Developing a High Precision Allergy Chip for Rapid Detection of IgE Interactions with Immobilized Allergens from a Blood Sample.

The proposed research aims to address the pressing issue of false negatives and false positives in allergy testing by developing an allergy chip that can immobilize allergens on a nitrocellulose substrate for testing IgE interactions from a blood sample. Currently, patients must undergo painful and time-consuming skin prick tests to determine their allergies, leading to potential inaccuracies and delays in diagnosis and treatment. The development of the allergy chip has the potential to revolutionize allergy testing by providing a non-invasive and efficient method for identifying allergens in patients, ultimately improving patient outcomes and reducing healthcare costs associated with unnecessary testing and treatments. This innovative technology will not only benefit patients by streamlining the diagnostic process, but will also advance the field of allergy research by enabling more precise and comprehensive testing methods.

The proposed research project seeks to revolutionize the way allergies are diagnosed by developing an allergy chip that can detect IgE interactions with immobilized allergens using a small blood sample. This technology fills a critical gap in the field as the current gold standard for allergy testing, the skin prick test, is often painful and time-consuming. Our approach differs from other research in the field by providing a minimally invasive, efficient, and accurate method for allergy testing that can identify a wide range of allergens in a single test, reducing the likelihood of false negatives and false positives. This innovative technology has the potential to greatly improve the quality of life for individuals suffering from allergies while also simplifying the diagnostic process for healthcare providers.

The scientific methods and techniques to be employed in the research include utilizing surface modification techniques to immobilize allergens on a nitrocellulose substrate in a controlled and uniform manner. This will be achieved through the use of advanced protein immobilization protocols that ensure stable and reproducible attachment of the allergens. The interaction between the immobilized allergens and IgE antibodies in the blood sample will be detected and quantified using state-of-the-art fluorescence imaging and analysis techniques. Statistical analysis will be performed to determine the sensitivity and specificity of the allergy chip in identifying true allergic reactions from the blood sample.

**Specific Aims**

Specific Aim 1: Development of nitrocellulose substrate for allergen immobilization. The aim is to optimize the surface modification of nitrocellulose to successfully immobilize a broad range of allergens for subsequent testing for IgE interactions.

Specific Aim 2: Develop a protocol for efficient and reproducible immobilization of a panel of common allergens on the nitrocellulose substrate. This aim will focus on testing different methods and concentrations to achieve optimal binding and stability for subsequent testing of IgE interactions.

Specific Aim 3: Optimizing Allergen Immobilization Efficiency. This aim will focus on optimizing the immobilization efficiency of a selected panel of common allergens on the nitrocellulose substrate to ensure accurate detection of IgE interactions from blood samples.

The expected results of this proposed research will be the development of a highly sensitive and specific allergy chip that can accurately detect IgE antibodies against multiple allergens from a small blood sample. The successful creation of this allergy chip will significantly reduce false negatives and false positives compared to current methods, leading to more accurate diagnosis of allergies in patients. These results will contribute to the advancement of a commercial product that can revolutionize the way allergies are diagnosed and managed, ultimately improving patient care and quality of life. Additionally, this research will increase knowledge in the field by providing a new and innovative approach to allergy testing that can be applied in various medical settings.

The team members have extensive experience in surface modifications for protein immobilization, making them well-equipped to develop and optimize the allergy chip. Their expertise in chemistry research will enable them to effectively immobilize allergens on the nitrocellulose substrate, reducing the risk of false negatives and false positives. Additionally, the collaboration with the medical allergist brings clinical insights that will ensure the chip accurately detects IgE interactions with allergens. Overall, the team's collective knowledge and skills make them well-positioned to tackle the challenges associated with developing the allergy chip.