

# ENDOPHYTE SERVICE LABORATORY

SPRING 2022

139 Oak Creek Building, Corvallis OR 97333 | 541-737-2872 | [emt.oregonstate.edu/endophyte-lab](http://emt.oregonstate.edu/endophyte-lab)

## Letter from the Director

It is an understatement to say that it has been a challenging past couple of years. Despite the hurdles that the pandemic dealt, the Endophyte Service Laboratory (ESL) rose to the occasion and delivered levels of service and quality assurance/quality control that addressed the needs of our clients. We hired a new technician (welcome Dr. Honneffer!) as well as numerous students and, with them, navigated to create a safe workplace that was able to return results for submitted samples in a timely manner. We are fortunate to work with such a great team! The first part of this newsletter is dedicated to introducing you to them.

Our website went through a major overhaul which resulted in increased functionality on both the user and laboratory interfaces in addition to enhanced security. This is still a work in progress; please provide feedback so that we can better optimize the system. Moreover, with the addition of a new non-commercial client web-based form, we are now 100% electronic in our sample submission and results communication. A new mass spectrometer instrument has also been added to our equipment inventory which will be utilized to develop more precise assays for detection of both current and projected mycotoxins of concern in feed materials. I thank you for your overwhelming support and patience throughout these difficult times; we feel enormous gratitude for our clients and the relationships that we have built with each of you. I wish you a great harvest for the coming year and hope that we can continue to play a positive role in meeting your food safety objectives. I'm happy to say that my door is OPEN once again if you would like to stop by; I'm also available by Zoom or phone (541-737-9414) if you'd like to chat.

*Jennifer Durringer, PhD*



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# Meet our faculty team!



**Anita Holman, BS**  
*Laboratory Technician*

In 1990, I started as a freshman work-study student for the College of Veterinary Medicine. As I worked toward my degree in Biology, I was able to continue working for the same lab. It allowed me to explore many areas of science and meet people from around the world. I helped out with projects involving nutrition for typical livestock but also our native wildlife and exotic things like rhinos. I also got to help with a project involving baleen whales and the degradation of crude oil to explore an environmental cleanup option. I got to learn about different types of racing animals and drug testing. The year before graduating, I was trained to test for endophyte alkaloids in feed that can cause health problems for livestock if not kept below threshold levels. After graduation I applied and got a faculty research assistant position at OSU and have been testing for endophyte alkaloids and now ergot alkaloids too. Over the years, the endophyte alkaloid testing has grown from a few hundred tests a year to thousands of tests a year. It has helped the lab survive and thrive while other testing ceased, and new testing was and is still being developed. The lab and my position later became part of the College of Agricultural Sciences and is now part of their Environmental and Molecular Toxicology department. I am also part of a team of people doing research to help people in our state and beyond. With their help, I also train students to work in the lab and do clinical testing. I may not always love my job and the challenges it comes with, but it gives me a great sense of pride to know that every day I make a positive difference for people and countless animals.



**Julia Honneffer, PhD, DVM**  
*Laboratory Technician*

Julia grew up in Corvallis, until educational endeavors took her to Minnesota (BA in Chemistry, Macalester College), North Carolina (MS in Chemistry, UNC-Chapel Hill, and DVM, NC State University), and Texas (PhD in Biomedical Sciences, Texas A&M University). Along the way, she experienced the gamut of research from benchtop chemistry to veterinary medicine, as well as working in pharmaceutical and environmental testing laboratories. While earning her DVM, she became smitten with metabolomics and was thrilled to contribute to veterinary research during her PhD, using metabolomics and genomics to learn more about gastrointestinal diseases of dogs. She moved back to Corvallis with her husband and their entourage of pets in 2017. She joined the Endophyte Service Laboratory in 2021, where she performs analyses on forage samples using high pressure liquid chromatography (HPLC) and oversees the Quality Control/Quality Assurance (QA/QC) program for the laboratory. In this role, she has the opportunity to solve complex problems and find solutions to enhance efficiency and maintain integrity of results. As time permits, she looks forward to involvement in other advanced projects in the laboratory, including development of a mass spectrometry method for ergot alkaloids, and collaboration with other researchers to apply her background in metabolomics. In her free time, she enjoys gardening year-round, firmly believing the quote, "a day without dirt under the fingernails is like a day without sunshine." She and her husband enjoy walking their dog in the neighborhood or hiking in MacDonald Forest and have a love of cooking and eating good food. Her favorite dessert is tiramisu and she has a peculiar fondness for Excel.

