



studentsourcing antibiotic discovery

# in **Titletown**

LAMBEAU FIELD, GREEN BAY, WI

12/10/2025



[tinyearth.wisc.edu](http://tinyearth.wisc.edu)

# SCHEDULE OF EVENTS

## TIME (CT) SESSION

### 2:30 PM Doors Open

**Parking:** When you arrive at Lambeau Field, enter the Northeast parking lot (Lot 3) off Lombardi Avenue. Parking is free.

**Entrance:** Enter the stadium at the American Family Insurance Gate. Once inside, take the elevator or the escalator to Level 1 – Atrium Floor. The event will be held in the Atrium.

[Lambeau Field Parking & Entrance Map](#)

### 2:30 – 4:30 PM Registration and Poster Set-up

**Students:** Plan to arrive no later than 4:00pm to register and set up your posters.

**Poster size:** Max 40"x32" (landscape or portrait). You will be assigned a poster number and location at registration. Binder clips and tape will be available to attach posters to the easels.

[Lambeau Field Atrium Map](#)

### 4:30 – 5:50 PM Welcome Address and Keynote Presentation

#### Michael Alexander

Chancellor, UW-Green Bay

#### Christopher Caldwell

President, College of Menominee Nation

#### Anindo Choudhury

Interim Vice President and Chief Academic Officer, Saint Norbert College

#### Kristen Raney

President, Northeast Wisconsin Technical College

#### Land Acknowledgment – Savannah Hackey

Student, College of Menominee Nation

#### History of Tiny Earth – Sarah Miller

Director, Tiny Earth, University of Wisconsin-Madison

#### Keynote – Fred Appelbaum

Executive Senior Vice President, Fred Hutchinson Cancer Center  
Professor, Division of Hematology and Oncology, University of Washington

### 5:50 – 5:55 PM Break/Transition to Posters

### 5:55 – 6:40 PM Student Research Poster Presentations Session #1

### 6:40 – 6:45 PM Break/Transition to Posters

### 6:45 – 7:30 PM Student Research Poster Presentations Session #2

### 7:30 PM Closing Remarks & Poster Take-down

**Students:** Plan to remove your poster and disassemble your easel after the poster session; return the easel to the bins before leaving.



**Michael Alexander**  
Chancellor, UW-Green Bay

Since being named seventh chancellor of UW-Green Bay in May of 2020, Chancellor Alexander initiated six strategic priorities to support the future of the University. One of those priorities is to renew and strengthen our commitment to sustainable practices and environmental stewardship. Dr. Alexander served as provost and vice chancellor for academic affairs from 2019-2020. During that time, he created an Office of Sustainability to improve efficiencies and increase the profile of UW-Green Bay as a campus traditionally engaged with environmental study; and restructured Graduate Studies and the Office of Grants and Research, setting the stage for the University's growing research efforts. Dr. Alexander has degrees from the University of Georgia, UW-Milwaukee, and UW-Madison.



**Christopher Caldwell**  
President, College of Menominee Nation

Dr. Christopher Caldwell, President of the College of Menominee Nation, is an enrolled member of the Menominee Indian Tribe of Wisconsin. He has led the College since February 2020, serving first as Interim President, and was officially elected by the Board of Directors in June 2021.

Dr. Caldwell is the fourth person to lead CMN. He has been in a range of positions at the College including student, director, adjunct, and President. An alumnus of the College, Dr. Caldwell began his higher education here at CMN earning his Associate's Degree in Sustainable Development. He holds a Bachelor's Degree in Natural Resources from the UW-Madison, a Master's Degree in Environmental Science and Policy from UW-Green Bay, and a PhD in Environment and Resources from the Nelson Institute for Environmental Studies at UW-Madison.

Sustainability is true to Dr. Caldwell's core having served in previous positions of; Tribal Resources Director/Compliance, Enforcement Officer for the Menominee Indian Tribe, Forest Products Technician with the USDA Forest Service's Forest Products Laboratory in Madison, student/intern with the U.S. Department of Interior Bureau of Indian Affairs-NCCE, Timber Market/Forestry Technician with Menominee Tribal Enterprises and the Director of the Sustainable Development Institute at CMN.



**Anindo Choudhury**  
Interim Vice President and Chief Academic Officer, Saint Norbert College

Anindo Choudhury is Interim Vice President and Chief Academic Officer at St. Norbert College, where he's also Professor of Biology and Environmental Science. He previously served as Associate Academic Dean and Director of the SNC Collaborative. Anindo earned degrees in Zoology and Parasitology from India and Canada and held research roles at the University of Toronto and USGS before joining St. Norbert in 2001. A leading parasitologist, he's published 83 peer-reviewed papers—many with student collaborators—seven book chapters and served as Associate Editor for six international journals. He's currently President of the American Society of Parasitologists. His awards include the Klopotek Innovative Teaching Award, Founders Award, and Educator of the Year. He also led the NSF S-STEM grant, the largest federal grant in the college's history. Fun fact: several parasites—including two flukes, a tapeworm genus, and a tapeworm family—are named after him.



**Kristen Raney**  
President, NWTC

Dr. Kristen Raney has served as the president of NWTC since 2023. Under her leadership, NWTC launched new strategic priorities focused on strengthening K12 and transfer pathways, improving post-graduation success, and delivering the workforce needed by industry partners in Northeast Wisconsin. In 2025, NWTC was a Top 10 finalist for the Aspen Prize for Community College Excellence. Dr. Raney has held multiple positions in both academic and student affairs, including faculty, dean, vice president, and vice chancellor. She is an Aspen Fellow and serves as a Peer Reviewer with the Higher Learning Commission. Dr. Raney earned degrees from Edgewood University, UW-Stout, and St. Cloud State University.

# SPEAKERS



**Savannah Hackey**  
Student, College of Menominee Nation

Savannah Hackey is a first-year student at the College of Menominee Nation (CMN) where she is pursuing her degree in Natural Resources and hopes to go into the forestry field or work with wildlife in the future. Her interest stems from her mother, who raised Savannah with a burning passion for Mother Earth and making a difference in any way she can. Recently, Savannah worked at the CMN Sustainable Development Institute as a fruit tree project assistant as part of a USDA NIFA-funded project to build a northern fruit tree consortium at CMN and with regional partners. Savannah's main goal for the project was to get the community involved more, as well as educate and leave behind information about fruit tree maintenance and care for generations to come.



**Sarah Miller**  
Executive Director, Tiny Earth, UW-Madison

Sarah Miller is the Executive Director of Tiny Earth, a global initiative based at the University of Wisconsin-Madison that empowers students to address the antibiotic crisis through hands-on research. A passionate advocate for equity in science, Sarah has dedicated her career to transforming STEM education to be more active and inclusive. She has led national efforts to redesign science teaching, authored foundational texts like Scientific Teaching and Entering Mentoring, and published in leading journals. Her leadership continues to shape the future of STEM education.



Keynote Speaker  
**Fred Appelbaum, MD**  
Executive Senior Vice President  
Fred Hutchinson Cancer Center  
Professor  
Division of Hematology and Oncology  
University of Washington

Dr. Frederick Appelbaum is a pioneering researcher in hematologic malignancies with over four decades of contributions to laboratory and clinical science. In 1978, he published the first report demonstrating autologous transplantation as a curative treatment for malignant lymphoma. Since then, his work has focused on leukemia, immunotherapy, and allogeneic hematopoietic cell transplantation. Dr. Appelbaum has maintained continuous peer-reviewed funding from the NIH for 40 years and has authored or co-authored more than 700 peer-reviewed publications. His groundbreaking research has shaped modern approaches to cancer treatment and continues to influence the field globally.

## 1 Antibiotic-Producing Microbes in Soil Adjacent to the Fox River, Green Bay, Wisconsin

JACOB ARCEO

Northeast Wisconsin Technical College

Antibiotic resistance among ESKAPE pathogens remains one of the most significant public health challenges in the world, as the discovery of new antimicrobial compounds continues to decline. The Tiny Earth project aims to address the issue by encouraging students to isolate antibiotic-producing microbes from local environments. Soil was collected on September 16, 2025, at Ashwaubomay Park in Green Bay, Wisconsin, six inches deep near the Fox River. The soil temperature was 71° F with no detectable moisture and contained minimal organic matter, including decaying roots and vegetation. Given the Fox River's history of industrial runoff and pollution, it was hypothesized that the soil would contain microbes adapted to chemical stress by producing antibiotic compounds. To test this, soil dilutions were plated on R2A media and incubated at 37° C. Twenty bacterial colonies were isolated and screened using master and tester plates against *Erwinia* and *Bacillus* species to detect inhibition zones. Colonies 12 and 20 inhibited *Erwinia*, while colonies 18 and 20 inhibited *Bacillus*. Colony 20 shows dual inhibitory activity and was further screened against eight additional bacteria, including *L. antibioticus*, *B. subtilis*, *E. coli*, *S. epidermidis*, *E. aerogenes*, *A. baylyi*, *P. putida*, and *M. smegmatis*. Preliminary results indicate the presence of antibiotic-producing microbes in Fox River soil. These findings suggest that polluted or chemically stressed environments may support microbial communities with antibiotic-producing potential. Further testing and analysis are ongoing to characterize these isolates.

## 2 Fungi-rich Soil Collection from High Cliff State Park Contains Antibiotics

AVA DELONEY

Northeast Wisconsin Technical College

Since the discovery of antibiotics, pathogens have evolved to withstand them. Every year, this evolution pushes antibiotics closer to becoming obsolete, taking millions of lives in the process. The Tiny Earth program aims to give college students the knowledge and resources needed to collect and test soil samples from their communities, to hopefully discover new antibiotics. For my sample, I thought back to how the first antibiotic called penicillin was discovered from mold (fungi). So, I decided to visit High Cliff State Park and got my sample underneath a mushroom that had fallen to the ground from a dying

tree. My hypothesis was that the nutrient rich soil under the mushroom would contain many microbes with antibiotic properties. The microbes from my sample were inoculated and then tested against the bacteria *Bacillus* and *Erwinia* to see whether the microbes from my sample could counter these bacteria. My sample showed activity when introduced to *Bacillus* and to *M. smegmatis* when testing against ESKAPE pathogens. My hypothesis was wrong because I thought there would be an abundance of possible antibiotic producing microbes when really there was only one. As my research continues, I hope to find new results and information about my sample.

## 3 Turning on the Waterworks for Bacteria

ALEXIS APPLETON, JACOB WILINSKI,  
LYDIA MOROZOV, AUBREY VANDER WIELEN  
Northeast Wisconsin Technical College

Over the years, scientists have been searching for answers against antibiotic-resistant bacteria. Many antibiotics have been made by certain pharmaceutical companies, but due to human error in use, overprescribing and unfinished courses, antibiotic resistance has grown. An opportunity was introduced by the Tiny Earth organization, and we were given a chance to study different soil samples from environments we hypothesized would have the most antibiotics. Our hypothesis was that soil closer to water sources would present higher bacterial antibiotic producers because of potential runoff that contains antibiotics or resistant genes. Our group of scientists gathered a soil sample from four different bodies of water to determine if there were bacteria present that fought the antibiotic-resistant bacteria *Erwinia* and *Bacillus*. The various samples were acquired from ponds and streams, in or on the edge of heavily wooded areas. We performed a series of dilutions, platings, and isolation of bacterial colonies, and then proceeded to test them against ESKAPE strains. Our results showed that several of our isolates were active against bacteria, inhibiting: *Bacillus subtilis*, *E.coli*, and *P. putida*. These findings support our hypothesis that soils near bodies of water contain antibiotic-producing microbes that are active against bacteria. This emphasizes the connection between environmental exposure and the current problem of antibiotic resistance. Through further research, we can gather more samples closer to industrial or agricultural water runoff and compare them to the natural sources that we have previously collected.

# STUDENT POSTERS

## 4 Antibiotic Producers Collected from Whistling Straits Golf Course Soil

ABIGAIL WASMER

Northeast Wisconsin Technical College

Scientists have been investigating antibiotic resistant pathogens to create a successful antibiotic since the early twentieth century. The search for treatments against antibiotic resistant pathogens has caused an increase in innovation. However, there has been a struggle to find an antibiotic to reduce mortality rates. I was given the opportunity to present my findings of antibiotics released from microbes in soil at the Tiny Earth conference. I took a sample from Whistling Straits Golf Course. Due to my soil environment, my hypothesis was that my sample would contain several microbes that release antibiotics. This soil was found in a heavily trafficked area by many organisms. My soil sample was along Lake Michigan making the environment more suitable for antibiotic producing organisms to be present. I diluted my soil sample and used the streak plate method. The purpose of that method was to see which microbes produced antibiotics against the bacteria *Bacillus* and *Erwinia*. My soil sample had two antibiotic releasing microbes. However, one of them was a double producer against both bacteria. I decided to use my antibiotic double producer and test them against ESKAPE pathogens. Antibiotic producing microbes that were found in my sample came out to be four. My hypothesis was accurate; my soil environment was suitable for antibiotic producing microbes to be present. Results are still to be determined of antibiotic producers within Whistling Straits soil because my research is continuing.

## 5 Campus Soil as a Source of Antibiotic-Producing Microbes: A Comparative Study

JOSEPH WEIGLEIN, OLIVIA SCHWECHEL

Northeast Wisconsin Technical College

Antibiotic resistance has become one of the most critical global health threats, prompting scientists to seek out new sources for antibiotics. Tiny Earth has founded a research project that engages students in collecting soil samples from diverse environments to identify potential antibiotic-producing bacteria. For our project, we collected samples from two sites: near a residence hall dumpster at the University of Wisconsin-Green Bay (UWGB) and near a parking lot trash can at Northeast Wisconsin Technical College (NWTC), both campuses my partner and I attend. Our hypothesis was that the

soil from UWGB would contain more microbes due to increased human interaction and frequent residential trash removal, while NWTC would have fewer microbes because of the reduced use of its outdoor trash can provided for miscellaneous waste. Our samples were collected using sterile technique, mixed and diluted with PBS, and inoculated using the streak plate method to create isolated colonies. These colonies were then tested against *Erwinia* and *Bacillus* to assess antibiotic-producing capabilities. UWGB yielded three potential antibiotic-producing colonies, whereas NWTC had none. Our hypothesis was supported, as UWGB produced more antibiotic-producing colonies. The next phase of our research involves testing two of these colonies against antibiotic-resistant bacterial strains. Our study is ongoing, and further results will be shared upon completion.

## 6 Tackling Antibiotic Resistance

ALEXA KALLIES, IZZY DAY, EMILY FREIMUTH,  
BRYN GUNDERSON

Northeast Wisconsin Technical College

Antibiotic resistance is an issue that has been around for decades and yet has no resolution. Antibiotic resistance is the development of bacteria that allows it to be resistant to drugs that are supposed to cure an infection. Infections from MRSA to strep throat can be antibiotic resistant. Soil samples were collected from four different high school football fields, Freedom, Seymour, Shawano, and Wautoma. We decided to choose football fields because there's a wide variety of people that gather frequently. We predict that one antibiotic producing microbe will be found at each football field. Methods included soil dilution, changing of culture conditions, isolating and testing against ESKAPE pathogens. In our all tester plate, one bacteria from all four fields were active against *L. antibioticus* and *S. epidermidis*. The Shawano and Seymour fields each produced one bacteria active against *M. smegmatis*. Based on the ESKAPE pathogens, our bacteria did not have a preference on what it attacks. Our testing procedures for possible new antibiotic producing microbes are still in progress.

## 7 From Soil to Solution: Discovering and Comparing Antibiotic Activity in State Park Ecosystems

ALESHA WINGERS, MACY HERMAN, MEKENZIE SRNKA

Northeast Wisconsin Technical College

Antibiotic-resistant pathogens are microbes that develop defenses against antibiotics. This can make it difficult to kill the bacteria and can lead to severe diseases. This is an

issue that is growing over time, and that is why scientists are on the hunt to find new antibiotics that may treat these antibiotic-resistant pathogens. The Tiny Earth Project is a way that enables students to help find new antibiotics in the microbes around them. For our project, we took a small soil sample from High Cliff State Park and Potawatomi State Park. Our hypothesis was that the soil found in the Potawatomi State Park would contain more microbes that contained antibiotics because it was found in an area that was more moist. We diluted soil samples from each park to make inspecting the colonies more manageable. We tested the different bacterial samples against both *Erwinia* and *Bacillus* to see if our bacteria produce antibiotics. After reviewing our bacteria, we found that the sample from High Cliff State Park was a double producer, killing both strains of tester bacteria. On the other hand, the Potawatomi State Park showed no activity against either the *Erwinia* or the *Bacillus*. Our hypothesis was inaccurate, indicating that there was a higher chance of finding antibiotic-producing microbes in a dry environment, such as High Cliff State Park, rather than a moist one like Potawatomi State Park. Experimentation is ongoing to identify the bacteria from each park.

## 8 Digging for Cures: Isolating Antibiotic Producing Bacteria from My Garden

SORAYA LOMELI  
Northeast Wisconsin Technical College

The growing global health crisis of antibiotic resistance raises an urgent need for discovering antibiotic producing microorganisms. This project aimed to find antibiotic producing bacteria from right beneath our feet; local garden soil. I hypothesized discovering at least 2 antibiotic producing bacteria from my garden, as we receive and mix in soil from a local farm yearly. It was believed that because garden soil is so rich in nutrients and optimal for crop growth, it would be the ideal environment for bacteria and include multiple antibiotic producing microorganisms. After the soil was collected, it was brought to the university for dilution and plating using the four-streak method. The microorganisms found were then inoculated and screened against the bacteria *Erwinia carotovora* and *Bacillus subtilis* to indicate the presence of antibiotic producing microbes against the bacteria. Results showed only one bacterium with activity against *Erwinia carotovora*. This bacterium was then screened against the ESKAPE pathogens and showed activity against; *E. coli*, *E. aerogenes*, *A. baylyi*, and *P. putida*, all of which are gram negative, with *Bacillus* shaping, and have no grouping. Research is still ongoing to determine the nature of this antimicrobial compound, and results are yet to be determined.

## 9 Determinant Factors in the Soil That May Affect Canine Health

TYLER ROLOFF  
College of Menominee Nation

Research indicates that antibiotic resistance can occur in bacteria that affect animal health (Smith, 1974). This research was conducted to identify if soil microbes may have had an effect on dogs confined to a specific environment. Soil was collected from three bear dog runs on the Menominee reservation during late fall and tested on potato dextrose agar and tryptic soy agar several isolates from each run were patch tested against *Escherichia coli*, *Enterobacter aerogenes* and *Staphylococcus epidermidis*. One isolate from Run One identified one gram-positive *Bacillus* that exhibited zones of inhibition against *E.coli* and *E. aerogenes*, and Run Three produced one gram-positive *Bacillus* and one gram-positive coccus that exhibited a zone of inhibition against *E. coli*. This study may add to existing research conducted on canine health and more specifically inform residents of the Menominee reservation of potential microbial effects on canines.

