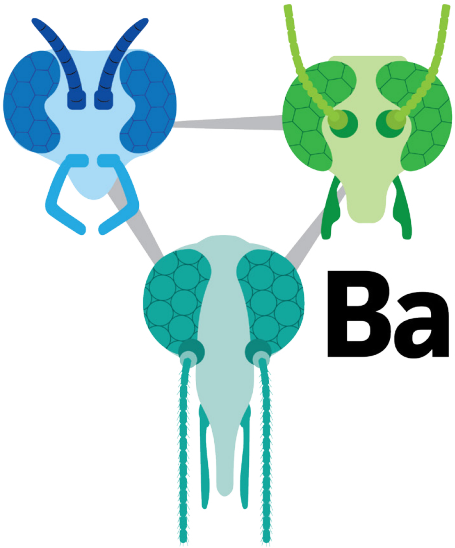


Bangladesh '18

Conference Booket
2nd September 2018

THE Pirbright INSTITUTE

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

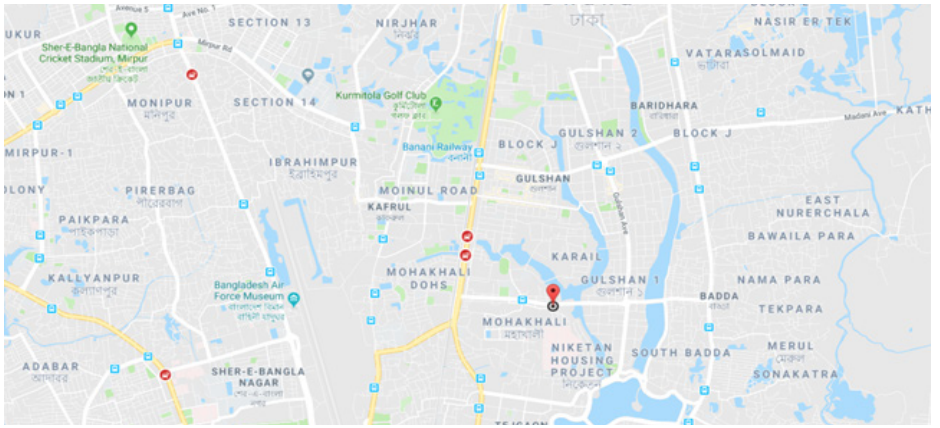
GCRF Global Challenges Research Fund

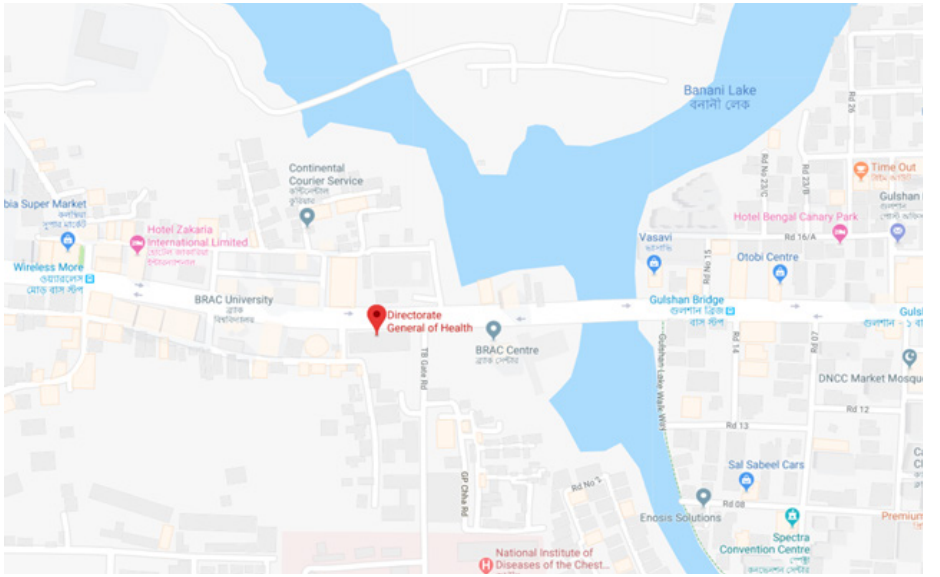
BBSRC bioscience for the future

Contents

Location

MIS Auditorium, Directorate General of Health Services, Government of Bangladesh, Mohakhali, Dhaka-1212





Welcome from Bangladesh

Disease Control Division, Communicable Disease Control (CDC) of Directorate General of Health Services (DGHC) has been implementing major vector borne diseases (malaria, kala-azar, filariasis, dengue, chikungunya, etc.) control/elimination programme in Bangladesh.

