



THE OHIO STATE UNIVERSITY

2020 GLOBAL ONE HEALTH DAY CONFERENCE

ABSTRACTS

STRENGTHENING GLOBAL
RESILIENCE THROUGH ONE
HEALTH: **A 2020 VISION FOR A
SUSTAINABLE FUTURE**

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ANTIMICROBIAL RESISTANCE

Antibiofilm activity of *Lavandula dentata* and *Origanum vulgare* essential oils against *Candida* spp

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Introduction

Candida albicans is the most common human fungal pathogen and one feature of *Candida* species pathogenicity is their ability to form biofilms. Biofilms protect from external factors such as host immune system defenses, contributing to the perpetuation of the disease and resistance to antifungal treatment. The increase in fungal infections due to the appearance of resistant fungi to different antifungal drugs, in addition to the few drugs available, makes it necessary the search for new alternatives for treatment.

Objectives

This study aimed to assess the in vitro antibiofilm activity of two essential oils from commonly available plants: *Lavandula dentata* and *Origanum vulgare*, on inhibiting *C. albicans* biofilm formation in comparison to standard antifungal agents.

Materials and Methods

We tested the effect of these essential oils on the first stages of biofilm formation: filamentation and the adhesion ability of *C. albicans*, determined by changes in morphogenesis and through crystal violet assay, respectively. The antibiofilm effect on the maturation stage was evaluated through scratch assay and viability by MTT reduction assay.

Results and Discussion

Both oils were able to inhibit filamentation, adhesion, and biofilm formation in an abiotic surface, exerting significant antifungal activity against the candida strains compare to fluconazole and nystatin. The inhibitory activity of *O. vulgare* essential oils in *C. albicans* was higher than *L. dentata*. This study demonstrates that the use of both essential oils from *L. dentata* and *O. vulgare* could be a promising strategy against resistant biofilms from *Candida* spp.

Impact

We cannot forget that a biofilm is a community of microbial cells that are adhered to a surface, and interactions between fungi and bacteria play a key role in the development of different diseases. Essential oils possess a wide range of antibacterial and antifungal potential and could be a natural, biodegradable, non-toxic, eco-friendly, and safer alternative to the used of toxic synthetic chemical compounds.

Antimicrobial activity of *Solanum torvum* hydroethanolic extracts against important mycobacterial strains

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Introduction

Tuberculosis (TB) caused by *Mycobacterium tuberculosis* complex remains a leading cause of morbidity and mortality worldwide. The zoonotic infectious condition represents a never-ending challenge towards which drug discovery efforts are needed.

Objectives

The current study was designed to evaluate the in vitro antimycobacterial activity of ethanolic extracts from roots, stem bark, leaves and unripe fruits derived from *Solanum torvum*, a shrub traditionally used against respiratory tract illnesses, including tuberculosis.

Materials and Methods

The phenotypic colorimetric micro plate alamar blue assay (MABA) was used to study the antimycobacterial activity of the ethanolic extracts against six mycobacterial strains. Each experiment was run in triplicate. Data generated was analyzed using descriptive statistics to obtain mean minimum inhibitory concentration values.

Results and Discussion

The roots, stem bark, leaves and unripe fruits exhibited minimum inhibitory concentration values of 1.250 mg/mL, 0.078 mg/mL, 1.250 mg/mL and 0.625 mg/mL against the pathogenic mycobacterial strain, *M. tuberculosis* H37Rv (ATCC 27294) respectively. *Solanum torvum* stem bark has demonstrated moderate activity against the pathogenic *Mycobacterium tuberculosis* strain. This observation validates the ethno pharmacological use of the plant species against tuberculosis. Further studies are required to isolate, elucidate the structure and characterize the antimycobacterial compounds responsible for the observed activity.

Impact

Findings from the current study will potentially contribute towards bioprospecting for a new class of ligands with activity against sensitive and drug resistant strains of *M. tuberculosis*.

Resistancebank.org: An open-access repository for surveys of antimicrobial resistance in animals

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Introduction

Antimicrobial resistance (AMR) is a growing threat to the health of humans and animals that requires global actions. In high-income countries, surveillance systems helped inform policies to curb AMR in animals. In low- and middle-income countries (LMICs), demand for meat is rising, and developing policies against AMR is urgent. However, surveillance of AMR is at best nascent, and the current evidence base to inform policymakers is geographically heterogeneous. Thus far, a large body of evidence on AMR trends in animals in LMICs is scattered across the veterinary literature as point-prevalence surveys (PPS), i.e. epidemiological studies on foodborne pathogens.

Objectives

Our work aims to centralize information on PPS conducted in food animals in LMICs and make them freely available to researchers and decision-makers. This goal can be achieved through the development of an online platform that displays AMR data aggregated in different outputs as graphs, maps, and reports. In addition, the platform should also actively involve researchers in sharing their AMR results to provide users with up-to-date AMR information.

Materials and Methods

We developed the online platform "resistancebank.org" as a shiny application through the R programming language. In addition, we used JavaScript, CSS, and HTML languages to customize the User Interface. Then, we deployed the application on the shinyapps.io cloud servers.

Results and Discussion

The platform can be accessed via any internet browser at <https://resistancebank.org>. It centralizes information AMR in animals from 1,285 surveys from LMICs. Surveys were conducted between 2000 and 2019 and include 22,404 resistance rates for pathogens isolated from chickens, cattle, and pigs. The platform provides access to individual PPS, country-level reports, and maps of AMR at 10x10 kilometers resolution. In addition, it allows researchers to upload their PPS results through a form or an Excel template.

Impact

resistancebank.org aims to be a starting point to integrate PPS results. The platform is a surrogate but not a substitute for state-of-the-art systematic surveillance systems. It summarizes current knowledge on AMR in animals and provides a tool for strengthening his evidence-based with additional PPS in the future. Furthermore, it overcomes barriers associated with traditional scientific publication (publication fees and access fees), thereby improving the visibility of researchers from LMICs, and empowering local communities of scientists. Locally, resistancebank.org could be used to encourage epidemiological investigations by field officers from LMICs in areas of particular interest. Globally, resistancebank.org offers the opportunity to support the actions of international funders such as the Bill & Melinda Gates Foundation, the Fleming Fund, the Food and Agriculture Organization, and the World Organization for Animal Health.

Role of flavohemoglobin from multidrug resistant *Staphylococcus aureus* in cellular physiology and virulence

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Introduction

One of the important bacterial pathogens of global concern is *Staphylococcus aureus*, capable of causing a wide variety of infections due to its adaptability to hostile cellular environment. A putative hmp encoding gene was identified in the genome of multidrug resistant *S.aureus* strains that exhibited significant sequence homology with the known flavohemoglobins.

Objectives

1) Bioinformatic analysis of *S.aureus* flavohemoglobin (Sa-hmp); 2) Molecular and biochemical characterization of Sa-hmp; 3) Elucidating the regulation of hmp in *S.aureus* virulence.

Materials and Methods

The hmp gene was identified in different multidrug resistant *S.aureus* strains using BLAST search. The identified gene was bioinformatically characterized using various in silico approaches like structure based multiple sequence alignment, identify-similarity and phylogenetic analysis. The gene was cloned and expressed in heterologous and native hosts. Molecular, biochemical and regulatory studies were performed to delineate the biochemical and regulatory features of the Hmp protein. Techniques used included standard bioinformatic analysis, molecular and biochemical techniques used to characterize the hmp gene from *S.aureus*.

Results and Discussion

- Growth studies showed significant increase in the NO consumption activity as compared to the control cells indicating that Sa-Hmp efficiently metabolizes NO and display a potent NOD activity. Further, results from hmp null mutant of *Salmonella enterica* suggests that Sa-Hmp provide significant protection against toxic nitrogen species.
- RT-PCR results clearly indicate the expression of Hmp in different stages of growth cycle of *S.aureus*.
- Identification of multiple putative sarA boxes in the regulatory sequences of Sa-hmp indicated for possible role of pleiotropic regulator sarA in the regulation of Hmp.

Impact

This study suggests that Hmp of *S.aureus* display oxygen dependent NO metabolizing activity in *E. coli* and *S.aureus* and protects the cells from the toxicity of NO and NO releasing compounds. These results have emphasis the importance of protection machinery against reactive nitrogen species during infection stages for successful survival of *S.aureus*. We have shown for the first time that the virulence regulator sarA protein efficiently binds to the putative sarA boxes in the regulatory sequences of hmp gene of *S.aureus* suggesting a pivotal role in the *Staphylococcus* pathogenesis. Thus, the examination of the Staphylococcal flavohemoglobin, their oxygen and NO metabolism as well as possible regulation by virulence regulator shall open up new avenues to decipher the overall complex regulatory strategy by which *S.aureus* senses and responds to its environment, may shed a ray of hope for the development of new therapeutic strategies against *S.aureus*.