## 10 Dirt Detectives: Uncovering Antibiotic Power in Soil

CHERA GREENE, CHLOE HANSEN  
Northeast Wisconsin Technical College

Before penicillin, small infections were considered deadly. Discovering antibiotics was a true turning point in medical history, leading to the mass production of life-saving drugs during World War II. However, within just a few years, bacteria began to change, leading to an increase in antibiotic resistance. The Tiny Earth Project is an academic, collaborative, and innovative way to discover newly identified antibiotic-producing bacteria by inviting students worldwide to engage in research that can contribute to a global solution. Our team selected soil from each of our yards based on their contrasting compositions - one primarily clay and the other sand. We hypothesized that the microbial population would differ substantially. After collecting our soil samples, we began diluting them, inoculating 20 sample colonies from each onto a plate containing *Erwinia* or *Bacillus* cultures. One of the clay samples showed clearing in both cultures, indicating that it may be a dual producer. Whereas the sand sample showed clearing for one of the cultures on the *Erwinia* plate. These samples were then selected to do further testing with the ESKAPE pathogens. In the clay sample, the selected microbe demonstrated "swarming" behavior, covering the plate and preventing any clear

# STUDENT POSTERS

zones from forming against the ESKAPE pathogens. Additionally, the sand sample tested against the 8 ESKAPE pathogens exhibited three potential antibiotic producers, one of which had activity within 24 hours. These results are currently pending. Our research into potential antibiotic-producing bacteria in clay and sand soil is ongoing, and further results are forthcoming.

## 11 Antibiotic Producers: Field vs. Wooded Area

JAMI TURRIFF, ALLISON SCHOENIKE  
Northeast Wisconsin Technical College

Due to the increase in antibiotic resistant organisms, many infections are becoming untreatable, leading to more fatalities. To counteract this problem, The Tiny Earth Project is educating students around the world about this crisis and allowing students to help in the discovery of antibiotics by experimenting on soil near them. In this experiment, we took our research from two different nature settings. Our first sample was taken from a dry and sunny field, and the second was from a moist and dark wooded area. Our hypothesis was that the woods would hold more antibiotic-producing bacteria because it was wetter, darker, and livelier, compared to the barren and dry field collection. After collecting our samples, we diluted them and used the spread plate method to see which bacteria were present in our different soils. After incubation, the microbes were tested against the gram-negative bacteria, *Erwinia*, and the gram-positive bacteria, *Bacillus*, to see which microbes would be antibiotic-producing. Our experiment showed that our field collection had three antibiotic-producing bacteria, while our woods collection had two antibiotic-producing bacteria, all on the *Bacillus* plates. We then took one of our antibiotic-producing colonies from each collection and put them against the relatives of ESKAPE pathogens and saw one antibiotic-producing colony on each of our collection sites. Our hypothesis was inaccurate because both our collection sites contained the same number of antibiotic-producing bacteria. Our investigation of the field and woods soil collection is currently in progress; therefore, certain results remain under analysis.

## 12 Microbial Landscape Survey in a Fruit Tree Plantation on the Menominee Reservation

SAVANNAH HACKEY, SHERILYN KING  
College of Menominee Nation

Research shows that the loss of soil quality may impact sustainable agriculture systems, and designing orchard systems requires the promotion of soil biodiversity

(Freitas J, Silva, P 2022). This study was conducted to identify antibiotic-producing bacteria in the soil of Pamela Plum trees on the Menominee Reservation. Soil was collected from Pamela Plum trees near a high-traffic area and a low-traffic area, and grown on potato dextrose agar. Isolates were tested against *Escherichia coli*, *Enterobacter aerogenes*, and *Staphylococcus epidermidis*. This study found two isolates that had slight antibiotic production against *E.coli*. This study helps to support previous research of the importance of soil biodiversity in agricultural systems. This study will also help add to research being conducted on the College of Menominee Nation Campus, in an effort to build a northern fruit tree consortium.

## 13 Discovering Antibiotic-Producing Bacteria in Fox Crossing Creek Soil

MOEKA FUJITA  
Northeast Wisconsin Technical College

Since Alexander Fleming discovered the first antibiotic in 1928, antibiotics have transformed modern medicine and saved millions of lives. However, overuse and misuse of these drugs have led to the rise of antibiotic-resistant bacteria, causing higher infection-related mortality worldwide. Because antibiotic development is less profitable for pharmaceutical companies, research and discovery of new antibiotics have slowed down. This makes community-based efforts to discover novel antibiotic-producing bacteria more important than ever. Through the Tiny Earth program, this project aimed to discover soil bacteria capable of producing antibiotics. I predicted that soil from a diverse environment would contain microorganisms with antimicrobial activity. A soil sample was collected from a creek area in Fox Crossing, chosen for its combination of residential surroundings, wildlife presence, and high moisture—conditions that promote microbial diversity. The sample was diluted, streaked on PBS, R2, and TSA media, and twenty colonies from those media were screened against *Bacillus* and *Erwinia* species. Colonies that showed inhibition zones were further tested against ESKAPE pathogens. Two colonies showed inhibitory activity against *Bacillus* which is gram-positive bacteria. One colony tested against ESKAPE pathogen showed activity against *Bacillus subtilis*, *Staphylococcus epidermidis*, and *Mycobacterium smegmatis*. These preliminary results suggest that soil from Fox Crossing creek contains bacteria capable of producing antibiotic compounds. This research supports the importance of exploring local environments to find new potential sources of antibiotics and contributes to the global effort to combat antibiotic resistance.

## 14 Antibiotic Producers Collected Near Bodies of Water

SOPHIE BROOKER, BRITTANY GERSEK,  
SOPHIA GALOFF, EVA HARO  
Northeast Wisconsin Technical College

Antibiotic resistance is a problem faced in healthcare worldwide. Bacteria have grown increasingly resistant to antibiotics, and antibiotics cannot be discovered at a rate to keep up with the growing resistance, leading to ineffective infection treatment. The Tiny Earth Project tasks students to aid in this search using local soil samples. We collected our soil samples from the shores of 3 different bodies of water – Lake Michigan in Manitowoc, the Bay of Green Bay at Nicolet Park, and Long Lake near Brillion – to see how their antibiotic-producing bacteria compare. Our hypothesis was that Long Lake and Lake Michigan would have more antibiotic-producing bacteria due to the impact of the water treatment plant on the Bay. We created dilution plates from each sample and then modified our culture conditions to better meet the conditions of the microbes' original habitats. After isolating 20 colonies from each site and testing against *Bacillus* and *Erwinia*, we found that Long Lake contained zero antibiotic-producing bacteria, Lake Michigan produced one antibiotic-producing bacteria against *Bacillus*, and the Bay produced five antibiotic-producing bacteria against *Bacillus*. We chose a single antibiotic-producing bacteria from each site and tested against ESKAPE pathogens. The bacteria chosen from the Bay and Long Lake were active against *Bacillus subtilis*, while the bacteria from the shore of Lake Michigan did not show any ESKAPE pathogen activity. Our hypothesis was incorrect – the shore of Green Bay produced more antibiotic producing bacteria than Long Lake and Lake Michigan. Our research is ongoing and further results are yet to be determined.

## 15 Refill Due: Soil Rx

HOLLY FRENCH  
Northeast Wisconsin Technical College

The last time a new class of antibiotics was approved was in 1987. It has been thirty-eight years. This has become a serious problem, as we are witnessing an increasing prevalence of antibiotic resistance in our country. That's why the Tiny Earth curriculum is so vital to complete. NWTC Microbiology students set out to find novel antibiotics, using the Tiny Earth curriculum. Students went out into nature to search for the soil we thought would contain novel antibiotics. We obtained a sample and noted the conditions, coordinates, and the surrounding

foliage of the area. I hypothesize that I will find a novel antibiotic within my soil sample, which will help the medical community in its battle against antibiotic resistance. After obtaining my soil sample, several different methods were used to determine antibiotic production. We diluted the soil and inoculated it onto LB agar plates. We also tested our soil bacteria against nine different known pathogens and noted any zones of inhibition on our all-tester plate. We also grew our plates in various conditions, which included room temperature growth and dark room growth. My bacteria grew better in the room temperature environment and grew less in the dark room. The results from the all-tester plate showed two zones of inhibition. My bacteria affected *Enterobacter aerogenes* and *Escherichia coli*. These results mean that my soil has antibiotic-producing bacteria within it. Further testing will be done to try and identify my chosen soil bacteria. The hope is that the bacteria will produce novel antibiotics that can further help the medical community.

## 16 Antibiotic Producers From My Tomato Garden

KENDAHL KIVISTO  
Northeast Wisconsin Technical College

The last class of antibiotics was approved in 1980; despite the growth of antibiotic-resistant bacteria, many pharmaceutical companies have discontinued their search to find new antibiotics. This has been caused by the constant rise of new resistant bacteria, decreased funding, and the lack of profit that antibiotics make. Scientists are projecting that 10 million people will die annually from antibiotic-resistant bacteria by 2050. Through the Tiny Earth organization, I have gained the opportunity to research soil to find new microbial antibiotics and present my findings. I collected soil samples from my own personal tomato garden to use for this project. I hypothesized that due to the dark and moist environment of my garden, bacteria would thrive. Therefore, I would produce at least 2 microbial antibiotics. I diluted my garden soil and then plated it using the streak method. Using the microbes from the streak plate, I inoculated them and tested their growth against the bacteria *Bacillus* and *Erwinia*. This would determine if any of the microbes were antibiotic producers against those bacteria. The microbes were found to not be antibiotic producers against *Erwinia* and *Bacillus*. I then chose one colony of microbes and tested it against the ESKAPE pathogens. It was found that the microbes are an antibiotic producer against *E. coli*. My hypothesis was incorrect as my soil only contained one antibiotic producer instead of two. At this time, my research is ongoing and will be updated once results are confirmed.

# STUDENT POSTERS

## 17 Antibiotic Producing Bacteria

NATALIE VIERCK  
Janesville Research Institute

With the rise in antibiotic resistant bacteria, an investigation into finding bacteria that produce antibiotics from soil was initiated. Bacteria collected were tested against ESKAPE relatives to test if they show antibiotic production. A series of PCRs and gel electrophoresis targeting 16s rDNA were completed. Once accomplished, the results were sent to be sequenced. With sequenced results, the bacteria were able to be identified. In the future, bacteria will be tested to see their impact on plant growth.

## 18 Nature's Pharmacy: Digging for New Antibiotics in Wisconsin Parks

DANIELA ZISNATH OLMOS MARTINEZ, SARAH SCHADRIE,  
YARASET VIVIANA TORRES ALVARADO  
Northeast Wisconsin Technical College

Antibiotic resistance is a growing global health crisis impacting healthcare, food production, the environment and public health. According to previous research, soil can play an important role in finding new antibiotics and is considered a rich reservoir for antibiotic production towards other organisms. With the increased mortality due to antibiotic resistance, The Tiny Earth Organization offered the opportunity to do research on soil samples. We decided to use soil from different parks around Wisconsin to discover new microbes that produce antibiotics. Our hypothesis was that the soil samples with moist conditions and presence of animals in the area would produce more microbes with the potential of having antibiotics due to the nutritionally rich environment conditions. For methods, we diluted and plated our soil samples using the streak plate technique. Isolated colonies were then extracted and screened for antibiotic activity against *Bacillus subtilis* and *Erwinia carotovora* using basic screening techniques. Promising microbes from each site were then tested against relatives of the pathogens to evaluate broader antibiotic potential. We tested three samples, the first one had dry conditions, the second one had moist conditions; both had animal presence and showed no evidence of antibiotic activity. Our third sample collected from a moist environment with no animal presence had activity from *Escherichia coli* and *B.subtilis*. Our hypothesis was partially correct with one of our two moist samples having positive activity. Our research is still ongoing and will be better concluded at the symposium.

## 19 Water, Oxygen, Waste: The Cycle of Life

YANET TORRES-MEJIA, EMMA-LEE LAMPINEN,  
DAGON GEE  
Northeast Wisconsin Technical College

As humanity evolved, so did antibiotic resistance. In recent years, scientists have encountered antibiotic resistant pathogens that have become immune to multiple antibiotics. In this Tiny Earth Project, we each took a soil sample from a different area. One sample was taken by water, one by a tree, and the last sample was taken from a landfill. Through our tests and experiments, we hope to find an antibiotic-producing microbe. Our project addresses the problem by using three different sources of bacteria: two samples were from natural areas, one dry and one wet, and the third was taken from a landfill. Our prediction was that the liquid environment would have the most interesting findings, since there are many bacteria that prefer more moist environments. The methods used were changing culture conditions that altered the environment and testing 20 bacteria from each sample for antibiotic production against gram-positive and negative bacteria. Along with that, we did the all tester by choosing bacteria against relatives of pathogens for antibiotic resistance. Our experiment showed that the oxygenated, and contaminated areas had no interesting data, but the sample from near a liquid source showed antibiotic activity against four organisms. Our results mean that there was more antibiotic activity in moist environments compared to other environments. We were hoping to grow bacteria that can be used to produce antibiotics, but this is still an ongoing process.

## 20 Tiny Earth - A Garden of Bacteria

TILLIE GAVLEK  
Northeast Wisconsin Technical College

Scientists are being faced with a big problem, antibiotic resistance. Antibiotics help us treat all kinds of infections, but we are seeing more people develop antibiotic resistance. This can either be due to being treated for the same infection repeatedly, bacterial change in DNA or misuse of antibiotics. My hypothesis for this experiment was that the garden would produce at least one microbe emitting antibiotic properties due to its location, in a back yard with a pool and a pond, as well as being fertilized. Vegetables are not only good for us, but they can provide many important vitamins, minerals and antioxidants that are helpful for our body. For this

experiment I took a soil sample from a vegetable garden, right in the middle of it, to see if I could find a new antibiotic to treat infections. After collecting the soil, we diluted it and grew it on a Luria Broth (LB) plate. My next plating technique was to narrow down the already grown microbes and screen it against the bacteria *Bacillus* and *Erwinia*. After inoculation and 1 week of growth I had one colony that produced an antibiotic property, it was against *Erwinia*. My hypothesis was partially correct. My soil did produce one colony with antibiotic properties. My research of my antibiotic producing soil is still ongoing, so there are some results that are to be determined.

## 21 To Find or Not to Find

**NAZARETH GONZALES YANEZ**  
Green Bay West High School

Over the last 30 years, over 30 million people have died from infections caused by antibiotic-resistant bacteria. Tiny Earth focuses on searching for new antibiotics in order to address this global crisis. This research project is an extended research to last year's. It began with a soil sample collected at the Fox River located next to large factories (44.48968°N, 88.02637°W). One gram of soil was serially diluted with sterilized water and plated on a Luria-Bertani agar (LBA) plate containing cycloheximide in order to separate bacteria from one another. Isolated bacteria were later on patched to PDA and LBA agar to create master/library plates, creating a surplus of individual bacteria for additional studies. Soil isolates were screened for antibiotic activity by patching isolates on PDS, LBA, 10% tryptic soy agar (TSA), and 100% TSA, and Resonance 2 Agar (R2A) plates containing *Escherichia coli* or *Bacillus subtilis*. Three isolates displayed antibiotic activity (isolates 2,4, and 9). The isolates were gram stained, identified by BLAST analysis of the DNA sequence for the 16S rRNA gene and continued by several biochemical tests.

## 22 The Path to Antibiotic Discovery Part 2

**ADRIANA FLORES TORRES**  
Green Bay West High School

Antimicrobial resistance has become a significant global health crisis in the modern era, due to many factors like overconsumption, misuse, and agricultural use of antibiotics. Tiny Earth research aims to find a solution to this problem by looking in the soil for potential novel antibiotic-producing bacteria that could help combat this crisis. A soil sample was taken from a previously examined

site on the UW - Green Bay Cofrin Arboretum (44.52655°N, 87.92643°) to assess the reliability of reproducing data of antibiotic activity from previously analyzed soil. One gram of soil was diluted in sterile H<sub>2</sub>O and plated onto Luria-Bertani agar (LBA) plates. Unique colonies were picked and patched onto LBA and potato dextrose agar (PDA) plates to create library plates. Isolates were screened for antibiotic activity against *Escherichia coli* (*E.coli*) and *Bacillus megaterium* (*B.megaterium*) on different media. Five of nine isolates showed antibiotic activity, and were Gram stained. The polymerase chain reaction (PCR) was performed on each isolate to amplify the DNA sequence of the 16S rRNA gene. The sequences for each isolate were entered into the BLAST database to identify the genus of the isolates. Several biochemical tests were performed to further characterize each isolate. This research is significant because it examines the reliability of the experimental approach described here to reproduce antibiotic activity in a previously studied site.

## 23 Diving Deeper into the Soil: Are Green Bay's Trails the Answer to the Antibiotic Crisis?

**DAYANA ZAMORA**  
Green Bay West High School

Due to the intensifying global antibiotic-resistant bacteria crisis, there is an increasing demand for novel therapeutics to combat infections. To aid this pressing matter, the Tiny Earth research initiative is diving into the study of antibiotic producers found in soil. A soil sample was collected from Sargent Benjamin Edinger Trail (44.5291247, -88.0520085) and was serially diluted in sterile water and plated on Luria Bertani agar (LBA) containing cycloheximide. Once diluted, colonies were picked and patched on Potato Dextrose Agar (PDA) and LBA plates to develop library plates. The spread-patch method was utilized to screen for antibiotic activity against *Escherichia coli* (*E. coli*) and *Bacillus megaterium* (*B. megaterium*) on a range of diverse media, including LBA, PDA, Reasoner's 2A Agar (R2A), 10% Tryptic Soy Agar (TSA) and TSA agar. Two narrow spectrum, antibiotic-producing isolates were identified ("Isolate 6 and 7"). Isolate 6 inhibited *E. coli*, and isolate 7 inhibited *B. megaterium*. After Gram-staining, isolate 6 appeared to be composed of gram-positive rods, while isolate 7 was composed of gram-negative cocci. The polymerase chain reaction (PCR) will be used to amplify the DNA sequence for the 16S rRNA gene, which will then be subjected to the Basic Local Alignment Search Tool (BLAST) to analyze and identify the genus of each isolate. With the results of this study, a new perspective is developed to illustrate the diversity of antibiotic producers found in soil.

# STUDENT POSTERS

## 24 Rooting Out Resistance

JOCELYN SANNES  
Green Bay West High School

Tiny Earth research is trying to solve the global health crisis of antibiotic resistance by examining antibiotic activity in soil bacteria. A soil sample was collected at the University of Wisconsin Green-Bay Cofrin Arboretum (GPS Coordinates: 44.526022, -87.926453) and diluted in sterile water and plated on Luria-Bertani Agar (LBA). Unique colonies were patched to LBA plate and Potato Dextrose Agar (PDA) to create library plates that could be used for the rest of the semester. Each isolate was patched to a variety of agar containing either *Escherichia coli* (*E.coli*) or *Bacillus megaterium* (*B.megaterium*) to screen for antibiotic activity. Three isolates were antibiotic producers. Isolate #6 had antibiotic activity against both *E.coli* on Reasoner's 2A (R2A) agar and *B.megaterium* on LBA. Isolate #8 only had antibiotic activity against *E. coli* on LBA. Isolate #9 had antibiotic activity against *E.coli* and *B. megaterium* on R2A, LBA and Tryptic Soy Agar (TSA). Each isolate was then Gram stained. Isolate #6 is a gram-negative rod. Isolates #8 and #9 are gram-positive rods. Then the isolates went through a BLAST analysis to find their genus. This research is valuable because it will help solve the global health crisis of antibiotic resistance.