Vector-borne diseases are putting heavy toll on mortality and morbidity every year in this country. We need trained human resources especially entomologists for proper management of all disease vectors to maintain low transmission. Currently the country has a lack of trained entomologists who will assist in different national disease control programmes to achieve their goal. Nowadays, young graduates are reluctant to take entomology as their career. Without having a guided career path, lack of incentives and availability of proper training are responsible for the current situation.

The Pirbright Institute, UK is interested to train the early-career researchers (MSc students with a specialization in Entomology) as well as other entomologist working in GoB and other organizations with different capacities. This will be beneficial for us in developing capacity for human resources to devote their life for combating against all vector-bourne diseases which exist in the country.

I wish every success of the training programme and express my gratitude to all trainers who travelled from long distance only to support our countrymen.

Prof Dr Sanya Tahmina
Director, Disease Control &
Line Director, CDC,
DGHS, Mohakhali, Dhaka-1212

Welcome from the Gnatwork

We are excited to welcome you to Bangladesh for the first international meeting of the Gnatwork. The Gnatwork was established to bring together workers on blackflies (Simulidae), sandflies (Psychodidae) and biting midges (Ceratopogonidae) from around the world. We hope that the Gnatwork annual meetings will enable individuals working on these vectors to meet and exchange ideas regarding technical issues that arise when working on small biting flies. Our post-meeting workshops will also teach technical skills to early-career researchers within vector-bourne diseases.

We look forward to talking to you all over the course of the meeting and hope that you find the meeting both enjoyable and productive.

Emma Howson

Agenda

08:45-09:15 Registration

Theme 1: Introduction to the Gnatwork and vectors Chair: Dr Simon Carpenter	
09:20 - 09:30	Conference welcome
09:30 - 09:50	The Gnatwork: membership and opportunites Dr Simon Carpenter
09:50 - 10:10	Sandfly biology and their role as vectors Prof Mary Cameron
10:10 - 10:30	Biting midges: biology and their role as vectors Dr Lara Harrup
10:30 - 10:50	Biology and vectorial roles of blackflies Prof Robert Cheke

Theme 2: Vector research within Southern Asia Chair: Prof Mary Cameron and Dr Rajib Chowdry	
11:30 - 11:50	Understanding biology and ecology of bluetongue vectors of West Bengal, India Dr Rupa Harsha
11:50 - 12:10	Research on Visceral leishmaniasis vector (*Phlebotomus argentipes*) control in Bangladesh Mr Rajib Chowdhury
12:10 - 12:30	One Health research in Bangladesh Dr Ariful Islam

Lunch and poster session	
12:30 - 14:00	Lunch and poster session

Theme 3: Trends and opportunities in vector research Chair: Prof Neal Alexander and Prof Bob Cheke	
14:00 - 14:20	Spatial modelling of leishmaniasis vector occurrence and case incidence Prof Neal Alexander
14:20 - 14:40	Of creatures big and very small – veterinary aspects of vector-borne pathogen transmission Dr Karin Darpel
14:40 - 15:00	3D virtual histology of parasites in their hosts and of the development of insects of medical and veterinary importance Dr Martin Hall

Organising Committee

Bangladesh

Dr Dinesh Mondal
Senior Scientist
Nutrition and Clinical Services Division
Emerging infections and Parasitology laboratory
International Centre for Diarrhoeal Disease Research, Bangladesh

Mr Rajib Chowdhury
Laboratory for Parasitology
International Centre for Diarrhoeal Disease Research, Bangladesh

UK

Dr Emma Howson
Network manager
The Pirbirght Institute, UK

Dr Simon Carpenter
Network Director
The Pirbright Institute

Professor Mary Cameron
Network Co-Director
The London School of Hygiene and Tropical Medicine

Speaker Biographies

Theme 1: Introduction to the Gnatwork and Vectors

The Gnatwork: membership and opportunites
Dr Simon Carpenter

Dr Simon Carpenter has worked for nineteen years on *Culicoides* biting midges and the pathogens that they transmit. During this time, he has published over 70 papers on the biology and ecology of these arbovirus vectors and conducted studies in the field and laboratory in the Mediterranean Basin, India, Brazil and South Africa. Dr Carpenter has also led a previous BBSRC funded network on Culicoides in India (IBVNet) and participated in three network-based EU projects on vectors (Medreonet; EDENext and Vectornet). He has recently co-organised the largest ever symposium specifically on *Culicoides* ecology and biology at ICE in Orlando, Florida and acts as a founder member of the OIE policy working group on the genus. Dr Carpenter possess unrivalled links within the community, both through the pathogen reference laboratories maintained at The Pirbright Institute and his own field- and laboratory-based studies.

