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THE BIOSCIENCE NEWSLETTER

Official Newsletter of the UDS Faculty of Biosciences



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MESSAGE FROM THE DEAN

I welcome you to the 2nd quarter edition of The Bioscience Newsletter (TBN). The Faculty of Biosciences has been up to many activities that focus on the quality training and development of our students, and building of enabling systems where everyone can realize their highest potentials. In this edition of TBN, you will be treated to a series of thematic seminars featured in our Bioscience Discourse for the quarter, illustration of our attractive postgraduate and undergraduate academic programmes, postgraduate thesis experience, exhibition of our infrastructural capacity and competence, and evidence of practical training of the minds and hands of our students.



PROF. ELLIOT H. ALHASSAN, DEAN

BIOSCIENCE DISCOURSE

Bioscience discourse is a seminar series of the Faculty of Biosciences of the University for Development Studies (UDS), where Faculty members and invited guest-scientists present their research work, innovations, innovative ideas, scientific propositions, etc, to their peers and students for a constructive discussion (discourse). Having launched BD in January 2022, it has so far featured 11 speakers of varied specialties in the Faculty and beyond. The BD platform is growing stronger and the impact on members is commendable; members are getting to understand the research activities of one another and that is promoting collaborations and peer review, whereas students are getting to appreciate the areas of specialty in biosciences as demonstrated by their mentors, and also learning how quality research is conducted and communicated. In this edition, BD series is composed of thematic presentations from five senior and early-career researchers.



A snapshot of s Bioscience Discourse session
Photo Credit: Bluecraft photos

FISHERY CONTRIBUTION OF THE TONO RESERVOIR TO POVERTY REDUCTION

Water is a major resource for life, as such, human settlements are confined to the surroundings of natural or man-made water resources. The Tono reservoir was constructed between 1975 – 1985 by the government of Ghana to promote all-season crop production in the Kassena-Nankana West District of the Upper East Region. The 5 km long and 93 000 000 m³ storage capacity water reservoir has served its primary purposed in crop production and beyond.

Notably, the reservoir has been a source of livelihood for fishers but this aspect has not been adequately studied. Therefore, a research team, led by the senior scientist and Head of Department of Fisheries and Aquatic Resources Management, Dr. Daniel Nsoh Akongyuure evaluated the contribution of the Tono reservoir to poverty reduction among fishers in the catchment area. In their article led by Dr Akongyuure, [<https://doi.org/10.2989/16085914.2017.1344120>], the team noted that the reservoir contributes tremendously to fishers' income and household livelihood. There was low incidence of poverty among fishers when the data were tested against the 6th Ghana Living Standards Survey (Ghana Statistical Service, 2014) and the poverty rate and poverty gap indicators of EUROSTAT (2016).

During a discourse session in the Faculty of Biosciences, Dr. Akongyuure observed that the reservoir's potential could be harnessed by introducing alternative livelihood projects such as "Aquaculture for food and jobs" in the riparian communities to enhance the livelihood of fishers.



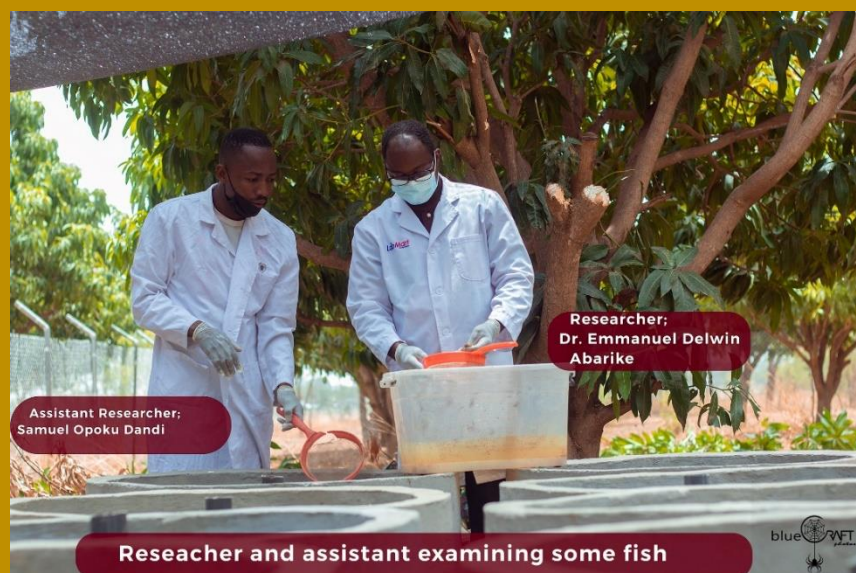
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CHARACTERIZATION OF *AEROMONAS JANDAEI* IN NILE TILAPIA