CLIMATE CHANGE AND HEALTH

Spatial-temporal analysis of *Clostridium chauvoei* endemic cases among ruminants in Volyn Oblast, Ukraine

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Introduction

Analysis of publications on molecular genetic studies of the emphysematous carbuncle's causative agent - *Clostridium chauvoei*, gives us a reason to attribute blackleg disease to dangerous zoonoses that occurs animals and humans. The antigenic and genetic affinity of the pathogen strains isolated from territories of different continents of the world indicates that its evolution as a pathogen occurred simultaneously on all continents. Evidently, all continents have similar conditions that have a decisive impact on the survival, spreading and formation the parasitic form of *C. chauvoei*.

Objectives

The purpose of this work is to conduct a spatial-geographical analysis of blackleg outbreaks in Ukraine in order to identify patterns of disadvantage of individual territories in relation to this infection.

Materials and Methods

C. chauvoei cases data were statistically processed and mapped to natural and geographical factors of the region Oblasts based on this; maps were developed using QGIS 3.8.3 (QGIS Development Team, 2019).

Results and Discussion

There were the blackleg clusters in every analyzed area. The most specific territorial zones were in the Volyn region Oblast, where we identified seven disadvantaged areas. They are usually located in river basins and reclamation systems. In particular, Volodymyr-Volyn (Luga and Svinoriyka rivers), Gorokhivska (Lypa River), Kovelsky and Turiysk (Turii and Stokhid rivers, and reclamation and drainage systems located between them), Manevytska (Stir River), Rozhyshchena (Fosa River, Buttercup and Stochod) and the Kashir-Kashirska (Cir River). Imposition of a map of disadvantaged points on the physical map of the area shows that the intensity of the epizootic process has the depth of aquifers (the closer they are to the surface, the higher the probability of outbreaks of infection), with the displacement of the soil and the destruction of the surface of natural meadow pastures or hayfields.

Impact

Natural geological and geographical factors are crucial in shaping endemic blackleg cases which clustered in the certain geographical areas.

***Anaplasma* sp. in collared anteater (*Tamandua tetradactyla*) from Paraná state, southern Brazil – Preliminary data**

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Introduction

Anteaters (*Pilosa: Myrmecophagidae*) are neotropical mammals with a diet based on termites and/or ants. In Brazil, the collared anteater (*Tamandua tetradactyla*) is widely distributed, and this species may be found through all Brazilian biomes. Anteaters are frequently exposed to ticks, being *Amblyomma calcaratum*, *Amblyomma goeldii* and *Amblyomma nodosum* are the main tick species found affecting collared anteaters. Despite tick species collected from collared anteaters has been recently found as carriers of *Rickettsia* spp., the potential role of anteater ticks as vectors of other tick-borne pathogens remains to be investigated.

Objectives

This study has aimed to screen collared anteaters from Paraná State, southern Brazil, for *Anaplasma/Ehrlichia* infection.

Materials and Methods

Blood samples were collected from two collared anteaters referred to the Veterinary Teaching Hospital, Universidade Federal do Paraná, Parana State, southern Brazil. Ticks parasitizing the animals were collected and morphologically identified. DNA was extracted from blood samples and further screened by PCR assays targeting two portions of the 16S rRNA gene of *Anaplasma/Ehrlichia* spp. One collared anteater PCR-positive sample was sequenced by Sanger method and submitted to Blast® analysis.

Results and Discussion

One of two (50%) collared anteater sample was PCR-positive for *Anaplasma/Ehrlichia* spp. The concatenate sequence of the 16S rRNA gene fragment (770 bp) showed 98.19% identity with *Anaplasma platys* detected in *Canis lupus familiaris* from Saint Kitts and Nevis (CP046391), and South Africa (MK814419). A total of six *A. calcaratum* (four males, and two females) ticks were collected on two collared anteaters.

Impact

This is the first report on the detection of *Anaplasma* sp. Infecting collared anteaters. Sequencing analysis of other different *Anaplasmataceae* genes will reveal the *Anaplasma* sp. infecting the animals.

Hemotropic *Mycoplasma* sp. and tick-borne disease pathogens in white-eared opossums (*Didelphis albiventris*) from Foz do Iguaçu City, Paraná State, southern Brazil: A tri-border area of Brazil, Paraguay and Argentina – Preliminary Data

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Introduction

Hemotropic hemoplasmas are gram-negative bacteria that attach to the surface of erythrocytes of a wide variety of mammals, including humans. A novel hemoplasma species named '*Candidatus Mycoplasma haemoalbiventris*' has been recently described in free-living white-eared opossums (*Didelphis albiventris*) from Southern and Central-Western Brazil.

Objectives

The present study aimed to i) screen opossums for tick-borne disease (TBD) pathogens and ii) detect and molecularly characterize hemoplasma species infecting free-ranging opossums from Foz do Iguaçu City, a tri-border area of Brazil, Paraguay and Argentina.

Materials and Methods

A total of twenty blood samples from free-living white-eared opossums were evaluated by PCR assays.

Results and Discussion

All samples consistently amplified the mammalian endogenous gapdh gene. Two out of 20 (10%; 95% CI: 2.7% – 30%) opossums were positive for hemotropic *Mycoplasma* sp. by a panhemoplasma PCR assay based on 16S rRNA. Hemoplasma-positive samples were also submitted to a PCR targeting the 23S rRNA gene. All opossums tested negative for *Theileria/Babesia* spp. and *Ehrlichia/Anaplasma* spp. by PCR. Sequencing of the 16S and 23S rRNA, and RNase P gene fragments will reveal the hemoplasma species infecting animals.

Impact

The molecular characterization of the recently described '*Candidatus Mycoplasma haemoalbiventris*' infecting opossums in Brazil will provide the evidence that two hemoplasma species are able to infect *Didelphis* sp.

***Ehrlichia* sp. Screening in horses highly exposed to tick bites in a rural settlement from southern Brazil – Preliminary data**

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Introduction

Ehrlichia spp. are gram-negative, obligatory, and pleomorphic intracellular bacteria that infect a wide variety of mammalian species. In horses, few studies have described the presence of *antiEhrlichia* spp. antibodies in animals from Brazil, the United States, and Nicaragua. Recently, a potentially novel *Ehrlichia* species has been identified by phylogenetic analysis of 16S rRNA, *dsb*, *sodB*, and *groEL* genes in horses from Brazil and Nicaragua. However, clinical signs and vector for this infection remains unknown.

Objectives

In order to better characterize this novel ehrlichial agent and identify the putative tick vector, the present study has aimed to screen a population of horses highly exposed to tick bites for *Ehrlichia* spp. infection.

Materials and Methods

A total of 22 horses from a rural settlement located in southern Brazil (22° 54' 34.4" S 51° 13' 49.1" W) were evaluated. DNA was extracted from whole blood samples and a PCR for the mammal endogenous *gapdh* gene performed. Subsequently, samples were screened by PCR based assays targeting the *sodB* and *dsb* genes of *Ehrlichia*.

Results and Discussion

One out of 22 (4.54%) horse sample amplified a fragment for *Ehrlichia* by both PCR assays. The *gapdh* gene was consistently amplified in all samples. Eight out of 22 animals (36.36%; 95% CI: 0,95 – 0,95) were infested by ticks at the time of sampling. Ticks were identified as *Dermacentor nitens* (43; 31 M and 12 F) and *Rhipicephalus microplus* (2 M and 11 F). Horse and tick DNA samples will also be screened by a qPCR assay targeting the 16S rRNA gene of *Ehrlichia* and PCR-based assays for other tick-borne pathogens. Additionally, serological assays using *E. canis*, *E. minasensis* and *Theileria equi* crude antigens will also be performed on horse samples.

Impact

This study will provide data to equine veterinarians and vector-borne disease researchers. In Brazil, equine piroplasmiasis cases refractory to treatment with imidocarb dipropionate undergo treatment with oxytetracycline therapy, which is effective against *Ehrlichia* species. Our hypothesis is that equine ehrlichiosis is underestimated.

Goat carcass microbial investigation in the Ethiopian Export Abattoirs Debrezeit, Ethiopia

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Introduction

The safety of meat has been at the forefront of societal concerns in recent years, and indications exist that challenges to meat safety will continue in the future (Sofos, 2008). The control of food safety and quality is an integral part of national programs for development. The food industry uses microbial test as an indicator to determine the overall level of sanitation within the manufacturing and distribution processes & to determine whether the processing kill step was significant. The higher the microbial load found in TPC is, the greater is the possibility that the processing environment is not clean or that the process was not sufficient enough to kill an adequate number of organisms present. Microbiological criteria are used at any stage in the food chain to assess the acceptance of lots of raw material or finished product. they are based on the absence/ presence of certain microorganisms or quantitative limits per units.

Objectives

The aim of the study was to investigate HACCP/ GMPs practices and evaluate the microbial contamination status of goat carcass in the Ethiopian export abattoirs.

Materials and Methods

The research materials included cotton swabs, ice boxes, alcohol, amenities, water, camera and 12 samples of fresh goat carcass were randomly assessed from 3 major export abattoirs in Modjo town post carcass washing, organic acid spraying and 24 hours chilling. The samples were collected from different portions of carcasses and 36 abattoir employees' hands and apron who engaged in meat washing along with the water they used to wash. The samples were collected once/week from each export abattoir. The samples were aseptically collected in different clean polyethylene bags and were transferred immediately to the laboratory for bacteriological quality assessment. The samples were collected in aseptic containers labeled and transported in an ice box for 30 minutes, subjected to qualitative or quantitative analysis for bacterial indicator organisms.

