

Foodborne Pathogens in Different Types of Milk: From the Microbiome to Risk Assessment

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Abstract : Microbiological hazards can be transmitted to humans through milk. In this study, we compared the microbiome composition and presence of foodborne pathogens in organic milk (n=6), organic hay milk (n=6), standard milk (n=6) and high-quality milk (n=6). The milk samples were collected during six samplings between December 2022 to January 2023 and between April and May 2024 to take into account seasonal variations. The 24 milk samples were submitted to DNA extraction and library preparation before shotgun sequencing on the Illumina HiScan™ SQ System platform. The total sequencing output was 600 GB. In all the milk samples, the phyla with the highest relative abundances were Pseudomonadota, Bacillota, Ascomycota, Actinomycetota and Apicomplexa, while the most represented genera were Pseudomonas, Streptococcus, Geotrichum, Acinetobacter and Babesia. The alpha and beta diversity indexes showed a clear separation between the microbiome of high-quality milk and those of the other milk types. Moreover, in the high-quality milk, the relative abundance of Staphylococcus (4.4%), Campylobacter (4.5%), Bacillus (2.5%), Enterococcus (2.4%), Klebsiella (1.3%) and Escherichia (0.7%) was significantly higher in comparison to other types of milk. On the contrary, the relative abundance of Geotrichum (0.5%) was significantly lower. The microbiome results collected in this study showed significant differences in terms of the relative abundance of bacteria genera, including foodborne pathogen species. These results should be incorporated into risk assessment models tailored to different types of milk.

Keywords : raw milk, foodborne pathogens, microbiome, risk assessment

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