NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Health, Natural Resources and Applied Sciences

# Research Day 2024

*Theme: Health and Natural Sciences for Social and Economic Development*

Date: Wednesday 08 May 2024
Time: 08:00 – 12:30
Venue: Faculty of Health, Natural Resources and Applied Sciences Auditorium, NUST Lower Campus

## Overview of the Faculty of Health, Natural Resources and Applied Sciences

The Faculty of Health, Natural Resources and Applied Sciences (FHNRAS) offers programmes aimed at the production of graduates for the Agriculture, Applied Sciences, Applied Mathematics, Applied Statistics, Actuarial Science, Natural Resources and Public Health economic sectors of the country. The Faculty consists of three (3) Schools, namely the School of Agriculture and Natural Resources Sciences, the School of Health Sciences and the School of Natural and Applied Sciences, each consisting of two departments. The Faculty currently offers Bachelor degrees (NQF level 7) in Agricultural Sciences, Applied Mathematics and Statistics, Emergency Medical Care, Health Information Systems Management, Horticulture Sciences and Natural Resources Sciences. It offers professional Bachelor degree programmes in Medical Laboratory Sciences (formerly Biomedical Sciences), Environmental Health Sciences and Human Nutrition at NQF level 8. In addition, Bachelor of Science Honours (NQF level 8) with specialisations in Applied Biology, Biotechnology, Applied Chemistry, Applied Physics, Applied Mathematics, Applied Statistics, Health Information Systems and Emegrency Medical Care. The following programmes are offered in the Faculty at (NQF level 9), Master of Agribusiness Management, Master of Health Sciences, Master of Natural Resources Management, MSc degrees in Applied Mathematics and Applied Statistics, Natural and Applied Sciences. The Faculty is also offering Doctor of Philosophy degrees (NQF level 10) in Natural Resources Sciences, Applied Mathematics, Applied Statistics and Health Sciences as well as a PhD degree programme in Natural and Applied Sciences.

## Introduction to the Faculty's Research Activities

The Faculty's research areas revolve around relevant societal and industrial investigations that are expected to contribute to the scientific and technological development of the country. Research activities in the Faculty are carried out within five (5) niche areas namely, Environmental and Human Health; Indigenous Knowledge and Medicinal Plants; Mathematical and Statistical Modelling, Nanotechnology and Advance Materials and Agriculture and Natural Resources. Other research activities that are not aligned directly with the above niche areas are also accommodated.

The Faculty encourages both community-based reflective and Multi-, Inter-, and Trans-disciplinary (MIT) research activities. The former ensures the translation of research knowledge for the benefit of our communities. The latter forms the basis of development and contemporary problem solving in line with the provisions of NDP-5 and vision 2030. From the above, the Faculty aims to conduct quality and outcome-based applied research for the benefit of the Country. This will focus primarily on national priorities followed by regional, continental, and global needs.

**Vision 2030:** Spearheading knowledge creation in Agriculture, Health, Natural Resources and Applied Sciences for innovation, technological, and entrepreneurial nation.

**Mission**: A dynamic and responsive Faculty, meeting the needs of stakeholders through excellent education and applied research.

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## Programme

Director of Ceremonies: **Dr Hilma Amwele**
*Associate Dean: School of Agriculture and Natural Resource Sciences*

| Time | Presenter | Activities/Topics |
|---|---|---|
| 08:00 | Arrival and Registration | **Ms Muriel Mouton** *Secretary to the Executive Dean, FHNRAS* |
| 08:45 | Welcome Remarks | **Dr Onesmus Shuungula** *Executive Dean: FHNRAS* |
| 08:55 | Opening Statement | **Dr Anna Matros-Goreses** *Executive Director: Directorate of Research, Innovation and Partnerships* |
| 09:15 | Keynote Address | **Mr Benedict Libanda** *CEO: Environmental Investment Fund of Namibia* |
| 09:35 | Short Break (Group Photo) | |
| 10:00 | Presentation | **Prof Gail Hughes** *University of the Western Cape, South Africa* |
| Faculty Presentations<br>Chairperson/ Rapporteur: **Dr Meed Mbidzo** | | |
| 10:20 | Analysis Of Predator-Prey Models With Infection in Both Species and Human Intervention | **Mrs Lutopu Khoa** |
| 10:40 | A Critical Review of the Namibian Biosafety Regulations and their Implication on Processed Food and Feed Importers | **Dr Paulus Mungeyi** |