## 25 The Cure Beneath Our Feet

EVA CHANG  
Green Bay West High School

The Tiny Earth Program aims to address the increasing global problem of antibiotic resistance by discovering new microorganisms that produce antibiotic properties from soil. This issue is important because antibiotic-resistant infections are becoming increasingly difficult to treat, posing a significant threat to the world. A soil sample was collected on the UW-Green Bay Cofrin Arboretum at (44.3264°N, -87.92635°W) and was diluted in sterile water to separate bacteria. Separated bacteria were then patched to Luria-Bertani agar (LBA) and potato dextrose agar (PDA) containing cycloheximide to create library plates. Antibiotic activity in each isolate against *Escherichia coli* (*E.coli*) and *Bacillus megaterium* (*B.megaterium*) was assessed on 5 different agar plates, LBA, PDA, Reasoner's 2A (R2A), 10% and 100% Tryptic Soy Agar (TSA). This showed that 4 isolates had inhibition zones indicating antibiotic production in certain bacteria colonies. The bacteria were then streaked on agar plates to dilute the microorganisms with each section, ensuring that single cells are deposited far enough apart to grow into individual colonies. A Gram

staining analysis showed that two bacteria were Gram-positive bacilli, and the other two were Gram-negative cocci based on their cell wall composition. Biochemical tests and BLAST analysis will be used to identify and confirm the genus of each antibiotic producer.

## 26 One Cure at a Time

JASMINE MARTINEZ  
Green Bay West High School

The goal of Tiny Earth research is to find a solution to the global health issue of antibiotic resistance by studying different antibiotic production in soil bacteria. A soil sample was collected from the University of Wisconsin-Green Bay Cofrin Arboretum (44.526430, -87.926339). The soil sample was serially diluted in sterile water and plated on Luria-Bertani Agar plates (LBA). Unique isolates were picked and patched LBA and Potato Dextrose Agar (PDA) to create library plates for additional tests. Antibiotic activity was assessed by patching soil isolates to agar plates containing either *Escherichia coli* (*E.coli*) or *Bacillus megaterium* (*B.megaterium*). Seven isolates were screened for antibiotic activity, and two were antibiotic producers. We plated all of the isolates onto the Reasoner's 2A Agar plates (R2A). Isolate seven had antibiotic activity on the both *E.coli* and *B.megaterium* R2A plates. Both isolates have antibiotic activity against *E.coli* and *B.megaterium*. Upon Gram staining it was determined that both isolates were gram-positive rods. This research is valuable because it advances global health by discovering bacteria with antibiotic-producing potential.

## 27 The Solution to the Antibiotic Apocalypse

EMILY BENECHÉ  
Green Bay West High School

The goal of Tiny Earth is dedicated to finding a solution to the global health issue of antibiotic resistance. The importance of this research is to help solve this crisis by studying different antibiotic activity in soil bacteria to find new antibiotic producers. The process of this experiment was started by collecting a soil sample from the University of Wisconsin Green Bay Cofrin Arboretum (44.526430-87.926339). The soil sample was serially diluted in sterile water and plated on Luria-Bertani Agar plates (LBA) to separate bacteria. Unique colonies were picked and patched on a Luria-Bertani Agar plate (LBA) and a Potato Dextrose Agar (PDA) to create library plates for additional tests. Antibiotic activity was assessed by patching isolates to agar plates containing either *Escherichia coli* (*E. coli*) or *Bacillus megaterium*.

(*B. megaterium*). Seven isolates were screened for antibiotic activity, and two were antibiotic producers. Both isolates have antibiotic activity against *B. megaterium*. We plated all of the isolates onto the Reasoner's 2A Agar plates (R2A). Isolate four had antibiotic activity against *E. coli* R2A plate. Upon Gram staining, it was determined that both isolates were gram-positive rods. This research is valuable because it advances global health by discovering bacteria with antibiotic-producing potential.

## 28 Underwater Unveiling: An Extended Study

ALLISON DULANSKI  
Green Bay West High School

The goal of Tiny Earth is to help solve the global health crisis for antibiotic resistance. Our research helps to solve that problem by studying antibiotic activity in soil bacteria to discover novel antibiotic producers. This research project started by collecting sediment from Lake Mendota, Madison, Wisconsin (43.108253, -89.469689). One gram of soil was serially diluted in sterile water and plated onto Luria-Bertani Agar (LBA) plates. Unique colonies were picked and patched onto (LBA) and Potato Dextrose Agar (PDA) to produce library plates for additional experiments. Isolates were patched to a variety of media containing either *Escherichia coli* (*E. coli*) and *Bacillus megaterium* (*B. megaterium*), which are gram-negative bacteria and gram-positive bacteria, respectively, to screen for antibiotic activity. Out of 12 isolates, one (isolate #8) appeared to be an antibiotic producer, with a clear zone of inhibition against *B. megaterium* on PDA. After Gram staining it was determined that isolate #8 is a gram-negative coccus. BLAST analysis of the DNA sequence of the 16S rRNA gene and biochemical tests will be used to characterize this antibiotic producer. This research is valuable because it has the potential to locate previously undiscovered bacteria and novel antibiotics, allowing the world to combat the global health crisis of antibiotic resistance.

## 29 Digging up Trouble

JIZELLE CORTES  
Green Bay West High School

There is a global crisis regarding antibiotic resistance in the world right now and tiny earth is a program that is trying to solve that crisis. The type of research done for tiny earth is by collecting a soil sample and looking deeper into that sample to see if there were any antibiotic producers. The soil sample was collected at the Wisconsin Green Bay Cofrin Arboretum (44.52662 N, 87.92647 W) Once the sample was collected it went through a serial

dilution process with sterile water and then placed onto Luria-Bertani Agar(LBA). Once there was identification of the isolated bacteria colonies, we used the picking and patching method and transferred them onto the library plates, which were the LBA, and Potato -Dextrose Agar(PDA). The PDA and LBA plates were then utilized in order to spread patch our colonies on tester strands. Out of the 7 isolates only two ( Isolate #3 and Isolate #4) were antibiotic producers because of the clear zone of inhibitor Isolate 3 presented antibiotic activity against *Escherichia coli* (*E.coli*) on the TSA plate, LBA plate, and R2A plate. It also presented antibiotic activity against *Bacillus megaterium* (*B. megaterium*) on TSA 100%, and LBA plate. Isolate #3 showed no growth on the rest of the agar plates (PDA,TSA 10%,). Isolate #4 presented antibiotic activity against *E.coli* on TSA 10% but no growth on the rest of the agar plates (PDA, TSA 100%,LBA). A gram stain test was performed next and both isolates were Gram+ Bacteria.

## 30 Exploring Earth's Pharmacy

LIZAYAH DATES  
Green Bay West High School

Bacteria are becoming more resistant to antibiotics, creating a global health crisis. Tiny Earth research examines antibiotic activity in soil bacteria to identify novel antibiotics. One gram of soil was diluted in sterile water and plated on Luria-Bertani agar (LBA) containing cycloheximide. Unique colonies were patched to LBA and potato dextrose agar (PDA) to create library plates for additional tests. Antibiotic activity was determined by picking and patching each of six isolates on a variety of agar in the presence of *Escherichia coli* (*E.coli*) or *Bacillus megaterium* (*B. megaterium*). Isolates number 4, 5, and 6 have antibiotic activity against *E. coli*, and Isolate number 4 has antibiotic activity against *B. megaterium*. After Gram staining it was determined that isolate number 4 is a gram-positive coccus. Isolate number 5 is a gram-negative *Bacillus*, and isolate number 6 is a gram-positive coccus. Biochemical tests and BLAST analysis of the 16S rRNA gene will be used to characterize each isolate further.

## 31 Antibiotic Producers from Menominee County

KIMBERLY HOPPE  
Northeast Wisconsin Technical College

Since the late 1980's no new antibiotics have been discovered. This inability to find new antibiotics may play a crucial role in our future. With the rise of antibiotic resistance occurring, this will lead to future problems in healthcare and increased mortality rates. The Tiny Earth

# STUDENT POSTERS

project is a way to get students connected to the rising concern while also a potential solution and new antibiotic discovery. I chose the soil I did because it was near tree roots, moss, and deer trail near a food plot. I predicted this site to produce antibiotic microbes because of the moss and moisture retention mixed with tree roots, high organic matter, and nutrient competition, giving antibiotic producers good chances at growing. Methods used for this project were soil dilution and transfer to plates. At the next lab, potential microbes were inoculated and screened against bacteria *Bacillus subtilis* and *Erwinia carotovora* to see which antibiotic microbes grew against those bacteria. From there, the soil isolate was chosen, inoculated, and plated. My results from the selected soil isolates showed three potential zones of inhibition and a double producer on both *B. subtilis* and *E. carotovora*. I then selected one spot from the antibiotic screening plates that was a double producer and potential zone of inhibition to culture and move forward with. My hypothesis was correct in that it would produce an antibiotic microbe. Our research is still ongoing; therefore, further results are still to be determined at this time.

## 32 Antibiotic Producing Bacteria Collected from Different Starbucks in the Green Bay Area

DOROTHY BUTZLAFF AND JIMENA ROBLES  
Northeast Wisconsin Technical College

The world is in a state of antibiotic resistance which means that bacteria are becoming resistant to antibiotics that used to help fight off infections and illnesses. As scientists are making new antibiotics, the time it takes them to make it versus the time it takes bacteria to become resistant to them, makes it nearly impossible to stay ahead of the resistance. My classmates and I at NWTC have been focusing on finding unknown bacteria/microbes that can be isolated and turned into an antibiotic that bacteria aren't resistant to. My partner and I went to two different Starbucks in the Green Bay area and took some soil from their property hoping to find some new bacteria. Our hypothesis was that we would find 10 different antibiotic producing bacteria from each soil collection. We isolated the bacteria by diluting and plating it by using pipettors and the streak plate method. We then tested our bacteria against *Erwinia* and *Bacillus* to see if it produced antibiotics against them. The Starbucks on Military Ave in Green Bay had one antibiotic producing bacteria that fought against *Bacillus*. Our hypothesis was inaccurate because we thought we'd find 10 antibiotic producing bacteria but only found one. We are continuing to research so there will be more results at a later time.

## 33 From Sweet Petals to Spicy Peppers: Discovering Antibiotics in Soil to Eradicate a Global Dilemma

ALLY ROMANDINE, CHRISTINA MALZAHN,  
MARIA STANZEL, LAUREN MCDOWELL  
Northeast Wisconsin Technical College

Antibiotic resistance has been a growing global problem due to many bacteria becoming resistant to antibiotics, which are used to treat bacterial infections. This is problematic as it causes prolonged hospital stays, leading to higher mortality rates and other complications. To help address this issue, we examined unexplored soil samples of Pink Dekko Maxx Petunias and Thai Super hot peppers from Green Bay Botanical Gardens to find new antibiotics. We believe that there will be a new antibiotic located in the soil collected from the petunias. Our group hypothesized that the petunia's soil could contain new antibiotics because of its high traffic environment. This would prove that the petunia's soil contains favorable properties beyond its visual appearance. To begin our testing, we diluted both soil samples down to isolate the bacterial colonies using the streak plate method. After this was achieved, we found many unique colonies on the agar plate and used these colonies against *Erwinia* and *Bacillus* bacteria. The petunia plant had five possible antibiotic releasing microbes against *Bacillus*, while the pepper plant had no activity. Then, we selected one isolated bacteria from these five microbes to further test against ESKAPE pathogens, which are bacteria known to be antibiotic resistant. Our results revealed that the petunia plant soil indeed had more microbe producing antibiotic agents compared to the peppers, proving our hypothesis to be accurate. There will be more data to come and additional results will be revealed later.

## 34 Antibiotic Producers in Varying Water Concentrations

JACOB ZUELKE, SARA HARTMAN, STEPHANIE DECARLO  
Northeast Wisconsin Technical College

The first antibiotic, penicillin, was introduced to the general public in 1945. Penicillin rapidly lost its effectiveness as bacteria developed resistance. With time, bacteria continue to develop resistance to current and newly produced antibiotics. Our group is conducting research to find new antibiotic-producing bacteria. We hypothesized environments exposed to water will result in more antibiotic-producing bacteria due to constant fluctuations in the ecosystem. To test this theory, soil samples were collected from a woodland, bog, and river.

Four dilutions of each sample were created, then placed on LB agar plates to isolate bacterial colonies. After incubation, 20 isolated colonies from each ecosystem were placed on a new LB agar plate to be tested against gram-positive bacteria (*B. subtilis*) and gram-negative bacteria (*E. carotovora*). The cultures tentatively support our hypothesis with three gram-negative antibiotic exhibitors in bog soil, one gram-positive antibiotic exhibitor in river soil, and zero antibiotic exhibitors in woodland soil. The most promising colony from each respective soil sample is currently being tested against escape pathogens.

## 35 Buried Potential

KAYLEE STENZEL, ROBERT LASON, BRIANNA HAASE  
Northeast Wisconsin Technical College

Imagine a world in which a valuable resource is slowly fading from humanity's grasp—a world where the substances vital to our survival are becoming scarce. That resource is antibiotics. In recent decades, scientists have become increasingly aware of the growing concern surrounding antibiotic-resistant pathogens. Given the urgency of this global issue, the Tiny Earth initiative was created and introduced at NWTC to help discover new sources of antibiotic-producing bacteria through student research. Our goal was to isolate and identify soil bacteria capable of producing antibiotic compounds that could inhibit the growth of other microorganisms. We hypothesized that soil collected near a natural body of water on undisturbed land would contain bacteria with antibiotic-producing or resistant properties. We predicted that the soil isolates would produce zones of inhibition when tested against known bacterial strains, indicating potential antibiotic activity. We gathered a soil sample from an area near a natural water source and performed isolation, inoculation, and identification procedures. Individual colonies were cultured and tested against *Lysobacter antibioticus*, *Bacillus subtilis*, and *Staphylococcus epidermidis* using techniques to observe inhibition zones. Our experiment showed that the isolated soil bacteria produced clear zones of inhibition against *L. antibioticus*, *B. subtilis*, and *S. epidermidis*, suggesting that it may produce substances capable of inhibiting bacterial growth. This indicates potential antibiotic-producing activity within the soil sample. The results support our hypothesis that the soil bacteria could produce antibiotic compounds effective against other bacteria. This suggests that the organism possesses natural defense mechanisms that allow it to survive in competitive microbial environments and could be a promising source for future antibiotic discovery.

## 36 Antibiotic Producers Collected from Transformer & Compost Soil

CHARLZ NASH, JOSEPH SCHMIDT  
Northeast Wisconsin Technical College

Since the first antibiotic, Penicillin, was discovered by Alexander Fleming, antibiotic resistance was inevitable and even predicted by Fleming himself. As further antibiotics were discovered, humanity began to put them in everything, from deodorants to livestock feed, and in turn, gave bacteria billions of attempts to develop resistance. Such resistance is commonplace in the 21st century, thanks to widespread over-usage, and antibiotic research has slowed due to high costs and low profits, and as a result, much of the research has shifted to college-based research, such as the Tiny Earth Project, wherein students collect soil samples from areas where they believe there may be antibiotic-producing bacteria and bring them into the lab for our class for isolation and testing. This process has already seen favorable results, as in 2025, researchers discovered a new antibiotic called lariocidin, produced from *PaeniBacillus* sp. M2, and derived from a soil sample from a Hamilton backyard [1]. We had 2 separate purposes for finding bacteria that have antibiotic properties: (1) to demonstrate that 2 separate locations with different soil conditions can house antibiotic-producing bacteria and (2) to delay the arrival of the post-antibiotic era. We both found bacteria that produced antibiotic properties against the gram-positive *Bacillus subtilis*. They were also tested against 8 ESKAPE bacteria and produced negative to inconclusive results.

## 37 Healing From the Ground Up

LILY CISLER, ALYSSA JENQUIN,  
SAMANTHA EKLUND, CARSON KIDD  
Northeast Wisconsin Technical College

As our medicine becomes more advanced as the years go on, so does the resistance by the microbes we are seeking to destroy. The last antibiotic that was found suitable for use in humans was found over twenty years ago. To find a solution, the Tiny Earth organization turns to students and gives them the opportunity to go out into nature to search for antibiotic-producing bacteria to fight this health crisis. Our group chose four locations to collect soil samples from to search for antibiotic-producing microbes. We hypothesized the following: The pollution of the Fox River bank could increase the presence of bacteria in the soil and could have antibiotic properties for competing microbes. The graveyard was chosen for the association of decomposition in the

# STUDENT POSTERS

soil. St. Vincent Hospital soil was expected to harbor microbes influenced by the presence of medical waste. Finally, the wooded soil was chosen for the presence of undisturbed, natural bacteria with little human activity. Through diluting our samples, growing colonies, we tested for visible signs of antibiotic activity on several agar plates. The wooded area, graveyard, and St. Vincent all showed antibiotic activity in their soils. We then plated and tested the bacteria showing activity against various ESKAPE pathogens to further our search. Currently, our research and testing are still ongoing. We will report our findings from further testing as we complete it.

## 38 Antibiotic-Producing Microbes Research

**KALINA MAHAN**  
Northeast Wisconsin Technical College

As seen in research from past scientists and students alike, we are approaching a decline in new antibiotics and current ones able to fight against infections. As a student at NWTC, I was instructed to take samples from dirt to find antibiotic-producing bacteria. I took my sample from my parent's backyard. Their backyard is connected to a marsh environment with a partially man-made pond. Where animals are frequent and have algae and lily pads growing during warm seasons. I hypothesized that there will be at least one antibiotic-producing bacteria in the soil sample. The bacteria, after some time to incubate and grow, were inoculated against *Bacillus* and *Erwinia*. The purpose being to deduce what bacteria from the dirt sample could have antibiotic properties to fight against *Bacillus* and *Erwinia* bacteria. I found two that produced antibiotics against *Bacillus*. Following these findings, I applied those two antibiotic-producing microbes into a new plate with various pathogens under the name of ESKAPE. After inoculation with the ESKAPE pathogens in the all-tester plate, consistency in their preference was very apparent. The microbes collected were consistent with their action (and preference) towards *Bacillus subtilis*. Both created a circle around the colony, which shows it is actively preventing growth of the pathogen. For those reasons, this microbe is chosen to be further experimented on for its genetic identity. In summary, my results confirm that there is at least one antibiotic-producing microbe from the sample. I believe my hypothesis is accurate through which one consistent type of microbe has antibiotic-producing capabilities.