Results and Discussion

The mean result for fresh goat carcass quality as determined for CFU, *E.coli* & TPC in three abattoirs of 144 samples from the three carcass sites was 1.36, 128 and 1.90count/cm². The upper & lower values are higher for TPC than CFU and *E.coli* and it was statistically significance at (p< 0.05).

Impact

The result confirmed that the bacterial loads decline from washing to acetic acid spray to chilling in three of the abattoirs' sampled carcass parts, confirming that the sequential procedures do have vital effects in minimizing the bacterial counts. Carcass contaminating bacteria should be determined. Besides to the refreshing training need of abattoir employees, the abattoir supervisors could be source of contamination for they used to hurry in and out restlessly ignoring the clean to dirty area routine food processing procedures.

Seroprevalence of anti-*Toxoplasma gondii* and anti-*Brucella* spp. antibodies in pregnant women from Mogadishu, Somalia

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Introduction

Toxoplasmosis and brucellosis are zoonotic diseases of worldwide distribution that affects humans and animals. Limited data were available in Somali people and their animals being therefore considered a public health concern and neglected infectious diseases.

Objectives

To evaluate the prevalence of anti-*Toxoplasma gondii* and anti-*Brucella* spp. antibodies in pregnant women in Mogadishu, Somalia.

Materials and Methods

Blood samples were collected from 307 pregnant women from Mogadishu, Somalia and were tested for anti-*T. gondii* antibodies by Latex Agglutination Test (LAT) and anti-*Brucella* spp. antibodies by Rose Bengal Plate Test (RBPT) and competitive-ELISA (cELISA).

Results and Discussion

A total of 159/307 (51.79%; 95% CI: 46.2–57.35%) pregnant women were seroreactive for *T. gondii* by LAT at different stages of pregnancy, while for anti-*Brucella* spp. antibodies detection, combination of tests results revealed an overall seroprevalence of 1.30% (4/307) with 0.65% (2/307) for RBPT and 0.98% (3/307) for cELISA. Two women were seropositive for both agents.

Impact

The present study is an evidence of the existence of high seropositivity of anti-*T. gondii* antibodies and low seropositivity of anti-*Brucella* spp. Antibodies among pregnant women from Mogadishu, Somalia. Since the awareness on these zoonotic pathogens in Somalis is very low, the people in this country are at great public health risk. Additionally, there are little or no medical and veterinary efforts to maximize toxoplasmosis and brucellosis detection rates in humans and animals in the country, thus preventing recognition of any association between zoonotic diseases and immunocompromised patients including pregnant women. Therefore, there is a need to promote the One Health concept among multi-sectoral professionals for better and sustainable integrated health development and implementing effective control strategies against these zoonotic diseases.

Change in rabies host species and their influence on human infection in Ukraine

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Introduction

Globally, 60,000 human deaths annually from rabies worldwide, that more than any other zoonotic pathogen. During the 1950-2018 period, 1,798 cases in humans were reported in Ukraine. The aim of our study was to conduct the analysis of changes in sources and reservoir of the rabies virus during 1950-2018, and their impact on the biological risk level and conduct GIS analysis of the attacks for humans and spread of rabies in Ukraine.

Objectives

The aim of our study was to conduct the analysis of changes in sources and reservoir of the rabies virus during 1950-2018, and their impact on the biological risk level and conduct GIS analysis of the attacks for humans and spread of rabies in Ukraine.

Materials and Methods

Data used from the Public Health Centre of the Ministry of Health of Ukraine and the State Regional Laboratories of Veterinary Medicine annual reports. For GIS analysis, QGIS 3.4.6 software was used.

Results and Discussion

It was determined that the sources of rabies virus have varied 3 times: in the 50's-when the main reservoir of the rabies were dogs; from the 70's-foxes; today, when the main reservoirs are foxes and raccoon dogs, but the main sources are foxes, cats and dogs. During 2009-2018, 15,248 cases of rabies in animals were reported. Among wild animals, rabies was registered mostly in foxes-5,283 among domestic: in cats-4,272 and dogs-3,170. We have established the dynamics and frequency of attacks on humans and founded that dog attacks on humans were most common (625,338 bites), but the risk of rabies infection with contact with dogs was 0.7%, bats 1.2%, cats-3.6%, foxes-40%, raccoon dogs-47%. Spatial-geographical analysis and mapping the territory on the degree of biological threat showed that domestic carnivorous attacks were observed on the East of the country near the large cities. Most of the wild carnivores were attacked in the West of the country near the border of EU countries.

Impact

Ukraine remains the only country in Europe where rabies is spread among wild and domestic carnivores. Therefore, it is necessary to intensify rabies control measures to prevent the spread of infection throughout Ukraine and beyond.

Outreach project to promote One Health in Brazil: One Health ES

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Introduction

One Health is a holistic approach that involves human, veterinary, and environmental health to promote better responses to a challenging scenario for preventing and control public health risks globally. Therefore, One Health requires interprofessional and intersectoral action, demanding human resources with knowledge and skills to its application.

Objectives

Health promotion and prevention and control of diseases by applying the One Health approach.

Materials and Methods

A team from the Federal University of Espírito Santo (UFES) in the city of Vitória, ES recognizing the importance of train professionals in this approach, developed an outreach project entitled One Health ES, which involves faculty, professionals, and undergraduate and graduate students of different areas, such as Medicine, Veterinary Medicine, Nutrition, Pharmacy, Biology, Biomedicine, and Dentistry. Periodically, the group meets online to debate publications involving One Health and to plan and propose projects to be implemented in the community aiming the health promotion and the prevention and control of diseases by applying the One Health approach, such as publication of informative material in social media. One Health ES also organizes webinars with invited experts from Brazil and other countries, improving the network for further projects. The team also conducts research using this approach, which is promoted in the social media of One Health ES.

Results and Discussion

This project resulted in an engagement in the interprofessional actions, with collaborative participation of the entire team and the dissemination of the relevance of the One Health concept to many undergraduate and graduate students and to the general community.

Impact

The most important impact of this outreach project was to highlight the promising contributions of the One Health initiative in the public health system in Brazil.

Return on investment and benefit/cost analysis of rabies prevention efforts in Ohio (2014-2018)

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Introduction

Rabies is a zoonotic disease affecting all warm-blooded animals. In the U.S., dog-mediated rabies has been eliminated however, rabies exists mainly in wildlife. Raccoon rabies is endemic in the eastern part of the U.S. and its westernmost barrier lies in eastern Ohio, making Ohio a focus of rabies prevention efforts to stop the barrier from spreading further west. Rabies prevention efforts in Ohio focus on the distribution of ORV (Oral Rabies Vaccine) throughout 15 counties in eastern Ohio.

Objectives

- Determine the Return on Investment (ROI) of rabies prevention efforts focused on the ORV (Oral Rabies Vaccine) for both the 15-county area, and the entire state of Ohio for each of the years 2014-2018
- Determine the Benefit/Cost Ratio (BCR) of rabies prevention efforts focused on the ORV (Oral Rabies Vaccine) for both the 15-county area, and the entire state of Ohio for each of the years 2014-2018

Materials and Methods

Costs of rabies prevention efforts from 2014-2018 were obtained from 15 Ohio counties, the State of Ohio and the National Rabies Management Program. Information on collaborations was obtained. A literature review was conducted using Google Scholar to obtain current costs of PEP and animal testing. Population estimates were obtained from U.S. Census Bureau online data. Benefit/cost analysis was calculated using a calculator and return on investment was calculated using both a calculator and an ROI template.

Results and Discussion

The BCR ranged from 1.25 to 2.47 for years 2014-2018. Simple ROI (without consideration of the time value of money) ranged from 0.25 to 1.47 and cumulative ROI (with consideration of the time value of money) at discount rates 3%, 4%, 5% and 10% ranged from 1.81 (3%) to 1.86 (10%). Decrease in BCR and ROI appears for years 2017 and 2018 due to increased distribution of bait due to a breach in the barrier in late 2016. The BCR and ROI of rabies prevention in Ohio appear to be lower than typical within the broader context of public health interventions. However, they do appear to be within the range of rabies prevention programs in particular.

Impact

Controlling rabies is critically important to prevent human deaths and alleviate its burden in livestock, wildlife and companion animals, and on local and national economies. The results of this project may be used as input in decision-making when planning rabies prevention programs in the context of scarce resources. Perhaps the methods used in this project may inform work in other areas of infectious disease, such as COVID-19.

A cross-sectional survey on ecology and epidemiology of bat rabies in Pakistan—One Health perspective

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Introduction

Serologic evidence of rabies exposure was identified among bats in the Indian subcontinent; however, bats are not considered as rabies exposure in Pakistan. There is a need to increase focus on frugivorous bat as a rabies reservoir due to its ever-increased conflict with fruit growers in Pakistan.

Objectives

A knowledge, attitude, and practice, baseline assessment targeted to populations at risk for exposure to bats would be beneficial in developing public health education and intervention strategies.