# Students of the ESL~2022



**We have begun hiring and training nine students who will support sample analysis through summer harvest this year.**

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**Working in the ESL provides students with an experiential opportunity from which they can build laboratory and team-based skills as they apply the scientific knowledge they have gained from their program of study.**

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**Students develop an understanding of how information generated in a lab impacts Oregon agriculture and how pivotal good communication and group synergy is to achieving our mission of “providing exceptional service to our customers for their mycotoxin and natural product testing and informational needs.”**



## VISION

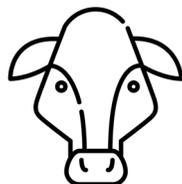
To be an international leader in providing exceptional service to our customers for their mycotoxin and natural product testing and informational needs as research emphases and market requirements evolve.

## MISSION

The **mission** of the Endophyte Service Laboratory (ESL) is to deliver quantitative results for mycotoxins of concern in feed materials to forage producers, consumers and other concerned parties. Additionally, we collaborate with diverse partners and stakeholders, support the transmission of reliable contemporary knowledge of mycotoxins, and monitor standards of food safety.

## VALUES

- Provide accurate information in the form of mycotoxin results and accompanying consultation to our clients for their feed and food materials.
- Employ high-throughput workflows and outputs to meet the demands of the forage harvest season, and to fulfill the needs of the industry and individual stakeholders for production of high-quality agricultural products.
- Disseminate current scientific literature, Extension publications and other resources to the public through our website and educational displays at local, regional and national meetings.
- Participate in international collaboration with other laboratory groups to share testing methodologies and best practices in order to support the efficient functioning of the forage export/import industry and the continued consistency and accuracy of results, building trust into the entire supply chain.
- Offer opportunities for Oregon State University (OSU) students to receive hands-on experience in a high-throughput laboratory environment to more fully enrich their education and meet OSU's mission of "producing skilled graduates who are critical thinkers."
- Support OSU's land grant mission by serving the people of Oregon and the world under the College of Agricultural Sciences' area of excellence in "Sustainable food and agricultural systems;" in-so-doing, contribute to the state's economic prosperity and confidence in a safe food supply.



