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Immunomodulatory impact of bacteria isolated from human breast milk. In vitro analysis.



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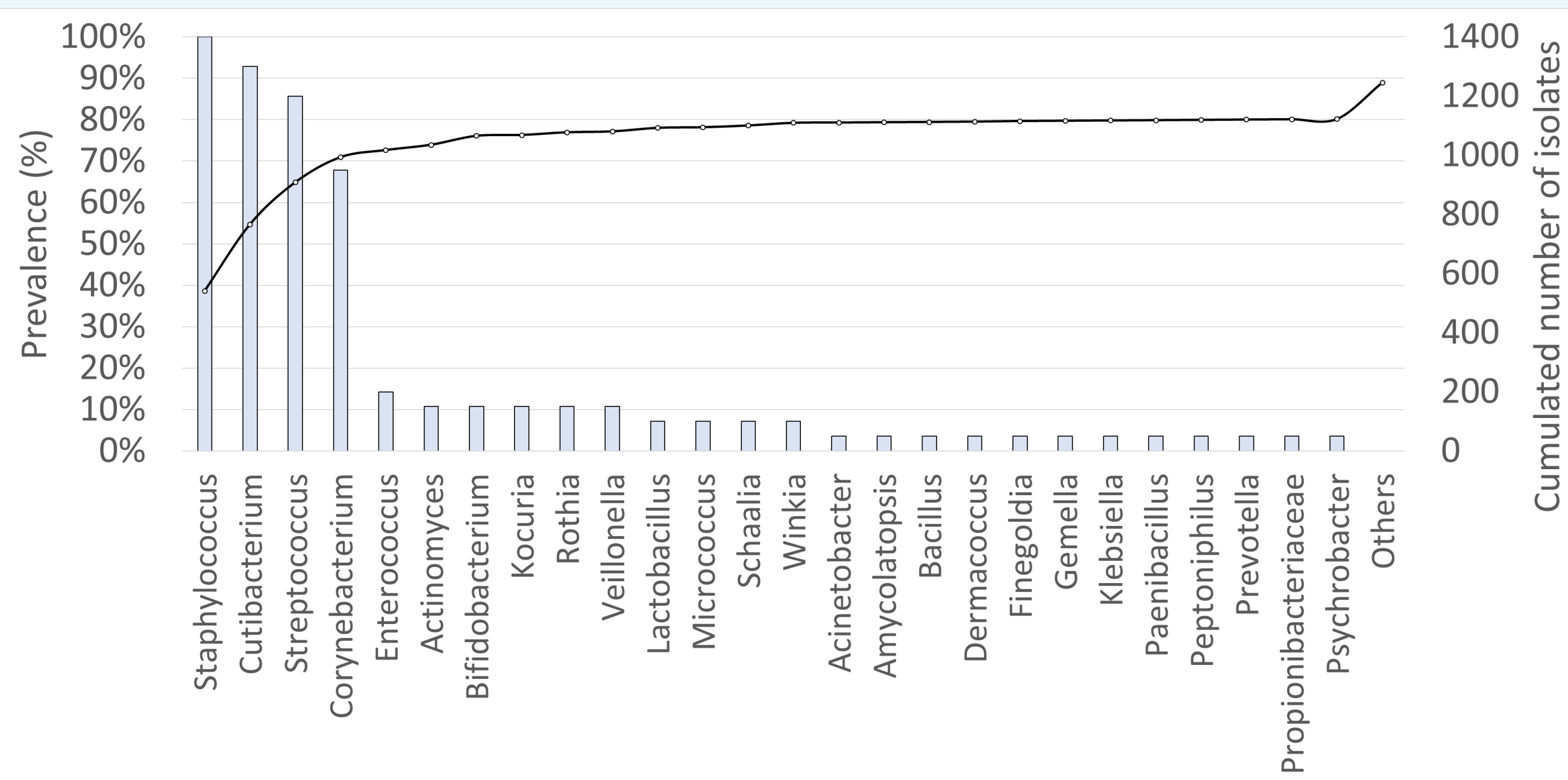
CONTEXT

Breastfeeding is recommended by the WHO for the first 6 months of life. Compared to infant formula (IF), human milk (HM) provides health benefits, including protection against intestinal and respiratory infections in early childhood and a lower risk of metabolic and immune diseases later in life. Discrepancies in health benefits are probably due to different nutritional and non-nutritional composition between IF and HM, the latter being more complex and richer in bioactive components.

