Transfer academic to business

Speaker: Wen Hao Chen

Resume

CTO Jan. 2021 – Apr. 2023

Allerxis Inc; Delaware, USA

CEO Jan. 2020 – Oct. 2021

Taiwan user friendly sensor and tech. Inc.; Tainan, Taiwan

Skydeck GIP team Jun. 2020 – Sep. 2020

UC Berkeley; USA

Project manager May. 2019 – Apr. 2020

National center university; Taoyuan, Taiwan

Assistant Researcher Jan. 2019 – Apr. 2019

National Applied Research laboratories; Hsinchu, Taiwan

Senior engineer May. 2018 – Dec. 2018

Taiwan carbon nano technology corporation; Hsinchu, Taiwan

Postdoc researcher May. 2015 –May. 2018

Academia Sinica; Taipei, Taiwan

Postdoc researcher Jul. 2015 – May. 2015

National Chung Cheng University; Chia-yi, Taiwan

摘要

近年來，隨著全球人們使用壽命的延長，健康保健意識在世界各地越來越重要。 隨著越來越先進的技術的發展，越來越多的奈米技術將被用於疾病診斷或疾病治療。 在本次演講中，根據我的經驗，介紹了三個奈米粒子表面修飾應用於生物感測器和疾病治療的案例。 無論要開發什麼複雜、先進的技術，更重要的是有多少人能夠接受並使用它。 首先，我們談談生物感測器。 BIACORE 是一種基於表面等離子共振（SPR）效應的無標記生物感測器系統。 當材料被切割成奈米尺寸時，會提供一種特殊的「局部表面等離子體共振（LSPR）」效應。 當抗原與奈米粒子表面的抗體結合時，此效應會引起吸光度改變。 即使 LSPR 生物感測器對於免疫測試也具有非常高的靈敏度，但奈米顆粒在基底上的均勻性和高覆蓋度是一個非常重要的問題。 為此，我採用有機合成的方法創造了一種新的帶有巰基的矽烷分子「巰基丙基雜氮矽三環」（MPS）。 MPS 非常適合表面改質且對水分的干擾較小。 當我們用乙醯基對 MPS 的巰基進行上保護時，上保護的 MPS 表現出優異的表面改質效果，並且可以在水溶液中對基材進行改質。 這種結構打破了矽烷分子的框架，為表面改質材料創造了新的選擇。 即使這項進步可以減少 FOPPR 系統中晶片的時間和成本，但該系統沒有明確的目標，市場帶來的價值並不好。

其次，當我在中研院工作時，我專注於設計用於治療亨廷頓神經元疾病的胜肽/奈米顆粒藥物。90%以上的神經元疾病是由特殊蛋白質聚集並誘導細胞死亡引起的。 在亨廷頓舞蹈症的治療中，我們開發了親和胜肽並將其修飾在金奈米顆粒上，這種親和奈米顆粒具有高效的抑制和解聚亨廷頓蛋白聚集體的作用。 親和奈米粒子在體內試驗中仍表現出很好的抑制亨廷頓蛋白聚集的效果。 即使親和奈米顆粒顯示出治療亨廷頓氏症的巨大效果，但仍難以應用於疾病治療，因為血腦屏障（BBB）會抑制藥物進入大腦並進行治療。 近年來，越來越多的研究人員關注腸腦軸理論，他們聲稱腸道中的細菌會產生一些特殊的小分子，這種分子可以穿透血腦屏障進入大腦，抑制神經元疾病。因此消化道疾病患者罹患神經元疾病的風險較高。為此，我們找到了一個特殊的消費者市場食物過敏原。

乳糜瀉是一種由對食用麩質的免疫反應引起的疾病。美國有 300 萬乳糜瀉患者，約 30% 的美國人喜歡無麩質飲食。麩質不是水溶性蛋白質； 這種現象會誘發麩質，很容易在食品中交叉污染，品質控制測試難度高。針對這個市場，我們利用側流技術為消費者打造了個人使用的便攜式麩質感測器整體解決方案。在這個系統中，我們合成了特殊的離子液體來提高麥醇溶蛋白的溶解度，在金奈米粒子上包覆兩性離子結構，以抑制快速測試和影像分析中的假陽性/陰性，從而量化麥醇溶蛋白的含量。 好的產品可以帶給消費者好的體驗，但仍需要好的行銷來推廣。 如何做好食物過敏原市場的行銷是一個重要的議題。 在這次演講中，我將分享我如何打入食物過敏原市場的經驗。

Abstract

In recent years, as people increase their service life globally, the consciousness of healthcare is more and more important in the world. According to more and more advanced technology was to be developed, more and more nanotechnology was to be used to develop in disease diagnosis or disease therapy. In this talk, three cases of surface modification of nanoparticles applied to biosensor and disease treatment in my experience. Whatever the complex or advanced technology was to be developed, more important is how many people can accept it and use it.

First, we talk about biosensors. BIACORE is one kind of label free biosensor system based on surface plasmon resonance (SPR) effect. When the material is cut out to nano size, it will provide a special effect "local surface plasmon resonance (LSPR)" effect. The effect will induce the light absorbance making change when the antigen binding with antibody on the nanoparticle surface. Even the biosensors of LSPR have very high sensitivity for immune tests, but how homogenous and high coverage the nanoparticle on substrate is a very important issue. For this reason, I used organic synthesis to create a new silane molecule with mercapto group "mercapto-propyl-silatrane"(MPS). MPS is great for surface modification and low interference with moisture. When we capping the mercapto group of MPS by acetyl, the capping MPS shows an excellent effect of surface modification and can modify substrate under water solution. This structure breaks the frame of silane molecules and creates a new choice of material in surface modification. Even this advance can reduce the time and cost of the chip in FOPPR system, but the system does not have clear target and market bring about the value is not good.

Second, When I work at academic Sinica, I focus on designing peptide/nanoparticle drugs for treatment of Huntington neuron disease. more than 90% of neuron disease is from special protein aggregated and induced cell death. In the treatment of Huntington's disease, we develop affinity peptide and modify it on gold nanoparticles, this affinity nanoparticle has a high effect of inhibiting and disaggregating the Huntingtin protein aggregates. The affinity nanoparticle still shows a great effect of inhibiting the Huntingtin protein aggregated in vivo test. Even the affinity nanoparticle shows a great effect of treating Huntington disease, but it is still difficult to apply to treatment patents, because the blood brain barriers (BBB) will inhibit the drug into the brain and treatment.

In recent years, more and more researchers are focusing on gut–brain axis theory, they claim bacteria in the gut will produce some special little molecule and the molecule can penetrate the BBB into the brain and inhibit neuron disease. The disease of digestive tract patients has a high risk of getting neuron disease. For this reason, I found a specific

market of food allergen. Celiac disease is an illness caused by an immune reaction to eating gluten. 3 million of celiac patients in the US and around 30 % of people prefer gluten free diets in the US. Gluten is not a water-soluble protein; this phenomenon induces gluten and is easily cross contamination in food and difficult test in quality control.

For this market, we used lateral flow to create a total solution of a personal used portable gluten sensor for consumers. In this system, we synthesize special ionic liquid to raise the solubility of gliadin, coating zwitterionic structure on gold nanoparticles to inhibit the false positive/ negative in rapid test and image analysis to quantify the gliadin content.

A good product can provide a good experience for consumers, but it still needs great marketing to promote. How to do the marketing in the market of food allergen is an important issue. In this talk, I will be sharing my experience of how to penetrate the market of food allergen.