Nile tilapia production is gaining ground in Ghana as a sustainable option to meet the country's fish needs. However, its production has been plagued with many challenges among which there is a widespread occurrence of bacterial infections such as *Aeromonas* spp. To sustain the production of Nile tilapia in Ghana, there has been the need to take prudent steps to reduce losses relating to bacteria infection.

In a research project funded by the International Foundation for Science (IFS) of grant number **I2-A-6542-1**, Dr Emmanuel Delwin Abarike and his postgraduate students of the Department of Fisheries and Aquatic Resources Management have been successful in isolating and characterising *Aeromonas jandaei* GH-AS II in Nile tilapia from cage fish farms at Akosombo stratum II in Lake Volta. The bacterial isolate *A. jandaei* GH-AS II was found to have the potential to cause mortality (up to 50% at 1×10^5 CFU/mL) in Nile tilapia. *Aeromonas jandaei* GH-AS was found to be resistant to Tetracycline and Ampicillin but susceptible to Amoxicillin.



A test of the antimicrobial properties of Guava, Bitter, and Neem leaf extracts showed that at concentrations 10, 30, 50, 70, and 100 mgmL⁻¹ the growth of *A. jandaei* GH-AS II in vitro was inhibited. To understand the full potential of Guava, Bitter, and Neem leaf extracts, in vivo trials are now being conducted to observe their efficacies on the growth and resistance against *Aeromonas jandaei* GH-AS II in Nile tilapia.



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DETECTION OF HEPATITIS B VIRUS SURFACE ANTIGEN AND ANTIBODY MARKERS IN CHILDREN AFTER THE PENTAVALENT (DTP-HBV-HIB) VACCINATION

Hepatitis B is a very common liver disease caused by the hepatitis B virus (HBV). It is bad news to fact-check out the statistics concerning people living with and those that die from complications that are associated with this disease. Looking at the mode of transmission it is alarming that most people are unaware they are living with the disease. Sub-Saharan Africa falls under the hyperendemic hepatitis B areas even though presently, there are other solutions to treat HBV so that people don't die of complications.

Ways of managing HBV in Ghana include regular screening but Mr Thomas Apiung's research on the HBV is an additional effort towards the advocacy of the disease with much focus on children. Mr Apiung is an Assistant lecturer in the Department of Microbiology of UDS. He carried out a cross-sectional study on children of 5-36 months at a pediatric hospital in Accra to assess hepatitis B antibody response among children vaccinated with the pentavalent vaccine. His research concludes that the responses to the HBV component of the pentavalent (DTP-HBV-Hib) vaccine were encouraging even though HBV infection is still possible despite infant vaccination.

Mr Apiung's recommendations after the study include the need to acquire pre- and post-vaccination outcomes in children. Also, there is the need for a booster dose during early childhood and finally, the establishment of national data and urgent protocol to ensure the effective elimination of HBV infections in Ghana.



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PATULIN CONTAMINATION IN APPLES

Patulin contaminations in the apple value chain keep raising global food safety concerns. Patulin is a secondary metabolite (mycotoxin) produced by the blue mold *Penicillium expansum* that grows on fruits and vegetables. It causes various toxicological effects after prolonged exposure by ingestion. Moldy apple fruits and juice made of such are toxic to consumers' health.



The market for apple fruit in Ghana is enormous, although the country grows no apples. Prof. Gustav Komla Mahunu, the Head of the Department of Food Science and Technology, is advocating for a holistic strategy for the prevention and control of patulin in fresh apples and other products made from apple fruits in Ghana and the sub-region. In an observational survey across many local markets, Prof. Mahunu noticed that apples are handled very poorly, a premise for microbial contamination such as *P. expansum*. Prof. Mahunu had worked extensively studied patulin contamination and degradation in apples at Jiangsu University, China, during his Ph.D. studies [see <https://doi.org/10.1016/j.biocontrol.2015.10.012>, <https://doi.org/10.1016/j.postharvbio.2018.03.005>, <https://doi.10.3109/1040841X.2015.1009823>, and <https://doi.org/10.47881/103.967x>] and had preferred some advice for the public: do not eat damaged or moldy apples nor use them to make juice, consume fresh apple juice as soon as possible, and store prepackaged apples and apple juice by the manufacturer's instruction provided on the label. He seeks to explore local biocontrol alternatives to prevent *P. expansum* infection and patulin decontamination. In concluding remarks, Prof. Mahunu indicated that he is open to collaborations and funding toward the surveillance, prevention, and control of patulin in apple fruits and products in Ghana. He further called on all relevant stakeholders to get involved in this action.

