Preface

Frontiers in Cancer Immunotherapy: Understanding the Role of Gut Microbiota

Davide Prosperi

1Department of Biotechnology and Biosciences, University of Milano-Bicocca, Piazza della Scienza 2, 20126 Milan, Italy; 2Nanomedicine Laboratory, ICS Maugeri S.p.A. SB, via S. Maugeri, 10-27100 Pavia (PV), Italy

The clock chime has started the third decade of this century and cancer remains one of the most challenging unsolved health problems, although several successful strategies are now available to face a broad range of malignancies and many important objectives have been achieved in the interpretation of phenomena that regulate cancer onset, growth, progression and metastasis. In such a restless research effort, greatest relevance has been attributed to the role of tumor microenvironment in identifying and deciphering challenging hurdles that oncologists often meet in the attempt to totally eradicate residual tumor foci, which may cause malignant recrudescence. In addition, albeit apparently without a direct connection, increasing evidence supporting the function of gut microbiome in eliciting cancer onset and progression as well as the response to cancer treatments has been observed in the recent years [1-4]. The research in this field is still in its infancy and we urgently need breakthroughs that could suggest possible main roads to enter the intricate network of factors controlling cancer progression, tumor microenvironment modulation, the immune system response and how all of these may relate to the gut microbiome composition and activity. The latter refers to the collective genomes of microorganisms within a community, whereas the term microbiota is defined by the microbe population itself. The cross-talk between gut microbiota and the immune system is assumed to play a fundamental role in educating the immune system in recognizing commensal bacteria and distinguish them from threatening foreign microbes, thus strongly influencing the innate and adaptive immunity [5]. An indirect evidence of such a pivotal function was provided by a few experimental works using animal models lacking gut microbiota, which exhibited severe defects in their immunity [6]. On the other hand, results from several studies support the hypothesis that commensal microbiota can significantly impact the development of many life-threatening diseases, including cancer. For example, microbiota is capable of transforming a wide variety of metabolites, including hormones and other metabolites that can modulate the immune response significantly and can potentially affect cancer immunotherapy and, under certain circumstances, chemotherapies. In contrast, preclinical studies evidenced that careful optimization of microbiota composition was able to improve the immunotherapy outcome [8].

In brief, we are only at the beginning of this holistic vision of human disease pathogenesis and treatments. What is now becoming increasingly clear is that gut microbiome is expected to play a prominent role in future strategies for cancer treatment. However, despite such an enthusiastic expectation, the underlying mechanisms behind the interconnections among microbiome, immune system and cancer arrest or progression remain poorly understood. While regulating gut microbiome may result in the improvement of cancer immunotherapy efficacy, it should be noted that conventional chemotherapy can strongly affect the microbiota composition, altering its function and interaction with the immune system, thus leading to severe consequences on cancer persistence and diffusion. There is much work that needs to be done in a synergistic manner involving complementary expertise to improve our understanding of the complex network of interactions that contribute to enhance immunosurveillance and stimulate host immune response against the various types of cancer. In the next years, we estimate that several research groups will endeavor to disclose such mechanisms, adding another brick in the construction of a big wall against cancer fighting.

REFERENCES


Prof. Davide Prosperi
Editor-in-Chief: Current Pharmaceutical Biotechnology
E-mail: davide.prosperi@unimib.it