# Toxicity Trends from FY21-22

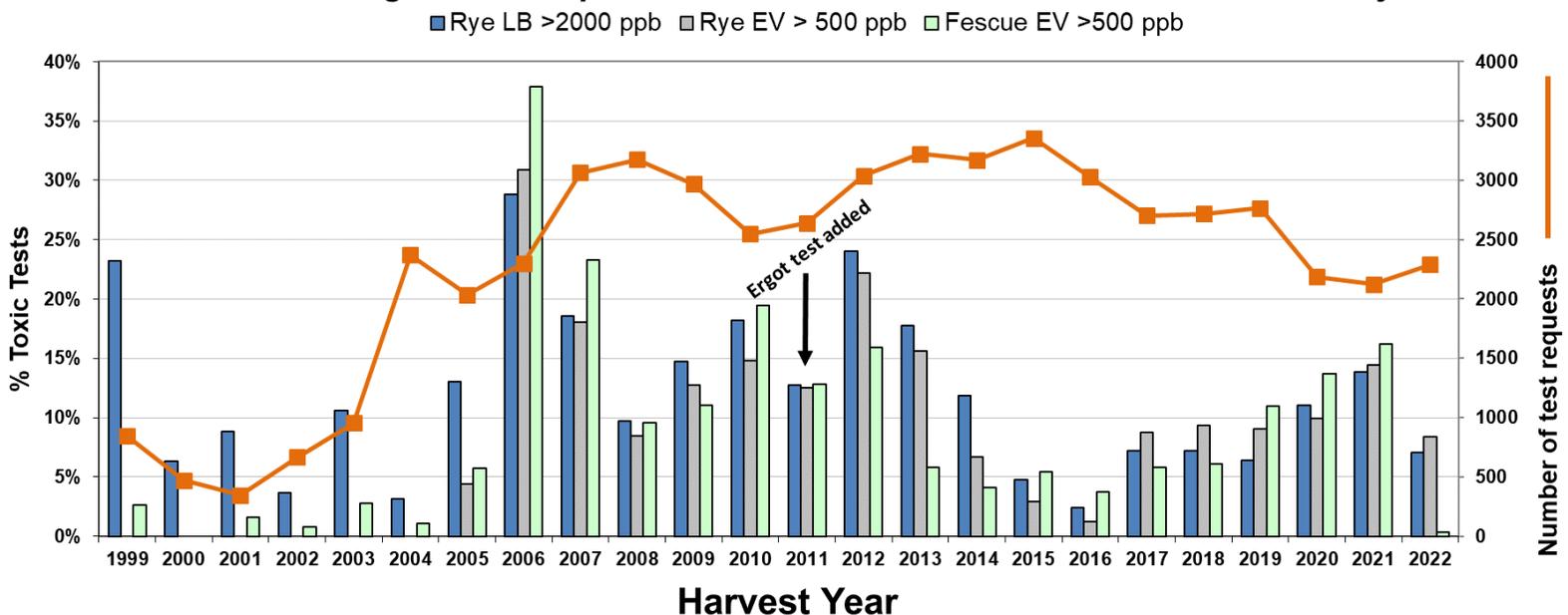
**Bottom line: Toxicity was down!**

This breaks with the trend that we had been seeing over the last three years of increasing toxicity for samples received in the ESL. The caveat must be taken that toxicity is only calculated on samples submitted to our laboratory and thus is not representative of a certain geographic area or crop year, i.e. this was not a randomized sampling of perennial ryegrass or tall fescue fields in Oregon. We don't have any solid data to propose a hypothesis as to why this occurred but is just the sort of project being targeted by

collaborative "big data" initiatives in current research funding programs.

- Toxicity was determined based on percentage of perennial ryegrass samples with greater than 2000 ppb lolitrem B (LB) (blue box) and percentage of perennial ryegrass (gray box) and tall fescue (green box) samples with greater than 500 ppb ergovaline (EV), axis on the left.
- Number of test requests the data is pulled from is shown in the orange trendline, axis on the right.

**Percentage of test requests that exceed established thresholds of toxicity**



# Endophyte Research

## Saga of the sod webworm



Francesca Rossi is an undergraduate student researcher in Dr. Duringer's Laboratory and has been working with her for over two years. She conducted research under the Oregon Seed Council project "Sod webworm management in perennial grass seed production systems" lead by Dr. Betsy Verhoeven with support from Dr. Navneet Kaur and Dr. Duringer. Below is an abstract from Ms. Rossi's presentation at the Society of Toxicology Annual Meeting in San Diego, CA March 27-31, 2022. Francesca received the Undergraduate Research Award which covered travel expenses to attend the meeting. Only 14 awards were given from a nationwide pool of applicants.

### Association of Ergot Alkaloid Profiles with Insect Tolerance in Grass Cultivars

Francesca Rossi<sup>1</sup>, Leanna Van Slambrook<sup>2</sup>, Betsy Verhoeven<sup>2</sup>, Navneet Kaur<sup>2</sup>, and Jennifer Duringer<sup>1</sup>

<sup>1</sup>Department of Environmental & Molecular Toxicology, Oregon State University, Corvallis, OR, USA

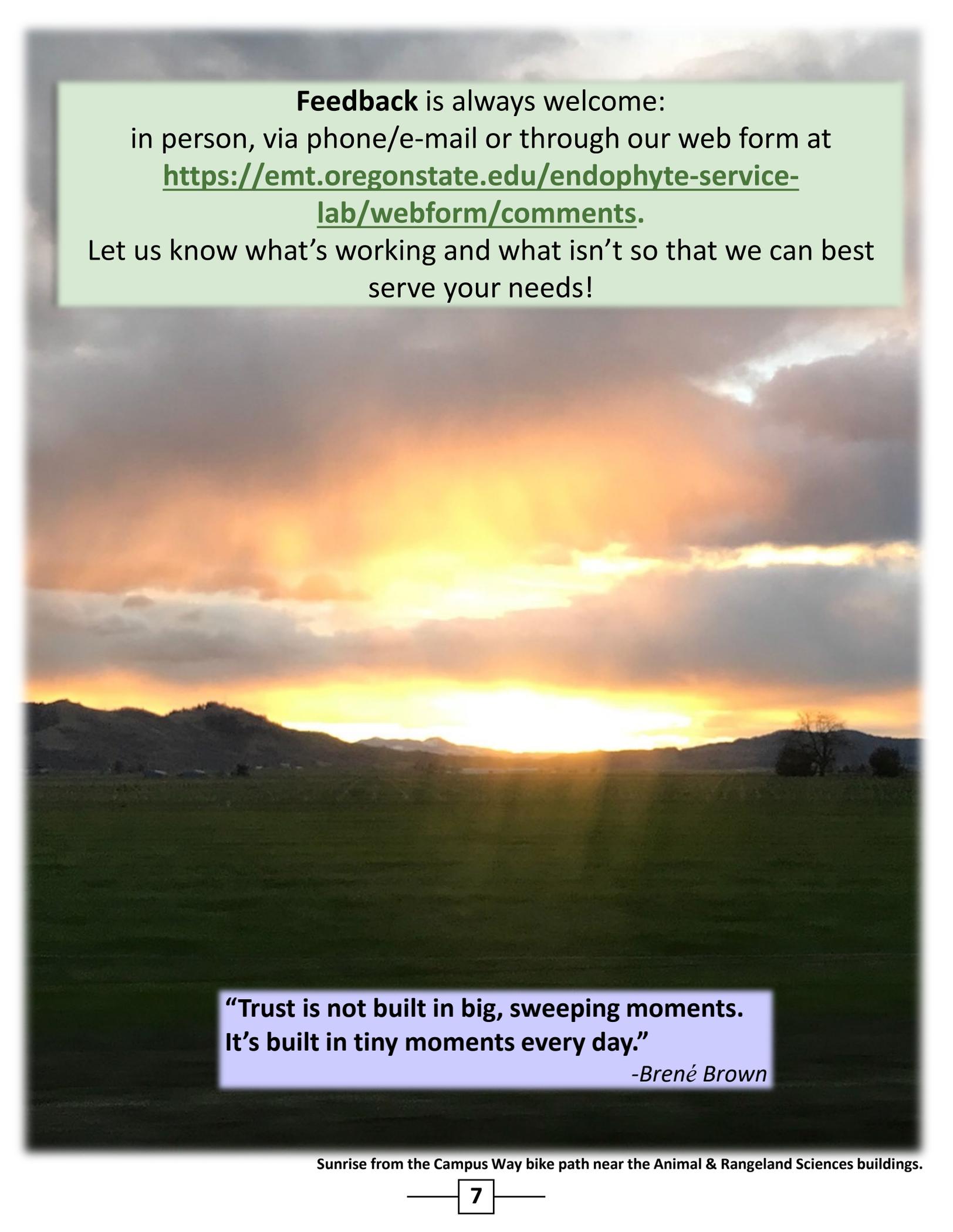
<sup>2</sup>Department of Crop and Soil Sciences, Oregon State University, Corvallis, OR, USA

