Breakthrough development in cancer immunology published in Nature

April 23 2015, by Regina Jehle

BioNTech AG announced the publication of a scientific article on therapeutic immune responses to cancer in the internationally renowned scientific journal Nature. The paper shows an important scientific foundation for the clinical development of truly personalized yet broadly applicable cancer treatment for any patient. This publication represents results from an interdisciplinary collaboration between scientific and clinical teams at TRON, La Jolla Institute for Allergy and Immunology and BioNTech AG to elucidate novel cancer immunotherapy principles, translate these into individually tailored mRNA cancer vaccines and progress clinical development to provide new treatment options for cancer patients.

The article, titled "Mutant MHC II epitopes drive therapeutic immune responses to cancer," describes a novel immunological principle relevant to cancer immunotherapy and how this translates into patient specific mRNA cancer vaccines targeting multiple mutations. Ugur Sahin, co-founder and CEO of BioNTech and colleagues, identified tumor-specific mutations capable of inducing immune responses in mouse models of skin, breast and colon cancer, and showed that a large fraction of these mutations can be recognized by immune cells called CD4+T cells. The study shows that the proportion of mutations recognized by immune cells is at least ten times higher than previously reported. The finding is extremely important as immune recognition of tumor-specific mutations has been previously shown to be required for clinically successful cancer immunotherapy.

Ugur Sahin, CEO of BioNTech, said: "This novel insight indicates that most human cancers may be eligible for successful cancer immunotherapy.However, every patient's tumor possesses a unique set of mutations that must first be identified, which means that targeted vaccine approaches need to be individually tailored.Our aim is to make truly personalized cancer immunotherapies affordable and broadly available."

The paper outlines a novel technology solution that uses this insight for truly personalized medicine. It describes a blueprint for personalized yet broadly applicable cancer treatment. This involves computer assisted design of a tailored cancer vaccine using a patient's cancer genome data - the "mutanome". It also confirms that "just in time" production of a patient specific mRNA cancer vaccine, that importantly targets multiple mutations, is feasible.

These discoveries have already been implemented by BioNTech in a first-in-concept clinical trial (NCT02035956) in melanoma, using its fully integrated and operational process from sequencing each patient's tumor to delivery of that patient's individualized cancer vaccine. This approach can either be used as a standalone treatment or combined to improve the clinical success of checkpoint blockade treatment. Further studies are being planned. BioNTech owns all commercial rights for the exclusive exploitation of the entire concept.

More information: "Mutant MHC class II epitopes drive therapeutic immune responses to cancer." *Nature* (2015) DOI: 10.1038/nature14426

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