



ANNUAL REPORT

2019-2020





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NORMAN CHIU

LAURA FLORES-BOCANEGRA

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FRANKLIN MOY

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RICK BUNCH

MITCHELL CROATT

TYLER GRAF

DOW HURST

JOHN Z. KISS

CEDRIC PEARCE

HUZEFA RAJA

DANIEL TODD

QIBIN ZHANG

YEAR AT A GLANCE

SEPTEMBER 2019 to AUGUST 2020






- 55 PUBLICATIONS BY MC² SCIENTISTS
- 27 CO-AUTHORED PUBLICATIONS *with* MC² COLLABORATORS
- 48 PRESENTATIONS BY MC² SCIENTISTS

\$13 MILLION IN GRANT SUBMISSIONS

\$4.5 MILLION IN CONTINUING GRANT FUNDING

\$4.8 MILLION IN NEW GRANT FUNDING AWARDED

*Selected new funding from
The National Institutes of Health*

- 
\$1.6 MILLION - DR. OBERLIES
 NATIONAL CANCER INSTITUTE
Discovery of anticancer agents of diverse natural origin
- 
\$1 MILLION - DR. CECH
 NATIONAL CENTER FOR COMPLEMENTARY AND INTEGRATIVE HEALTH
 Center for High Throughput Functional Annotation of Natural Products (HiFAN)
- 
\$447k - DRS. JIA AND CHIU
 NATIONAL HEART, LUNG, AND BLOOD INSTITUTE
Novel carbon nanodots for modulation of OxLDL mediated inflammation and inhibition of atherosclerosis
- 
\$405k - DR. CROATT
 NATIONAL CANCER INSTITUTE
TAK1 Inhibition by (5Z)-7-Oxozeaenol Analogues for Anticancer Leads
- 
\$355k - DR. ZHANG
 NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES
Lipidome Remodeling During Development of T1D



CHEMIST SEARCHES FUNGI FOR ANTICANCER DRUG LEADS

Dr. Nicholas Oberlies describes himself as “pretty passionate” about fungi. That may be an understatement.

“I could geek out about fungi for hours,” said the UNC Greensboro professor of chemistry and biochemistry. “You could argue that half of us wouldn’t be alive today if it weren’t for fungi.”

Fungal cultures have been used for decades in life-saving medicines, most notably penicillin and statins. Still, there are no drugs derived from fungi specifically for fighting cancer.

That’s what Oberlies and his team are trying to find. His lab recently received a \$1.5 million grant from the National Cancer Institute (NCI) to discover new anticancer drug leads in fungi, specifically those used in fermentation.



“There’s something like five million fungi in the world, and only about 125,000 have been discovered. The exciting thing about this project is we may discover a compound in fungi that could eventually become an anticancer drug—or we may have already discovered one.”

The Oberlies Research Group has been mining fungi for promising leads since 2007, producing over 50 manuscripts on the topic and two patents. Yet drug discovery is still considered to be in the early stages. That’s in part because, historically, most research on fungi has focused on developing antibiotics.

“Post-World War II, everybody turned their attention to antibiotic drug discovery because penicillin was so successful,” Oberlies said.

Yet lately interest in fungi has seen a resurgence, thanks to movies like “Fantastic Fungi” and flocks of citizen scientists trekking through woods and lakes to document their diversity. Neither animals nor plants, fungi are a Kingdom of their own, composed of yeasts, molds, and mushrooms. They’re old—with some dating back more than 500 million years—and seemingly endless—with many still waiting to be discovered.

Oberlies and his team have also been known to forage through forests to discover new

fungi, but for this project, they collaborate with Mycosynthetix, Inc., a biotechnology company in Research Triangle Park with a library of more than 50,000 fungal strains.

After isolating promising compounds, the Oberlies lab then sends leads to their collaborator at the University of Illinois at Chicago, who tests their effectiveness on ovarian cancer cells. Also collaborating on this project are teams at Columbia University and Ohio State University.

Despite ten years of diligent research—and the identification of several encouraging leads—there’s still more to do. This latest round of funding from NCI will support five more years of research. And with 1,500 people dying from cancer each day in the U.S., the implications of Oberlies’ study is clear.

Thankfully, there seems to be no limit to fungi ... or their potential.

“Everywhere we look, we discover new fungi,” said Oberlies. “When I go to the beach, I collect new fungal samples. I’ve discovered new fungal samples on campus ... I’ve worked on this project for ten years, and I could work on it for 30 more. We’re just scratching the surface.”

STORY BY ELIZABETH KERI, COLLEGE OF ARTS & SCIENCES
PHOTOGRAPHY BY MARTIN KANE, UNIVERSITY COMMUNICATIONS

‘YES, AND CAFÉ’ PODCAST

HOSTS: DR. OMAR ALI AND DR. NADJA CECH

DEBUT: MARCH 2020

EPISODES: 10 AND COUNTING

WHAT IT’S ABOUT: ‘YES, AND’ IS THE POWERFUL, INTENTIONAL, AND CREATIVE PRACTICE OF BUILDING WITH OTHER PEOPLE. THE NAME COMES FROM IMPROVISATIONAL THEATER. SO, WHAT IS IT? ONE: PAYING ATTENTION. TWO: AFFIRMING. AND THREE: BUILDING ON WHAT OTHERS GIVE YOU. THAT’S IT! YES, AND.