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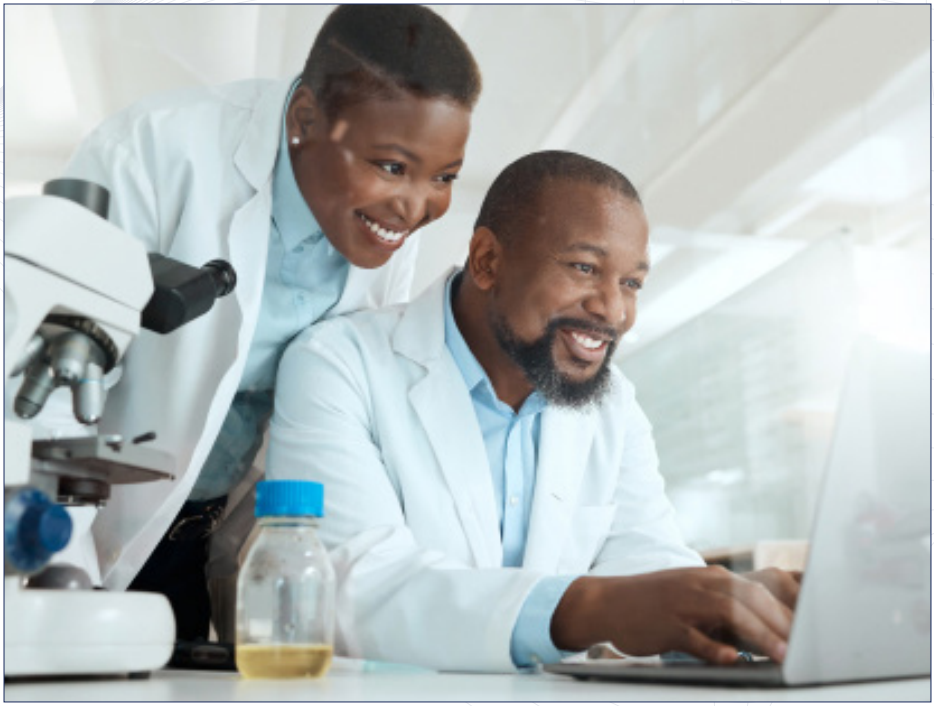
| 11:00 | Investigating the Potential Of Succulent Plants to Produce Volatile Fatty Acids | **Mr Absalom Shitalangaho** |
| 11:20 | Molecular Epidemiology and Antimicrobial Resistance of Vaginal Candida Glabrata Isolates in Namibia | **Dr Cara-Mia Dunaiski** |
| 11:40 | Presentation of Posters | **Maths Tutorial Centre** |
| 12:05 | Handing over of Certificates of Appreciation for Career Fair 2024 | **Dr Onesmus Shuungula**<br>*Executive Dean: FHNRAS* |
| 12:15 | Closing Remarks | **Dr David Iiyambo**<br>*Head of Department: Mathematics, Statistics and Actuarial Science* |
| 12:30 | Lunch | |



## Keynote Speaker

**Mr Benedict Libanda** is the founding and current Chief Executive Officer of the Environmental Investment Fund of Namibia. He holds a Masters degree in Development Studies obtained from the University of the Free State and a Masterdegree in Business Administration from Leicester University.

He has years of experience in environmental and climate finance, climate fund design and structuring, resource mobilization, project planning, and management. Mr. Libanda has successfully mobilized over US$400 million for climate investment during his carrier from agencies such as the Green Climate Fund, Agency for French Development, Swedish Environmental Fund, Global Environmental Facility. Through his role at the Environmental Investment Fund of Namibia, he is part of the Namibian team entrusted with the implementation of the Namibian Green Hydrogen Strategy and Roadmap.

## Guest Speaker

**Professor Gail Hughes** has 40 years of experience as a public health professional/researcher/academic and epidemiologist working in diverse work environments, including pharmaceutical industry, government sector, global consultant, and academia.

She served as the Director of South African Herbal Science and Medicine Institute (SAHSMI), and the Deputy Dean of Research and Postgraduate Studies in the Faculty of Natural Sciences at UWC. She received her postgraduate degrees/training at University of California-Berkeley (USA) in epidemiology, maternal and child health, and global HIV/AIDS. Professor Hughes's current research revolves around integrative health and medical pluralism in resource constrained populations with noncommunicable diseases (NCD), and Infectious Diseases; with focus on influencing policy, legislation and health professional awareness for better health options and outcomes.

## Analysis of Predator-Predator Models with Infection in Both Species and Human Intervention

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[3,] University of Namibia, Department of Computing, Mathematical and Statistical Sciences, Namibia.

### Biography

**Mrs Lutopu Khoa** has a Master of Science in Mathematics from the University of Namibia. She is currently a Junior Lecturer in the Department of Mathematics, Statistics and Actuarial Science. Qualification: BSc (Hons.) Mathematics and Statistics (UNAM), MSc Mathematics (UNAM).