AIM & STRATEGY

Our hypothesis is that HM health benefits come in part from the bacteria of the HM microbiota, which may promote the maturation of the immune system through their role on gut immune homeostasis. This study aimed to better understand the immunomodulatory role of HM bacteria. Bacteria were isolated from healthy breast milk and screened for their immunomodulatory potential on two different cellular models: PBMC (blood mononuclear cell) from 2 healthy donors and a multicellular model of intestinal epithelium enterocytes (Caco2), caliciform cells (HT 29-MTX), M cells (differentiated Caco2) and macrophages (THP-1).

→ HM Bacteria collection



→ PBMC model

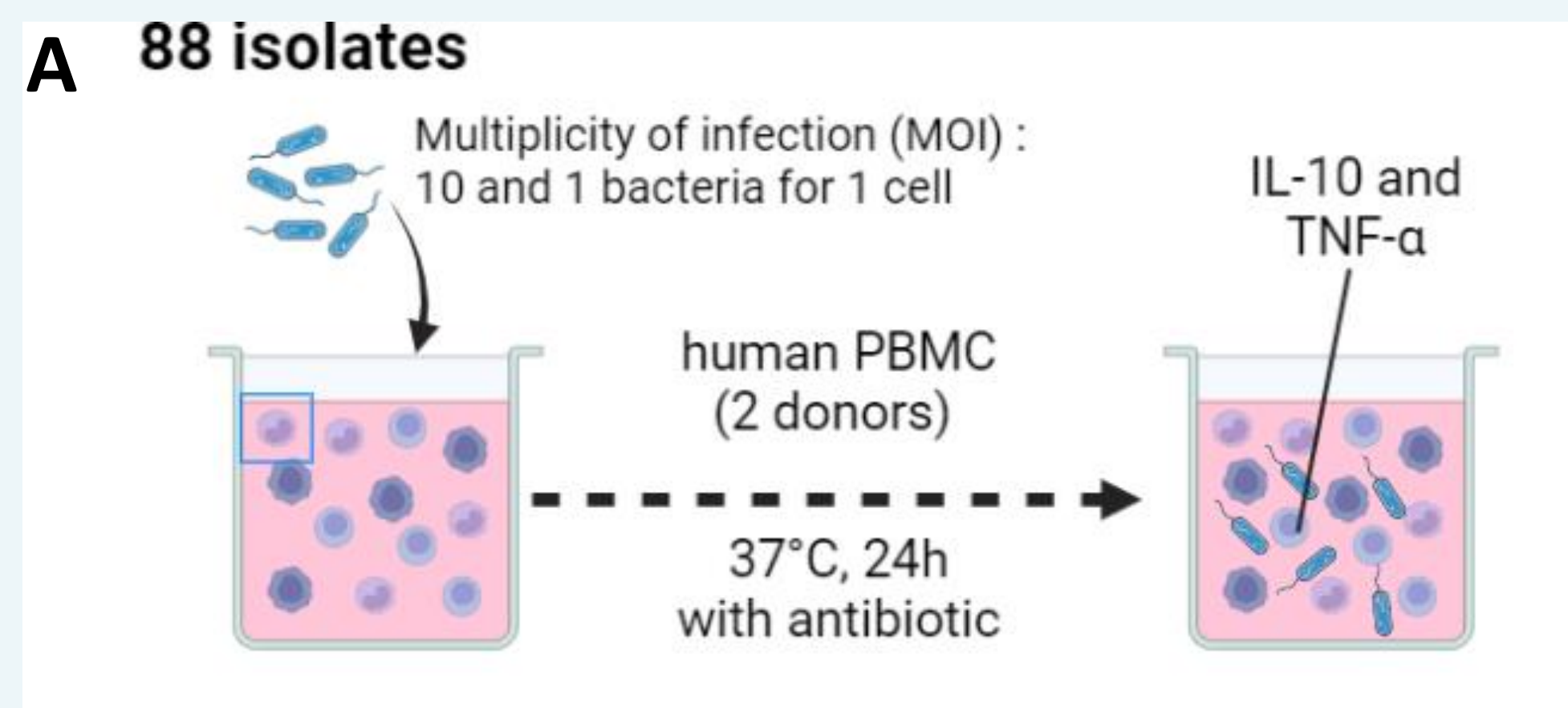


Figure 2: A. PBMC stimulation by HM bacteria; B. HM bacteria clustering by Multidimensionate scaling (MDS) with k-means clustering according to the production of IL-10 and TNF-α by PBMC stimulated by these isolates.