Materials and Methods

A cross-sectional study was conducted between October 2018 and February 2019 among individuals (n=1466) having two different residential, topographic (Mountainous and Plain Region) and provincial backgrounds (Punjab and Khyber Pakhtunkhwa) were selected to investigate the ecology and epidemiology of rabies and its association with bats. Structure questionnaires were used to assess knowledge, attitude, and practices of respondents. Cross tabulation and univariate analysis models were used to investigate potential predictors of risk behaviors.

Results and Discussion

The majority of the respondents 795 (54%) were unaware of bats' role in the spread of rabies. It was found that (=45%) respondents from all the four backgrounds believed bat can suck blood despite no reported hematophagous bat species in the country. Mountain dwellers reported more bat bites (193 (23%) p < 0.05, OR 1.45) and were less likely to visit doctors after suspected rabid dog or bat bites (481 (46%) p < 0.05, OR 1.45) than people from the plains. Univariate analysis model highlighted that only topographic residential backgrounds (Mountain & Plain) had significance (p< 0.05) in describing bat bites and human rabies related deaths as a result of not visiting doctor after suspected dog or bat bite incidents.

Impact

Disease ecology and laboratory characterization of the virus responsible for human deaths in the mountainous regions in Pakistan will provide essential information required to develop strategies for rabies prevention and control.

Evaluating extraction methods to study the urine microbiome

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Introduction

The urinary microbiome is the collection of microbes present in urine that play a role in host health. Studies of urine microbiota have traditionally relied upon culturing methods aimed at identifying pathogens. However, recent culture-free sequencing studies of the urine microbiome have determined that a diverse array of microbes are present in health and disease. To study these microbes and their potential role in diseases like bladder cancer or interstitial cystitis, we must first be able to detect and extract microbial DNA from urine, which is a low biomass sample.

Objectives

The objectives of this study are to compare total and bacterial DNA concentrations in healthy canine urine using five extraction methods and to compare microbial community composition and diversity by extraction method.

Materials and Methods

Urine samples were collected from ten healthy dogs, and 3 ml of urine from each dog was extracted using five different extraction methods including: QIAamp® PowerFecal® DNA Kit, QIAamp® BiOstic® Bacteremia DNA Kit, DNeasy® Blood & Tissue, QIAamp® PowerFecal® Pro DNA Kit (Qiagen, Germany) and an extraction protocol using magnetic beads. Qubit 4.0 Fluorometer was used to measure initial DNA quantities extracted from urine samples. Quantitative Polymerase Chain Reaction (qPCR) was used with select primers and probe designed to amplify microbial DNA. DNA from urine samples were sequenced using Illumina MiSeq. Microbial diversity analyses were conducted in Quantitative Insights into Microbial Ecology (QIIME2) version 2020.2 to process genomic sequences, analyze alpha (within-sample) and beta (between-sample) diversities, and taxonomic abundances by dog, sex, and extraction method.

Results and Discussion

Significant differences in the urinary microbiota were attributed primarily to dog and sex and not to extraction method. Although not significant, the Bacteremia kit yielded the highest total DNA concentrations (Kruskal-Wallis, $p = 0.165$), the highest bacterial DNA concentrations (KruskalWallis, $p = 0.0433$), and the greatest number of 16S sequencing reads (Kruskal-Wallis, $p = 0.368$). The Bacteremia kit also extracted bacterial DNA from the greatest number of samples. Bacterial diversity and taxonomic abundances at the phylum level were not significantly different by kit (Kruskal-Wallis, $p = 0.8097$), dog (Kruskal-Wallis, $p=0.120$), nor sex (Kruskal-Wallis, $p=0.308$).

Impact

These results indicate that the Bacteremia kit is an effective option for studying the urine microbiome. These results lay the foundation to study the urine microbiome in a wide range of urogenital diseases.

Non-pharmaceutical Intervention (NPI) related community practice for the prevention of Covid-19 in Addis Ababa, Ethiopia: A 10 weeks trend analysis

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Introduction

The COVID-19 pandemic has started to affect Ethiopia since March 13, 2020 when the first case was detected. Since then, the incidence of cases seems to be increasing day by day, and as of the end this study (June 28,2020), 5689 cases were identified with 98 deaths. This is expected to escalate further during the rainy season in Ethiopia. The health sector has recommended a set of universal preventive measures to be practiced by the community. However, knowledge on adherence to these preventive measures is limited.

Objectives

To rapidly appraise and monitor the preventive behavior of the population in Addis Ababa.

Materials and Methods

A repeated series of cross-sectional non-participatory observation at ten different public places for preventive behaviors related to hand washing, keeping physical distance, and respiratory hygiene practices was done for the period of April 20-June 28,2020 covering 10 weeks. WHO operational definitions of the preventive behaviors were adopted for this study. The selected observation sites include gates or entrances of institutions including health facilities, workplaces, banks, food establishments, religious institutions); public transport waiting areas; street crossing sites where people are walking in mass; and markets that include traditional-open markets and supermarkets.

Results and Discussion

A total 12056 individual observations with 52% males, and 82% in 18-50 years old age group were involved in this study. This study found out a coverage of 77%, 35% and 24% of mask utilization, physical distancing, and hand hygiene, respectively. The combined practices using all three and any two were less than 40%. Hand hygiene played a role of effect modifier for both physical distancing and mask using. Conclusion: our study indicated the level of practices that may not act as barrier to stop the risk of COVID-19 transmission in a population

Impact

The findings are input to inform the Ministry of Health in taking preventive measures

Effects of tetracycline hydrochloride on the microbiota of Africanized honeybees

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Introduction

Bees play a critical role in ecosystem function and stability in many habitats. Many species are threatened by human activities ranging from deforestation to chemical use. During the SARS-COV-2 pandemic, many people have developed severe acute respiratory syndrome. To avoid secondary bacterial infections, common during respiratory viral infections (Morris et al. 2017), antibiotics, including tetracyclines, are being used as prophylactic treatment (Sodhi and Etminan 2020). Increased antibiotic use can result in increased antibiotic contamination in the environment and specifically in wastewater (Hendriksen et al. 2019) where bees may forage (Lau and Nieh 2016).

Objectives

Understand the potential effects of tetracycline exposure on the honeybee gut microbiome.

Materials and Methods

Bees were collected from hives, placed in controlled temperature chambers, and divided in two groups: the control group was fed 50% (w/v) sucrose solution and the treatment group was fed 450 ug/ml of tetracycline suspended in 50% (w/v) sucrose solution. Then, we collected 20 bees at each of the following time points: 0, 72, 144 and 216 hours. Next, we used 16S rRNA sequencing to amplify all the bacteria DNA in the gut. Finally, we analyzed the microbial community looking for changes in the microbiome profile through QIIME 2.

Results and Discussion

Tetracycline significantly and increasingly altered bee gut microbial composition over time. The tetracycline treated bees had a decreased relative abundance of the family *Rhizobiacea* and increased bacteria from the class Gammaproteobacteria and the genus *Lactobacillus*. Previous studies have demonstrated that changes in the bee microbial communities due to chemical exposure have been linked to increased susceptibility to opportunistic pathogens and mortality (Motta et al., 2018).

Impact

The microbial community alterations we observed in this study, may also affect the bee health. More studies need to be done assessing behavioral and survivorship data to determine if these changes are associated with positive or negative health outcomes.

Identification of potent Acetylcholinesterase inhibitors from plants for treatment of Alzheimer's disease exploiting the in silico approach

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Introduction

Alzheimer's Disease (AD) has become one of the most prevalent dementia type diseases in the world. It is also a very common type of age-related dementia which is increasing its numbers rapidly. Intellectual morbidity, psychomotor dysregulation, delusions, hallucinations etc. are some of the familiar symptoms of AD. In the familial and congenital cases of AD, genetic factors play very important roles. Different hypotheses have been developed by the scientists that shed light on several reasons for AD onset and development. One of the hypothesis of AD development which is known as the cholinergic hypothesis. According to this hypothesis, the loss of functions of the cholinergic neurons and thus the cholinergic signaling and neurotransmission in the brain may be responsible to the AD development. This experiment was conducted focusing on the cholinergic hypothesis of AD development.

Objectives

Among many hypotheses that describes different reasons for the development of AD, the cholinergic hypothesis is one of them that depicts that the degradation of an important neurotransmitter, acetylcholine by the enzyme acetylcholinesterase (AChE), is responsible for the development of AD. Although, many anti-AChE drugs are already available in the market, their performance sometimes yield unexpected results. Therefore, researches are going on to find out potential anti-AChE agents both from natural and synthetic sources.

Materials and Methods

In this study, 50 potential anti-AChE phytochemicals were analyzed using numerous tools of bioinformatics and in silico biology to find out the best possible anti-AChE agents among the selected 50 ligands through molecular docking. Thereafter, various pharmacological and physiological properties of the best selected ligands were predicted by determining the druglikeness properties, conducting the ADMET test, PASS and P450 site of metabolism prediction and DFT calculations.