(UN)ORDINARY PEOPLE

The room goes silent as the co-hosts silently nod that they’re ready, and the “Recording in Progress” light goes on. They wait a beat, and the friendly and enthusiastic voice of Dr. Nadja Cech registers on the mic. “Welcome to the ‘Yes, And Café,’ a podcast that explores, learns, and creates with ordinary people who do extraordinary things.”

In the new podcast series at UNCG, Cech (Chemistry & Biochemistry) and Dr. Omar Ali (Lloyd International Honors College) speak with a diverse lineup of guests to dig into how the themes of play, openness, and working across boundaries and identities enhance their work, their research, and their lives.

Guests include UNCG faculty, administrators, staff, alumni, visiting guest speakers, and local community members. During each episode, the main guest is joined by a student, allowing for a variety of perspectives and voices on any given issue.

The new podcast series is the latest in a long list of collaborations between Cech and Ali. They



Dr. Omar Ali, left, and Dr. Nadja Cech chat with guests as they record an episode of the “Yes, And Café” podcast in November 2019.

have co-taught courses, conducted workshops and conferences together, and co-led creative endeavors such as “The Underground Railroad Tree: Explorations in History, Science, and Art” exhibition in downtown Greensboro.

This cross-disciplinary approach to teaching and learning is typical of Cech and Ali, and it’s the underlying philosophy of the new podcast series.

To listen to the podcast visit news.uncg.edu/yes-and-cafe-podcasts/

STORY BY MATT BRYANT, UNIVERSITY COMMUNICATIONS
PHOTOGRAPHY BY MARTIN KANE, UNIVERSITY COMMUNICATIONS

NIH FELLOWSHIP PROGRAM

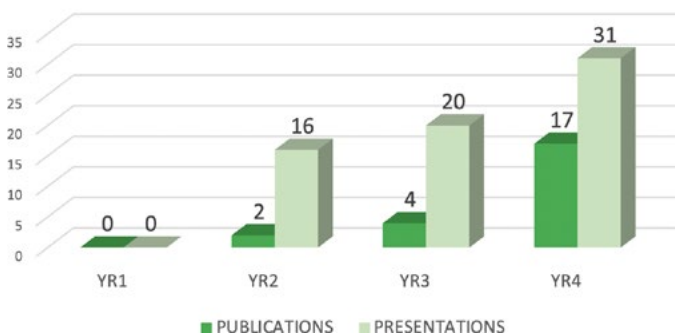
RUTH L. KIRSCHSTEIN INSTITUTIONAL NATIONAL RESEARCH SERVICE AWARD PREDOCTORAL TRAINING: INNOVATIVE TECHNOLOGIES FOR NATURAL PRODUCTS AND INTEGRATIVE MEDICINE

Our National Institutes of Health funded “Predoctoral Training: Innovative Technologies for Natural Products and Integrative Medicine” is one of only three institutional predoctoral training awards (T32) in basic science supported by the National Center for Complementary and Integrative Health. Situated within the Medicinal Chemistry Collaborative and led by Dr. Nadja Cech, this program supports four PhD students enrolled in the Department of Chemistry and Biochemistry at UNCG. An additional trainee is currently funded by an individual (F31) National Institutes of Health predoctoral fellowship grant.

Our NIH fellowship program prepares trainees for independent research careers with a combination of mentored laboratory research, scientific coursework, seminars, hands on training, and internships. An important element of this work is hands on training in our outstanding NMR and mass spectrometry facilities, where trainees design experiments, operate instrumentation and carry out data analysis.

The UNCG T32 fellowship program entered its fifth year of funding during the spring 2020 semester. We are proud to share that our trainees have been highly productive over the first four years of the program, with a steady increase in numbers of presentations and co-authorships on publications with each subsequent training year. Our trainees achieved 23 publication co-authorships and 67 presentations cumulatively by the end of year 4. A renewal application was submitted to NCCIH in June and is awaiting a funding decision.

PUBLICATIONS AND PRESENTATIONS BY T32 TRAINEES



PREDOCTORAL TRAINEE HIGHLIGHTS

GABRIELLE P. DAILEY used her impressive science communication skills to win the campus-wide 2019 3-Minute Thesis competition

DERICK D. JONES, JR. was recognized with a 2020 Spartan Leadership Award for his outreach activities with the UNCG Graduate Student Association

AMBER M. KELLEY earned her PhD in August and has secured a Postdoctoral Research Associate position with Dr. Kevin Frankowski at UNC Chapel Hill

SONJA L. KNOWLES, previously a T32 fellow, was awarded a F31 fellowship in August 2019 to study the evolution of fungal pathogenicity, a collaboration with evolutionary biologist Dr. Antonis Rokas at Vanderbilt University

HEATHER L. WINTER was appointed as a T32 fellow in January 2020 to complete the cohort of trainees