Sandfly biology and their role as vectors
Professor Mary Cameron

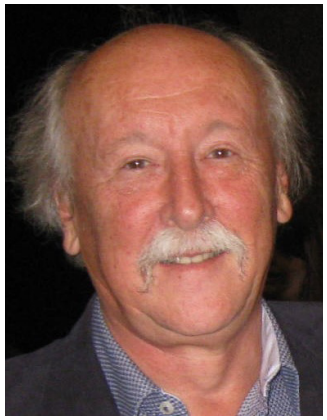
Professor Cameron is Professor of Medical Entomology at the London School of Hygiene & Tropical Medicine (LSHTM), UK and has over 30 years of experience in delivering international level field and laboratory research focusing on novel trapping methods for the surveillance and control of a wide range of medically important arthropods, including sandflies. During this time, she has developed a strong collaborative network and is a sought after and leading authority in her field. She is currently involved in consortia and research projects based in India, Brazil and Bangladesh funded by the Bill and Melinda Gates Foundation, EU: Marie Curie – Initial Training Network (ITN), Science Without Borders and the BBSRC. She is also a Member of the WHO Regional Technical Advisory Group to support the Kala-azar elimination programme in the South-East Asia Region. In addition to her research programme, Prof. Cameron enjoys transferring her research skills by training others and disseminating her knowledge. She is the Programme Director for the MSc Medical Entomology for Disease Control and MSc Medical Parasitology at the LSHTM, a Vice-President, Trustee and Fellow of the Royal Entomological Society and is editor-in-chief of the journal Medical and Veterinary Entomology.

Biting midges: biology and their role as vectors
Dr Lara Harrup

Dr Lara Harrup is a senior postdoctoral research scientist in the Entomology group at The Pirbright Institute. She is an ecological geneticist and specialises in vector ecology, arbovirus epidemiology (disease spread) and the biology of *Culicoides* biting midges and *Culicoides*-borne arboviruses. Her recent research interests focus on combining field entomology and ecology with genetic and genomic characterisation of *Culicoides* populations to investigate vector-virus-host interactions for economically important arboviruses including African horse sickness virus, bluetongue virus, Oropouche orthobunyavirus and Schmallenberg virus. Dr Lara Harrup specialises in the establishment of vector surveillance networks and research projects in logistically difficult areas and has on-going collaborations with Brazil, India and Trinidad. As part of this work she continues to support entomological research units established in southern India via a Combating Infectious Diseases in Livestock for International Development (CIDLID) project working on 'Monitoring and intervention strategies for bluetongue virus epidemics in rural India' and co-supervises a PhD student at the University of the West Indies, Trinidad and Tobago. Lara is an external guest lecturer at several UK universities and runs training courses both in the UK and overseas on *Culicoides* biology and control, techniques for arbovirus infection studies, and the morphological and molecular identification of *Culicoides*.

Biology and vectorial roles of blackflies

Professor Robert Cheke



Robert A. Cheke is Professor of Tropical Zoology at the Natural Resources Institute of the University of Greenwich, based at its Medway campus in Chatham, UK, and a Visiting Professor at the Department of Infectious Disease Epidemiology at Imperial College London, UK. He has over 40 years of experience of field and laboratory research in Africa focusing on the biology and control of blackflies, vectors of onchocerciasis ("river blindness"), but he has also worked on other vectors of medical and veterinary importance and on agricultural pests such as locusts and quelea birds. From 1979 until 1990 he worked with the WHO Onchocerciasis Control Programme in West Africa studying blackfly migrations, identification methods, larvicide testing and the vector competence of different cytoforms before working with the WHO African Programme for Onchocerciasis Control as part of the team that eliminated onchocerciasis vectors from Bioko, Equatorial Guinea. Latterly he has worked on blackfly projects in Ghana investigating the potential effects of climate change on river blindness and on onchocerciasis transmission dynamics. He is currently involved in a NERC consortium studying mosquitoes in England and working with collaborators in China on models of the transmission of dengue and other diseases. In addition to his research programme, Prof. Cheke contributes to MSc and PhD programmes and other training courses in the UK and Africa.

