Michigan State University

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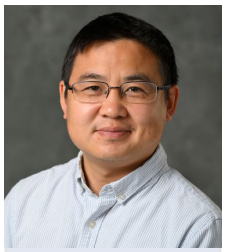
Research discussion with Dr. Bin Chen

Tell us about your current research?


Dr. Bin Chen

One pillar of my research is to develop new methods to leverage the emerging omics data in drug discovery. Conventional drug discovery focuses on finding agents that modulate one molecular feature (mostly protein target). This approach was adopted a few decades ago, even before the emergence of omics technologies. Today's technologies allow profiling thousands of molecular features including proteins, mRNAs, and metabolites, all of which can contribute to disease development. RNAseq data alone includes approximately 60,000 features. Finding one magic bullet from these thousands of features is challenging. Moreover, focusing only on a single feature does not fully utilize all the information generated from new omics technologies. We employed a systems approach that considers how drugs affect a disease gene expression signature (comprised of a set of up-/down-regulated disease genes). Using this approach, we, like many others, discovered therapeutic candidates for a number of diseases. We recently published the OCTAD platform in Nature Protocols, which allows researchers to predict repurposed drug candidates for cancers and cancer subtypes. Currently, we are improving this approach to support the virtual screening of novel compounds through collaboration with computer scientists.

What excites you the most about it?

Systems-based approaches including our own can rapidly identify novel compounds against diseases. Ideally, to implement our approach to the large-scale screening of a compound library based on gene expression features, gene expression profiles associated with every compound in the library should be known. However, gene expression profiling of so many compounds under various biological conditions is currently impractical. My lab tried various machine learning models to predict drug-gene expression signatures. The performance was not ideal until recently we developed a novel deep learning model that substantially boosted the performance. With the predicted profiles of over 7 million compounds, we can quickly predict novel compounds given a disease gene expression signature. We are super excited to apply it to find new drugs for tough diseases such as liver cancer and DIPG, as well as SARS-CoV-2. We are working closely with our drug repurposing core to validate candidates.

What are the next steps?

The next step is focused on the validation of the drug hits in various indications. I am thrilled that Drs. Jamie Bernard, Karen Liby, and Bryan Copple expressed an interest in testing compounds for us. Besides, we will develop an AI model to support de novo drug design. As the emergence of single-cell RNASeq data, we plan to apply this approach to identify compounds that could control cell lineage development or modulate the microenvironment.

Research discussion with Dr. Jamie Alan

Tell us about your current research/grant?


Dr. Jamie Alan

This is a highly collaborative grant with clinicians (Dr. Cara Poland), basic scientists, and social scientists. Addiction medicine curriculum has often been neglected in undergraduate medical education. Very few medical schools have a curriculum that dedicates time specifically to addiction medicine. Implementing an elective or required addiction medicine curriculum during medical school, can boost students' confidence in their ability to screen, manage, and treat patients with substance use disorders. Consistent, early training and education in addiction medicine during Undergraduate Medical Education (UME) can help identify students who can go on to serve as champions and future leaders who can serve as the next generation of educators in the field.

What excites you the most about it?

Teaching is my passion, and I love teaching medical students. Addiction medicine is so very important and vital, and introducing this curriculum early is key. Also, this is my small part in fighting the opioid epidemic.

What are the next steps? Where do you see it going?

The sky is the limit! We are developing a program that can be adapted for all sorts of professional students including PA students, nursing students, etc. The best way to tackle a problem is to get all of the medical team involved, and it's my job to provide the educational component.

Hanna H. Gray Fellow: Dr. Evert Njomen

Dr. Evert Njomen

We have some great news to share about Evert Njomen. Evert's PhD Research was supported by the Integrative Pharmacological Sciences Training Program housed in our Department. She graduated from MSU with a dual major PhD in Chemistry & Pharmacology and Toxicology in 2019. Dr. Njomen is currently a post-doc at Scripps. We recently chatted with Dr. Njomen about her awesome accomplishment:

Can you tell me about your award and what it means to you?

The Howard Hughes Medical Institute (HHMI) Hanna H. Gray fellowship is aimed at supporting diversity in biomedical research through the recruitment of outstanding early-career scientists who have longed to become the next leaders in academic research. Fellows are supported during the postdoctoral phase and potentially during their early years as independent faculty. To me, this award is a reassurance that my science matters and that I have the potential to become an independent investigator. In graduate school, I heard this countless times from my mentor, Prof. Jetze Tepe, but it is a different level of self-assurance coming from scholars who do not know me that well, the HHMI Scientific Advisory Committee.

How will this award help you in your career moving forward?

This award is a complete game changer- the beginning of an incredible career trajectory for me. It is not just the financial support for my ongoing research, it is also an invitation to join the HHMI scientific community, a network of some of the best scholars in the field of biomedical science. I believe it also positions me to inspire the next generation of female scientists, particularly those from disadvantaged backgrounds like me.

What is your current area of study?

I will describe myself as a chemical biologist. My interests have always revolved around harnessing the power of chemistry in tackling some of the challenging questions in biology. At Scripps, under the leadership of Prof. Ben F. Cravatt, my research team and I are focused on using chemical proteomic tools to exploit part of our immune system, the autophagy pathway, in broadly targeting different pathogenic organisms, including new and drug-resistant strains.

When not at work, what do you do for fun?

I enjoy dancing - in grad school I used to claim this was my fall-back career; Face-time cooking with my family back in Cameroon; and beach walks - you must enjoy the California waters!

What is one unique thing about yourself?

I was a middle school teacher of Chemistry and Biology before the opportunity for graduate school presented itself. I am forever indebted to Dr. Stanley-Pierre Ngeyi for 20-years' worth of sponsorship and the privilege to dream beyond high school.

What is your favorite MSU memory?

I obviously miss everything about MSU, but I will say the countless afternoon dessert trips to the dairy store with my lab mates cannot be topped.

New Grants:

Design and syntheses of potent antagonists of 3kPZS through medicinal chemistry optimization. Awarded to: Ellsworth, Edmund; Neubig, Richard; Li, Weiming. Sponsor: Great Lakes Fishery Commission. $306,737

Blast from the past

How many Pharmacology & Toxicology people can you identify in the photo?

Questions or comments? Something you'd like to share? Send us an email! We would love to hear from all of our alumni and friends. The more updates and news we get from our alumni, the more news and updates we will include in our communications!

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