FROM THE INTERVIEW

UŞ: mRNA is a natural molecule, it's one of the first molecules of life. It is a carrier of genetic information. But in contrast to DNA, it's not stable. So, it can be used to transfer information to human cells. And the human cells can use this information to build proteins, which can be used for therapeutic settings, for example, to make a protein which is a vaccine, or to make a protein which is an antibody, or to make a protein which is another type of drug. And we were fascinated by this molecule class, because it was very clear that mRNA can be produced pretty fast, within a few days. And we were, as medics, we were particularly interested to develop personalized medicines. That means a treatment and immunotherapy specifically designed for a cancer patient, because one of the key challenges in cancer treatment, is that every patient has a different tumor. If you compare two tumors of two patients with the same type of tumor, the similarity of the tumors is less than three percent and 97 percent is really unique. And today, it's still not possible to address the uniqueness of the tumor of a patient. And therefore, we were seeking for a technology which could be used for immunotherapy and which could be used to develop a treatment within the shortest possible time. The idea to get the genetic sequence of the tumor and then make a vaccine which is personalized, within a few weeks.

CA: Is it fair to say that almost all of the significant things that happen to us biologically are actions done by proteins, and that it's mRNA that actually makes those proteins? If you can understand the language of mRNA, you can get involved in pretty much everything of significance to the well-being of a human being.

ÖT: Exactly. So, in principle, the information instructions are in the DNA. These have to be translated into protein because proteins are the actors which keep our cells alive and our organism functional. And the way how to translate what is instructed by DNA in a fashion that it is well-timed and happens at the right places, into protein, there is messenger RNA. Messenger RNA sort of instructs when and how much of which protein has to be built in order to ensure the activity of our body.

CA: So, you can almost think of DNA as the sort of The Oxford English Dictionary of Language. It sort of sits there as the reference point. But for the actual living work, the living work of language out there in the world instructing things, that is done by mRNA.

UŞ: Yeah, absolutely, it is possible. So, the human cells, exactly, DNA is like a library. If you have the platform for the messenger RNA therapy, you can deliver any type of message and the body cells ensure that the message is translated into the right protein.

ÖT: A high advantage of mRNA is that it is so versatile. You can deliver all sorts of messages, as Uğur has called them. On the one hand, you can deliver the blueprint for the protein which you want to be produced in this cell. But you can, with the same molecule, also design into the mRNA instructions how this protein should be built, instructions to the protein factories of the cell. So, you can define whether you want this protein to be built in high amounts or for a long duration, how the pharmacokinetics of this protein should be in the cell.