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Letter to Editor

The Microbiome and the Future of Anesthesia

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Dear editor,

One of the many developing interests in the medical field is the utilization of the human microbiome, which is a complex system of thousands of microorganisms within various body systems, whose population is unique to the individual. Much of this hype is secondary to the work performed under the aptly named Human Microbiome Project (1). The human microbiome grants an individual, unique qualities ranging from specific inflammatory markers to the development of neurological processes. These qualities are adaptable and respond to numerous types of external and internal stimuli. Examples of these changes can be witnessed when the host is exposed to chronic pain stimuli - neurological, visceral, or otherwise. It has been documented that pain signals alter microbiome metabolites, and the subsequent treatment of that pain further induces changes within the microbiome. It is suggested, then, that the gut microbiome is a dynamic population that is constantly changing within a person, and thus "anybody's" microbiome can be entirely different from the next.

The field of anesthesiology may be next to utilize the human microbiome. A recent paper published by Minerbi and Shen (2) has focused its efforts on reviewing the advancements made thus far. The review showed a comprehensive summary of findings, which revealed that the introduction of anesthetic drugs into a host greatly altered gut microbiome populations, metabolites, and the subsequent communication of the "gut-brain axis". This axis is a two-way communication pathway between the gut microbiome and the central nervous system via metabolically active metabolites. This relationship has been documented with the investigations of postoperative cognitive dysfunction, an ongoing phenomenon of cognitive decline post-anesthesia, which has represented that the gut microbiome decreases the permeability of the blood-brain barrier and can modulate the occurrence of neuroinflammation (3-5). Nevertheless, research on these exact pathways and their influence on the host is in its infancy.

This opens a promising avenue of research; by cataloging the observed changes in the microbiome when a host is exposed to a specific anesthetic drug, researchers can propose a causal relationship between the microbiome population and activity shifts with the introduction of a particular anesthetic drug. This approach to precision medicine can easily transition from bench to bedside, utilizing microgeonomics with special attention to the cell-free DNA as shown by teams in China (6) and with newer technologies similar in nature to the Karius, currently used in diagnostics (7,8), and other methods such as the one reported by Whittle et al (9) to identify the populations that inhabit one's microbiome by utilizing advanced algorithms and soft AI. This approach to personalized anesthesia can solve three prevalent phenomena within the field, including unpredictable anesthetic emergencies and side effects, the ability of the trained anesthesiologist to select the best possible cocktail of anesthetic drugs to avoid postoperative sequelae, and the possibility of allowing a better understanding and utilization of drugs employed in pain management and the origin of complex pain symptoms in the first place (3-5).

It is the authorial team's highest recommendation that patients undergoing a surgical intervention have small fecal samples taken, processed with cell-free DNA testing, and their outcomes with different catalogued drugs. While minorly intensive in the short-term, such testing may prove to be strongly beneficial in providing personalized

medical therapy with special attention drawn to ensure the benefit to the patient first and foremost, avoiding potential pitfalls which are now simply unavoidable. With a deeper understanding of these relationships, both microbiology and anesthesiology fields have the potential to make leaps and bounds in advancements to further keep patients safe.

Conflict of Interests

The authors declare that they have no conflict of interests.

Ethical Approval

Not applicable.

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