Several immune checkpoint blockade (ICB) agents have achieved FDA approval and are being used in multiple cancers with promising results, including improved durable response and, in some cases, cure of advanced disease. However, the response rate is still low at 15-20%, and the improvement in overall survival is limited. Significant effort is being made to search for biomarkers that identify patients who will benefit from anti-PD1 and anti-PD-L1 treatment. The clinically-used immunohistochemistry (IHC) assay for PD-L1 has several disadvantages, including variations in assays, antibodies and proportion of tumor cells with cell-surface staining. Additionally, different scoring methods and variable cut-off values have culminated in a lack of robust standard.

Tumor mutational burden (TMB), an indirect measurement of neoantigens produced in a tumor, is increasingly recognized as a promising biomarker for ICB. Several clinical studies have demonstrated the clinical utility of NGS-based TMB analysis as a predictor of response, and F1CDx from Foundation Medicine and MSK panel have been recently approved by FDA as companion diagnostics for ICB. A major caveat to current TMB assay is that it measures the *number* of unique mutations in a tumor, without taking into account of the ***size*** of input specimen or tumor ***purity***. More importantly, TMB analysis counts every mutation only once, no matter how many cancer cells in a tumor carry it.

To combat this issue, the Immortagen R&D team has developed an algorithm, called Mean Cancer Cell Mutation Burden (MCMB), which measures the number of mutations in every cancer cell in order to more accurately reflect the neoantigen produced in a tumor. MCMB is based upon the same NGS data used for TMB calculation but is expected to be superior for prediction of clinical outcomes.

Rheumatoid arthritis (RA) is a chronic, generally progressive autoimmune disease that causes functional disability, significant pain and joint destruction, and leads to premature mortality. It affect approximately 1% of the worldwide population. In the present, there is no cure for rheumatoid arthritis. Disease-modifying antirheumatic drugs (DMARDs) and biologic drugs are frequently used in the treatment of RA. However, these drugs can only slow the disease progression and save the joints and other tissues from permanent damage. Advanced understanding to the etiology and pathology of RA is the important