Theme 2: Vector research within Southern Asia

Understanding biology and ecology of bluetongue vectors of West Bengal, India

Dr Rupa Harsha

Dr. Rupa Harsha did her B.Sc. (Honors) and M.Sc. (Zoology) with specialization in Microbiology and Parasitology from the University of Burdwan, Burdwan, West Bengal, India. In 2017 she was awarded Ph.D. in Zoology working under the guidance of Prof. A. Mazumdar, Entomology Research Unit, The University of Burdwan. Thereafter, she joined as an Assistant Professor in Department of Zoology, Balurghat College affiliated to Gour Banga University, West Bengal. Her area of research is on the biology and ecology of *Culicoides*, the vectors of BTV. The Ultra Violet light trap was designed and fabricated by her in collaboration with USIC, The University of Burdwan. She has carried out exhaustive field trials on the abundance, seasonality of the biting midges i.e. *C. oxystoma*, *C. peregrinus*, *C. innoxius*, *C. fulvus* and some members of subgenus Avaritia in the Burdwan and Hooghly districts of West Bengal. She has published over 9 peer-reviewed papers in national and international journals (Medical and Veterinary Entomology, Zootaxa, Zoologischer Anzeiger). She has made significant contribution in the understanding of the bionomics of vector species of medico-veterinary importance, viz. etc.

Research on visceral leishmaniasis vector (*Phlebotomus argentipes*) control in Bangladesh

Mr Rajib Chowdhury

My name is Rajib Chowdhury from Dhaka, Bangladesh. I did MSc in Zoology with specialization in Entomology and also MPH in Epidemiology. I work in the International Centre for Diarrheal Disease Research, Bangladesh ('icddr,b') as a consultant. I have been involved in Neglected Tropical Diseases (NTDs) research, especially visceral leishmaniasis (VL) for more than 17 years. In this long period of work with VL, I focused on generating evidence on epidemiological features, proper diagnosis & management, and effective vector control interventions for Bangladesh as well as the Indian sub-continent. In the meantime, I have worked for the WHO, at the Regional Office for South-East Asia, New Delhi, India as Technical Officer and as a Fellow in the Fellowship programme on Project Management. I was involved in monitoring project activities supported by the WHO/TDR in the South-East Asia Region from 2006 to 2012.

One Health research in Bangladesh

Dr Ariful Islam

Dr. Ariful "Arif" Islam, Research Scientist at EcoHealth Alliance (EHA), currently working in Bangladesh as the Country Coordinator for the USAID supported Emerging Pandemic Threat Program's PREDICT project based at Institute of Epidemiology, Disease Control and Research (IEDCR). Using the OneHealth Approach, the project is investigating the behaviors, practices, and ecological and biological factors driving disease emergence, transmission, and spread. Dr. Ariful Islam's work is focused on understanding the drivers of zoonotic viruses such as Nipah virus, avian influenza, MERS-CoV, Ebola, Novel viruses discovery and zoonotic disease emergence at the animal, human and ecosystem interface.

As a Bangladesh program coordinator at EcoHealth Alliance, Dr. Arif coordinates all of EHA's sampling, testing, capacity building and training efforts in Bangladesh. Dr. Arif began working with Eco Health Alliance in January 2009 on the Nipah virus ecology research project in Bangladesh. In 20102, Dr. Arif became the PREDICT Bangladesh country coordinator for USAID's Emerging Pandemic Threats program. Dr. Arif works closely with partners from the Institute of epidemiology, Disease control and Research (IEDCR), the Bangladesh Forest department, the Department of Livestock services, icddr,b, Bangladesh Livestock Research Institute (BLRI), and local universities to develop personnel and laboratory capacity and establish sustainable disease surveillance systems. Dr. Islam also acts as an Executive Board member of One Health Bangladesh. For the last eight years, Dr. Arif has strengthened his One Health skillset while working with PREDICT to prevent, detect, and rapidly respond to the spillover of potentially infectious pathogens from wildlife to humans and domestic animals. His team has worked with partners and colleagues to build and develop the capacity for conducting One Health surveillance activities `in the field and viral detection in laboratories. As a native of Bangladesh, Ariful Islam's long-term goal is to contribute to the improvement of high quality scientific research in Bangladesh through his work at EcoHealth Alliance.