## 39 Digging For a Cure: Antibiotic Discovery One Soil Sample at a Time

**PARIS BARAJAS MORA, ALLISA SMOODY,  
HANA SHARKEY, BECKY LOPEZ, JODY RUSK**  
Northeast Wisconsin Technical College

With antibiotic resources being limited, bacteria within the human body are becoming resistant to the few antibiotics there are and new ones need to be found in order to protect our bodies from pathogens. The Tiny Earth Project was created to allow students to sample soil all over the world to find new antibiotic sources to fight back against antibiotic resistance. Through the Tiny Earth Project, hands-on experience is gained in microbiology research as well as a deeper understanding of the importance of discovering new antibiotics. This project demonstrates how even small-scale research can contribute to a larger effort to combat antibiotic resistance and inspire future innovation in microbiology. During this project, laboratory techniques in culturing and gram staining are demonstrated and strengthened. Taking into consideration the thought process that water contains many bacteria, we took soil samples from different areas near bodies of water. Our hypothesis was that the soil near these bodies of water would produce a large amount of bacteria since these areas have no filtration system and are natural. Our soil was taken from 5 different types: a creek, marsh, public pool, pond, and a lake across Wisconsin. We diluted the soil into streak plates and bacteria was isolated from the diluted plates. Our plates were then tested against relatives of ESKAPE pathogens to test for antibiotic activity. With the five samples that were taken, four out of the five had activity against *Bacillus subtilis*. The plate with the most bacterial activity was the creek plate. *E. coli*, *A. baylyi*, and *P. putida* were active against these organisms. Unlike the other samples, *B. subtilis* did not show activity against the sample bacteria. By isolating and testing soil bacteria for antibiotic production, it is apparent the complexity of microbial interactions and the global challenge of antibiotic resistance. With experimental testing still ongoing, more results are to come.

## 40 Antibiotic Producers Collected from Farm Forest & County Forest Preserve

**KIRSTIN BUMBAR, SAVANNAH BUSNELLI**  
Northeast Wisconsin Technical College

Antibiotic resistance is an ongoing issue nationwide with several antibiotic-resistant bacteria existing these days. Each year over two million people are infected by these "superbugs" resulting in several thousands of deaths. The Tiny Earth Project addresses this issue by having students discover antibiotic-producing bacteria in soil.

Our project is focused on comparing soil from two types of forests. We took samples from a farm forest and a county forest preserve. Our vision is that forests would provide a greater diversity of microbes due to the larger amount of natural flora and fauna including mycelium. Our hypothesis is that the farm forest would contain more microbes with possible antibiotic properties than the county forest preserve due to influences from nearby farm animals introducing a greater diversity of microbes. We are using multiple methods of testing including streak plate, changing inoculation conditions, testing against multiple types of bacteria as well as additional tests we have yet to perform. We are testing our microbes for production of antibiotics against several types of bacteria. We have initially found that the farm forest has a double producer against *Bacillus* and *Erwinia*, and the county forest only has a single producer against *Bacillus*. Since our research and testing is still ongoing, we look forward to more results yet to be determined.

## 41 Antibiotic Producing Bacteria: Urban vs Woodland

EMILY LILLGE, KAITLYN WUBBEN, LAKEN THIELKE,  
GABRIELLE WISNIEWSKI  
Northeast Wisconsin Technical College

Antibiotic resistance is one of the most serious challenges in modern medicine, as many bacterial infections have become increasingly difficult to treat with existing drugs. The Tiny Earth project encourages students to take part in the search for new antibiotics by isolating and studying soil microbes that may naturally produce antibiotic compounds. The goal of this study was to determine whether antibiotic-producing microbes were present in the soil samples and, if so, to isolate and compare them. Our hypothesis was that the wooded soil from Stephenson, WI, would contain more antibiotic-producing microbes than the park in Black Creek or the soil from Suamico because the wooded environment has higher moisture, more organic matter, and less human disturbance. To test this, soil samples were collected from all three sites and plated using serial dilution and streak plate methods to isolate colonies. The isolates were then screened for antibiotic activity using Master and Tester plates inoculated with *Erwinia* and *Bacillus subtilis*. The Suamico soil showed no bacterial growth, while the park in Black Creek produced two antibiotic-producing isolates. The Stephenson wooded soil contained one isolate that produced a visible zone of inhibition, indicating antibiotic activity. Growth appeared most consistent in darker, cooler incubation conditions. These results partially supported our hypothesis, showing that environmental differences can influence bacterial diversity and antibiotic production. Our research is still ongoing, and additional testing will be completed to confirm the antibiotic activity of the

remaining isolates and determine whether other bacteria from these samples also produce inhibitory compounds. Therefore, some results are still to be determined.

## 42 Isolation and Molecular Characterization of Antibiotic-producing Soil Microbes from Whitewater, WI

HOLLY CASUCCI  
University of Wisconsin-Whitewater

The growing crisis of antibiotic resistance has created a critical need for new antibiotics. The Tiny Earth project engages undergraduate students in the global search for antibiotic-producing microbes in soil. In this study, our three-person research team collected soil samples from three locations in Whitewater, WI, and performed serial dilutions ranging from 1:10 to 1:100000 to isolate diverse bacterial colonies. Each group member plated dilutions on Potato Dextrose Agar (PDA) to promote microbial growth. Isolates were screened for antimicrobial activity against two nonpathogenic relatives of clinically significant bacteria—*Escherichia coli* (Gram-negative) and *Bacillus subtilis* (Gram-positive). Four isolates inhibited quantifiable inhibition zones, indicating the synthesis of antimicrobial compounds in the sampled soil. When tested against additional nonpathogenic bacterial ESKAPES, these isolates inhibited six bacterial species—*Bacillus subtilis*, *Staphylococcus epidermidis*, *Escherichia coli*, *Pseudomonas putida*, *Enterobacter aerogenes*, and *Acinetobacter baylyi*—highlighting their broad range of antimicrobial properties. Future analysis will include biochemical testing and polymerase chain reaction (PCR) to identify the bacterial isolates. These additional methods will help determine the identity of bacterial organisms and their possible capabilities.

## 43 From Thermal to Temperate Conditions Aquatic Environments: Sculpting Soil Bacterial Secondary Metabolite Antibiotic Production

MARILYN KOEHLER, GRACE KANNING,  
BEN ELGERSMA, KAITLYN LYSEN  
University of Wisconsin-Madison

This study investigated whether soil bacteria from a hot spring environment produce more secondary metabolites than those from non-extreme freshwater soils. Based on prior findings of antimicrobial activity in hot springs, we hypothesized that bacterial isolates from the Pray, MT hot spring would show greater antimicrobial potential compared to those from Lake Mendota, WI, and Rogers, MN. Freshwater soil samples

# STUDENT POSTERS

from Pray, MT, Madison, WI, and Rogers, MN were collected, diluted, and plated to isolate bacterial colonies for screening against ESKAPE-relative strains. Zones of inhibition were measured to assess how soil origin influenced the production of secondary metabolites by bacterial isolates. We ran a 2x3 Fisher Exact Test finding a 2-tailed P value greater than 0.05 therefore we failed to reject the null hypothesis: no difference in the average number of colonies that produce antibiotic secondary metabolites in soil near hot springs than other fresh water soils, such as ponds and lakes. Although we fail to reject the null hypothesis, our p-value was near statistical significance and there remains possibility that differing aquatic climates have different implications for antibiotic secondary metabolite production.

## 44 Tiny Earth Antibiotic Soil Samples

**BRYCE WALSTROM**  
Northeast Wisconsin Technical College

A world beneath our own was always something out of a fantasy until the study of Microbiology started and revolutionized the way we view the things around us. There are only a dozen known and usable novel antibiotics that have been discovered and rapidly decreasing in discovery rates by scientists in recent decades. The Tiny Earth program has instilled a way for us to discover as we learn. We started with our own soil samples gathered in a specific location. I had used soil from a freshly logged area near the Marinette NWTC campus, where I hypothesized that with the newer changes in environment in the area with the soil that there would be more variability in my microbes. The sample was then taken to the lab, diluted down using standard dilution techniques and then streak plated. After inoculation they were tested in a master plate, an *Bacillus subtilis* plate, and an *Erwinia carotovora* plate to determine which microbes produce antibiotics against the bacteria. I found four different colonies with zones of inhibition: three on *B. subtilis* and one on *E. carotovora*. After close consideration colony #3 was my choice and was tested against the rest of the available ESKAPE bacteria. I had hoped to have at least a double producer, but I did manage to get a few antibiotic producing microbes out of my soil sample. My bacteria produced a zone of inhibition against *E. aerogenes* on the all-tester plate. PCR was started. Future lab results will be determined.

## 45 Finding New Antibiotic Producing Microbes in Brown County, WI

**EMILY LOEBER, MACKENZIE ALBERT, SCARLET PACHEO**  
Northeast Wisconsin Technical College

Since Penicillin was first created in 1928, antibiotic resistance has weakened our healthcare systems and puzzled scientists worldwide. As bacteria evolve to be increasingly impregnable against our known antibiotics, we must keep up at the same pace. Our microbiology class in Brown County, WI has been recruited to scout for new antibiotic producing bacteria. In our lab group, our aim was to find diverse bacteria within our geographical area. We scouted near areas in Brown County. Our hypothesis was that each location would produce different results, with some producing antibiotic bacteria. In our group of three, we collected soil samples from Oneida, De Pere, and Appleton. We then diluted these 3 soil samples and plated them on 4 plates, each with a greater dilution. From these dilutions, 20 independent colonies were picked to be tested against *E. carotovora* and *B. subtilis* to see if they were antibiotic producers. We noticed that only 2 out of our 3 group members' microbes were successful in competing with *E. carotovora* and *B. subtilis*. De Pere had 4, Appleton had possibly 1, and Oneida produced 0 antibiotic producers. Our hypothesis was accurate, as each location generated different bacteria that performed differently when competing with other known bacteria. These experiments are ongoing, as we further isolate our microbes and continue to test them against known resistant bacteria. Results are to be determined.

## 46 Antibiotics Discovered in Garden Health or Garden Illness

**AMY BARRETT, ANNE VIRTUES**  
Northeast Wisconsin Technical College

Pathogen resistance to antibiotics occurs when they develop the ability to defeat the antibiotics designed to kill them. Since the 1990's there have been no new developments in finding new antibiotics. We now find ourselves in the post antibiotic era. As microbiology students we're working towards combating this critical health threat by participating in The Tiny Earth project, exploring new microbes that could potentially release new antibiotics. We surveyed soil samples from two local gardens. The first soil sample was from a garden that was a possible source to MRSA infection. The second sample was taken from a cultivated vegetable garden. Our hypothesis is we wouldn't find as many antibiotic sources in a cultivated vegetable garden as we would in soil from a contaminated sample with possible MRSA bacteria. We diluted our soil and plated our samples using the streak plate method. Our microbes were inoculated and

screened against *Bacillus* and *Erwinia* bacteria to observe any possible production in antibiotic properties. The cultivated vegetable garden didn't produce any evidence of antibiotic microbes. The sample from the contaminated garden yielded one significant piece of evidence towards antibiotic producing properties. Our results were in line with our hypothesis. The garden sample obtained from the contaminated soil generated antibiotic producing characteristics. Research pertaining to this discovery is still being conducted and will be completed by the time that we present our study at the Tiny Earth conference.

## 47 Possible Findings of Antibiotics in Parks

EMMA STRANDELL, DAWN PEARSON,  
CAITLIN MORGANTI  
Northeast Wisconsin Technical College

With the rise of antibiotic resistance, scientists have been trying to develop new antibiotics to get out of the post-antibiotic era. Different parks in Brown County and surrounding areas were investigated to see if they contain bacteria that produce new antibiotics. The soil properties found in the corresponding parks ranged from dry to moist, and gritty to smooth. Our hypothesis is that the park with the highest traffic will have a higher probability of producing antibiotics. Each sample was diluted and plated using LB agar. Different conditions were chosen such as medium, temperature, or light. Soil samples were tested against *E.carotovora* and *B.subtilis* to see if there were any antibiotic producers. The results obtained showed no antibiotic activity. Then a bacteria from the Master plate was used on a streak plate and an All-tester plate against the eight ESKAPE pathogens. Currently, the results do not support the hypothesis. The results against the eight ESKAPE pathogens are still pending.

## 48 Collections from Brown County Golf Course & Residential Backyard

OLIVIA GAUTHIER, ALEXIS YANTES  
Northeast Wisconsin Technical College

Antibiotic resistance has been a growing concern since the discovery of the first antibiotic in the 20th century. As resistant bacteria continue to emerge, the need to identify new sources of antibiotics has become increasingly urgent. The Tiny Earth Project encourages us to collect and test soil samples from different environments to discover potential antibiotic-producing microorganisms. Our research was collected from two different locations in Brown County: Brown County Golf Course and a residential backyard to determine which environment might contain bacteria capable of producing antibiotics. We hypothesized that the residential backyard would produce more antibiotic producing microbes due

to its lower human activity and natural water compared to the frequently maintained and irrigated golf course. Our soil samples from both locations were diluted and tested using the streak plate technique with *B. subtilis* and *E. carotovora* to detect potential antibiotic production. The Brown County Golf Course sample showed no antibiotic-producing colonies, while the residential backyard sample displayed one colony with possible antibiotic activity. Additional testing was conducted with the selected colony against eight known bacteria to confirm these results. We did the same testing with a random colony from the golf course to see if further testing would produce an antibiotic. Our findings support our hypothesis that less disturbed environments may produce a greater diversity of antibiotic-producing bacteria. Further testing is ongoing to confirm potential antibiotic producers from the residential backyard.

## 49 Identifying Antibiotic Producing Bacteria in the Soil of Wild Ginger on the Oneida Reservation in Northeast Wisconsin

MARGARET CORNELIUS  
College of Menominee Nation

Wild ginger is a very important medicinal plant for indigenous communities. It has been used for digestion and indigestion, and also helps with colds and coughs, etc. Wild ginger is known amongst the indigenous peoples as a spiritual medicinal herb and a physical herb used for washing hands, cleaning physically and spiritually. This study tried to identify antibiotic-producing bacteria in the soil near wild ginger outcroppings on the Oneida Reservation in northeast Wisconsin. Soil samples were collected, isolated, and Gram-stained for identification. Isolates were tested against *Escherichia coli*, *Enterobacter aerogenes*, and *Staphylococcus epidermidis* for antibiotic qualities. This study found one isolate showing a light zone of inhibition against the *E. aerogenes*. This study can help support indigenous medicine and back it with scientific evidence. Further research could include testing soil microbes with other Safe ESKAPE pathogens and testing other outcropping areas of wild ginger in other areas of Wisconsin at different times throughout the year.

## 50 Potential Antibiotic-Producing Bacteria from the Grotto of Our Lady at Saint Norbert College

ETHAN COSTELLO  
Saint Norbert College

Natural Antibiotics are in high demand due to the rise of antibiotic resistant bacteria. In accordance with the Tiny Earth project's guidelines, bacteria from the fence

# STUDENT POSTERS

near the Calawerts Family Grotto of Our Lady near the Mary Minahan McCormick hall were isolated through a  $10^4$  dilution and were cultured in a 1/10 LB agar media. After isolating 5 out of the 11 colonies formed, they were patched with ESKAPE pathogens safe relative to determine which were antibiotic producers. The plate-patching was observed on a 1/10 LB agar media since they grew better on that plate. The result was three were observed to have antimicrobial activity and were then gram stained and examined under a microscope. A PCR with two primers, 63F and 1387R was then conducted and run on a 0.7% agarose gel, with two samples showing a visible band of expected length. Both samples were cleaned and sent for 16S rRNA sequencing. The sequences from both primers of the two products were then analyzed to identify bacterial species by comparing them to sequences in the NCBI BLAST database. Both of the products were strongly related to many pseudomonas. Specifically, the 14F 63F (99.54%), 14R 1387R (99.87%), 15F 63F (99.85%), and 15R 1387R (99.88%) are identical to *Pseudomonas fulva*, *Phytopseudomonas punonensis*, *Pseudomonas argentinensis*, and *Phytopseudomonas straminea*, *PhytoPseudomonas argentinensis*, *Phytopseudomonas flavescens*, *Pseudomonas punonensis*, and *Ectopseudomonas oleovorans*.

## 51 Tiny Earth: Antibiotic Producer Specimen Collection

**BRIANNE HAZELWOOD**  
Northeast Wisconsin Technical College

Scientists have discovered that diseases caused by bacteria are becoming untreatable due to the pathogen's resistance to antibiotics. Antibiotic resistance of pathogens is a contributing factor in the increase of deaths around the world. The Tiny Earth organization introduced the idea of people going out into our communities and collecting a soil sample in hopes of finding a microbe that will produce a new antibiotic. Once we have completed our findings, we have the opportunity to present them at the upcoming conference. I collected a soil sample from my home in Iron Mountain, MI. My hypothesis was that my soil sample would produce at least two antibiotic producers due to the conditions around the soil from my collection being wet and fungal. I diluted my soil and plated it using the streak plate method. Once my sample was inoculated, the microbes from my plate were screened against the bacteria *Bacillus subtilis* and *Erwinia carotovora* to see which microbes would produce antibiotics against either bacterium. My sample produced one zone of inhibition on the *Bacillus subtilis* plate. I then chose that sample on the *Bacillus subtilis* plate, to screen against the ESKAPE pathogens provided. My result showed that it produced three additional zones of inhibition. My hypothesis was not accurate as I predicted to only produce two antibiotic producers, and

my sample instead produced three antibiotic producers. The research on my soil sample is still ongoing at this time; therefore, some results are still to be determined.

## 52 Discovering Antibiotic-Producing Microbes from Local Wetland Soil

**GARRETT GARDNER, THERON MIRON**  
University of Wisconsin - Green Bay

Antibiotic resistance is an escalating global threat, emphasizing the urgent need for new antimicrobial-producing organisms. As part of the Tiny Earth Project, this study examined local soil microbial communities to identify bacteria capable of producing antibiotics. A soil sample was collected from a dried streambed in Cecil, Wisconsin (44.81602° N, 88.31694° W) at a depth of 11 cm in early September. One gram of soil was serially diluted in sterile water and plated onto Luria-Bertani agar (LBA) containing cycloheximide to inhibit fungal growth and select for bacteria. Sixteen isolates were obtained and screened for antimicrobial activity against safe relatives of ESKAPE pathogens, specifically gram-negative *Escherichia coli* (*E. coli*) and gram-positive *Bacillus megaterium* (*B. megaterium*), using spread/patch techniques. Two isolates, #7 and #15, displayed antimicrobial activity. Isolate #7 exhibited narrow spectrum activity against *B. megaterium* on Tryptic Soy agar (TSA), while isolate #15 demonstrated broad spectrum activity against both *B. megaterium* and *E. coli* on TSA and LBA. Gram staining shows that both isolates are gram-positive, rod-shaped diplobacilli. These findings suggest that local wetland soils require further investigation, as they harbor bacteria with antimicrobial producing capabilities, including the much-needed broad-spectrum antimicrobials. This work also demonstrates the effectiveness of course-based research initiatives like the Tiny Earth Project in addressing the discovery of antibiotics.

