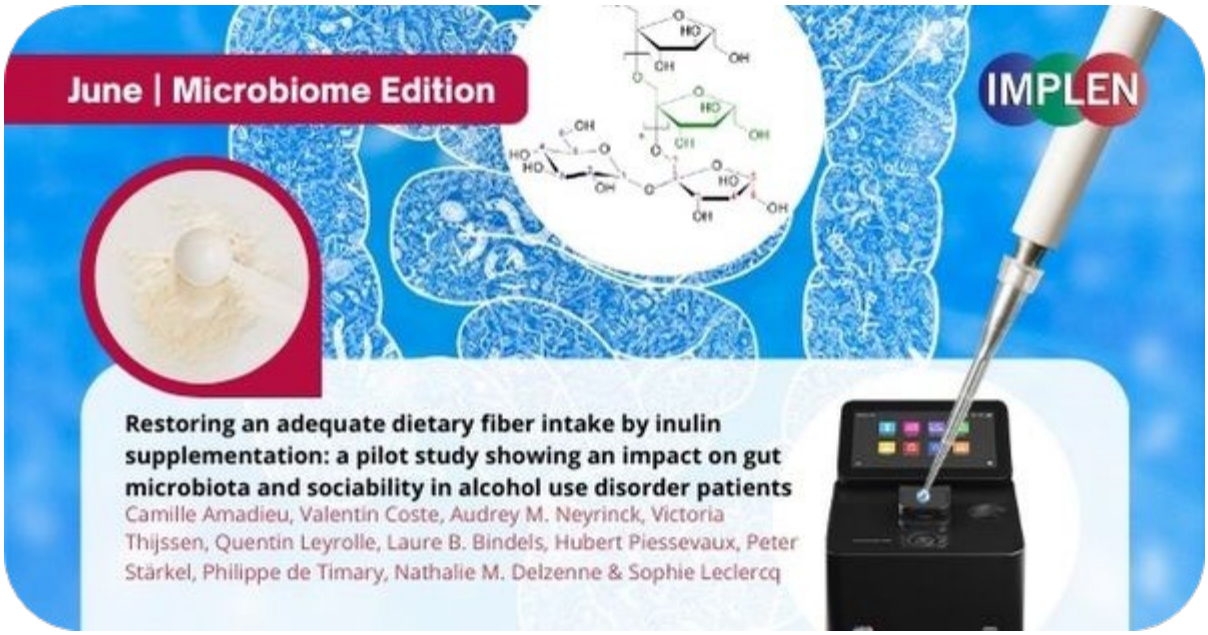
Implen Journal Club | June Issue

Welcome to our June issue of the #Implen #JournalClub in 2022.
Microbiome Edition



In this kick-off issue of this month's Implen NanoPhotometer® Journal Club: Microbiome Edition, we are highlighting the work of Amadieu et. al. published in the journal of Gut Microbes, which was the first to show that inulin, a prebiotic fiber t alcohol use disorder (AUD) patients. AUD is a chronic relapsing disease associated with malnutrition, metabolic disturbances, and gut microbiota dysbiosis that are correlated with the severity of psychological symptoms. This study investigated whether the altered gut–microbiota–brain axis in AUD patients could be improved by modulating the gut microbiota composition by supplementing with inulin during alcohol withdrawal. All patients showed an improvement in depression, anxiety, and craving scores during alcohol withdrawal regardless of the intervention group. Interestingly, only patients treated with inulin significantly improved the sociability score and had an increased serum level of brain-

derived neurotrophic factor. This work has set the foundation for future studies to investigate whether inulin could be a nutritional approach to improve psychological symptoms and the biological outcomes of patients with alcohol use disorder.

The NanoPhotometer® was used in this work as part of the Gut2Brain clinical study to measure the extracted genomic dsDNA concentration.