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ASSESSING THE QUALITY OF COCOA

Today, there are cocoa varieties that people can enjoy and make money out of within three years of planting basically because of viable seeds, proper fertilizing and irrigation, fermentation and drying regimes. The cocoa processing industry of Ghana will not achieve their vision to process quality and healthy products for consumers, chocolate producers or pharmaceutical industries if they don't look out for some quality parameters. With knowledge about what cocoa means to the consumer and the economy of Ghana, the industry standards need to be met to bring out the unique texture, appearance, smell and taste expected of premium quality cocoa.

The emergence of the "fine flavour cocoa" which is capable of being produced in Ghana is already serving the quality needs of consumers and relevant industries. With this variety, Ghana will be capable of increasing its cocoa revenue while consumers also appreciate what they use their money to purchase. Dr Isaac Yaw Berbiye, a lecturer in the Department of Biological Sciences of UDS is focused on the fermentation regimes and biochemical quality parameters of cocoa. He has begun a study to assess whether bagged cocoa products labelled for export have these quality parameters. His research also emphasizes the comparison between cocoa in Ghana and what is produced in neighbouring Ivory Coast and some other countries like Trinidad and Tobago based on these quality parameters.

Dr Berbiye with high optimism is open to collaborators and funding opportunities as he concludes that "Ghana continues to be a very good exporter of cocoa but then I aim to try and move away from the normal trend and enter into the biochemical aspect of it so that at least if we are able as a country to identify a specific biochemical trait, Ghana could put itself out there as a country that is a major exporter of cocoa beans that is rich in say polyphenols then we can have the bargaining power just like those who have the "fine flavour cocoa".



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FACULTY OF BIOSCIENCES – STUDY PROGRAMMES

The Faculty of Biosciences is made up of 6 Academic Departments that ran undergraduate and postgraduate programmes indicated below.

Department of Biotechnology

- Dip. Biotechnology and Molecular Biology
- BSc. Biotechnology and Molecular Biology
- MSc. Biotechnology
- MPhil. Biotechnology
- PhD. Biotechnology

Department of Fisheries and Aquatic Resources Management

- Dip. Aquaculture technology and Fisheries Sciences
- BSc. Aquaculture Technology and Fisheries Sciences
- MPhil. Fisheries Science
- *PhD. Fisheries Science*
- *PhD. Sustainable Aquaculture*

Department of Biochemistry and Molecular Biology

- *BSc. Biochemistry*

Department of Microbiology

- *BSc. Microbiology*

Department of Biological Sciences

- *BSc. Biological Science*

Department of Forensic Sciences

- *BSc. Forensic Science*

The programmes italicized are at advanced stages of consideration for full accreditation by the Ghana Tertiary Education Council (GTEC). The other programmes are fully accredited by GTEC and are being ran with high enrollments.

POSTGRADUATE STUDIES – THESIS EXPERIENCE

Below are some of our postgraduate students sharing their thesis research experience.



PLASMODIUM FALCIPARUM HRP 2 AND 3 GENE DELETIONS IN NORTHERN GHANA

Malaria is hyperendemic in Ghana and has dominated outpatient morbidity for decades. Although there are five causative agents of malaria, Plasmodium falciparum is most deadly and prevalent in Ghana like most African countries. One of the diagnostic tools used is the Pfhrp2/3-dependent Rapid Diagnostic Test (RDT) kits. The target gene(s) of such RDTs may be absent or significantly altered in a P. falciparum isolate, hence, lead to misdiagnosis and mismanagement of disease.

The research sought to probe occurrence and prevalence of Pfhrp2 and 3 gene mutations and variability by employing the use of molecular-based techniques and genetic analyses.