The sod webworm (*Chrysoteuchia topiaria* Zeller) is one of the most destructive insect species found within grass seed operations in Oregon. During early life stages, larvae feed on the root systems leading to weakened crop stands and poor seed yields. Endophytes are mutualistic fungal species that co-exist within plants, producing secondary compounds known as mycotoxins which can serve as natural insect deterrents. Ergoline and peramine alkaloid mycotoxins expressed in some grass species have been shown to be effective insecticides, depending on their concentration and chemical profile. The present work quantified ergot alkaloids, ergoline alkaloids, and peramine across tall (n=10, TF) and fine fescue (n=8, FF), orchard grass (n=3, OG) and perennial ryegrass (n=11, PRG) via liquid chromatography-mass spectrometry (LC-MS/MS). Total mycotoxin concentrations were compared to insect resistance measured through no choice bioassays. It was found that, as a whole, ergot alkaloids averaged 91±87, 24±28, 23±13, and 39±26 ng/g; ergoline alkaloids 275±479, 2,479±7740, 173±228 and 1,665±5,170 ng/g; and peramine 1,280± 26, 24,506 ±22, 45± 0 and 17,241± 29 ng/g in TF, FF, OG and PRG samples that contained these compounds, respectively. The average percent mortality of the sod webworm on TF, FF, OG and PRG cultivars was 51%, 35%, 52% and 49%, respectively. When correlating percent insect mortality to mycotoxins detected, plants with high mortality had elevated levels of peramine and chanoclavine. This project advances the goal of protecting Oregon's grass seed industry from sod webworm predation by providing alternative, sustainable pest prevention strategies through the use of naturally occurring endophytes.

### Peer Reviewed Presentations

- 2022: Presentation of abstract at Stanford Research Conference (virtual), "a forum where undergraduates from around the world can present their work, connect with researchers inside and outside their fields of interest, and hear from distinguished researchers from a variety of disciplines."
- 2022: SOT Undergraduate Research Award to support travel and accommodations for the 2022 annual meeting in San Diego for presentation of abstract. One of 14 students awarded nationwide.
- 2021: Best undergraduate presentation-1<sup>st</sup> place-Pacific Northwest Association of Toxicologists regional meeting.
- 2021-2021: Continuing Undergraduate Researchers Program awardee, College of Agricultural Sciences, OSU. Winner, Outstanding Research Poster.

Interested in developing a research project with us? We would love to sit down and hear your ideas about mycotoxins and/or fungi! Please reach out to Dr. Duringer at [Jennifer.Duringer@oregonstate.edu](mailto:Jennifer.Duringer@oregonstate.edu) or 541-737-9414.



**Feedback** is always welcome:  
in person, via phone/e-mail or through our web form at  
<https://emt.oregonstate.edu/endophyte-service-lab/webform/comments>.

Let us know what's working and what isn't so that we can best serve your needs!

**“Trust is not built in big, sweeping moments.  
It's built in tiny moments every day.”**

*-Brené Brown*