## 53 The Discovery and Identification of Antibiotic-Producing Soil Bacteria

**HAYLIE DUMOULIN, PRANAVI KANTE**  
University of Wisconsin - Green Bay

Antibiotic resistance is a worldwide crisis with a crucial need arising for novel therapeutics. The Tiny Earth initiative aims to address this dilemma by isolating antibiotic-producing bacteria from soil samples collected from around the world. The collection of our soil sample took place at Fonferek's Glen Brown County Park (44.42449°N, 87.93870°W). One gram of the soil was serially diluted in sterile water, then plated on Luria-Bertani agar (LBA) plates containing cycloheximide to isolate a variety of bacteria. After incubation at 28°C for 48 hours, a library plate was created with the soil isolates using the "pick and patch" technique on Potato Dextrose

agar (PDA) and LBA plates. Each unique isolate was screened for antibiotic activity by patching the colonies on LBA, PDA, Tryptic Soy agar (TSA), and 10% TSA plates containing *Bacillus megaterium* (*B. megaterium*) or *Escherichia coli* (*E. coli*). Isolate numbers two and five were found to have antibiotic activity against *B. megaterium* on the PDA plate, and isolate number nine was found to have antibiotic activity against *B. megaterium* on the LBA, TSA, and 10% TSA plates. Further characterization revealed isolate two to be gram positive and isolate five and nine to be gram negative. Our findings will be added to the existing database of soil samples, contributing to future research on emerging antibiotic treatments.

## 54 Unearthing Antibiotic-Producing Bacteria in Soil, in Response to Antibiotic Resistance

RONNY DUPUIS, ZANE PLATT  
University of Wisconsin - Green Bay

As the disease burden caused by antibiotic resistance continues to worsen, discovering and developing new antibiotics becomes crucial in protecting our species. The research conducted in this lab aims to determine whether we can find antibiotic-producing bacteria in soil near Bayshore Pond within the University of Wisconsin-Green Bay arboretum. One gram of soil was serially diluted with sterile water, plated on Luria-Bertani agar (LBA) containing cycloheximide, and incubated at 28°C for 48 hours. Following incubation, unique colonies were picked and patched onto LBA and Potato Dextrose agar (PDA) to create library plates. These isolates were then patched and screened for antibiotic production against *Bacillus megaterium* and *Escherichia coli* on LBA, PDA, Tryptic Soy agar (TSA), and 10% TSA. Isolate 5 showed production against both *Bacillus megaterium* and *Escherichia coli* on 10% TSA. Isolate 6 showed production against *Bacillus megaterium* on LBA and 10% TSA. Isolate 7 showed production against *Bacillus megaterium* on LBA. Further characterization by Gram staining revealed isolates 5 and 6 as gram-negative rods and isolate 7 as gram-positive rods. Our results will be logged in a worldwide database of soil isolates and can be used for further analysis and development in the fight to discover new, effective antibiotics.

## 55 Antibiotic Activity in Soil Bacteria

ZOE, DAX, BRENDA XOLOT  
University of Wisconsin - Green Bay

Antibiotic resistance is a growing health crisis that demands the discovery of new antibiotic-producing microorganisms. The Tiny Earth Project aims to address this problem by discovering new antibiotic-producing

bacteria from local soil environments. In this research, soil samples were collected from the Brown County Dog Park (44.52604, -88.135819). The soil was diluted and planted to promote the growth of individual bacterial colonies. To isolate bacteria for study, two library plates using Potato Dextrose agar (PDA) and Luria-Bertani agar (LBA) were patched with 9 different bacteria taken from the serial dilution plates. To test for antibiotic activity, the colonies on the library plate were cultured in a variety of conditions and observed for zones of inhibition. Isolate 1 showed antibiotic activity against *Bacillus megaterium* (*B. megaterium*) on LBA. Isolate 4 had antibiotic activity against *B. megaterium* on LBA and Tryptic Soy agar (TSA). Isolate 7 had antibiotic activity against *B. megaterium* on LBA, TSA, and 10% TSA. Isolate 9 had antibiotic activity against *B. megaterium* on PDA and LBA, and activity against *Escherichia coli* on LBA. Gram staining was performed on the four isolates, revealing three gram-positive rod/bacillus-shaped bacteria and one gram-negative rod-shaped bacterium. These results indicate that the sampled soil contained a diverse bacterial population, which are able to produce antibiotics.

## 56 Exploring Antimicrobial Producers in Wisconsin Garden Soil

SOPHIA JIMOS, BROOKE REGISTER  
University of Wisconsin - Green Bay

Antibiotic resistance is a rapidly growing global health threat due to the diminishing effectiveness of current antibiotics. This research contributes to the Tiny Earth initiative by isolating soil bacteria with the potential to produce novel antibiotics. The soil sample was collected from a garden located in Pulaski, WI (44.70978°N, -88.21418°W), and one gram of soil was serially diluted in sterile water before being plated on Luria-Bertani agar (LBA) containing cycloheximide to isolate soil bacteria. Following incubation, unique bacterial colonies were isolated using the "pick and patch" method and transferred to master plates on LBA and potato dextrose agar (PDA). To assess antibiotic activity, soil isolates were patched onto LBA, PDA, Tryptic Soy agar (TSA), and 10% TSA plates containing either *Bacillus megaterium* (*B. megaterium*) or *Escherichia coli* (*E. coli*). Five isolates demonstrated antimicrobial activity: Isolates 7, 9, 14, and 15 inhibited growth of *Bacillus megaterium* (*B. megaterium*) on PDA and LB. Isolate 14 inhibited growth of *Escherichia coli* (*E. coli*) on TSA and *B. megaterium* on 10% TSA. Isolate 8 inhibited growth of *B. megaterium* on TSA. Gram staining determined that four isolates were gram-positive, and one isolate was gram-negative. These isolates underwent further analysis using biochemical tests and BLAST analysis of the DNA sequence for the 16s rRNA gene to determine the identity of each bacterium. This research supports the importance of exploring unique soil environments as sources of new

# STUDENT POSTERS

antimicrobial compounds. Such discoveries contribute to antibiotic discovery and resistance mitigation, ultimately enhancing future treatments for bacterial infections.

## 57 Understanding Antibiotic Resistance Through Research of a Soil Sample

KATE ISOM, KIERA ROTAR  
University of Wisconsin - Green Bay

The Tiny Earth Project aims to find antibiotic producers in soil samples. Soil was collected on campus at the University of Wisconsin-Green Bay in an overgrown field by University Housing. After collection, one gram of the soil sample was serially diluted in sterile water and distributed on agar plates of Luria Bertani Agar (LBA). Sixteen different colonies presented on the LB plates, and then were tested against both gram negative and gram positive bacteria, *Escherichia coli* (*E.coli*), and *Bacillus megaterium* (*B. megaterium*), respectively. Each isolate was tested for antibiotic activity on various agar, including Tryptic Soy Agar (TSA), TSA 10%, LBA, and Potato Dextrose Agar (PDA). Zones of inhibition were observed in four of the colonies, only found on *B. megaterium* plates of TSA, TSA 10%, and LBA. These would be considered narrow-spectrum antibiotics because they are only found on gram positive bacteria. Gram staining these antibiotic producing bacteria showed both gram-positive bacilli, and gram-negative cocci. These bacteria will then be subjected to Polymerase Chain Reaction (PCR), and then Basic Local Alignment Search Tool (BLAST) analysis to determine genus classification. These findings will further support the Tiny Earth Project's findings, and help aid in the discovery and research of antibiotic producers found in soil.

## 58 Discovering Antibiotic-Producing Bacteria in a Soil Sample

CHLOE THAO, MAEGYN CARTER  
University of Wisconsin - Green Bay

Antibiotic resistance poses a global health threat and can result in severe and untreatable health conditions if not addressed. A major goal of the Tiny Earth project is to reduce the effects of antibiotic resistance by discovering new antibiotic-producing bacteria in soil from around the world. For this research, a sample of soil near Maribel, Wisconsin (44.26084° N, 87.83041° W) was used to screen for antibiotic-producing bacteria. A 1g sample of soil was diluted with sterile water to isolate bacterial colonies on Luria-Bertani Agar plates (LBA). Twelve unique bacterial colonies were isolated and plated on two library plates, one using LBA, and one Potato-Dextrose agar (PDA). To examine antibiotic activity, soil isolates were patched to: 10% Tryptic Soy Agar (TSA),

100% TSA, LBA, and PDA containing either *Bacillus megaterium* (*B. megaterium*) or *Escherichia coli* (*E. coli*). Four antibiotic-producing bacteria were detected. All four showed antibiotic activity against *B. megaterium* on 10% TSA, 100% TSA, and LBA media. The four antibiotic-producing isolates were Gram stained. The results of Gram staining showed two gram-positive bacteria, one gram-negative bacterium. These data provide evidence of antibiotic production among the isolates studied in this project, which can further aid in the treatment of infections caused by antibiotic-resistant bacteria.

## 59 Tiny Earth, Huge Impact

PAITEN WESTPHAL  
Northeast Wisconsin Technical College

Antibiotic-resistant bacteria continue to threaten global health, highlighting the need for new antimicrobial discoveries. The Tiny Earth project encourages students to explore local soils in search of microorganisms that might produce novel antibiotics. In this study, I collected a soil sample from the Peshtigo Lions Recreation Area to isolate and characterize bacteria with potential antibiotic activity. I expected that the soil would contain diverse bacterial species, including some capable of inhibiting the growth of other microbes. The soil sample was diluted and plated on LB agar to obtain individual colonies. Each isolate was screened against *Bacillus subtilis* and *Erwinia Carotovora* to test for possible antibiotic production. From this sample, one distinct bacterial colony was successfully isolated and further tested. When tested on the all-tester plate, the isolate showed no visible zones of inhibition, suggesting that it did not produce detectable antibiotic compounds under the conditions used. The colony appeared round with an entire edge, a rough texture, and a flat elevation. While this isolate did not display antibiotic activity, the result still contributes valuable information to the Tiny Earth research project. Understanding which environments have active or inactive isolates can guide future sampling and screening efforts. Further analysis of additional isolates from this site could reveal bacteria that produce novel antimicrobial compounds to help address the ongoing challenge of antibiotic resistance.

## 60 Isolation of Antibiotic-Producing Bacteria from Different Forest Areas' Soil

CAROLE KOSKI, DURGA DUMRE  
Northeast Wisconsin Technical College

Antibiotic resistance has become a major global concern. In response to this growing problem, this research aims to explore natural soil environments as potential sources

of novel antibiotic-producing bacteria. Soil samples were collected from two forested areas (Calavera and Braid's Creek Park). These sites were chosen for their rich organic content and diverse microbial life, which are conducive to the growth of antibiotic-producing microorganisms. It was hypothesized that these soils contain bacteria capable of inhibiting the growth of common pathogenic species. Soil samples were serially diluted and plated onto nutrient-rich media to isolate distinct bacterial colonies. The isolated colonies were then tested on streak plates pre-inoculated with pathogenic bacteria to assess antibacterial activity. Preliminary results showed partial inhibition in several colonies, notably from the Calavera Park sample. The growth of the test microorganism around this colony was partially suppressed. The Baird's Creek sample also showed antibacterial properties against *B. subtilis*. However, the master plate had an insufficient amount of growth and could not be used in further testing. These findings suggest that forest soils are a promising source of antibiotic-producing bacteria. Continued testing, isolation, and molecular identification are required to confirm and characterize the antimicrobial potential of these isolates. This research underscores the value of citizen science and environmental microbiology in addressing the global challenges of antibiotic resistance.

## 61 Discovering New Antibiotic-Producing Bacteria From Soil

ALLISON JACOBSEN, NAOMI BALON  
Saint Norbert College

Antibiotic resistance is increasing, causing many antibiotics to no longer be as effective. This places a great deal of pressure on discovering new bacteria that may have antibiotic properties. In collaboration with the Tiny Earth project, the goal is to isolate new antibiotic-producing bacteria from soil. The soil used for isolation came from a household plant that had a mealybug infestation on its leaves. After using casitone yeast extract (1/10 CYE) as the medium, a three-step dilution of watered-down soil was spread onto three separate plates to observe growth. The next goal was to plate the isolates on an ESKAPE safe-relative pathogen to determine whether any colonies produced a zone of inhibition. This resulted in five isolated colonies, which were Gram-stained to help identify the organisms. A PCR protocol for the 16S rRNA gene was conducted and only two isolates showed visible bands on agarose gel electrophoresis. The two isolates were cleaned using a column to isolate the PCR product before being sent to a laboratory for sequencing. After obtaining sequencing results, the organisms were analyzed using the NCBI BLAST database to determine whether the isolates are already known or potentially novel antibiotic producers.

## 62 Tiny Earth, Big Impact: Searching for New Antibiotics in Our Soil

JADYNN SWIATNICKI  
Northeast Wisconsin Technical College

Antibiotic resistance has posed a significant global health concern for over seven decades. This is a growing problem largely due to the overuse and misuse of antibiotics. Understanding and addressing antibiotic resistance is critical in preventing a global health crisis. Through the Tiny Earth project, each student was given the opportunity to collect and test soil from our community in hopes to find microbes that produce novel antibiotics. My hypothesis was that I would find at least one antibiotic producing microbe. I collected soil from woods near Badger Park in Peshtigo, Wisconsin and performed multiple soil dilutions. From those six plates, I selected 20 colonies and tested them against *Erwinia carotovora* and *Bacillus subtilis* to determine antibiotic production. One colony produced a zone of inhibition in both, and I further tested it against nine different pathogens. Those results showed a zone of inhibition in *Staphylococcus epidermidis* and *L. antibioticus*. My results showed that I could have an antibiotic producing microbe and support my hypothesis by exceeding my initial expectations.

## 63 Luxemburg Dirt

LENA RENIER-LONG  
Northeast Wisconsin Technical College

Over the past years it has been increasingly difficult to find antibiotics that treat certain strains of bacteria. This is an issue because of the rise in antibiotic resistance. This research project is searching for bacteria that are capable of producing new antibiotics. Soil was collected from a residential area in Luxemburg, WI. The interest comes from the fact that the property is a very old residence and that the soil is sandy. Because of this there may be at least 1 antibiotic producing microbe. Soil was collected, diluted, and inoculated to plates. Colonies were counted from the plates and ones showing interest were reinoculated onto a different plate. Select colonies were tested against *B. subtilis* and *E. carotovora* to see if any colonies had antibiotic properties. There is evidence that one of the colonies may have activity against *B. subtilis*. With the colony only showing slight activity, it could mean that there is antibiotic potential. Since the colony showed activity against *B. subtilis* it's being tested against 8 ESKAPE pathogens, results are to be determined.

# STUDENT POSTERS

## 64 Bacterial Civil War: Discovering New Antibiotics from Soil Bacteria

SKYLAR NORMAN, RACHEL FAESSLER  
University of Wisconsin - Green Bay

Antibiotic-resistant bacteria are quickly becoming a major health challenge, making new antibiotic discovery crucial. One source of new antibiotics used by Tiny Earth student researchers is soil bacteria. We hypothesized that a soil sample found near the roots of a tree in the University of Wisconsin-Green Bay Cofrin Arboretum would contain antibiotic-producing bacteria. A soil sample was collected, diluted, and plated on Luria-Bertani Agar (LBA) and Potato Dextrose Agar (PDA) plates to separate bacteria. Nine colonies were isolated and screened for antibiotic activity against gram-positive *Bacillus megaterium* (*B. megaterium*) or gram-negative *Escherichia coli* (*E. coli*) on LBA, PDA, Tryptic Soy Agar (TSA), and 10% TSA. Four isolates produced antibiotic compounds. One isolate was effective against *E. coli* on LBA and TSA and effective against *B. megaterium* on 10% TSA, while three were effective against *B. megaterium* on PDA. Gram staining revealed that the isolate effective against *E. coli* was a gram-positive coccus, while the others were two gram-negative rods and a gram-positive rod. The method of collecting soil samples for antibiotic producers is fruitful. These bacteria are adding to a growing library of antibiotic producers that could be used to fight the growing challenge of antibiotic resistance.

## 65 Berry Powerful: The Antibiotic-Producing Potential of Elderberry Soil Isolates

LEO ZARZUELA, LILY AXELROD, HALEY FELDBRUEGGE, SVESHA JAMPALA  
University of Wisconsin - Madison

One of the most pressing issues we are facing in medicine today is the antibiotic-resistance crisis—and it is only getting worse. Certain plants, such as elderberries, are known to have antibiotic properties that may influence the microbial composition of their soil environment. It is possible that bacteria living in the soil near such plants have evolved the ability to produce antibiotic compounds in order to survive. A systematic observation experiment comparing the number of antibiotic-producing bacteria in soil collected directly beneath an elderberry plant to soil from a nearby area not associated with the plant was conducted. After isolating 256 bacterial colonies (128 from each variable), isolates were screened against 6 ESKAPE pathogen strains to see if they produced antibiotic compounds, which we visualized through zones of inhibition. We performed a 2x2 Contingency Fisher's Exact Test comparing the number of antibiotic producers between control and elderberry samples and obtained

a two-tailed p-value of 0.21. Overall, this led us to fail to reject our null hypothesis, meaning we cannot conclude that there is a difference in the soil type's ability to produce antibiotics. While there were some limitations with our study (for example, a small sample size of isolates), our findings ultimately contribute to addressing the antibiotic resistance crisis by identifying soil environments that may be enriched in bacteria capable of producing novel antimicrobial compounds, offering potential opportunities for future antibiotic discovery.

## 66 Discovery and Characterization of Fungal Antimicrobials from Environmental Samples

ELLA PATTY, RAMIRO CORTEZ, MITCHELL STARRY, SALEM OHIZU, LUKE MARKIEWICZ, MADELINE CORNELIUS, SARINA NEPAL, AND AIDAN DUNBAR, KATRINA HAMMERBERG, QUINTON HAGEN  
University of Wisconsin - Green Bay

Due to the misuse and overprescription of antibiotics, the world's health systems are experiencing a crisis of strains of bacteria mutating to become more resistant to current known antibiotics. To help combat this growing issue, research in collaboration with the Tiny Earth program, which seeks to address this growing issue through student-led research, was conducted on antibiotic-producing fungi in hopes of discovering novel antibiotics through similar techniques and methods. Fungal methods and results: One gram of serially diluted soil with sterile water was plated on Rose Bengal streptomycin agar or Potato Dextrose Agar (PDA) for selective fungal growth of isolated colonies that were later transferred for pure culture growth. Since summer 2024, a total of thirty-six antibiotic-producing fungi have been isolated. Antibiotics were produced against six Gram-positive and three Gram-negative ESKAPE safe-relative bacteria. Five antibiotics showed broad spectrum activity. Fungal isolates were further characterized and identified by Sanger sequencing of the ITS rDNA and microscopy. Simultaneously, an attempt is being made to isolate the antibiotic properties from these fungal isolates. Various methods, such as polarity extraction, TLC, column chromatography, and GC-MS Headspace Analysis, are being used to characterize a novel antibiotic.