Results and Discussion

The predictions of this study suggested that among the selected ligands; bellidifolin, naringenin, apigenin, and coptisine emerged as the four best compounds with quite similar and sound performances in most aspects of the experiments. However, more in vivo and in vitro analysis are required to finally confirm their safety and efficacy in this regard.

Impact

This study suggests bellidifolin, naringenin, apigenin and coptisine as the best inhibitors among all the 50 selected anti-AChE agents from plants. Their drug potentiality was checked in different post-screening studies where they were also predicted to show quite similar performances, although in some aspects, their performances were not up to the mark. However, more in vivo and in vitro researches must be performed on these four agents as well as the other remaining agents to finally confirm their potentiality, safety and efficacy.

HEALTH CAPACITY BUILDING

Assessment of food safety knowledge and behaviors of cancer patients receiving treatment

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Introduction

For any person diagnosed with cancer and receiving treatment, the risk of contracting a foodborne disease increases significantly from that of the general, healthy public. This increased risk is due to the compromised immune system of the cancer patient. Both cancer as a disease and cancer treatments increase patient susceptibility to foodborne infection, posed by inappropriate food handling practices. Despite this, it has been reported that health professionals do not consistently provide cancer patients with any food safety advice or information unless that patient is experiencing neutropenia, which is defined as a neutrophil cell count of 1,000 cells per μL or lower. A unified education system for cancer patients is needed, which directly addresses food safety issues specific to their situation and typical knowledge pitfalls.

Objectives

1) Determine food safety knowledge, behaviors, and attitudes of cancer patients; 2) Evaluate interplay of sociodemographic factors on cancer patient food safety knowledge and acquisition behaviors; 3) Evaluate the efficacy of a food safety education intervention for cancer patients.

Materials and Methods

The questionnaire included a comprehensive assortment of questions pertaining to sociodemographic characteristics of the participants. This was followed by a brief construct assessing patient disease characteristics and then a short, validated section to determine the food security status of the patient. Three sections of different aspects of food safety motivators were assessed: risk perception pertaining to food safety, attitudes towards food safety, and behaviors around food safety. All question responses were on a five-point Likert scale. Responses for risk perception ranged from “strongly disagree” to “strongly agree” and responses for both attitudes and behaviors ranged from “never” to “always”. All three sections were adapted from surveys administered and validated in a study by Medeiros et al. (2008). Data will be analyzed using SPSS.

Results and Discussion

The average general food safety score was $70.74\% \pm 15.53\%$. Cold food storage knowledge was the most poorly understood ($69.53\% \pm 17.47\%$) and separation to avoid cross-contamination knowledge was the best understood ($83.03\% \pm 15.62\%$). These data show certain weaknesses in food safety knowledge, among cancer patients seeking treatment, and can be used to properly educate this high-risk population on more safe food behaviors and practices. The findings are being used to develop effective food safety education programs, for cancer patients, and highlight the need for food safety education of patients during cancer treatment.

Impact

These findings will help healthcare providers to better educate patients in the food safety practices necessary to decrease risk of foodborne infection, and to provide targeted food safety education to low food security patients. The results of the second half of the study will demonstrate the efficacy of targeted food safety education for specific populations and will lay the groundwork for construction of a more widely applicable food safety intervention for cancer patients.

One Health and IPE: Empowering international healthcare providers into a new globally mindset

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Introduction

In the scenario of unprecedented pandemic related to COVID-19, an efficient local and international response is necessary to guarantee global health. One Health is a collaborative, multisectoral, and trans-disciplinary approach, recognizing the interconnections between people, animals, plants, and their shared environment. Interprofessional education (IPE) is present when members or students of two or more professions learn with, from, and about each other to improve collaboration and the quality of care and services. According to Caipe (UK) to achieve collaborative practice, people “should learn together to work together.”

Objectives

The goal of this poster is to present the module interprofessional and collaborative practice (IPEc), as part of the project “Joint Initiative for Teaching and Learning on Global Health Challenges and One Health” (JITOHealth), an initiative supported by the Center for International Health, funded by the German Academic Exchange Service.

Materials and Methods

All JITOHealth activities are developed through collaborative online international learning (COIL), in five modules, mixing graduate students in groups from different health professions and countries (Brazil, Germany, Kosovo, and Mozambique). For the IPEc module, learning objectives are: understand the professional role inside the healthcare system and in the One Health team, reflect the professional role that others have in a One Health team and give examples of good interprofessional teamwork in One Health.

Results and Discussion

Interprofessional training, especially when conducted based on COIL may empower health professionals to develop skills to deal with this reality in a globalized world. Therefore, the JITOHealth has the potential to improve the performance of the health systems by empowering professionals into a new mindset.

Impact

- Train the working group in collaborative online international learning (COIL)
- Identify and establish a partnership with experts in the area of One Health, infectious diseases, virtual teaching and training, and interprofessional education, creating a network to support further group actions
- Involve graduate programs of the institutions to guarantee credits for the students

Eyes wide shut: Uncovering gender bias in global health leadership

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Introduction

Women comprise 70% of the global health workforce yet hold only 8% of leadership positions. To address gender bias and the resultant inequities of power, we must examine structural, institutional and individual barriers to equal representation of women leaders in global health.

Objectives

Heteronormative and non-inclusive models of transnational leadership perpetuate stereotypes of how leaders should look, behave and interact with others. Utilizing intersectionality as a theoretical framework, this scholarly paper challenges current standards of leadership, and highlights the issues faced by women from varied backgrounds seeking leadership opportunities.

Materials and Methods

The methods for this project consist of ethnographic interviews considered in tandem with previous research. Recurring themes and trends were noted across published research on systemic gender bias in leadership generally, and in global health specifically. In my analysis, I took an intersectional approach, considering the overlapping and often additive structural biases at play across race, class, gender, and other social factors. Questions for interviews with six individuals were crafted as a result of this research, and the interviews were subsequently analyzed using a narrative-textual approach.

Results and Discussion

Themes from the comprehensive literature review consider that women and men lead differently. However, I posit that while inherent differences may exist, there is a continuum of leadership qualities that provide nuanced intersections of personality, privilege, experience and opportunity that should be more fully understood beyond the current research. Through literary synthesis and narrative textual analysis of personal interviews, leadership norms were reinforced. Historically, the male (normative) approach to leadership is associated with vertical ascension, exclusivity, individualism, transactional exchanges, and is reliant upon formal authority and organizational position. All six interviewees illuminated significantly variable obstacles across a wide spectrum of female 'lived experiences' including lack of confidence, cultural expectations and financial risk. An emerging theme in the literature is the need for transformational leadership to catalyze change both at the systems and individual level. Influence and networks are the bedrock of transformational leadership; they are both fundamental to the female approach to leadership.

Impact

A combination of the timing of mid-career pressures, implicit cultural barriers and divergent leadership styles persistently impede progress in leadership equity. Five of six interviewees emphasized that the empowerment of emerging women leaders in global health is possible through: incentivized mentorship, targeted sponsorship (and allyship) by current leaders and deconstruction of non-inclusive leadership norms.

Knowledge, attitude, and practices of veterinary professionals about rabies management and control in Pakistan in the One Health context

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Introduction

Pakistan has one of the highest numbers of human rabies cases with almost 6000 deaths annually. For the management and control of human rabies deaths, veterinary professionals' contribution is needed.

Objectives

We aimed to assess veterinary professionals about rabies control strategies from August 2019 to September 2020 in Pakistan.

Materials and Methods

A total of 375 practicing veterinary professionals having different levels of educational background with at least a degree of Doctor of Veterinary Medicine (DVM) from four provinces of Pakistan were included in this study through face-to-face interview.

Results and Discussion

Of the surveyed veterinarians 56.3 % (n=211) stated their exposure to a dog-bite at least once. About 51.2% (n=192) of practicing veterinarians were not vaccinated against rabies and 18.1% (n=68) stated that the rabies vaccine was not available even for them. Furthermore, 38.1% (n=143) never took part in a rabies awareness program for their community. Almost 43.2% (n=187) usually did not recommend pet owners about the vaccination against rabies for their dogs. Lack of awareness about the epidemiology of rabies in their area was significantly associated with not paying attention to the vaccination status of dogs about rabies during other treatments ($p=0.013$).

Impact

The implementation of One Health approaches, such as vaccination of dogs for the prevention of human rabies is highly recommended. The study highlighted many deficiencies and hurdles in the awareness and attitude of veterinarians in Pakistan. To remove these deficiencies, veterinarians should get training on rabies and incorporation of trained veterinarians on dog-bite case management. Through the implementation of such strategies, we will not only reduce the demand for rabies human vaccine which is already short in supply in developing countries but also play a role from in reaching zero by 30 the global strategic plan to end human deaths from dog-mediated rabies by 2030.

Knowledge, attitude and practice (KAP) survey of zoonotic tuberculosis prevention and associated determinants amongst livestock workers in Punjab, Pakistan

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Introduction

Tuberculosis (TB) has caused about 1 billion deaths over the past 200 years. Almost, 10 million people get infection of TB with 1.3 million deaths annually.

Objectives

This study aimed to assess the extent of knowledge and understanding of zoonotic tuberculosis spread and prevention among the herdsmen in Pakistan to provide the evidences for policymaking in the context of One Health.