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 Study programme: MPhil. Biotechnology
 Level: 600

Supervisors
 Dr Francis Addy
 Dr Cletus Adiyaga Wezena

PREVALENCE AND MOLECULAR DIVERSITY OF HEPATITIS B VIRUS IN THE SAVELUGU MUNICIPALITY, GHANA

Hepatitis B is caused by the hepatitis b virus (HBV). It is the leading cause of liver cirrhosis and hepatocellular carcinoma. Despite the high levels of hepatitis B and its effects in Africa, HBV epidemiology is poorly documented in the subregion. The research seeks to assess the prevalence and to characterize HBV using genotype-specific primers and nested PCR. This will be an avenue to understand the virus since the clinical course and long-term outcome of hepatitis B virus (HBV) infection is affected by several factors including viral genotype.



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PRACTICAL TRAINING EXPERIENCE

- ***AT THE FISH FARM OF THE DEPARTMENT OF FISHERIES AND AQUATIC RESOURCES MANAGEMENT (DFARM)***

The fish farm was established in 2019 with the primary objective of producing fingerlings and table size fish (Tilapia, *Oreochromis niloticus* and Catfish, *Clarias gariepinus*) for commercial purposes. In addition, it has been the Center in the Northern Region for most research work and training of students from UDS and other affiliated institutions on fish culture, water quality management, fish nutrition and environmental health management with respect to effluent treatment and its discharge.

Contact: Dr. Daniel Nsoh Akongyuure [HoD-DFARM], akongyuure@uds.edu.gh



Plate 1: Students monitoring physico-chemical water quality parameters on the fish farm. This has enlightened graduates to have in-depth knowledge on things that negatively affect the quality of water in fish culture and the how it can be mitigated.



Plate 2: Students taking weight and length of catfish. This is done from time to time to monitor growth performance of the fish in culture. It informs the farmer of the effect (positive or negative) of the nutrition and management practices on fish in culture.



Plate 3: Hematological and histopathological indices can be beneficial in monitoring the health status of fish (Nutrition, water quality, stress and the internal organs functioning), as long as interpretation account for inherent and extrinsic factors that can impact the cell appearance. Moreover, hematological and biochemical parameters are important indicators used in monitoring physiological, pathological changes in fish, metabolic disorders and other deficiencies.



Plate 4 and 5: Graduate student recycling aquaculture effluent. Water availability is key in a successful aquaculture system. In areas where water is limited, recirculation is adopted to reuse the same water after the effluent is made to pass through some filtration process after which its return back into the system.





Plate 6 and 7: Students setting up an aquaponics system where plants are planted on aquaculture effluents without soil with the help of stereofoam to keep the plants upright for it to utilize the nutrient (nitrate) in a way of purifying the waste water for reuse. Again, another chamber is created containing gravels after the aquaponic unit to facilitate the filtration process. With this unit, vegetables can be grown on both chambers (Aquaponic and gravel) in addition to water filtration for reuse.



- **AT THE DEPARTMENT OF BIOTECHNOLOGY (DB)**

In addition to the good theoretical foundational courses designed to equip our students, we also provide practical trainings in four novel (practical training) courses to prepare our graduates ready for the job market. We are very intentional about the practical trainings for our students at all levels and have pragmatic measures in place to ensure sustainability of this approach of education. This approach has been the game changer.

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Plate 8: A cross-sectional display of molecular biology equipment – Thermal Cyclers, UV chamber, gel documentation unit, etc.

PRACTICAL TRAINING EXPERIENCE



Plate 9 and 10: A snapshot of undergraduate students in a practical training session in the laboratory



