**Award Winning Research at Oklahoma State University**

Chemical Engineering professor and researcher, Josh Ramsey, Ph.D., recently received the 2019 President's Fellows Faculty Research Award for his research with smart material-based nanoparticles for delivery of protein therapeutics. Dr. Ramsey reports he initially began his research in delivery of macromolecules (i.e., genes and proteins) fourteen years ago while working to complete his Ph.D. in Chemical and Biomolecular Engineering at the University of Illinois. He has been particularly focused on protein delivery over the last eight years. He and his team at OSU are currently working with a hybrid delivery vector based on adenoviruses, which are responsible for causing several common illnesses such as a cold. Although this sounds like it would cause a negative effect, this technique is actually finding ways to make advancements in medicine and keep us healthier.

In order to target a certain cell or gene, the virus has attachments on its surface called fibers and knobs. They have used a process to remove these proteins, thus producing virus-like particles (VLP) or fibreless virus. In the past, gene therapy research was focused on finding various methods to deliver DNA to nucleases. This approach in different in that this vector or delivery method is transporting proteins instead. Normally the DNA is transferred and allowed to proceed to creating the proteins, so this is advanced in that it skips the first few steps of DNA being transcribed to RNA and RNA translating to the proteins.

Dr. Ramsey shared that this is a challenging field because finding a vector that will provide maximum benefit safely is a balancing act demonstrated through trial and error. They start by using a virus because it is nature's way of delivering genes. Eukaryotes recognize most viruses though, which is what activates our immune response. Our immune system will begin fighting the virus, causing fever and other symptoms which result in the death of the virus. By replacing the surface fibers of the virus with polymers, it allows the virus to hide from the body so it can reach its target. The next challenge is finding what is needed so that genetic material that will make the healthy change is released at the appropriate time and place.

The work that he and his team do could benefit all realms of medicine. He admitted that when he first began working in gene therapy, he believed the only benefits were going to be the ability to alter heritable genes. Since then, he sees the potential to cure not only heritable genes with mutations that cause cancer, but also non heritable traits that cause cancer and other diseases. He spoke strongly of how the views of medicine are changing because of this science. Instead of using chemotherapy and radiation, scientists are discovering ways to enhance our own immune responses to fight cancer and disease, rather than removing our natural defenses.