- The immunomodulatory effect was species- and strain-dependent.
- The 88 isolates were clustered into 4 groups: **anti-inflammatory**, **strong immunomodulatory**, **medium immunomodulatory** and **pro-inflammatory** tendency.
- Some strains belonging to genera not described as probiotics (like *Staphylococcus*) exhibited anti-inflammatory potential.
- 28 isolates were selected based on their immunomodulatory properties.

→ Quadricellular model of intestinal epithelium

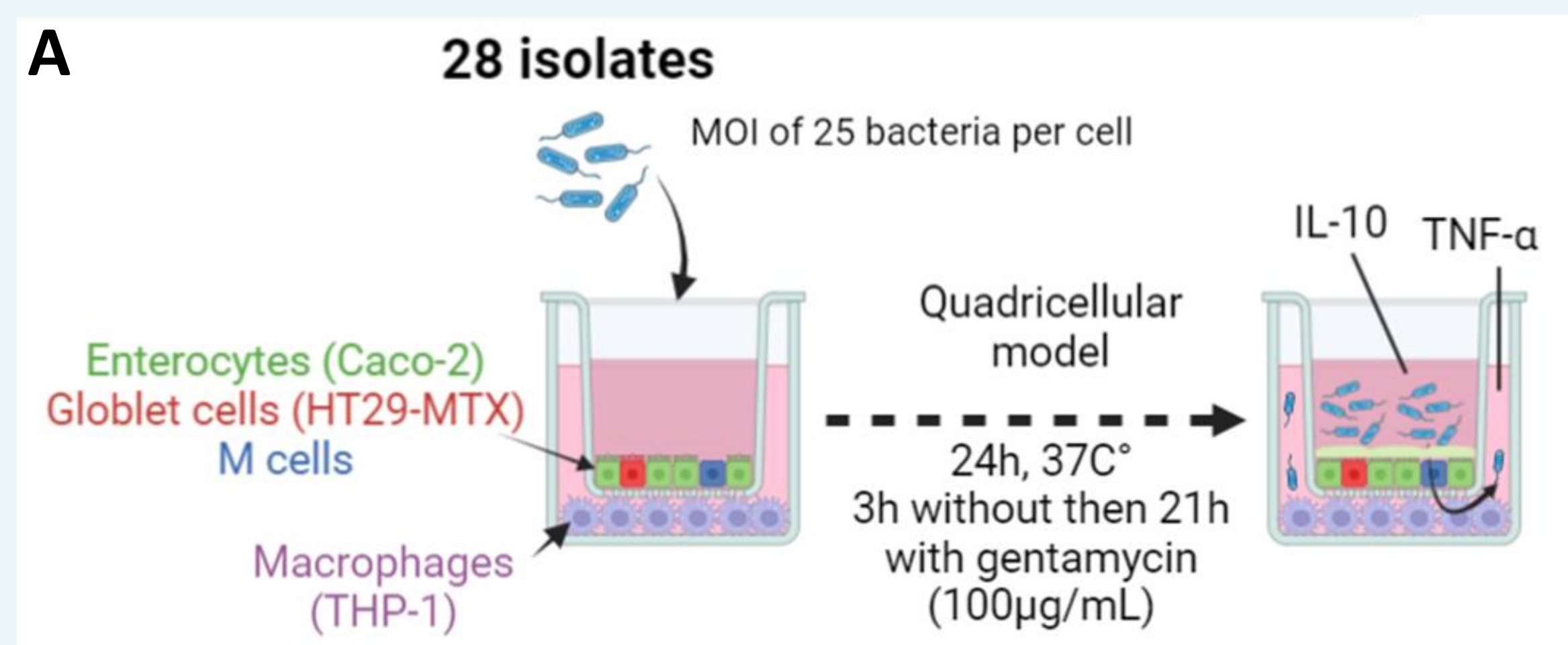
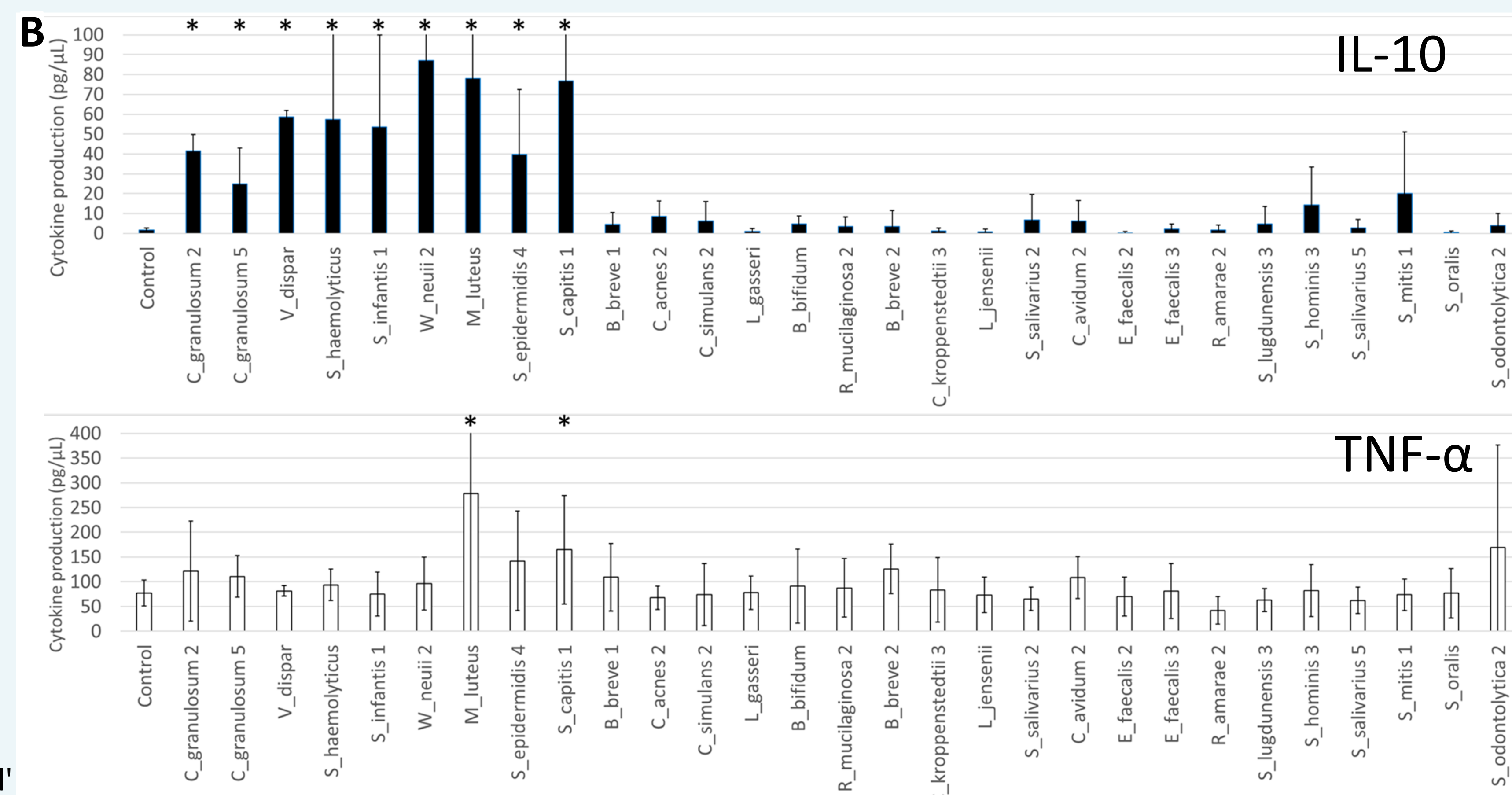