Materials and Methods

A cross-sectional survey (n=351) was conducted in 4 different regions of Punjab, Pakistan. Knowledge, attitude, and practices of herdsmen were assessed through a structured questionnaire. Bivariate and multivariate tests were used for statistical analysis.

Results and Discussion

Of 351 participants, 61% were unaware of the zoonotic transmission of tuberculosis. Majority 78.3% of respondents used to visit the hospital only when they get severely ill. Regarding the attitude towards disease, 35.9% herdsmen prefer to sell the infected animals to earn the instant profit and put the public at risk of getting zoonotic TB. The illiterate as an educational status was significantly associated with dung removal with naked hands ($p<0.05$) which was a high-risk activity for getting zoonotic TB. Majority of the respondents 62.7% have not heard about the TB control program in Pakistan. The illiteracy had significant association with not knowing the TB control program ($p<0.05$). Such KAP studies highlight the need of awareness campaigns against emerging zoonotic diseases, targeting the herdsmen not having formal education.

Impact

The studies like this in developing countries are needed and would play a key role for designing of enlightenment program addressing One Health challenges of transmission, handling of infected cattle and seeking urgent human medical check-up. It also would be helpful in spreading awareness which will lead to early detection of cases enhancing the contribution towards the Road Map for Zoonotic Tuberculosis by WHO which resonates that every tuberculosis case counts towards 2030 End-TB Strategy.

Prevalence and associated risk factors of Cystic Echinococcosis (Hydatidosis) in food animals of District Narowal, Pakistan

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Introduction

Echinococcosis is an emerging public health and socio-economic problem related to One Health. *Echinococcus granulosus*, causing Cystic Echinococcosis (CE), has an extensive variety of hosts including the dog as the primary host and any of the mammals (including humans) as an intermediate host. Its route of transmission is fecal-oral. Control can be done by adopting hygienic measures and by proper deworming of dogs and mammals. Pakistan has a large livestock population and bearing huge economic losses due to the endemic status of this disease.

Objectives

The current study was designed to gain insights about the prevalence of *Echinococcus granulosus* in the livestock population of district Narowal, Pakistan based on selected abattoirs along with an investigation of the risk factors associated with the disease.

Materials and Methods

A total of 503 food animals were screened for the presence of hydatid cysts by post-mortem examination. Samples comprising of hydatid cysts in the liver, lungs, spleen, kidney, and brain were collected in 70% ethanol. Fertility and viability of hydatid cysts were examined by Microscopy. DNA was extracted using WizPrep™ gDNA Tissue Kit and PCR was performed using specie specific primers for *E. granulosus* (Eg1F81, Eg1R83) targeting the nad1 gene. The amplified product was run on a gel dock apparatus and a band of 226-bp was visualized.

Results and Discussion

Out of 503 samples, 41 were positive by PCR. The overall prevalence of *E. granulosus* was calculated as 8.15%. The highest prevalence was found in Cattle (12.83%) followed by buffalo (6.86%), sheep (4.08%), and goat (1.29%). In organ-wise prevalence, the highest rate of infection was observed in the liver (35.71%) followed by lungs (33.33%) and then involvement of both organs at the same time (20%).

Impact

This study shows that *Echinococcosis* will continue to be of One Health importance in Pakistan. Such Epidemiological findings could help in developing prevention strategies and control programs for Hydatidosis in Pakistan.

Knowledge, attitude and practices of the resident community about visceral leishmaniasis in Bajaur and Mohmand agencies KPK, Pakistan

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Introduction

Lesihmaniasis is a protozoal disease caused the bite of Phlebotomine sandflies. Leishmaniasis also called as the poor people disease is common in Bajaur and Mohmand KPK, Pakistan in summer season from May to August.

Objectives

This study was designed to assess the Knowledge Attitude and Practices of peoples of Bajaur and Mohmand KPK, Pakistan and to purpose the policies accordingly.

Materials and Methods

Data were collected by well-structured questionnaire from the infected persons in Bajaur and Mohmand. A total of 320 participants were engaged in this study 160 from Bajaur and 160 from Mohmand. Bivariate and multivariate tests were done for statistical analysis.

Results and Discussion

Almost all participants heard about the *lesihmania* disease, the source of information was different from social media friends' newspapers. The highest portion of the participants thought that the splenomegaly was the main sign of visceral leishmaniasis. Almost all the participants knew that flies were responsible for the cause of disease. The overall assessment of participants indicates that 11.2% were Knowledgeable, 22% had positive attitudes and 4.2% had optimal practices on visceral leishmaniasis. In conclusion, the survey indicates that the participants had not better attitude about visceral leishmaniasis, and there was a large gap in knowledge and practices. The misunderstanding and improper practices are the serious concern in the control and prevention of disease. It is suggested that public health awareness program should be strengthened through conferences local elders' and local politician meetings and through social media to increase people awareness and improve the practices of local peoples against visceral leishmaniasis and furthers studies are strongly recommended for the better understanding and the dynamics of the disease in Bajaur and Mohmand.

Impact

The findings of this research would play a key role to devise One Health policy to control the leishmaniasis cases in the study areas by providing sufficient knowledge and prevention strategies.

Suicide among veterinarians in Brazil – Preliminary Data

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Introduction

Evidence from previous surveys of veterinarians has suggested veterinarians have a higher risk of suicide, compared with the general population. In Brazil, there is a lack of suicide mortality data, mainly involving veterinarians. This fact is related to misleading and losses on information about death causes collected by the Brazilian Mortality Information System (SIM).

Objectives

Hence, this study assessed, through a data survey, information on Brazilian veterinarians' suicide rates.

Materials and Methods

The present descriptive study was conducted through a review of the National and Statewide database that was performed on the SIM database. Additionally, we reviewed published articles, which were identified through a computerized search in Google Scholar, PubMed, MedLine, Scielo, and CAPES journal databases. The following general descriptors were used: suicide, veterinary suicide, and Brazil. The same descriptors in English were also searched with additional Portuguese and Spanish translations as keywords.

Results and Discussion

Data on veterinary suicide was retrieved from the SIM database from 2006 to 2012. The lack of the Occupational variable in the SIM database showed an important bias in the available data. Only one Brazilian State (Minas Gerais) uses the occupational variable in its system and two studies were found. Veterinary suicide average rates (2006-2009) were 2 times higher than the general population (10.81), and female veterinarians had a relative frequency of death by suicide three times higher than men (36.36%), from 2006 to 2012.

Impact

Our preliminary data highlights that the SIM database needs the immediate inclusion of the occupational variable on the system aiming reliability, precision, and up-to-date data on suicide mortality. Giving the high rates of veterinary suicide worldwide, there is an urgency that stakeholders create and implement suicide prevention strategies for veterinarians in Brazil.

Mental health and social skills of veterinary residents of Pernambuco State, northeastern Brazil – Preliminary Data

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Introduction

The mental health (MH) of veterinarians has become a topic of concern due to the increasing risk of suicide and mental health disorders (MHD), such as anxiety, depression and burnout. Worldwide, there is a lack of data on MH of veterinary residents (VR), mainly those associated with social skills (SS).

Objectives

Accordingly, this study aimed to verify and compare the associations between the manifestations of MHD and SS in VR in the Pernambuco State, northeastern Brazil.

Materials and Methods

A total of 23 VR of a Federal Institution of Pernambuco State were evaluated. A questionnaire was developed based on Nationally validated instruments (Resident Questionnaire - RQ; Burnout Syndrome Inventory - BSI; General Anxiety Disorder 7 – GAD7; Patient Health Questionnaire 9 – PHQ9; Multidimensional Scale of Social Expression, Motor Part – MSSE-M).

Results and Discussion

A total of 78.26% (18/23) VR showed MHD, with 86.96% (20/23) and 65.22% (15/23) reporting emotional distress and workload dissatisfaction, respectively. In contrast, 65.22% (15/23) and 91.30% (21/23) VR declared to be satisfied with the learning environment and felt professionally accomplished, respectively. Regarding SS, 52.17% (12/23) showed a bad repertoire, with 83.33% (10/12) reporting the lack of SS and poor MH. Conversely, 60% (3/5) VR reported good MH and good SS repertoires.

Impact

Our preliminary data shows VR in Pernambuco State are at high risk of develop MHD, mostly related to the lack of SS. Thus, Veterinary Residency Programs should create and implement strategies for the development of SS on VR. This study will follow-up VR aiming to establish a pilot protocol to combat occupational stress during the residency period.

Knowledge, attitude, and practices associated with brucellosis in livestock owners of South Punjab, Pakistan

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Introduction

Brucellosis is a serious contagious disease that causes reproductive failure and of zoonotic potential with profound public health importance. Globally, it is the second most important zoonotic disease after rabies. Human infection is acquired by consumption of unpasteurized milk or through direct contact with the infected animals or its aborted fetuses, or placentas.

Objectives

The present study aimed to appraise the livestock owners' knowledge, attitude, and practices related to brucellosis in South Punjab, Pakistan.

