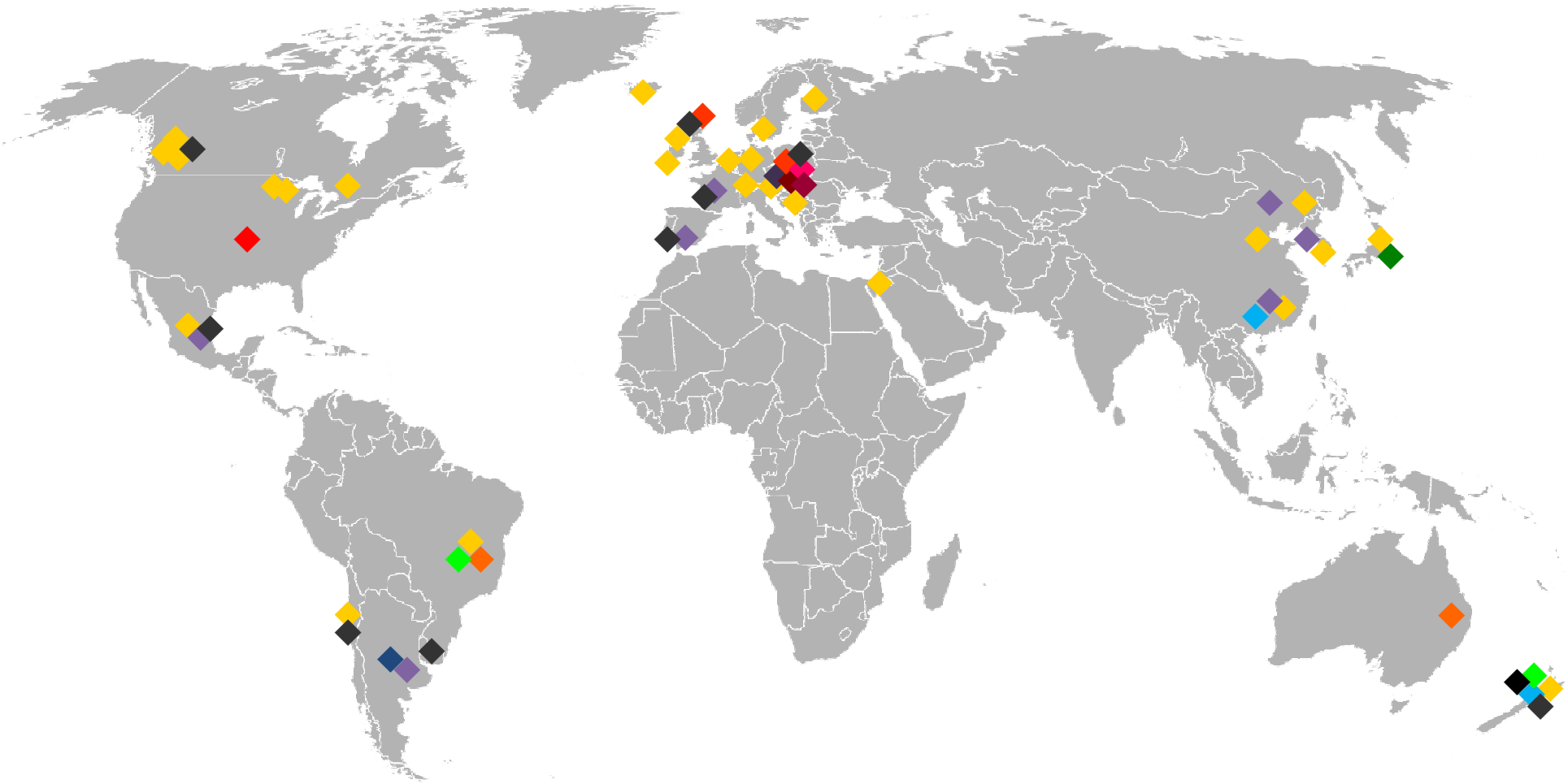
Benefits

- Reference to compare variability and changes observed in mitigation research programs
- Universality or regionality of rumen microbial populations?

Approach


DNA extraction
Rumen Samples
Metadata
DNA extracts
INTERNATIONAL COLLABORATORS
Data analysis and interpretation
PCR
Data
PCR processing
Pyrosequencing
Publication

Samples provided to date



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- American bison (*Bison bison*)
- Zebu (*Bos indicus*)
- Cattle (*Bos taurus*)
- *Bos taurus / indicus* hybrid
- Water buffalo (*Bubalus bubalis*)
- Goat (*Capra hircus*)
- Steinbock (*Capra ibex*)
- Roe deer (*Capreolus capreolus*)
- Red deer (*Cervus elaphus*)
- Sika deer (*Cervus nippon yesoensis*)
- Llama (*Lama glama*)
- Argali (*Ovis ammon musimon*)
- Sheep (*Ovis aries*)
- Chamois (*Rupicapra rupicapra*)
- Alpaca (*Vicugna pacos*)