### Abstract

The intricate interplay between infectious diseases and predator-prey dynamics holds pivotal significance. Within this context, our focus centres on the impact of human intervention through treatment and vaccination. This study delves into a predator-prey system, categorizing the populations as susceptible, infected with the disease, vaccinated when inoculated against infection, and under treatment post-infection. We formulate four comprehensive mathematical models that illustrate varying levels of human intervention: no intervention, intervention in the prey only, intervention in the predator only, as well as intervention in both species simultaneously. Mathematical proofs of model positivity and boundedness are provided. Following the derivation of equilibrium points, we analyse their stability by examining the signs of the eigenvalues from the Jacobian matrix and using the Routh-Hurwitz criteria. To verify our qualitative analysis findings, we conduct simulations using varied parameters in MATLAB.

We then draw conclusions regarding the impact that human intervention can have on a predator-prey system with infection. Simulation results indicated that without human intervention, predators faced extinction, whereas with treatment and vaccination in either the prey alone or in both predator and prey, the intervention demonstrated a positive effect, preventing the extinction of any species. Therefore, this study concludes that human intervention plays a crucial role in preventing species extinction.

*Keywords: Predator-Prey, Treatment, Vaccination, Equilibrium points, Stability analysis.*

## A Critical Review of the Namibian Biosafety Regulations and their Implication on Processed Food and Feed Importers

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### Biography

**Dr Paulus Mungeyi** is a Manager for the Biotechnology Division at the National Commission on Research, Science and Technology (NCRST), Namibia. NCRST is an agency of the Ministry of Higher Education, Technology and Innovation that is mandated to coordinate research, science, and technology in Namibia.

His primary role at the NCRST is ensuring the implementation of the Biosafety Act, 2006 (Act no. 7, 2006). He is a focal person coordinating the development of the National Sustainable Bioeconomy strategy. He is dedicated in assisting developing policies, strategies and programmes aimed at development Namibia and region through sustainable development, toward socio-economic advancement

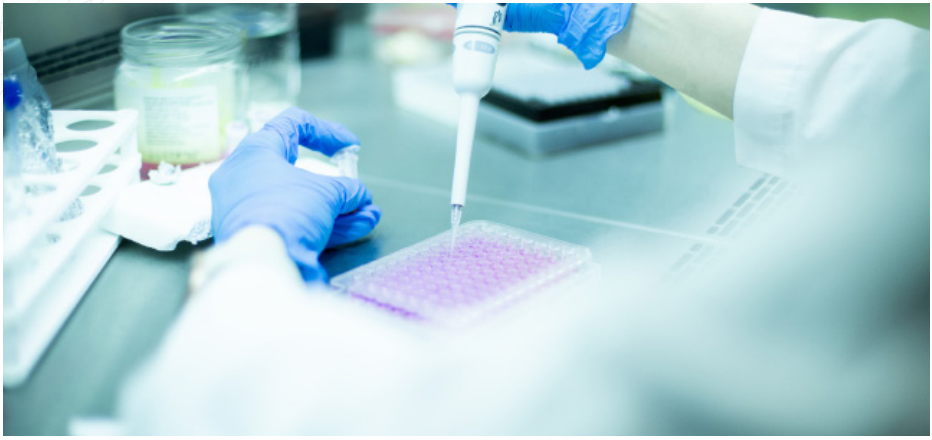
### Abstract

The study was carried out to investigate the implications of the Namibian biosafety regulations on Namibian food and feed importers. After the Biosafety Act, 2006 (Act No. 7 of 2006) was enacted, the biosafety regulation was gazetted in 2016, which saw the implementation of the biosafety framework. The first two objectives of the study were to assess the adoption and application of biosafety labelling regulations.

For these objectives, the study used a structured survey questionnaire based on responses from 135 Namibian importers of food and feed products who have the knowledge required for the adoption and application of the Namibian biosafety labelling regulations. For this objective, it was concluded that there is a need to reduce the current administrative burdens and improve dialogue between regulators and the food and feed importing industry while increasing the competence of regulators and creating more labelling regulation awareness for food and feed importers.

The study further established whether seeds, grains, processed foods, and feed products in the Namibian market, contain Genetically Modified Organisms (GMOs). A multistage probability random sampling was used to obtain samples from eight regions: the Khomas, Zambezi, Ohangwena, Omusati, Otjozondjupa, Kavango East, Kavango West, and Oshikoto regions. Most of the maize samples screened were positive for the presence of Genetically Modified (GM) content. According to the study, GMOs and GM products are present in Namibia. There is a need to raise awareness among importers, farmers, and traders, and ensure that everyone dealing with these activities is doing so under an authorised permit. Moreover, Namibia should learn from the progress made by South Africa and the European Union (EU) in establishing biosafety and biotechnology awareness institutions.