Materials and Methods

From the study regions, 4 districts were selected on the basis of a dense population of livestock. Among the livestock owners, 600 were interviewed to collect their knowledge about brucellosis and its zoonotic importance. In the One Health context, we were interested to ask about the brucellosis impact on farmers, their animals, and the food they produce.

Results and Discussion

Of the 600 respondents, 58.7 % and 69 % were unaware of the term brucellosis and its zoonotic potential, respectively. Correlation observed the educational status of the farmers was positively associated with knowledge of the zoonotic potential of brucellosis ($P < 0.001$). More than 50% of the participants did not suspect unpasteurized milk and raw meat as potential sources of infection. Seventy-seven percent of the workers were unaware about their local diagnostic test facility for brucellosis. Our study results delineated the association of diagnosed positive herd history for brucellosis on the extension of their calving period after abortion ($P < 0.001$). Contact with aborted fetuses and not burying the aborted fetus were common among respondents which not only enhance the zoonotic transmission of brucellosis which is killing 500,000 humans annually around the world but also a source of contamination for the surrounding environment as there are is lack of functionality of waste management authorities in south Punjab.

Impact

Our study also indicated that the knowledge of brucellosis among the livestock owners was inadequate, which may increase the zoonotic risk. One Health approach along with extensive control programs is needed with a focus on rural and underdeveloped areas of the country to prevent animal-to-human transmission and reduce disease incidence.

PLANT HEALTH AND FOOD PROTECTION

The pursuit of Native Fungal Biocontrol *Trichoderma* spp. for plant health

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Introduction

The overuse of chemicals in crop disease management has raised concerns over risks for environmental and human health. Perusing alternative biocontrol strategies may be challenging but can provide successful new tools using a greener approach.

Objectives

This study was designed to identify, characterize and determine the biocontrol efficacy of 41 native *Trichoderma* isolates collected from diverse microclimatic domains in Nepal.

Materials and Methods

Strains were assigned to taxonomic groups based on a maximum likelihood phylogenetic analysis constructed on a concatenated dataset using the internal transcribed spacer (ITS) region and translocation elongation factor (*tef1*) (1167 nucleotides total). The biocontrol mechanisms of the *Trichoderma* isolates were assessed in in vitro and greenhouse experiments. Two Ohio isolates were also evaluated. Co-inoculation plate assays were conducted to evaluate each isolate's inhibition of growth of the plant pathogens *Rhizoctonia solani*, *Phytophthora capsici*, and *Pythium ultimum*. Mechanisms of inhibition were characterized as competition, mycoparasitism, or antibiosis through the production of volatile and non-volatile inhibitors. The efficacy of these isolates in suppressing radish root rot (RRR), caused by *R. solani*, and clubroot in mustard greens, caused by *Plasmodiophora brassicae*, was tested under greenhouse conditions.

Results and Discussion

Four *T. asperellum* isolates (T22, T8, T24, and T25) and two *T. asperelloides* isolates (T1 and T30) reduced the RRR incidence in radish plants by more than 50% compared to the non-treated controls. Four *T. asperellum* isolates (T4, T25, T28, and T17) and one *T. asperelloides* (T8) suppressed clubroot severity by more than 75% compared to the non-treated controls.

Impact

T. asperelloides T8 and *T. asperellum* T25 outperformed the other *Trichoderma* isolates in confrontation and in planta experiments and merit further evaluation for biocontrol applications. This study provides a potential alternative for crop disease management and basis for additional investigations of *Trichoderma* diversity in Nepal.

Testing temperature-induced changes in hyphal growth and development of the fungi causing latent fruit rot in deciduous holly

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Introduction

Fruit rot of deciduous holly (*Ilex* spp.) is an emerging disease caused by a complex of seven fungal pathogens: *Diaporthe illicicola*, *Alternaria alternata*, *Colletotrichum fioriniae*, *Epicoccum nigrum*, *Colletotrichum nymphaeae*, *Alternaria arborescens* and *Diaporthe eres*. While disease symptoms were reproduced in research trials by inoculating wounded mature *Ilex* fruit with each of the seven pathogens, only *Diaporthe illicicola* consistently reproduced disease when inoculated on flowers at bloom. Controlled temperature experiments were conducted to monitor the hyphal growth and spore germination rates of *D. illicicola*, *A. alternata*, *E. nigrum* and *C. fioriniae* between 5-35°C to determine whether temperature alone is responsible for the latency in symptoms development.

Objectives

The objective of the experiments to be discussed was to identify whether the late-season temperature drop observed in deciduous holly fields prior to symptoms development is responsible for the onset of fruit rot symptoms.

Materials and Methods

Isolates of *Diaporthe illicicola*, *Alternaria alternata*, *Epicoccum nigrum* and *Colletotrichum fioriniae* were plated on PDA for 4 weeks until sporulation occurred. Spores were collected and used to create a spore suspension of 10e5 spores/mL sterile water. Hyphal plugs with a 4mm diameter were also cut from the plates. 5uL of suspension was dropped onto PDA plates and placed in temperature-controlled incubators set at 5C, 10C, 15C, 20C, 25C, 30C or 35C. Three replicates of each spore suspension at each temperature were assessed for germination rates at 2, 4, 8, 12 and 24 hours after plating. Spore germination rates were assessed by counting the number of germinated spores per 50 randomly selected spores. Spores were considered germinated when the germination hyphae length was 1x the length of the spore. Hyphal plugs were placed on PDA plates and also placed in the temperature-controlled environments described above. The diameter of the hyphal growth was measured every 3-4 days for three weeks. Each of the experiments described were repeated twice.

Results and Discussion

These results suggest that the late-season temperature drop does not directly induce changes in fungal growth consistent with the latency of symptoms development. Future work will explore potential interactions between *D. illicicola* and the faster growing fungi in the fruit rot complex as well as the ability of *Ilex* fruit extracts to inhibit or alter the growth of the fungi which cause fruit rot in deciduous holly.

Impact

Prior to the emergence of this disease in 2009, no significant diseases threatened the ornamental sale value of deciduous holly. The results of this research progress our understanding of this disease and future research will build off of this knowledge to ultimately allow for the development of an integrated disease management plan to control the disease in a sustainable way.

Studying the drought stress induced by Polyethylene glycol on Azerbaijan barley accessions

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Introduction

Barley (*Hordeum vulgare*) is one of the most important grain crops in the world and is well adapted to stress-prone conditions. Barley has also been used as a model in the study of biotic and abiotic stress tolerance and improving yield in other crops.

Objectives

Drought is abiotic stress which has a negative impact on plant growth and development thereby affecting plant growth and yield. In conditions of drought, the water intake is limited, and the result is inhibition of germination.

Materials and Methods

In order to choose barley accessions tolerant to drought during seed germination factorial experiment in a randomized complete block design with two replications were run in the Biotechnology laboratory of Khazar University in 2019. Eight Azerbaijan barley genotypes with different levels of PEG (0, -3, -6, and -9 bar) were used in this research. Traits such as root length, coleoptile length, plumule length, weight dry matter, percentage, and rate of germination were measured. According to the ANOVA results, different levels of drought stress, type of cultivar, and interaction between them had a significant effect on measured characteristics

Results and Discussion

Three of the most resistant accessions have been selected, which shows the highest percentage of germination, plume volume and plume dry weight in comparison with other cultivars. So, these genotypes were more tolerant to drought stress.

Impact

The drought-tolerant genotypes specified in this study will be grown in rain-fed regions in order to improve crop productivity and will be used in barley breeding programs to produce a stress-tolerant genotype.

Antibiotic and copper resistance in plant pathogenic bacteria - *Xanthomonas* spp. causing bacterial spot of tomato

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Introduction

Copper-based compounds have been used as a tool to prevent plant disease for more than 100 years. Through the years, these products have become widely used in agriculture to protect crops from both fungal and bacterial diseases. However, highly copper-resistant microbial populations have emerged due to this extended usage, which could endanger food security. Moreover, copper accumulates in soil, bonded to organic matter, and its impacts on human health and the environment should be considered. Similarly, starting from the 1950s, antibiotics have been used to manage bacterial diseases in both fruit and vegetable production. Streptomycin applications were very effective in controlling important bacterial diseases, such as fire blight in apple and bacterial spot in tomato. However, their continual use in agricultural systems has spawned a range of antibiotic resistant bacteria, including streptomycin-resistant populations.

Objectives

We conducted a six-year survey (2010–2012, 2017–2018) in Midwestern tomato fields to evaluate the distribution of resistance to copper and streptomycin among the *Xanthomonas* species associated with bacterial spot.

Materials and Methods

The sensitivity was assessed in in vitro plate assays. Copper sulfate assessed concentrations were: 30 ug/ml, 100 ug/ml, and 200 ug/ml, while streptomycin assessed concentrations were: 20 ug/ml, 200 ug/ml, 500 ug/ml.

Results and Discussion

Xanthomonas gardneri was the predominant species isolated in 2010, 2011, and 2012 (83%, 75%, and 65%, respectively). By 2018, *X. perforans* was the predominant species isolated from symptomatic tomato fruits. In 2010, all the recovered strains were sensitive to the highest concentration of copper sulfate (200 mg/ml). By 2018, over 50% of the recovered strains were resistant.