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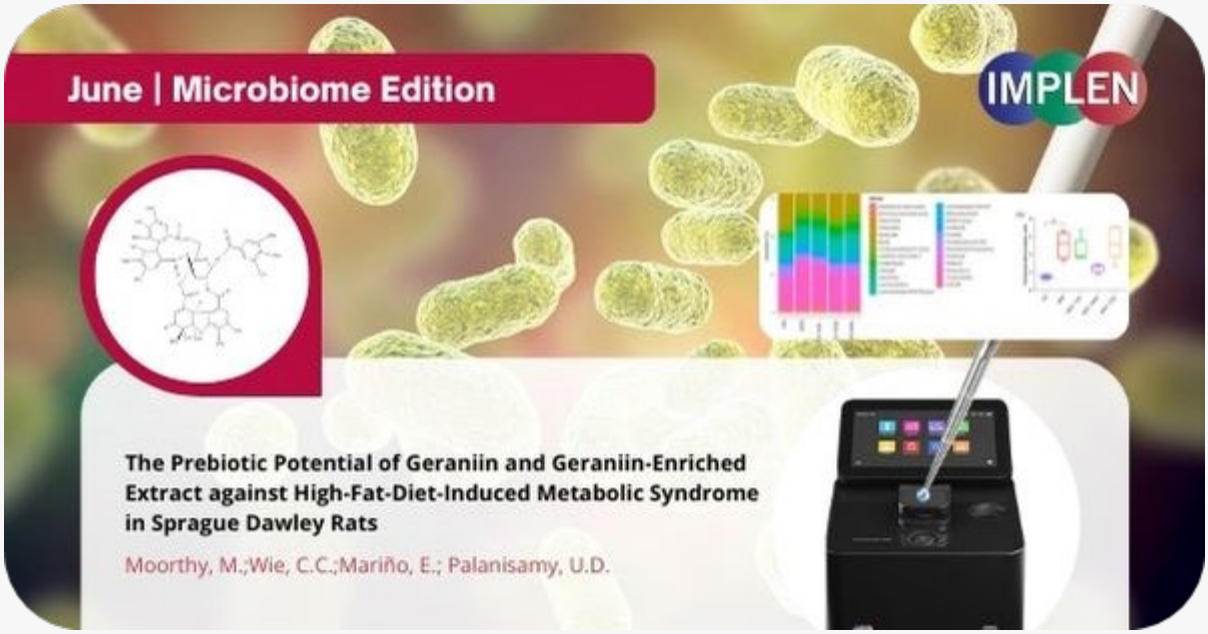

The second issue continues with exploring the topic of Gut microbiota, which have been shown to have a profound influence on our health– with an imbalance of the healthy gut microbiota being associated with obesity and metabolic syndrome. Alterations of the gut microbiota induced by a high-fat diet (HFD) are strongly linked to weight gain, adiposity, glucose intolerance, insulin resistance, inflammation, and oxidative stress. Moorthy et. al. reported in the journal of Antioxidants the first ever study to elucidate the effect of geraniin, a polyphenol shown to have promising health outcomes in association with the ability to positively reshape gut microbiome composition. Their findings indicate the possibility of utilizing geranin and an enriched extract of geranin (GEE) as a nutraceutical and potentially a prebiotic in managing diet-induced metabolic syndrome as it was demonstrated to significantly improve triacylglyceride, low-density lipoprotein, glucose intolerance, adiponectin, and metabolic endotoxemia. This work has set the stage for long-term studies to investigate changes in gut microbial strains and metabolomics to help elucidate the ameliorative role of geranin against diet-induced metabolic syndrome.

The NanoPhotometer® was used in this study to check the quality of the extracted genomic DNA.

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Next, we are exploring a new cross-disciplinary research field “osteomicrobiology”, which was coined for the study of microbiota and bone health recently emerging with probiotics being recognized as a prophylactic treatment for various bone health issues. Zebrafish larvae are increasingly being used to study vertebrate skeletal development and human pathologies such as osteoporosis, osteopetrosis and osteoarthritis. Sojan et. al. recently presented in the International Journal of Molecular Science two novel transgenic zebrafish lines containing the coding sequences for fluorescent proteins displaying fluorescence in developing osteoblasts and the bone extracellular matrix. These lines were utilized to visualize the formation of the zebrafish skeleton in response to exposure of two different probiotics, Bacillus subtilis and Lactococcus lactis, which were shown in this study to lead to an increase in osteoblast formation and bone matrix growth and mineralization. These findings confirmed the relevance of probiotics in promoting bone growth and bone health maintenance, opening a new outlook for the use of probiotics as a prophylactic treatment for improving bone growth and health, which is currently a very under-explored area of research.