## 67 Exploring Antimicrobial Produces in Wisconsin Garden Soil

BROOKE REGISTER, SOPHIA JIMOS  
University of Wisconsin - Green Bay

Antibiotic resistance is a rapidly growing global health threat due to the diminishing effectiveness of current antibiotics. This research contributes to the Tiny Earth initiative by isolating soil bacteria with the potential to

produce novel antibiotics. The soil sample was collected from a garden located in Pulaski, WI (44.70978°N, -88.21418°W), and one gram of soil was serially diluted in sterile water before being plated on Luria-Bertani agar (LBA) containing cycloheximide to isolate soil bacteria. Following incubation, unique bacterial colonies were isolated using the "pick and patch" method and transferred to master plates on LBA and potato dextrose agar (PDA). To assess antibiotic activity, soil isolates were patched onto LBA, PDA, Tryptic Soy agar (TSA), and 10% TSA plates containing either *Bacillus megaterium* (*B. megaterium*) or *Escherichia coli* (*E. coli*). Five isolates demonstrated antimicrobial activity: Isolates 7, 9, 14, and 15 inhibited growth of *Bacillus megaterium* (*B. megaterium*) on PDA and LB. Isolate 14 inhibited growth of *Escherichia coli* (*E. coli*) on TSA and *B. megaterium* on 10% TSA. Isolate 8 inhibited growth of *B. megaterium* on TSA. Gram staining revealed four gram-positive isolates and one gram-negative isolate. These isolates underwent further analysis using biochemical tests and BLAST analysis of the DNA sequence for the 16s rRNA gene to determine the identity of each bacterium. This research supports the importance of exploring unique soil environments as sources of new antimicrobial compounds. Such discoveries contribute to antibiotic discovery and resistance mitigation, ultimately enhancing future treatments for bacterial infections.

## 68 Isolation of a Soil-Derived Microbial Strain Producing Putative Broad-Spectrum Antimicrobial Activity

ERICA WOLF

Northeast Wisconsin Technical College

We are looking to find new antibiotic use found in the soil as there is a decrease in antibiotics being found today. We took a soil sample from a location that we thought might have potential of having antibiotic growth. My thought process was to try and find a broad spectrum antibiotic that can be implanted in today's treatment. If soil samples are collected from diverse environments, cultured and isolated, then some soil samples will produce antibiotic compounds effective against gram negative and gram positive microorganisms. I cultured and diluted my sample to get single colonies. From the single colonies I was able to choose different ways to culture them to see if they reacted differently (PDA and TSA along with the normal LB plates). We also tested them against a gram positive (*Bacillus sp.*) and gram negative (*Erwinia sp.*) to see if there was any difference between the two. I then tested the colony I chose to place against eight different bacteria to see if it killed any specific ones (gram negative or positive) in hopes to find it liked one thing or another or if it had potential for a broad spectrum. I have found out that my soil sample through all of the steps has liked both gram negative and positive. Therefore maybe a potential for a broad

spectrum antibiotic. With my sample reacting to the gram negative and positive that there is a possibility that there is potential for a new broad spectrum antibiotic use.

## 69 Bacteria Cultured from Oconto County Soil Inhibit Growth of *Erwinia* spp. but Not Common Pathogens

PETER OSUCHOWSKI

Northeast Wisconsin Technical College

The Centers for Disease Control and Prevention estimate that at least 35,000 annual deaths in the United States are attributable to antibiotic-resistant infections. Commercial pharmaceutical manufacturers have been unwilling or unable to develop novel antibiotics to address the growing health burden of antibiotic-resistant bacteria. Thanks to the Tiny Earth Project, college students in the United States may be able to help in the discovery of needed antibiotics. As microbiology students at Northeast Wisconsin Technical College, we participated in the Tiny Earth Project in the Fall of 2025. We hypothesized that bacteria sampled from the soil microbiome in our geographical area of northeast Wisconsin may exhibit useful antibiotic properties. To test this hypothesis, we obtained a sample of soil from the humus layer of a relatively biodiverse location. We successfully cultured and isolated several colony types, one of which showed inhibition of the growth of *Erwinia* spp. Unfortunately, our subsequent testing against several common bacterial pathogens showed no additional antibiotic activity. Finally, we used genetic sequencing to identify the species. We conclude that the bacterial species we isolated does not produce a useful antibiotic. Further research should focus on more promising species, including others inhabiting our region.

## 70 Antibiotic Producing Organisms Collected from Embarrass River, Wolf River, and Suamico River.

EMMA BARTELT, KENDRA WESTPHAL, REESE LARDINOIS  
Northeast Wisconsin Technical College

For many years, scientists have struggled to find new antibiotic-producing organisms due to the lack of resources. Scientists have involved students, leading to the Tiny Earth Project. Antibiotic resistance is when bacteria become resistant to antibiotics. The Tiny Earth Project allows students to study bacteria found in soil samples from locations of their choosing in hopes of finding antibiotic activity. We hypothesized that water sources harbor more bacteria that produce antibiotic activity. We collected samples from the Embarrass River, Suamico River, and the Wolf River. We believed that water sources would have lots of nutrients and organic matter

# STUDENT POSTERS

that bacteria need to feed on, including dead plants and animal waste. Water sources produce a moist environment in which bacteria thrive and multiply at a fast rate. We began by collecting soil samples, diluting them, and using the streak plate method to alter growing conditions. Along with that, we used master and tester plates to test whether colonies would show antibiotic activity against gram positive and negative bacteria. Embarrass River had one antibiotic-releasing microbe, Wolf River had three, while Suamico River had none. None of them were double producers. We then tested one of our antibiotic producers against relatives of the ESKAPE pathogens. The results showed that both Embarrass River and Wolf River had antibiotic-producing microbes. Our research on the antibiotic-producing microbes from Embarrass River, Wolf River, and Suamico River is still ongoing, and therefore, some of our results are yet to be determined as we continue to analyze potential antibiotic activity.

## 71 Exploring Compost as a Source of Novel Antimicrobial Bacteria

ANNA ETTEN, SARAH WELSCH, ABBY RADTKE,  
KATIE MLODZIK  
Saint Norbert College

Naturally occurring antibiotics are becoming more in demand due to the rise in antibiotic resistance among pathogenic bacteria. This has been characterized in the context of polypharmacy regarding bacterial infections. In alignment with the Tiny Earth Project's goals, bacteria were isolated from compost soil on a hobby farm in Plymouth, WI, and cultured on 1/10 LB and TS agar media. After isolating four colonies, they were patched on a lawn of two specific ESKAPE safe relatives to analyze possible antibiotic activity. Plate-patching was conducted with 1/10 LB agar media due to the wide host of bacteria that can grow on it. As a result, two colonies were observed to have possible antimicrobial activities against *S. epidermidis*. They were then Gram-stained and examined under the microscope. A PCR was then conducted using two primers: 63F and 1387R. After preparing the 0.7% agarose gel, the PCR products were loaded into the sample wells. One PCR showed two visible bands of the expected length. We isolated the 16S rRNA gene for sequencing from the PCR mixture using filtration centrifugation. After obtaining the sequencing results, the gene sequences from both primers were analyzed to identify bacterial species. It was done by comparing the sequences against the NCBI BLAST database. Sequencing of 16S RNA suggests that our unknowns are *Streptomyces* sp. (100.0% Reverse) and *Massilia eburnea* (88.96% Forward). A series of biomedical tests were performed to learn more about its metabolic characteristics.

## 72 Discovering New Antibiotics

MAKENNAH DAUSEY  
Northeast Wisconsin Technical College

Antibiotics are the main medications that stop or kill bacteria. But overtime, with the overuse and the small production of antibiotics, a lot of bacteria have become resistant to these current antibiotics. With antibiotics being overused and misused, it has become hard to treat infections, which leads to longer infections, higher medical bills, and more frequent deaths. My project is related to this problem because I dug up a sample of soil to run it through experiments and test to see if it had a potential of becoming an antibiotic producer. My prediction is that I will find some producers in my soil sample. Some of the methods I used to perform these experiments include soil dilution and plating. I did this so that I could start to isolate individual microorganisms in my soil sample. We then tested our samples against two different types of bacteria to see if they had any interaction with each other. We then took out soil samples and put them against nine different types of bacteria to see if they had any interaction with the bacteria and created any zones of inhibition. Lastly, we ran a PCR targeting the 16SrRNA gene. My experiment showed that I had a couple zones of inhibition against some of the bacteria. My results mean that my soil sample could potentially have a form of antibiotic producer and it supports my hypothesis.

## 73 Unearthing Antibiotic-Producing Bacteria in Soil in Response to Antibiotic Resistance

ZANE PLATT  
University of Wisconsin-Green Bay

As the disease burden caused by antibiotic resistance continues to worsen, discovering and developing new antibiotics becomes crucial in protecting our species. The research conducted in this lab aims to determine whether we can find antibiotic-producing bacteria in soil near Bayshore Pond within the University of Wisconsin-Green Bay arboretum. One gram of soil was serially diluted with sterile water, plated on Luria-Bertani agar (LBA) containing cycloheximide, and incubated at 28°C for 48 hours. Following incubation, unique colonies were picked and patched onto LBA and potato dextrose agar (PDA) to create library plates. These isolates were then patched and screened for antibiotic resistance against *Bacillus megaterium* and *Escherichia coli* on LBA, PDA, tryptic soy agar (TSA), and 10% TSA. Isolate 5 showed resistance against both *Bacillus megaterium* and *Escherichia coli* on 10% TSA. Isolate 6 showed resistance against *Bacillus megaterium* on LBA and

10% TSA. Isolate 7 showed resistance against *Bacillus megaterium* on LBA. Further characterization by Gram staining revealed isolates 5 and 6 as gram-negative rods and isolate 7 as gram-positive rods. Our results will be logged in a worldwide database of soil isolates and can be used for further analysis and development in the fight to discover new, effective antibiotics.

## 74 Detection of Possible Antibiotic-Producing Bacteria Within a Houseplant

ISABEL KOTNOUR, ABIGAIL RABIDEAU  
Saint Norbert College

Tiny Earth Project's goal is to tackle global antibiotic resistance by discovering naturally occurring antibiotics in soil. This has become a solution to the growing problem of antibiotic overuse, which is driving resistance. Bacteria were isolated from a Trader Joe's plant soil, plated on 1/10 LB agar, and incubated at 28.0. After successfully isolating and identifying 6 bacterial strains, 3 were tested for their potential as antibiotic producers. This process was carried out by patching each bacterial colony onto two safe relatives of ESKAPE pathogens: the gram-positive *Staphylococcus epidermidis* and the gram-negative *Escherichia coli*. All patch-plating continued to utilize LB agar media at 28.0. Antimicrobial production activity was clearly identified on one bacterial strain and suspected on a second. To further investigate, a Gram stain was performed to identify the cell type. Using 16F and 1387R primers, PCR was performed on two colonies, and the resulting product was loaded into sample wells for gel electrophoresis. Both PCR products resulted in a band of the expected length. To identify the bacterial species, the two PCR products were cleaned and sent for sequencing; specifically, the 16S RNA gene was amplified. Using the NCBI BLAST database, one bacterial colony was identified to be 99.76% *Streptomyces griseorubiginosus*, and the other colony was identified to be 99.85% *Amycolatopsis dendrobii*. A series of biomedical tests was conducted to better understand the metabolic characteristics of each colony.

## 75 From Pasture to Petri Dish: Discovery of Antibiotic-Producing Bacteria

LINSEY PARDOWSKY, AMELEA CRISWELL  
University of Wisconsin-Green Bay

Antibiotic resistance, a pressing worldwide health crisis, poses a threat to modern medicine. Tiny Earth, a student-led project, searches for naturally occurring antibiotic producers in soil. Our sample was sourced from an organic dairy farm pasture in Casco, Wisconsin. The soil sample was serially diluted and plated on Luria-Bertani (LBA) with

cycloheximide to assess the microbe population density and find unique microbes. The unique bacteria were picked and patched to create LBA and Potato Dextrose agar (PDA) master plates. Once our colonies grew, we patched them into tryptic soy agar (TSA), 10% TSA, LBA, and PDA plates, each being first spread with *Escherichia coli* (*E. coli*) or *Bacillus megaterium* (*B. megaterium*) to find zones of inhibition. Only three of our twelve unique bacteria showed antibiotic-producing activity. Isolate 8 showed antibiotic activity towards both *B. megaterium* and *E. coli* and Isolates 9 and 12 showed antibiotic activity towards *B. megaterium* only. Gram staining was then completed which showed that Isolate 9 was gram-negative rods and Isolates 8 and 12 were gram-positive rods. Then PCR analysis and biochemical tests were done to help determine the antibiotic-producing bacteria identities. BLAST analysis will later be completed. This study will be added to the Tiny Earth database, which contributes to the search for groundbreaking drug applications to fight infections caused by antibiotic-resistant bacteria.

## 76 Antibiotics in the Mudway: Do Water-Edge Soils Hold Potential

JANELLE MEINNERT, PHILLIP HILL, ALLYSON EDEN  
Northeast Wisconsin Technical College

There is a growing global health crisis caused by antibiotic resistance. This is where existing antibiotics are becoming less effective. The Tiny Earth Project investigates this issue by using college students to help widen the search for new antibiotic-producing bacteria in soil samples worldwide. Our hypothesis was that by choosing soil sites with a combination of water availability and biodiversity in the chosen areas it would result in finding naturally occurring antibiotic-producing bacteria. We thought that between the group we would find 2-3 bacteria that had antibiotic properties. We took our soil samples, diluted them to various concentrations in water and plated them using the streak plate method. We then picked unique colonies grown from the soil dilutes to create master plates of the unique colonies. Using these master plate colonies, we tested them against gram positive and negative bacteria, *Bacillus subtilis* and *Erwinia carotovora*, respectively. Finally, we picked the most promising candidates and tested them against relatives of 8 ESKAPE pathogens on tester plates. Early in the testing process we had a few colonies with zones of clearing on our soil dilutes plates (chicken and property line) against other bacteria on those plates. Out of the few colonies only the property line sample had zones of clearing on our ESKAPE pathogen plates. Our results show that although all our locations were near water this does not mean that there will be a better opportunity for antibiotic production as we only had one location and one bacterium showed any promise of production.

# STUDENT POSTERS

## 77 Antibiotic Producers Collected from Urban & Rural Area Soil

ABIGAIL EDGAR, SARAH DAHLQUIST  
Northeast Wisconsin Technical College

For many years, scientists have sought to discover new antibiotics as pathogens have become increasingly resistant to existing ones. It is predicted that if no new treatments are found, more people will succumb to illnesses and diseases that could otherwise be treated. However, the Tiny Earth Project presents an opportunity for the discovery of new antibiotic-producing strains following large-scale investigations. To contribute to the Tiny Earth Project, our group collected soil samples from both urban and rural areas. We hypothesized that rural samples would contain more antibiotic-producing microbes than urban samples. This was based upon the assumption that rural areas, which typically support abundant plant and animal life, harbor more microbial colonies, and therefore potentially more antibiotic-emitting microbes. We diluted our soil samples, plated them using the streak plate method, and observed the resulting growth patterns. The microbes were then inoculated onto plates containing *Erwinia* and *Bacillus* to compare growth patterns of each colony and determine which secreted antibiotics. We then selected one of our microbes from our urban and rural samples and tested it against relatives of the ESKAPE pathogens. Our results indicated that the rural soil sample contained an antibiotic-producing bacterium, whereas the urban sample did not. Our hypothesis was correct, as only the microbes from the rural area exhibited antibiotic activity. Analysis of our findings is ongoing, and some aspects of the experiment remain to be fully determined.

## 78 Digging for Hidden Antibiotics in Local Soil Samples

LYAN GARCIA CAMPOS  
Northeast Wisconsin Technical College

There are many antibiotic-resistant infections in the world, but there are believed to be many more antibiotics in the soil that can be valuable in the treatment of these. Tiny Earth is hoping to encourage people around the world to explore the soil in hopes of finding new antibiotics to fight these bacterial infections. At NWTC we have been given the opportunity to research a soil sample from a location of our choice to see if we are able to successfully discover a new antibiotic that might be useful in treating bacterial infections. My hypothesis is that my sample will contain only one zone of inhibition. I collected my sample in Marinette, took it to the lab, and diluted one gram of my sample four times. I then chose which dilution level had the best results and got two new media to have a new variable in each one and inoculated them with that

level of dilution to see how the results would vary. The week after, I inoculated three LB plates (one plain, one with *Erwinia carotovora*, and one with *Bacillus subtilis*) with 20 colonies each that I chose from my new media and four original plates. I then created an all-tester plate with nine different bacteria inoculated with the colony of my choice. Upon returning to the lab, I found that I had three sites with zones of inhibition. I only expected one, as stated in my hypothesis, so having three was unexpected.

## 79 Antibiotic Producers from Different Regions

CAILEY EVERARD, CORA BEHNKE, ZANDRIA KEL  
Northeast Wisconsin Technical College

For many years, researchers have had problems with antibiotic resistance. Pathogens have been evolving more resistance to antibiotics, making infections harder to treat. The Tiny Earth Project allows more of the community to help find different microbes in our soil that could release new antibiotics, and to present those findings at the Tiny Earth conference. We got our samples from three different kinds of places, one from the country, one from Seymour, and one from Green Bay. Our hypothesis is that the sample that was from the country will have the most microbes. We gathered our soil from different regions, then diluted the bacteria in the soil to get isolated colonies. Master and tester plates were made, selecting 20 isolated colonies and tested against gram-negative (*Erwinia*) and gram-positive bacteria (*Bacillus*). It showed if we had any antibiotic activity on these plates. Using one, we then tested those with activity to test against relatives of ESKAPE pathogens. Our results showed that between all three locations, there were 3 double-producing microbes. The country soil sample had 3 types of bacteria showing activity against *Bacillus*, and one against *Erwinia*, the double producer. The two cities' remaining soil samples both had one type of bacteria active against *Bacillus*, but one had a double producer active against *Erwinia*, while the other sample had a producer only on the *Bacillus* plate. Based on our current data, our hypothesis was accurate with the country soil having more microbes. Our research is ongoing on antibiotic-producing bacteria; more results are coming.

## 80 Uncovering Hidden Antibiotics in Backyard Soil: A Promising Isolate with Broad-Spectrum Potential

ANGELA CADENA  
Northeast Wisconsin Technical College

As antibiotic resistance continues to rise, the search for new antimicrobial compounds is more urgent than ever. Soil, often overlooked, is a hotspot of microbial life and a potential goldmine for discovering novel antibiotics. In

this project, a soil sample was collected from my backyard garden near elephant ear plants, close to but separate from a fishpond. Using Tiny Earth protocols, including soil dilution, culturing, and bioassay techniques like Master and Tester Plates, bacterial colonies were isolated and screened for antimicrobial activity. Out of all the colonies tested, one stood out. Colony #17 showed clear inhibition against *Erwinia* and *Bacillus*, suggesting it may produce a compound effective against both Gram-negative and Gram-positive bacteria. This broad-spectrum activity makes it a strong candidate for further investigation. While only one active isolate was obtained, its unique behavior highlights the hidden potential in everyday soil and the power of a student-driven discovery. Continued research on colony #17 could contribute to the fight against drug-resistant infections. This project shows that even a handful of soil from your own backyard might hold the key to the next big antibiotic breakthrough.

