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**Contact 9th Meeting of the Swiss Microbial Ecology from angel.rain@limnol.uzh.ch**

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**Type of presentation:**

Oral presentation

**Title:**

Elo-Rating as a tool for assessing microbial performance across biomes

**Authors:**

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**Abstract (300 words maximum): :**

Understanding the ecological processes that structure microbial communities requires disentangling the factors that influence patterns of diversity and coexistence. While microbial assembly mechanisms have been extensively studied at the local and regional scales, global patterns remain unclear. This study applied a ranking index adapted from competitive gaming tournaments (Elo rating) to assess the performance of taxa in communities from the Earth Microbiome Project (EMP) dataset. Our analysis included >4,000 samples of free-living and host-associated microbial communities from 14 biomes. Elo scores were calculated at the genus level, updated across biome samples over 1,000 iterations and compared with estimates from randomized null models. Median Elo-ratings for most EMP biomes were lower than in the null models ( $P < 0.001$ ), indicating non-random ecological patterns of metacommunity evenness. Moreover, Elo-ratings exhibited a highly skewed distribution, with biomes such as sediment and soil showing greater variability compared to plant surfaces or animal-associated systems. These patterns suggest that some biomes have relatively few strong competitors compared to metacommunity members. While most of the identified "winner" taxa were biome-specific, genera of potential pathogens, such as *Mycoplasma* and *Staphylococcus* were successful across multiple biomes. Our findings, derived from Elo ratings, revealed a hierarchical structure shaped by biome type. These findings highlight the role of ecological processes, such as environmental constraints and species interactions, in structuring microbial community assembly at the biome scale.

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