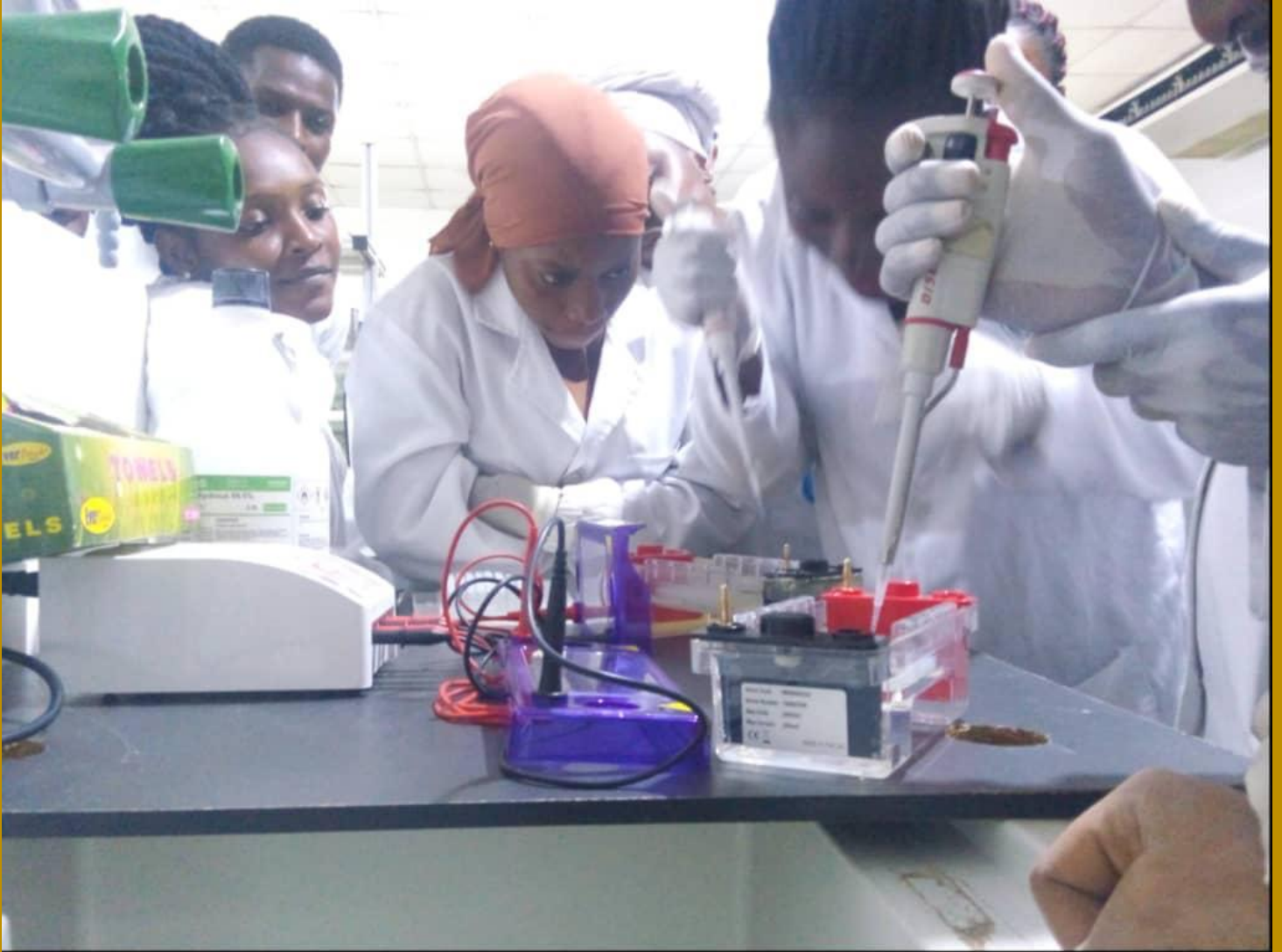
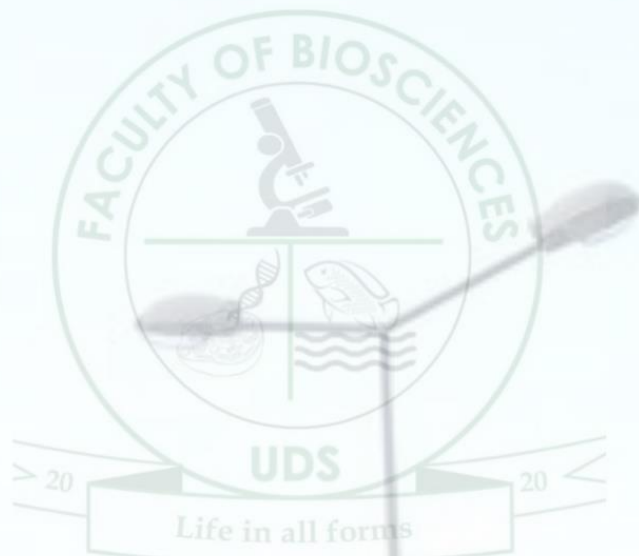


Plate 11: A group of students practicing the loading of PCR amplicons into an agarose gel



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