## 81 Looking For Antibiotic Producing Bacteria in Pamperin Park

**ANESSA COPPENS**  
Northeast Wisconsin Technical College

There is a major issue happening that is affecting many individuals worldwide, the lack of access to antibiotics, and the lack of new antibiotics being available. This problem continues to grow and is causing an increase in deaths related to antibiotic resistance. To help combat this problem, The Tiny Earth Project was created for students to obtain soil samples from their communities with the hope of discovering new microbes that have antibiotic producing activity in the soil. I have collected a soil sample from Pamperin Park in Green Bay, WI. My thought is that with this park being a high traffic area of people from all different areas exposed to and taking in many different things, there is a good chance the types of microbes we are looking for could be present in this soil. I collected and diluted my soil sample in the lab, choosing 20 unique colonies and tested them against *Erwinia sp.* and *Bacillus sp.* My bacteria showed activity with *Bacillus sp.* My next step was testing against 8 ESKAPE pathogens. Of those 8 pathogens, my bacteria showed to be active against *L. antibioticus* and *S. epidermidis*. As of now I cannot say if my hypothesis is correct or not. I have further testing to do. I am awaiting the results of my 4-way streak to move onto the next step of my testing. Since my bacteria were active against an ESKAPE pathogen, I think there is a possibility that I will end up with an antibiotic producing bacteria.

## 82 Isolation and Identification of *Bacillus megaterium* with Antimicrobial Activity from Fox River Soil

**JOSEPH JONES, LACI HOEKSEMA**  
Saint Norbert College

In response to the rise in antibiotic resistance, there is a greater need for antimicrobial compounds, particularly those of natural origin. A soil sample was collected from the bank of the Fox River near a construction project of the Donald & Patricia Schneider Family Hall at St. Norbert College. To adhere to the goals of the Tiny Earth Project, bacteria were isolated from the sample and cultured on LYE agar at 29°C. Six colonies were isolated and patch-tested on lawns of *Staphylococcus epidermidis* and *Enterobacter aerogenes* to identify species with potential antimicrobial activity. Three colonies appeared to produce antibiotic compounds against *Enterobacter aerogenes*; each was Gram-stained, yielding Gram-positive rods, and then amplified by PCR with primers 63F and 1387R. The products were loaded into sample wells of a 0.7% agarose gel, and electrophoresis was performed to reveal the appropriate bands for the two PCR products. Both PCR products were cleaned before 16S rRNA gene sequencing. Using the sequencing results, analysis was conducted to identify the bacterial species of interest in the NCBI BLAST database. Sequence analysis suggests that the unknown species were 100% similar to *Bacillus megaterium*. Following this identification, a variety of biomedical tests were conducted to understand the bacterial pathways further.

## 83 Antibiotic Producers Collected from Local Spots in Wisconsin

**GHAOZHIA THORE, SAMANTHA HELMLE, ARLYCE VANCAMPENHOUT, CHRISTINA WESTBERG**  
Northeast Wisconsin Technical College

The purpose of the Tiny Earth Project is to combat antibiotic resistance by collecting bacteria from local soil and advancing the discovery of new antibiotics. Antibiotic resistance is a concern in public health, with an estimated 2.8 million antimicrobial-resistant infections occurring every year in the United States. Our project contributes to this critical mission by collecting soil from areas near water and testing the bacterial growth for antibiotic properties that could lead to new treatments. To gather a diverse range of bacteria, we chose several locations near different water sources for soil collection and comparison. Our samples included soil from the following locations in Wisconsin: Duck Creek Quarry in Howard, a natural area pond in Green Bay, the Little Suamico River in Little Suamico, and a small ditch along the Ariens Trail in Brillion. Each group member collected soil samples from approximately two feet from the

# STUDENT POSTERS

water's edge and about six inches below the surface. We predicted that at least one of our samples would show moderate antibiosis. Our methods included sterile soil collection, dilution and titration, and colonization. After incubation in various growth conditions, we tested our isolated strains against multiple bacteria to assess their antibiosis capabilities. Results from Ariens Trail and Little Suamico showed activity against *Erwinia*, while results from the Howard Quarry showed activity against *Bacillus*. As our testing remains ongoing, it is encouraging that a few samples have already shown promise for antibiosis properties, which will contribute valuable data.

## 84 Competitive Inhibition in Antimicrobial Bacteria

ANTHONY MADRID  
Northeast Wisconsin Technical College

The question asked by every healthcare professional is simple yet profoundly complex: how can we save lives? We aim to answer that question by researching potential antibiotic-producing bacteria. This study aims to find antibiotic-producing bacteria through competitive inhibition with other organisms. Over the course of the last three months, soil samples were collected, serially diluted, isolated, and tested against known ESKAPE cousin bacteria, such as *E. coli* and *S. epidermidis*, to determine if they might prove to be effective antibiotic producers. Bacteria that showed the most potential, via zones of inhibition, were tested against various types of known organisms. While the sample we isolated did not show promising results, this was only a single microbe tested. There are many more that could and should be tested.

## 85 The Hidden Pharmacy Beneath Our Feet

ALEC OBERHOFER, ALEXANDRA GARCIA-RUBIO  
University of Wisconsin-Green Bay

The growing threat of antibiotic resistance is a global health issue. Antibiotics are becoming less effective against evolving bacterial pathogens. The Tiny Earth Project is an initiative that aims to address this problem. To investigate this, soil was collected from the Brown County Dog Park (44.5266°N, 88.13534°W). One gram of the collected soil sample was serially diluted in sterile water and plated on Luria-Bertani agar (LBA) containing cycloheximide for 48 hours at 28 degrees Celsius to isolate bacteria. Ten unique colonies were patched to LBA and Potato Dextrose agar (PDA) to create library plates. To screen for antibiotic activity, soil isolates were patched to Tryptic Soy agar (TSA), 10% TSA, PDA and LBA plates containing either *Escherichia coli* (*E. coli*) or *Bacillus megaterium* (*B. megaterium*). Three isolates showed antibiotic activity. Isolate number 7

showed antibiotic activity against *E. coli* on 10% TSA and *B. megaterium* on 10% TSA. Isolate number 8 showed antibiotic activity against *B. megaterium* on LBA and 10% TSA. Isolate number 9 showed antibiotic activity against *B. megaterium* on LBA. The Gram stain was performed on the three unique colonies to determine if they are gram positive or gram negative and observed the shape of the bacteria. Results indicated that colony number 7 from the library plate was a gram-positive *Bacillus*, colony number 8 was gram-negative *Bacillus*, and colony number 9 was gram-positive *Bacillus*. The antibiotic-producing bacteria identified will be studied for future therapeutics.

## 86 Antibiotic-Producing Microbes Collected from East Riverbank

K. PRELLWITZ  
Northeast Wisconsin Technical College

The rise in growing antibiotic resistance poses a significant threat to global health as bacteria become increasingly resistant to existing antibiotic treatments. This project aims to test soil-derived microbes to see if they can produce new antibiotics. Soil samples were collected locally from Ledgeview Park, located along the East River, to investigate the presence of microbes capable of producing new and original antibiotics, with the hypothesis that the unique conditions of the site, near water, might support the growth of such microbes. The soil sample was diluted and plated on LB agar using the streak plate method, colony counts were recorded, and the corresponding dilutions were further tested on R2A and LB plates incubated at 37°C to increase diversity. Additionally, the samples were challenged with *Erwinia* and *Bacillus* on LB plates to assess potential antibiotic activity. Preliminary results did not indicate the presence of antibiotic-producing microbes in the collected sample, which does not support the hypothesis. Research is still ongoing with continued testing against ESKAPE pathogens, and final results have yet to be determined.

## 87 Antibiotic Screening of Local Park Soil Bacteria

SAMANTHA HER  
Northeast Wisconsin Technical College

Antibiotic resistance has become a major problem over the years. This research project aims to test soil from Lois Aubinger Park in Ashwaubenon in hopes of finding bacteria with antibiotic properties. Lois Aubinger as it is a more natural area, therefore its soil may contain bacteria with antimicrobial properties. The soil sample was collected using sterile tools. It was then diluted and spread on to agar plates using the streaking method to isolate bacteria on the plates. The isolated colonies from those agar plates were then tested

against *E. carotovora* and *B. subtilis*. Only one bacterial colony appeared to show possible activity against *E. carotovora*. The rest of the results do not show any antibiotic producers of this soil sample at this time. This project is still ongoing, and there are more tests to be done. The results of those tests are not complete.

## 88 Finding The Hidden Antibiotic Producers

ZOEY BROWN

Northeast Wisconsin Technical College

We are now in the age of antibiotic-resistant pathogens becoming more prevalent. One way we can combat this is by using the Tiny Earth program to find antibiotics right here among us. We do this by finding and researching soil collected in our vicinity in hopes of finding new bacteria that have antibiotic properties. Hoping to find the right bacteria, I took a soil sample from my parent's back yard. My hypothesis was that the soil from the spot I collected would have lots of bacteria because there was a good amount of organic matter above and around the collection site. I diluted the soil 4 times and plated it on agar plates using the 4-way streaking technique. The bacteria I found was then inoculated and tested against *B. subtilis* and *E. carotovora* to see how my bacteria would react. My soil did have one possible antibiotic bacterium which was shown to resist *E. carotovora* but when tested against the ESKAPE pathogens my single bacteria showed no further results of being an antibiotic producer. My hypothesis was right that I did have lots of bacteria from my location of interest and having more organic matter means more possibilities for antibiotic producers. The research of my bacteria is ongoing as I am hoping to find out what bacteria I did find. Maybe it could be something new, only further research will tell.

## 89 Impact of Manure Treatment on Antibiotic Presence in Soil Bacteria

NOLAN BUNNELL, VERONICA STEWART,  
ASHTON LEAHY, EMILY AU

University of Wisconsin- Madison

Manure is commonly used as a fertilizer in agriculture to support crop growth. This is because manure treatment increases the abundance and diversity of the microbes in the soil biome. Previous antibiotic research tends not to look into manure because of the inconveniences that testing manure creates in the lab setting, however by using manure treated soil rather than manure itself most of these complications could be avoided. Soil samples were taken from several spots in two agricultural fields in Antigo Wisconsin. One being a field recently treated with manure and the other not. Bacteria from the soil samples were then grown and colonies were screened for antibiotic activity against ESKAPE pathogens.

## 90 The Impact of Water Depth on Abundance of Antibiotic-Producing Bacteria in Lake Mendota Soil

ANYA KAEHNY, EMILY LEIGHT, JACLYN CUMMINGS,  
YASMEEN SABKI

University of Wisconsin - Madison

This study investigated soil from three different depths of Lake Mendota in order to determine which depth was most likely to contain bacteria capable of inhibiting ESKAPE pathogen relatives, which are antibiotic-resistant organisms. The study evaluated how bacteria differ in amount and physical attributes, including antibiotic production, from a shallow depth (less than 1 foot below the surface), a medium depth (5 feet below the surface), and a deeper depth (9 feet below the surface). We hypothesize that as water depth increases, the number of antibiotic-producing bacterial colonies will decrease. After collecting and diluting soil samples, bacterial colonies were plated onto PDA agar plates, and colonies were picked and patched. The bacterial colonies were tested against six different ESKAPE pathogen relatives by screen plating, and the bacteria that were antibiotic producers created a clear zone of inhibition. Antibiotic-producing bacteria were found in all three soils. A 2x3 Fisher Exact Probability Test found a statistically significant difference between the three treatment groups, specifically between the shallow group and the other groups. These results support the research efforts used to fight against antimicrobial resistance. Future research will investigate genetic analysis of antibiotic-producing soil isolates with colony PCR testing.

## 91 Can this Bacteria Produce Antibiotics?

KENLEY KNIGHT

Northeast Wisconsin Technical College

Antibiotic resistant pathogens are a worldwide health threat that is on the rise. There are some bacteria that can no longer be effectively treated with antibiotics, but with the help of the Tiny Earth project we can contribute to the search for new antibiotics. I collected my soil sample from the Brown County Dog Park. My hypothesis was that my soil would have microorganisms able to produce antibiotics because the soil I collected was in a warm and moist area, favorable for bacterial growth. In the lab we diluted our soil samples and plated them to grow bacterial colonies on agar plates. I then chose two new conditions for my bacteria. I chose an R2A agar plate which is nutrient poor and a TSA agar plate which is nutrient dense. From there, the microbes were tested against *Erwinia* and *Bacillus*. None of my bacteria showed activity against *Erwinia* or *Bacillus*. I then chose one of my microbes to test against the

# STUDENT POSTERS

ESKAPE pathogens. So far, I have no evidence that my soil contains antibiotic producing microbes, however my research is ongoing, and results are to be determined.

## 92 Antibiotic Producers from Pamprin Park

DIANA AVILA HERNANDEZ  
Northeast Wisconsin Technical College

One of the many difficulties scientists all around the world have faced is the inability to find or create a drug that has the proper mechanism of action to be effective against antibiotic resistant pathogens. It is estimated that the mortality rate from antibiotic resistant pathogens is 5 million plus worldwide each year. The Tiny Earth organization is all about the mission of discovering a new antibiotic source that helps address the antibiotic resistance crisis, while also allowing students to learn and do research on soil that has some microbes that have antibiotics and contribute our research and findings to the public. Thus, to join in this project I have taken soil from Pamprin Park near water. My purpose in doing so was to see the soil near water containing more microbes that had antibiotics. To start this process, we diluted and plated our soil sample. The plate samples were then taken to be inoculated against the bacteria *Erwinia* and *Bacillus* to experiment with which microbes produce antibiotics against the following bacteria. My Pamprin park plate had 3 potential antibiotic releasing microbes. Then I picked one out of the 3 antibiotic producers because it showed the most activity and put them against ESKAPE pathogens. Which resulted in the bacteria being active against one out of the 8 pathogens which was *Bacillus*. Showing that my hypothesis was inaccurate, as the site didn't create more microbes with antibiotic activity. My soil project research is still ongoing, so results are yet to be concluded.

## 93 Antibiotics Found in SNC Soil

ABIGAIL DOLL, KEIRA JOHNSTON  
Saint Norbert College

Due to the rise in antibiotic resistance in pathogenic bacteria, the demand for naturally occurring antibiotics is on the rise. In alignment with the Tiny Earth Project's goals, bacteria were isolated from soil samples found around St. Norbert College's campus and cultured on 1/10 TS agar and incubated at room temperature. 10 colonies were picked from the plate and were patched on a lawn of ESKAPE pathogens in order to determine if they have antibiotic properties. Of those colonies, 4 were observed to have antibiotic activity; these colonies were then Gram-stained and examined under a microscope. A PCR was then conducted using two primers: 63F and 1378R. After preparing the 0.7% agarose gel, the

PCR products were loaded into the sample wells. After running electrophoresis for 3 samples, one of the PCR samples showed a visible band of the expected length. The colony was cleaned using a column and then sent in for sequencing of the 16S rRNA gene we amplified. After obtaining the sequencing results, the gene sequences from both primers were analyzed to identify bacterial species. This was done by comparing the sequence against the NCBI BLAST database. Sequencing of the 16S RNA suggests that this unknown is 100% *Paracoccus* sp strain. Then a series of biomedical tests was performed to determine more about its metabolic characteristics.

## 94 Backyard Antibiotic Producers

ADRIANA HURST  
Northeast Wisconsin Technical College

Every day the clock is ticking on our ability to fight off infections as pathogens become more resistant to our antibiotics. As pathogens build resistance against antibiotics, a disease that as of now may not seem like a big deal could end much more seriously without the aid of antibiotics to fight against it. The Tiny Earth project gives us the opportunity to help in the search for new antibiotics within our own communities to help fight against this threat. For this project I chose to take a soil sample from my backyard near a compost pile and common path that many animals use to travel. I hypothesize that I will find at least one microbe with antibiotic properties. To find some results on this I diluted and cultured the soil samples using a streak plate method. I then tested multiple colonies found from the dilution against *Bacillus subtilis* and *Erwinia*, then chose one that exhibited antibiotic properties against *Bacillus* to further test against ESKAPE pathogens. I found that one of the bacteria consistently showed antibiotic properties against *Bacillus*. This supports the hypothesis that there will be at least one microbe with antibiotic properties in my soil sample.

## 95 Breaking Ground on Antibiotic Discovery

KELSEY LAATSCH  
Northeast Wisconsin Technical College

Antibiotics have been around for almost 100 years and have only increased in popularity as they have discovered what they can be used for. This has led to a shortage of antibiotics in the world. This is due to how hard they are to find and can't just be man-made. This has led us to the Tiny Earth Project. This project is so that all of us are able to help with locating some more forms of antibiotics. We are in a crisis of losing the benefit of having antibiotics around us. This project could help find a new species in a place no one has ever looked and if found in a

routine area, it would be possible to help mass produce potentially. At this time my prediction is that I will not have discovered an antibiotic within this program. I do believe that with the right elements and a little more preplanning it could be possible to create an appropriate atmosphere for one, but I imagine that mine is too common and will not have anything undiscovered found within it. We have used a series of testing to help find out if our dirt collection sample hosts a form of an antibiotic. This included various growth environments. At this time I currently have two pending specimens that I am waiting to finish testing in regard to the possibility of antibiotic growth. My results at this time haven't been completed, but I am still optimistic about the results I do currently have.

## 96 Antibiotic Producers Collected from a Small Farm

ALISON DAILEY  
Northeast Wisconsin Technical College

Over the past couple of decades, antibiotic resistance has become a persistent problem within the scientific and medical communities. This has been compounded by the inability to discover new antibiotics. The lack of antibiotics has led to increased death rates worldwide. The Tiny Earth organization has provided an opportunity to examine soil in our communities to find new antibiotic microbes and present them at a conference. Within the community, a soil sample was taken from a small farm. The hypothesis was that the microbes would be higher at a small farm due to concentrated animal activity. The soil was plated and diluted using the streak plate method. These microbes were then inoculated and screened against the bacteria *Bacillus* and *Erwinia* to determine if any microbes were present that could produce antibiotics against these bacteria. The small farm had 2 microbes that produced antibiotics against *Erwinia* and none that produced against *Bacillus*. One of the 2 microbes was chosen and then screened against the ESKAPE pathogens. The microbe had zero antibiotic producers against ESKAPE pathogens. As the research on the antibiotic-producing soil from the small farm is still ongoing, some results are yet to be determined.