*Keywords: Genetically Modified Organisms, Labelling, Biosafety, Biotechnology, Awareness*



## Investigating the Potential of Succulent Plants to Produce Volatile Fatty Acids

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### Biography

**Mr Absalom Shitalangaho** is a recent Master's graduate in Natural Resources Management from the Namibia University of Science and Technology (NUST). His research interests lie in renewable resources for sustainable development.

Currently, Absalom is a student researcher at NUST working with the Perivoli Seed projects. In this role, he operates an anaerobic digester to produce biogas and bio-fertilizer, demonstrating to various audiences the potential of the anaerobic digestion process, particularly at the household level. He is driven by a passion to find innovative for natural resource management challenges that contribute to climate change mitigation and adaptation.

### Abstract

This study explores the potential of Namibian succulent plant biomass, specifically of Portulacaria afra and Euphorbia mauritanica, for volatile fatty acid (VFA) production through anaerobic digestion (AD). VFA's have diverse industrial utilities, such as the creation of bioplastics, food additives, pharmaceuticals, paints and perfumes. Arrested anaerobic digestion (AAD) under varying pH and temperature conditions was employed. The VFA analysis was based on Gas Chromatography-Mass Spectrometry (GC-MS). Results revealed significant influences of both pH and temperature on VFA concentrations, with distinct trends observed between the two succulent species.

Portulacaria afra exhibited maximal VFA production at a temperature of 37°C and pH 4, estimated to generate a maximum VFA concentration of around 6.42 g/L. Euphorbia mauritanica yielded a slightly lower estimated VFA concentration of 5.52 g/L under the same conditions. The identified optimal conditions align with recent findings, demonstrating the potential to achieve VFA concentrations exceeding 5 g/L with indigenous plants of Namibia. These findings contribute valuable data for optimizing bioenergy production strategies from succulent biomass, with applications in VFA-based bioproducts and biofuel.

*Keywords: Anaerobic digestion, Succulent biomass, Volatile fatty acids (VFAs), Gas Chromatography-Mass Spectrometry (GC-MS), Portulacaria afra, Euphorbia mauritanica*

## Molecular Epidemiology and Antimicrobial Resistance of Vaginal Candida Glabrata Isolates in Namibia

[1,] Cara M. Dunaiski, [1,2,] Marleen M. Kock, [3,] Annie Chan, [1,4,] Remco P.H. Peters

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### Biography

**Dr Cara Mia Dunaiski,** holds a Ph.D. in Medical Microbiology, an MSc and a BSc in Biomedical Sciences, showcasing extensive knowledge in health sciences. As a lecturer and biomedical scientist, her expertise in medical microbiology contributes to combating antimicrobial resistance.

Proficient in qualitative and quantitative research, she actively engages in interdisciplinary projects spanning experimental, clinical, and epidemiological domains.

### Abstract

Candida glabrata is the most common non-albicans Candida species that causes vulvovaginal candidiasis (VVC). Given the intrinsically low susceptibility of C. glabrata to azole drugs, investigations into C. glabrata prevalence, fungal susceptibility profile, and molecular epidemiology are necessary to optimise the treatment of VVC. This molecular epidemiological study was conducted to determine antifungal drug profile, single nucleotide polymorphisms (SNPs) associated with phenotypic antifungal resistance and epidemic diversity of C. glabrata isolates from women with VVC in Namibia. Candida glabrata isolates were identified using phenotypic and molecular methods. Antifungal susceptibility of strains was determined for fluconazole, itraconazole, amphotericin B, and anidulafungin. Whole genome sequencing was used to determine SNPs in antifungal resistance genes and sequence type (ST) allocation.

Among C. glabrata isolates, all (20/20; 100%) exhibited phenotypic resistance to the azole class antifungal drug, (fluconazole), and phenotypic susceptibility to the polyene class (amphotericin B), and the echinocandins (anidulafungin). Non-synonymous SNPs were identified in antifungal resistance genes of all fluconazole-resistant C. glabrata isolates including ERG6 (15%), ERG7 (15%), CgCDR1 (25%), CgPDR1 (60%), SNQ2 (10%), FKS1 (5.0%), FKS2 (5.0%), CgFPS1 (5.0%), and MSH2 (15%). ST15 (n = 8/20, 40%) was predominant. This study provides important insight into phenotypic and genotypic antifungal resistance across C. glabrata isolates from women with VVC in Namibia. In this study, azole resistance is determined by an extensive range of SNPs, while the observed polyene and echinocandin resistance-associated SNPs despite phenotypic susceptibility require further investigation.

*Keywords: Candida glabrata, Namibia, antifungal resistance, vulvovaginal candidiasis, whole genome sequencing.*

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