Impact

Resistance to copper sulfate increased in all strains over the survey period. Despite the limited use of streptomycin products in Midwestern processing tomatoes, resistance to streptomycin sulfate was commonly observed.

Effect of Moisture on Wheat Grain Contaminating with Zearalenone, an Estrogenic Metabolite produced by the fungus *Fusarium graminearum*

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Introduction

Fusarium head blight (FHB), a disease of wheat caused by the fungus *Fusarium graminearum*, is associated with grain contamination with mycotoxins, including zearalenone (ZEA), a potent estrogenic metabolite. Consumption of ZEA-contaminated grain is a public health concern, as it may cause hyperoestrogenic syndromes in humans and reproductive disorders in animals. ZEA is heat stable, persist through cooking, and not easily removed from contaminated grain.

Objectives

The objectives were to quantify the effects of temperature, relative humidity (RH), and rainfall on ZEA contamination of wheat grain, and evaluate harvesting strategies as an approach for minimizing the risk of ZEA entering the food chain.

Materials and Methods

FHB-affected wheat spikes were exposed to different temperature (20, 25, and 30°C), relative humidity (70, 80, 90 and 100%), and rainfall (0, 5, and 10 days of pre-harvest rainfall) treatments, and ZEA contamination of grain was quantified. Additionally, the effect of harvesting strategies on the ZEA content of grain was evaluated.

Results and Discussion

ZEA contamination was highest at 100% RH across all temperatures and FHB levels, and much lower at lower RH, even at high FHB levels. At 100% RH, ZEA contamination was higher at 20 and 25°C than at 30°C, suggesting that cool, wet conditions are required for ZEA production. Five or 10 consecutive days of simulated rainfall immediately before harvesting increased ZEA contamination. Grain harvested early and not exposed to simulated rainfall had lower mean ZEA compared to grain harvest late and subjected to pre-harvest rainfall, suggesting that early harvest could potentially be a useful strategy to minimize grain contamination with ZEA.

Impact

This study was the first to associate ZEA contamination of wheat grain with temperature, RH, and rainfall and show that early grain harvest could minimize grain contamination. These findings could be used to better understanding, predict the risk of contamination, and minimize the impact of ZEA.

Salmonella Species isolated from domestic animals in Zaria Kaduna State Nigeria

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Introduction

Salmonella is group of bacteria known to cause diseases in both humans and animals. *Salmonella* are rod-shaped gram-negative bacterium belonging to the family *Enterobacteriaceae*. *Salmonella* are non-spore-forming, predominantly motile with peritrichous flagella (Fabrega et al., 2013). *S. Pullorum* and *S. Gallinarum*, mostly isolated in poultry, are non-motile. It is the causative agent of salmonellosis which is a gastrointestinal infection. *Salmonella* are facultative intracellular pathogens with two recognized species only namely: *Salmonella bongori* and *Salmonella enteritica*.

Objectives

To investigate the prevalence of *Salmonella* species and annual rate in animals in Nigeria

Materials and Methods

Record books from the laboratory archives were used to gather data on the samples brought to the laboratory. Record books from the period of 2004 to 2013 were reviewed. The area covered for this study was Zaria Kaduna State. The data collected was then arranged in tabular form. Zaria town which is in Kaduna State is located within latitudes 11° 07', 11° 12'N and longitudes 07° 41'E, in the Northern region of Nigeria. A total of 459 samples were analyzed. Samples were submitted to laboratory based on different clinical signs observed in the clinical signs and placed into sterile sample bottles. All the samples collected were placed on ice and transported to the Bacterial Zoonoses Laboratory, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria for analysis. Bacterial isolation, identification and biochemical tests (indole, methyl-red, Voges-Proskauer, citrate (IMViC), motility and triple sugar iron, TSI) were carried out using standard procedures described elsewhere (Cheesebrough, 2002). Pure cultures obtained from nutrient agar slants were tested biochemically according to ISO 6529 (ISO, 2003). All the isolates were characterized using indole, methyl-red, Voges-Proskauer, citrate, motility, H₂S, sugar fermentation tests as described by Quinn et al. (2002).

Results and Discussion

A total number of 459 isolates of *Salmonella* spp were recorded in the bacteriology diagnostic lab of the Veterinary teaching hospital over the period of 10 years (2004 to 2013). This study further shows that there may be possibility of co-infection with other organisms.

From the results obtained it was clear to see that *Salmonella* is a major pathogen of chickens in Zaria. *Salmonella* is known to be of increasing significance in the poultry industry especially with improved breeds and genetic breakthroughs and in poultry production and also increased infections.

Impact

This showed the prevalence of *Salmonella* species in animals in Nigeria and feeds and other products in Nigeria.

Risk estimation for aflatoxin M1 due to dairy consumption in Chile.

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Introduction

Aflatoxin M1 (AFM1) is the hydroxylated metabolite of AFB1 found in milk and dairy products obtained from livestock that have ingested contaminated feed. AFM1 is considered to be a carcinogen to humans being in group 1 according to IARC.

Objectives

The aim of this work was to estimate AFM1 exposure by dairy consumption in Chile by the Estimated Daily Intake (EDI) and to assess the risk by the estimation of the Margin of Exposure (MoE).

Materials and Methods

EDI was estimated based on the reported consumption of dairy according to the National Food Consumption Survey (2010) and the AFM1 concentration in dairy according to the Chilean Surveillance Program of Mycotoxins during 2017 and 2018. It was assumed a mean weight of 15 kg for 2–5 years old, 32 kg for 6-13 years old, 58 kg for 14-18 years old and 70 kg for adults > 19 years old. Probabilistic models of each variable were sampled by the hypercubic Latin sampling method and variables were associated with a Montecarlo simulation. Since mycotoxin levels and food consumption data were not normally distributed, they were adjusted by the best fitting model or the model with the lowest Akaike information criterion (AIC), assuming in LOD a $LOD/2$. MoE was calculated as the ratio between reference BMDL at the 10% effect level (BMDL10) according to Udovicki et al 2019 (570 ng/kg bw/day), and the estimated EDI; a MoE <math><10,000</math> was considered of high health concern (EFSA 2013). Also, a Hazard Index was calculated dividing the EDI by the proposed value of $0.2 \text{ ng kg}^{-1} \text{ bw day}^{-1}$, according to Udovicki et al 2019. Generally, HI higher than 1 indicates a risk to consumers.

Results and Discussion

Estimation of a mean AFM1 exposure was in the range of 0.0170 to 0.2233. Based on these estimations, dairy was considered of public health concern in children of 2 to 13 years old, and particularly risky in the 2 to 5-year-old group. This study identified infants as groups particularly vulnerable to AFM1 exposure. Current regulation in Chile is based on European risk assessments and don't consider vulnerable groups. As aflatoxin B1 biomarkers have been identified in Chilean adults, breast milk also needs to be studied to assess exposure in nurslings. It's urgent to generate risk assessment based on local information, so food safety managers in Chile can take more accurate and informed decisions.

Impact

Estimations identified infants as groups particularly vulnerable to aflatoxin exposure. Is critical to generate local information in a One Health perspective, preventing fungus and mycotoxins from good agricultural practices. Also, to educate food safety managers and human health professionals who currently are not familiar with the concept in Chile.

Deciphering the novel role of AtMIN7 in cuticle formation and defense against the bacterial pathogen infection

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Introduction

The cuticle is the outermost layer of plant aerial tissue that interacts with the environment and protects plants against water loss and various biotic and abiotic stresses. ADP ribosylation factor guanine nucleotide exchange factor proteins (ARF-GEFs) are the key components of the vesicle trafficking system. Little is known about the defense-associated trafficking of cuticular wax and cutin components to the cuticle layer.

Objectives

Our study discovers that AtMIN7, an *Arabidopsis* ARF-GEF, is critical for cuticle formation and related leaf-surface defense against the bacterial pathogen *Pseudomonas syringae* pathovar tomato (Pto).

Materials and Methods

Integrated molecular, biochemical approaches, and spectroscopic techniques were applied in this study.

Results and Discussion

Our Transmission Electron Microscopy and Scanning Electron Microscopy studies indicate that the *atmin7* mutant leaves have a thinner cuticular layer, defective stomata structure, and impaired cuticle ledge of stomata compared to the leaves of wild type plants. GC-MS analysis further revealed that the amount of cutin monomers was significantly reduced in *atmin7* mutant plants. Furthermore, the exogenous application of either of three plant hormones, Salicylic Acid (SA), Jasmonic Acid (JA), and Abscisic Acid (ABA), enhanced the cuticle formation in *atmin7* mutant leaves and the related defense responses to the bacterial Pto infection. Taken together, our results firstly indicate that AtMIN7 is critical for cutin formation, perhaps by supporting the transport of cutin precursors and/or the related enzymes. Further, AtMIN7 may integrate the plant response to hormones with the modification of cuticle for the defense against Pto infection in *Arabidopsis*.

Impact

Our study and further investigation of the mechanisms of AtMIN7 may enable strategies to enhance plant health and yield through the genetic manipulation of the plant cuticle, which will reduce the agricultural chemical applications to benefit the environment and human health.



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