## 97 Discovering Earth's Hidden Helpers with Ground bees and cattail plants

AMANDA BUNTING, NATANAYA BURTON  
Northeast Wisconsin Technical College

Since the discovery of antibiotics, antibiotics have been curing infections for years. But over time pathogens have mutated making the antibiotics we currently use, ineffectively on these mutated pathogens. Scientists have been searching for new antibiotics to assist with curing infections since pathogens have mutated. Tiny earth

allows students to test soil in search of new antibiotic discoveries. In our group, we have tested two different soil samples. One soil sample was taken from an area where ground bees are found. Bees have been known to have healing properties from their honey to their venom. The second soil sample was collected from a ditch where a pipe drains sub pump runoff surrounded by cattails. Cattail plants are known as a source of vitamins and minerals when consumed. Cattail plants are also known for antimicrobial and anti-inflammatory properties. Both the samples have local hidden helpers (Bees and cattails), this would give great potential for microbes to grow. Both samples were diluted and plated using a streak plate technique. Then the isolated colonies were screened against multiple bacteria (*Bacillus* and *Erwinia*). This was done to see if either of the samples would produce antibiotics against the bacteria that were added. The bee plate showed two, one from each. Cattails plates showed four, all on the *Bacillus subtilis* plate. The next test was the ESKAPE test. Unfortunately, Cattail plants showed none but the soil from the bees showed one, *S. epidermidis*. Our research is still being tested currently.

## 98 Dirt to Data: Understanding Antibiotic Resistance

ARIANA JOHNSON, ALORA GIESBERS  
University of Wisconsin- Green Bay

Antibiotic resistance is an escalating global concern. Over time, antibiotics and other antimicrobial medicines are becoming less effective, making infections increasingly difficult or even impossible to treat. To help address this issue, we conducted research on a soil sample collected from UWGB's arboretum trail (44.5269704, -87.9182852). One gram of the sample was diluted with sterile water, plated on a Luria-Bertani Agar (LBA) plate, and incubated at 28°C. Our nine unique bacterial colonies were then streaked onto both LBA and Potato Dextrose Agar (PDA) plates to create master plates. We screened for antibiotic activity using LBA, PDA, Tryptic Soy Agar (TSA), and 10% TSA plates inoculated with either *Bacillus megaterium* (*B. megaterium*) or *Escherichia coli* (*E. coli*). Two of our isolates (2 and 5) demonstrated antibiotic activity against *B. megaterium* on LBA. Isolate 2 demonstrated antibiotic activity against *B. megaterium* on TSA. Upon further examination, both isolates were identified as gram-positive bacilli. These findings contribute to the global effort to discover new antibiotic-producing strains. Our isolates will be added to Tiny Earth's soil sample database, potentially aiding future research in the development of novel antimicrobial treatments.

# STUDENT POSTERS

## 99 Discovering Natural Antibiotic Producers: A Tiny Earth Investigation of Soil Bacteria near St. Norbert College

COLE PAWLITZKY, EZRA SCHERMACHER  
Saint Norbert College

Due to an increase in bacterial antibiotic resistance, there is a high demand for antibiotics occurring naturally in the environment. Keeping the Tiny Earth Project's goals in mind, soil samples were collected from underneath a tree near St. Norbert College in De Pere, Wisconsin, and cultured on 1/10 LB agar media. After isolating 24 colonies, the bacteria were patched on a lawn of ESKAPE bacteria closely related to pathogens to determine if any were possible antibiotic producers. Since they were observed growing better on 1/10 LB media, plate-patching was conducted on it. Four colonies were observed to have antimicrobial activities against *Escherichia coli*, and one against *Staphylococcus epidermidis*. They were then Gram-stained and examined under the microscope. A PCR was conducted using the two primers 63F and 1387R. Electrophoresis was run on a 0.7% agarose gel, which showed a visible band of the expected length as the outcome. Each PCR product was cleaned and sent in for sequencing the 16S rRNA gene we amplified. After obtaining the sequencing results, the gene sequences from both primers were analyzed to identify bacterial species by comparing the sequences against the NCBI BLAST database. Sequencing of 16S RNA suggests that Unknown A is 100% *Streptomyces lydicus* and Unknown B is 100% to *Pseudoduganella plicata*. A series of biomedical tests was performed to learn more about its metabolic characteristics.

## 100 Buy Dirt

JOSEPH ELLIS  
Northeast Wisconsin Technical College

The proliferation of pathogens resistant to antibiotics combined with the slackened pace in antibiotic discovery resulted in a unique crisis threatening global consequences. Because antibiotics are a low value product and pharmaceuticals for the treatment of symptoms are a high value product there is little money funneled into the discovery of new antibiotics. One of Tiny Earth's goals is the discovery of new antibiotics. My project is to sample soil from my property that should have significant microbial activity, isolate antimicrobial producing organisms in the environment, and then screen their extracts against the ESKAPE cousins. I took

a soil sample from a lowland adjacent to a creek on my property and used serial dilution to isolate a sample. I isolated bacteria from a Luria Bertani Agar plate. I did not find as many unique colonies as I had anticipated. This surprised me, but the prevalence of spreaders was likely to be blamed for the shortage. The lowland soil I sampled experiences periodic flooding, which changes pH and oxygen availability. This can create stress that may result in a greater diversity of species, as well as new challenges inducing microbes to produce secondary metabolites like antibiotics to inhibit competing microorganisms. In the struggle for survival and dominance an antibiotic capable of killing competing microorganisms may be produced and isolated for research.

## 101 Born From Beer: Bacteria Isolated From Soil Contained In A Neglected College-Home Planter

MAKOA BATONGBACAL, RYAN FLOOD, JOSHUA HOWE  
Saint Norbert College

Due to the rise of antibiotic resistance among pathogenic bacteria, and increased use of antibiotics in pharmaceutical settings, new varieties of naturally occurring antibiotics are rising in demand. In alignment with the Tiny Earth Project's goals, bacteria were isolated from a gross and neglected planter located in the upstairs of an on-campus housing unit. After isolating 5 colonies, they were patched on a lawn of ESKAPE safe relatives such as *Escherichia coli* and *Staphylococcus epidermidis* to determine possible antibiotic producers. Plate-patching was conducted with 1/10 LB agar media to provide a setting similar from which the bacteria were harvested from. Two colonies were suspected to have antimicrobial activities against the pathogen. The colonies were Gram-stained and examined under the microscope in order to determine gram-positive or gram-negative bacteria characteristics. A PCR of the 16S rRNA gene was then conducted using two primers: 63F and 1387R. After preparing the 0.7% gel, the PCR products were loaded into the sample wells. As a result, one PCR product yielded a visible band of the expected length. The corresponding PCR product was then purified and sent in for sequencing of the 16S rRNA gene. After acquiring the sequencing results, the gene sequence from both primers were analyzed to identify which bacterial species were present. In order to do so, the sequences were strategically compared to sequences of the NCBI BLAST database. The 16S rRNA suggests that this unknown is 75.31% to *Curtobacterium sp.* LCR22. Following the 16S rRNA results, a series of biomedical tests were performed to determine more about the distinct behavior and characteristics of the bacterial species.

## 102 Exploring Soil as a Source of Natural Antibiotic Producers

ALEXANDER KOUZOV, BRAEDEN BURGHER  
Saint Norbert College

Antibiotic resistance is becoming an increasing problem in today's world, so finding new bacteria that can make natural antibiotics is very important. In this Tiny Earth project, we began by collecting soil straight from our backyard to look for any antibiotic-producing bacteria. We initially diluted our soil sample to  $10^{-4}$  and spread all four of these dilutions in 1/10 tryptic soy (TS) agar plates, which were then incubated at 28.2°C. From the  $10^{-4}$  we were able to extract several colonies which we then re-streaked for isolation. A few were later restreaked against the *Acinetobacter baylyi* strain to test for antibacterial activity. A clear zone was formed between the two, suggesting that the isolate produces something that prevents the *Acinetobacter baylyi* strain from growing. A gram stain showed purple, filamentous cells, indicating a Gram positive cell. We then ran a PCR reaction using 63F and 1387R primers, running about 30 cycles using a hot start at 94°C. When we ran the sample on a 0.7% agarose gel, we saw a clean band showing that our DNA was successfully amplified. The DNA was then cleaned with a spin-column kit and sent out for sequencing. Once we analyze the 16S sequence the species can be identified and its antibiotic properties can be explored further.

## 103 Antibiotic Producers Collected from Black Creek, WI Soil

MEGAN HENDRICKSON  
Northeast Wisconsin Technical College

We are currently living in unsettling times where we are experiencing a rise in antibiotic resistance. The need for new and effective antibiotic discovery is imperative. The Tiny Earth project is a great way to engage students in addressing this challenge by allowing us to study soil samples locally and analyze them for antibiotic producing bacteria. The soil was collected from a drainage ditch that had water, vegetation, and appeared to have high amounts of organic matter within it. Due to these ideal conditions, I hypothesized that this soil would be rich in potential antibiotic producing microbes. The soil was then diluted and plated using the streak plate technique. 20 different isolated colonies were then selected to be screened against *Bacillus* and *Erwinia*. From this soil sample only one strong antibiotic producer was initially observed which is in line with the original hypothesis. It was then screened against the ESKAPE pathogens. Results from that screening have not yet been analyzed and the remaining research is yet to be conducted so some additional results and the determination of whether or not my hypothesis was correct are to be determined.

## 104 Antibiotic Producers Collected from NWTC

MIRYSSA VANDERTIE  
Northeast Wisconsin Technical College

Over the last few decades there has been an increase in antibiotic resistant pathogens. This antibiotic resistance has caused an increase in mortality due to infectious disease. This research is testing soil that may potentially hold microbes that can produce new or unknown antibiotics. I collected soil from a garden as it was hypothesized it holds more nutrients from the variety of plants and pollinating bees. These soil samples were then diluted and plated on an agar. Then re-plated on a dense and a high nutrient agar (TSA and R2A) to increase the diversity of growth. The sample was then inoculated and screened against the bacteria *B. subtilis* and *E. carotovora* to see if any microbes produce antibiotics against the bacteria. The results from that initial experiment revealed at least two bacteria that inhibit growth of *B. subtilis*. The microbe that had the most promising results were then screened against the ESKAPE pathogens, and the results of this experiment are yet to be determined.

## 105 Tiny Earth: Soil to Save Lives

MCKENZIE TRUESDELL  
Northeast Wisconsin Technical College

The use of antibiotics has led to the significant upbringing of antibiotic resistance. This is due to the overuse and misuse of them, leading to limited healthcare options when antibiotics are needed. Understanding the importance of antibiotic resistance and how it comes about is a reason Tiny Earth has conducted a project dedicated to giving students the opportunity to find microbes that produce new antibiotics. My hypothesis was that I would find at least one antibiotic producing microbe. I collected soil near 1436 Grant St. in Marinette, WI and performed multiple soil dilutions to six different plates. From those six plates, I had selected 20 colonies to test against *Erwinia carotovora* and *Bacillus subtilis* to determine if there was any antibiotic production. I had two zones of inhibition, which I then had chosen one to transfer over to nine different pathogens to be further tested. Those results showed a zone of inhibition in *Staphylococcus epidermidis* and *B. subtilis*. My results supported my hypothesis by showing that I could have at least one antibiotic producing microbe.

# STUDENT POSTERS

## 106 Using ESKAPE Bacteria to Test the Antimicrobial Effect of Disinfecting Wipe Compounds

KEIRA JOHNSTON, MADISON NYMAN, AVA NAEF,  
SARA NABIH, GRACIE VERBOOMEN  
Saint Norbert College

This research aims to determine the antimicrobial activity of compounds used in Rockline Industries' disinfectant wipes. Previous work centered around the antimicrobial effects of ColaLipid C (CL) and other surfactants, along with several organic acids. The current study analyzes small molecule acids and indoles with poor water solubility using non-CL solvents that do not inhibit bacterial or fungal growth alone. The research used the ESKAPE bacteria, the safe relatives of clinically relevant bacterial pathogens, along with several fungi. The bacteria were grown in Mueller-Hinton broth, diluted, and distributed into a 96-well plate with the respective testing solution. Growth inhibition was measured at 24 or 48 hours using a microplate reader. Many individual organic compounds and combinations of solvents and compounds were tested. These compounds included ARNs, SCN-2-51, MMN-11-1, CAP DIOL, DMSO, PEG, and glycines of varying carbon chain lengths. Of these compounds, ARN-111-21A, MMN-11-1, SCN-2-51, and C12 glycine were successful in inhibiting bacterial and/or fungal growth. Future plans include testing solution parameters like pH, additional organic acid and indole combinations, and testing more fungal species.

## 107 Observing the Impact of Acid Buffers in Growth Media on Antibiotic Production in Soil Bacteria

AASHRITH KAMINI  
Madison College

Antimicrobial resistance in bacteria is a growing issue impacting many people worldwide. Our research examines ways to increase antibiotic production, specifically through pH modification. Previous research has indicated impacts of pH modification on bacterial interactions, including metabolite production. We applied acid buffers (pH 2, pH 5, pH 7) to spread plate agar media and obtained unique bacterial isolates from two distinct soil samples. We screened these soil isolates against ESKAPE relatives and compared antibiotic production across conditions. This research is valuable because it provides key observations, information, and knowledge for discovering potential antibiotic compounds.

## 108 Say "Aloe" to Antibiotics: the Effects of Aloe Vera on Soil Bacteria to Produce Antibiotics

SOPHIA POLACEK, IAN TERRONES, OLIVIA JEZIOR,  
GIAYNAH RUIZ-GARCIA  
University of Wisconsin - Madison

Antibiotic resistance poses a critical global health threat. As bacteria rapidly gain resistance to antibiotics, it is imperative to keep researching new antibiotic producers. This study investigates the effects of Aloe Vera's antimicrobial properties, which are known to promote the growth of antibiotic-producing bacteria. By screening soil bacteria isolates against ESKAPE pathogen relatives, antibiotic-producing bacteria were identified. It is hypothesized that when soil bacteria is plated with Aloe Vera, more antibiotic-producing bacteria will be found. A Fisher's exact 2x3 statistical analysis was performed and confirmed the results insignificant with an obtained p-value of 0.469. Therefore the null hypothesis could not be accepted, and Aloe Vera did not select for antibiotic producing bacteria. Ten producers were identified, including broad-spectrum antibiotics.

## 109 The Effect of Vitamin B12 on Antibiotic Production in Soil Bacteria

MEGAN MALINSKY, LILA JAMES, ETHAN VANG,  
PATRA RABIDEAUX  
University of Wisconsin - Madison

There has been an ongoing global health crisis in which bacteria have become resistant to our everyday use of antibiotics. It is estimated that bacterial AMR was directly responsible for 1.27 million global deaths in 2019 and contributed to 4.95 million deaths (WHO, 2013). Specifically, ESKAPE pathogens are the leading cause of the antibiotic resistance crisis. Vitamin B12 plays roles in DNA synthesis, metabolic regulation, and neural function; however, evidence also suggests that it may influence microbial metabolism and competitive behaviors in soil environments (Kumar et al., 2023). This project hypothesized that the presence of B12 would influence the amount of bacteria with antimicrobial properties. To test this relationship, several microbial techniques were used, such as the pick and patch method, serial dilutions, ESKAPE relative pathogen screening, and genetic analyses using PCR. It was deemed an effective antibiotic producer when there was an area with no ESKAPE strain surrounding the isolate. The results of this project found no significant difference between the media that had no Vitamin B12 compared to the media that had a diluted version of the Vitamin B12.

Future steps should include conducting this experiment across larger parameters and the use of different dilutions of soil samples, as well as the Vitamin B12 supplement. Although there was no significant difference between B12 media bacterial growth and our control plates, 44 bacterial isolates were found with antibiotic properties against the ESKAPE relatives and were characterized using biochemical and genetic analyses.

## **110** Tiny Earth: The Identification of Antibiotic Producing Bacteria from Soil Samples


**POOJA THAKUR**  
Northeast Wisconsin Technical College

This study investigates if common household soil (calcareous loamy texture, moderate drainage, mild slope, ~69 °F surface temperature at night) may include bacteria that manufacture antibiotics in addition to the worldwide problem of antibiotic-resistant infections. After serially diluting a soil sample from a residential site, the isolates were plated on standard agar and tested for antibiotic activity against indicator bacteria. Despite the emergence of numerous microbial colonies, none of them showed any discernible antibiotic action under our screening conditions. These findings imply that either our culture and screening conditions were subpar or that there were no cultivable antibiotic producers in that soil. Future research should take into account different media, induction techniques, sample locations, and molecular screening for clusters of silent biosynthetic genes.

## **111** Secrets of the Soil

**AMANDA GERLACH**  
Northeast Wisconsin Technical College

Antimicrobial-resistance has become one of the most concerning public health threats in the entire world. Some of the reasons why antibiotic resistance has become such a problem in treating bacterial diseases are because of antibiotic overuse in clinical treatments, overuse of antibiotics in animal healthcare, and antibiotic overuse in agricultural practices. Many of the most effective antibiotics were originally grown from bacteria living in soil. These microbes have evolved chemical defenses to outcompete neighboring organisms, and those compounds can be used to combat human pathogens. By exploring soil microbiomes, scientists can discover new bioactive molecules that may offer hope for treating infections that no longer respond to existing antibiotics.



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Tiny Earth inspires and retains students in the sciences while addressing one of the most pressing global health challenges of our century—the diminishing supply of effective antibiotics. An innovative program spanning 30 countries, 47 states, Washington DC, and Puerto Rico, Tiny Earth brings together more than 14,000 students per year who are contributing to studentsource new antibiotic discovery from soil. Tiny Earth is expanding rapidly throughout Wisconsin. To date, 26 Wisconsin colleges, universities, and high schools have partnered with Tiny Earth to identify new life-saving antibiotics produced by soil bacteria, which have historically proven to be the most productive source of new antibiotics.



## The Tiny Earth Antibiotic Discovery Pipeline



Worldwide network of instructors teach evidence-based hands-on science.

**800+**  
Instructors  
Worldwide

**80+**  
Trained Yearly



Students study microbes from local soils with interactive research.

**16,000+**  
Students per  
Year

**540**  
Institutions



Pathogen-inhibiting isolates are recorded in the global Tiny Earth Database and shared.

**26,380**  
Total Isolates

**1653**  
Isolates from  
Outside the U.S.



Students share samples with the Chemistry Hub scientists for genomic and metabolomic analysis.

**34**  
Contributing  
Institutions

**4,335+**  
Isolates in the  
TECH Collection

**291**  
Complete  
Genome  
Sequences

**22**  
High Priority  
Isolates



Identifying antibiotic compounds to combat the resistance crisis.

**28**  
Known bioactive  
structures  
identified

**Coming Soon:  
Novel Antibiotic  
Structures**

### Connect with Tiny Earth

Tiny Earth Partner Instructors (TEPIs) teach Tiny Earth students all over the globe to develop and test hypotheses, collect soil, isolate bacteria, screen for antibiotic activity, and log data in the Tiny Earth Discovery Database. Check out upcoming events where TEPIs and students gather to share experiences and resources.

[tinyearth.wisc.edu](http://tinyearth.wisc.edu)