SEMINARS RELATED TO NATURAL PRODUCTS AND INTEGRATIVE HEALTH, DEPT. OF CHEMISTRY & BIOCHEMISTRY

<i>Dismantling Barriers to Student Success in STEM Courses Through Inclusive Excellence</i>	FEB 2020	DR. KELLY Y. NEILES, St. Mary's College Of Maryland
<i>Favoring Luck by Prepared Minds: Design and Discovery of New Reactions</i>	JAN 2020	DR. MITCHELL P. CROATT, University Of North Carolina Greensboro
<i>Tales From My Career in the U.S. Public Health Service</i>	NOV 2019	LT. LAUREN E. WOODARD, PH.D., Center for Drug Evaluation and Research, U.S. Food and Drug Administration
<i>Combinatorial Biocatalysis: A Sustainable Route for Production of Terpenoid Bioactives</i>	NOV 2019	DR. THOMAS B. BRÜCK, Technical University Of Munich
<i>Advanced Analytical Methods in Deciphering the Role of Diet and the Microbiome</i>	OCT 2019	DR. CARLITO B. LEBRILLA, University Of California, Davis
<i>Taking Nanoparticles to the Mesoscale for Sustainability and Beyond</i>	SEP 2019	DR. RIGOBERTO HERNANDEZ, Johns Hopkins University
<i>The Allure of Kratom: A New "Legal high" or A New Way to Treat Pain and Addiction?</i>	SEP 2019	DR. SCOTT HEMBY, High Point University

RESEARCHER IDENTIFIES LINK BETWEEN COVID-19, SELENIUM

An international team of researchers, including UNC Greensboro Biochemistry Professor Ethan W. Taylor, has identified a significant association between COVID-19 prognosis and regional selenium status in China.

Selenium is an essential dietary trace element that over the last 40 years has been found to be a significant factor affecting the incidence, severity, or mortality of various viral diseases, in animals and humans. This has been studied most extensively in the case of HIV and AIDS, where selenium status has proven to be an important determinant of disease progression and mortality. As China has geographical regions known to have either extremely high or low soil selenium levels, one of the first human diseases associated with selenium deficiency was identified there, in a region of Heilongjiang province named Keshan.

Keshan disease, involving a potentially fatal weakening of the heart, eventually proved to have a viral cofactor (Coxsackievirus), but its incidence and severity were greatly reduced through dietary selenium supplementation. Other diseases associated with viral infections that had been endemic in these low selenium regions of China have been at least partially controlled or treated by selenium supplementation. These include liver cancer associated with hepatitis viruses and "epidemic hemorrhagic fever" associated with hantavirus infections.

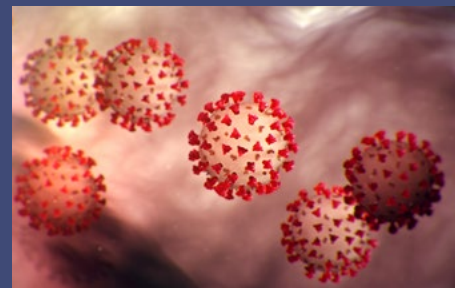
"Considering this history of viral infections that can be exacerbated by selenium deficiency,

we hypothesized that selenium status might be a factor in the outcome of COVID-19," Taylor said. "The study was made possible by the fact that for many cities in China there is accurate published data on the average level of selenium in human hair, which is highly correlated to dietary intake."

Using cumulative COVID-19 outcome data from Feb. 18, the study found that in the city of Enshi, which has the highest selenium intake in China, the cure rate (percentage of COVID-19 patients declared "cured" by that date) was almost triple that of the average for all the other cities in Hubei province. In contrast, in Heilongjiang province, where Keshan is located and selenium intakes are among the lowest in the world, the death rate from COVID-19 was almost 5 times as high as the average of all the other provinces and municipalities outside of Hubei.

For 17 cities outside Hubei, the researchers were able to show a significant positive relationship between the reported COVID-19 cure rate and selenium status, although they emphasize that this is not proof of a causal relationship, as many possible confounding factors (such as age and comorbid conditions) were not accounted for in their study. However, the results do indicate further research in this area is necessary and may guide ongoing public health decisions.

"A role for selenium may also help explain phenomena such as the recently reported blood clotting in COVID-19, because selenium



is known to have an anti-clotting effect. There have also been reports of heart problems like myocarditis, which is reminiscent of Keshan disease, which was a viral myocarditis," said Taylor.

"These findings are particularly significant for myself and Prof. Jinsong Zhang" (who are joint first authors on the new study), he added, "because we had presented research findings at an international symposium on SARS in Beijing in 2003, strongly suggesting that selenium would be a factor in SARS pathogenesis. Many of those observations we made 17 years ago still apply to the SARS-Coronavirus-2, the cause of COVID-19, which is a close relative of the original SARS virus."

The international collaboration was led by Dr. Margaret P. Rayman at the University of Surrey in the United Kingdom.

The research has been published in The American Journal of Clinical Nutrition.



OUR RESEARCH CONTINUES

Dr. Laura Flores-Bocanegra, Research Scientist with the Oberlies Group, works in the lab in July 2020.