Progress so far

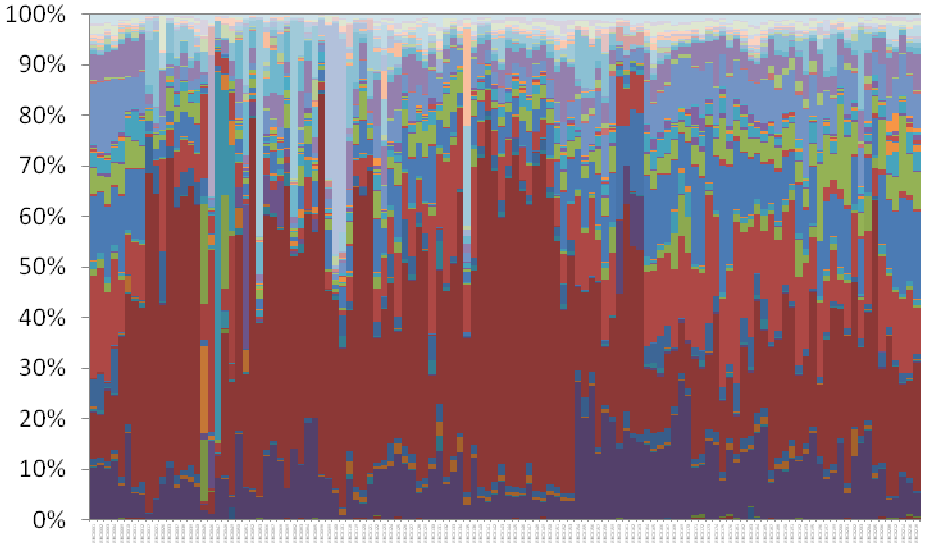
- Received
  - > 500 samples
  - 26 countries
  - 15 species
    - Several sheep and cattle breeds
      - Sheep
        - » Blackbelly, Canadian Arcott, Chilota, Corriedale, Dorper x Mongolian, Jezersko Solcavska, Suffolk, Texel
      - Cattle
        - » Angus x, Belgium Blue, Belted Galloway, British x Continental, Chinese Holstein, Cika, Danish Shorthorn, Finnish Ayrshire, Friesian, Friesian x Hereford x Holstein, Friesian x Holstein, Friesian x Jersey, Hereford, Highland, Holstein, Holstein x Simmental, Icelandic, Japanese Black, Jersey, Jutland, Korean Native, Limousin, Limousin x, Nordic Red, Simmental, Western Finncattle
      - Zebu
        - » Nelore
  - Variety of ~100 diets

- Processed
  - 1st round of sequencing – 120 samples (data received)
  - 2nd round of sequencing – 260 samples (sent for sequencing)

- Breeds in data analysed to date (next slides)
  - 11 cattle, 5 sheep, 1 zebu, 1 water buffalo, 3 goat, 1 llama and 1 alpaca breeds