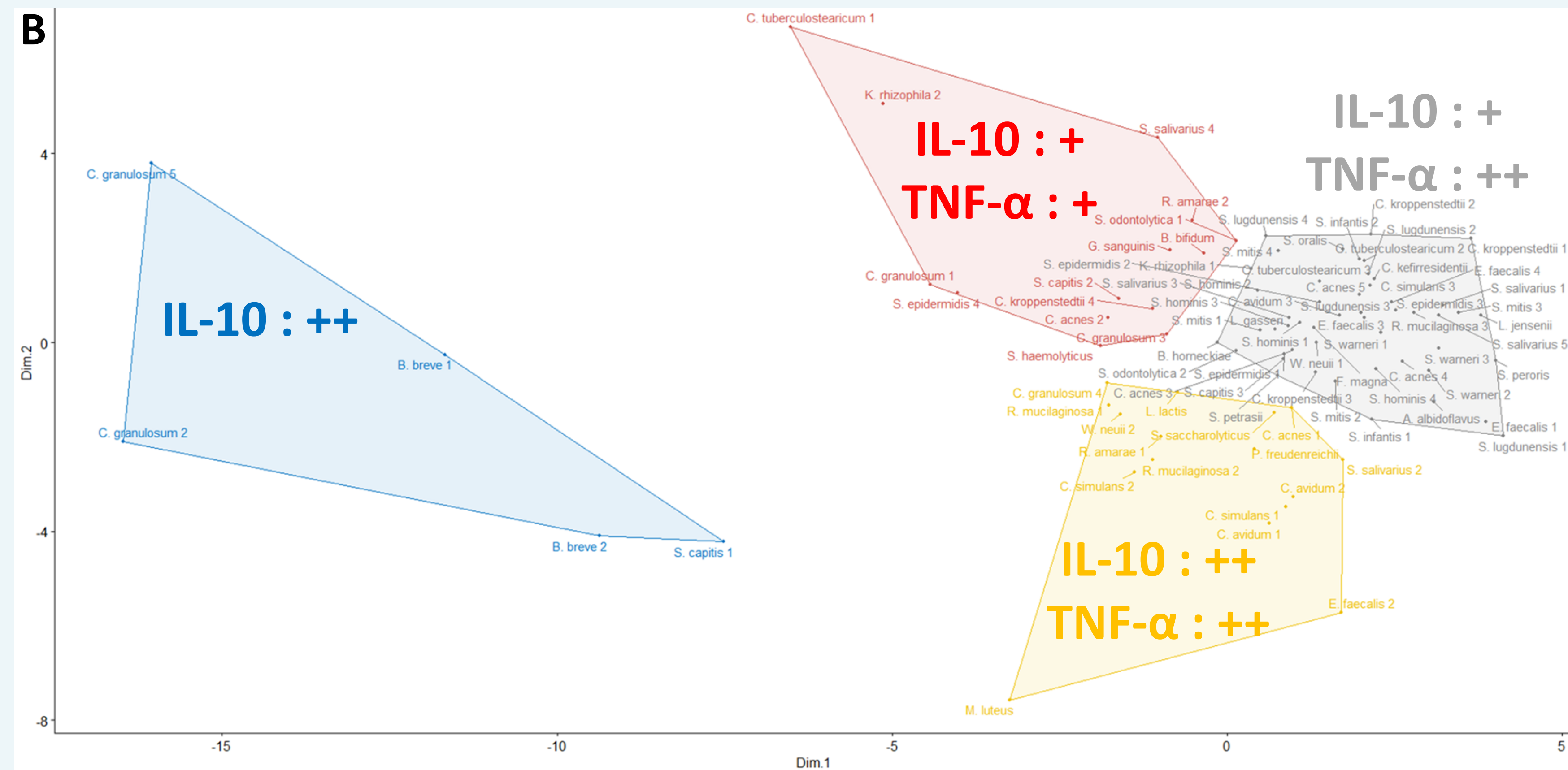


Figure 3 : A. Stimulation of the quadricellular model of intestinal epithelium by HM bacteria; B. IL-10 production (pg/mL) in the apical compartment and TNF-α production (pg/mL) in the basal compartment by the quadricellular model cells stimulated by each isolate.

* : P < 0.05 in comparison with 'control'



Isolates can be divided into 3 groups based on IL-10 and TNF-α production: **dominant anti-inflammatory activity**, **immunomodulatory activity (both pro- and anti-inflammatory)**, **low or no immunomodulatory activity**.

CONCLUSION & PERSPECTIVES

Human milk bacteria have a significant immunomodulatory potential depending on species and strains, illustrating the potential of the HM bacterial community and the subtle balance between pro- and anti-inflammatory profile. Further investigations on the synergistic potential of these bacteria combined in consortia with different profiles (anti-inflammatory and strong immunomodulatory profiles) are in progress before characterising the impact of these bacteria in vivo (Yucatan mini-pig piglet model).