The NanoPhotometer® was used for this study to determine the final total RNA concentrations extracted from the zebrafish larvae.

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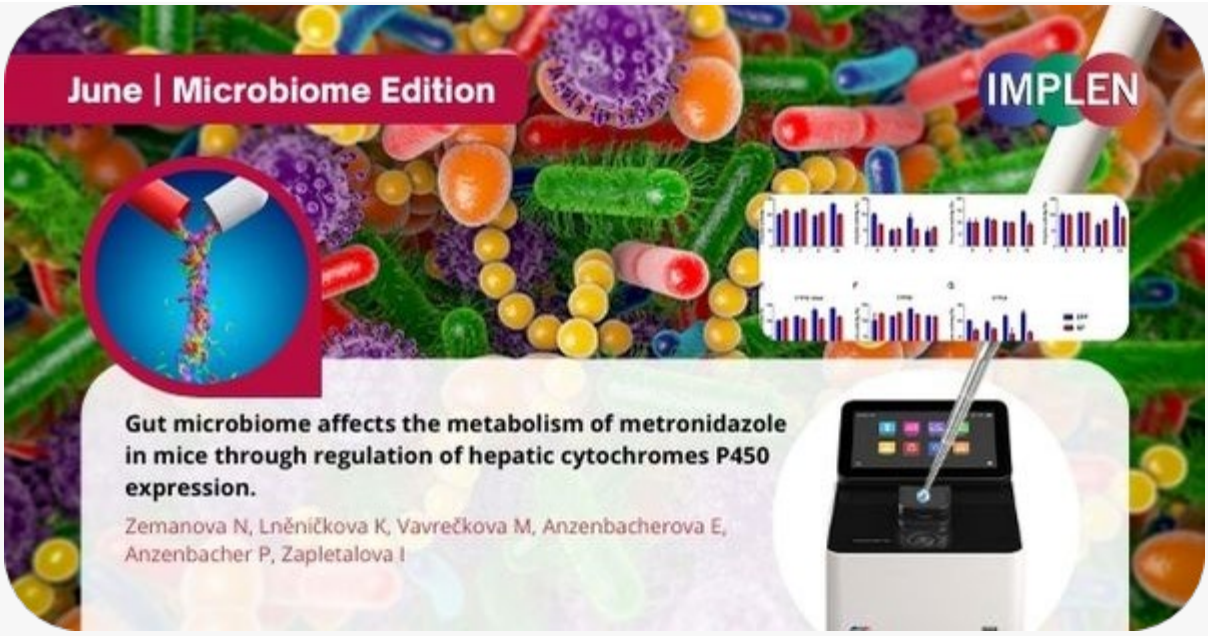

Last issue of the Implen NanoPhotometer Journal Club: Microbiome Edition finishes on the topic of the microbiome, which is now considered as a significant metabolic organ with an immense potential to influence overall human health and has been reported to modulate the fate of more than 30 commonly used drugs. Zemanová et al. recently published a study that analyzed the effect of gut microbiome on the fate of the antibacterial and antiprotozoal drug metronidazole through modulation of system of drug metabolizing enzymes, namely by alteration of the expression and activity of selected cytochromes P450 (CYPs), a superfamily of heme-containing enzymes capable of metabolizing structurally diverse exogenous and endogenous substrates. In this study it was found that the absence of microbiota significantly affected plasma concentration of metronidazole, resulting in higher levels (by 30%) of the parent drug in plasma. The results presented here highlighted the effect of gut microbiota along with concomitantly taken medication on the pathways involved in the regulation of CYP synthesis and hepatic drug metabolism with apparently relevant clinical implications. This illustrates a complex interplay of both the altered properties of drug metabolism and the role of gut microbiota and demonstrates the need for a better understanding of the ways gut microbiota alters drug metabolism and to increase the efficacy of the pharmacotherapy.

The NanoPhotometer® N60 was used in this study to quantify the RNA spectrophotometrically.

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