Bacteria and fungi

Bacteria – genus level



Succinivibrio

63% prevalence, Ø abundance 1.1%

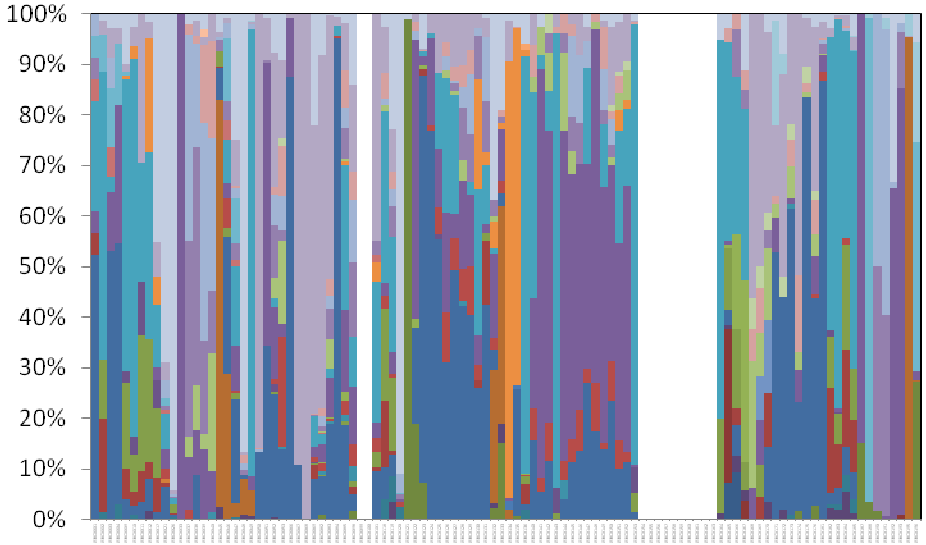
Butyrivibrio

100% prevalence, Ø abundance 3.7%

Prevotella

100% prevalence, Ø abundance 32.8%

Fungi – sub-genus level



SK3

70% prevalence, Ø abundance 10.6%

***Neocallimastix* 1**

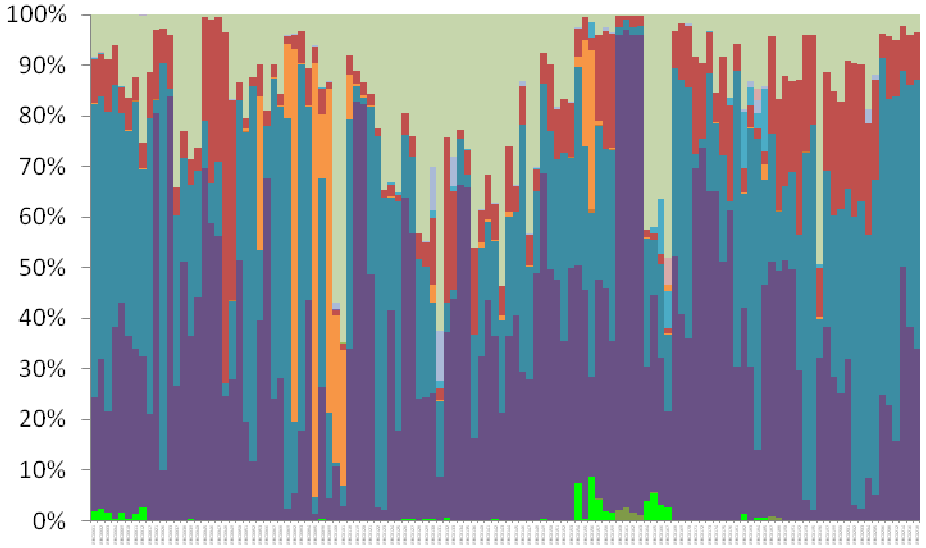
55% prevalence, Ø abundance 13.3%

***Caecaomyces* 1**

59% prevalence, Ø abundance 15.9%

Archaea and protozoa

Archaea – mixed taxonomic ranks



Mbb. ruminantium

100% prevalence, Ø abundance 30.4%

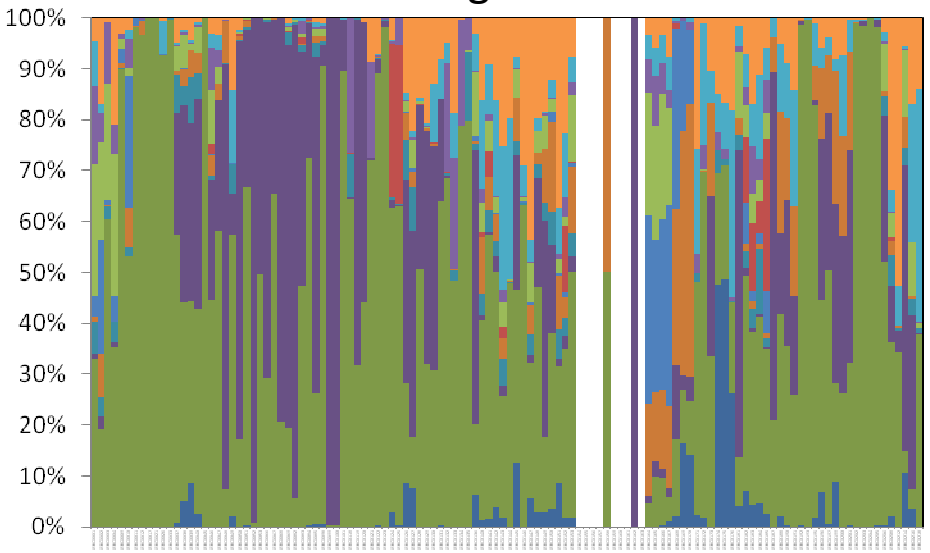
Mbb. wolinii

40% prevalence, Ø abundance 3.5%

Methanobacterium

37.5% prevalence, Ø abundance 0.48%

Protozoa – genus level



Isotricha

77.5% prevalence, Ø abundance 7.1%

Entodinium

92.5% prevalence, Ø abundance 42.3%

Next steps

- **3rd and FINAL round of sequencing**
  - Deadline for sample submission JUNE 2013
  - Especially interested in samples from **India** and **Africa**

- Data analysis
  - Variation
  - Diversity
  - Novel groups
  - Core community
  - Metadata
  - Etc.

Acknowledgements

- **Global Rumen Census Collaborators**
  www.globalrumencensus.org.nz/samples

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