Theme 3: Trends and opportunities in vector research

Spatial modelling of leishmaniasis vector occurrence and case incidence
Professor Neal Alexander

Neal Alexander is Professor of Medical Statistics and Epidemiology at the London School of Hygiene and Tropical Medicine, where he is a leader of the methods theme of the MRC Tropical Epidemiology Group. He is also leader of the Epidemiology and Biostatistics Unit at CIDEIM in Cali, Colombia, where he been based since 2004. He previously lived in Nigeria and Papua New Guinea, working on trials of ivermectin against onchocerciasis and lymphatic filariasis. His first degree is in mathematics and PhD on the epidemiology of lymphatic filariasis. He leads a module on the LSHTM distance learning MSc in Clinical Trials. I have been trial statistician of several trials of the Leishmaniasis East Africa Platform (LEAP) consortium, and am the principal investigator of one of the component projects of an NIH-funded TMRC programme on the hidden burden of cutaneous leishmaniasis in Colombia. I am also collaborating on the DENGUE-INDEX project in Thailand.

Of creatures big and very small – veterinary aspects of vector-borne pathogen transmission
Dr Karin Darpel

Dr Karin Darpel is a veterinarian with more than 10 years' experience in pathogenesis, immunology and virology of Culicoides-borne viruses focusing specifically on arboviruses of veterinary importance. Her group at the Pirbright Institute is particularly interested in the mammalian immune response towards insect blood-feeding and/or insect saliva and how the skin-vector interface may influence the dissemination and pathogenesis of transmitted viruses. Ongoing collaborative research projects within her group are funded by BBSRC, DEFRA or EU Horizon 20:20. In addition to her research programme Dr. Darpel contributes to BSc Veterinary Medicine, MSc and PhD programmes and she is a guest lecture in Veterinary Virology at the School of Veterinary Medicine, University of Surrey.

3D virtual histology of parasites in their hosts and of the development of insects of medical and veterinary importance
Dr Martin Hall

Martin Hall is Head of the Parasites and Vectors Division in the Department of Life Sciences at the Natural History Museum in London. He joined the Museum in 1989 following seven years studying the biology, behaviour and novel methods for control of tsetse flies in Africa. While his research has included studies of a number of biting flies, such as Tabanid horse flies and Culicoides midges, his focus has been on fly species that develop as larvae on carrion and/or on live animals, on the latter causing the neglected disease known as myiasis. This has included field studies in Europe, South and Central America, Africa, the Middle East and Asia. His most recent laboratory research focuses on the use of micro-CT scanning techniques to study metamorphosis and development of blow flies and bot flies within their puparia and to conduct 3D histology to visualise parasite:host interactions, notably of Dicrocoelium liver flukes in ants, their intermediate hosts. He is a guest lecturer on BSc and MSc courses at several UK universities and presently has two PhD students. Martin has been a Vice-President of the Royal Entomological Society, was the founding President of the European Association for Forensic Entomology and is currently on the Editorial Boards of Medical and Veterinary Entomology and Forensic Science International.

Poster Abstracts

1

Immature taxonomy of *Culicoides* spp. in vector identification and habitat characterization

Paul, N.[1,2], Mazumdar, S.M.[1], Sarkar, S.[1] & Mazumdar, A.[1]

[1]Entomology Research Unit, Department of Zoology, Golapbag Academic Complex, The University of Burdwan, Burdwan 713104, West Bengal, India
[2]Office of the Chief Medical Officer of Health, Rampurhat HD, Department of Health & Family Welfare, Government of West Bengal, Rampurhat-731224, India

Study on holometabolous insects lies in their presence of remarkably different phenotypic expressions of its life stages with a different set of characters. Beside adult taxonomy, it is imperative to work out the morphotaxonomy of pupa, larvae and egg stages intra and inter species taxa. Character congruency of immature and adult stages should be addressed to resolve the problem of cryptic, morpho-equivalent, geoform, eco-form species. Accurate knowledge of unique character of the immature forms should be utilized in identify the species. Specifically, eggs of *Culicoides* spp. (viz. *C.anophelis*, *C.fulvus*, *C.peregrinus*, *C.huffi* and *C.oxystoma*) possess specific chorionic markers, which may be useful and powerful tools of identification of the species at a very early stage. Moreover, body texture of immature also exhibits modifications depending on its specific microhabitats. In India, 79 species of *Culicoides* spp. have been indentified; *C. innoxius*, *C. peregrinus*, *C.huffi* and *C.oxystoma* have been studied based on immature taxonomy. The detail description and analysis of the immature of the potent vector species shall provide a framework for vector identification and specially its habitat characterization. Taxonomic sufficiency of the Culicoides vectors prevalent in this continent will play an important and decisive role mitigating Bluetongue in animals. Our attempt is to collate the data of the vector species in Indiafor vector biologists and vector ecologists.

2

Field based study on attraction of adult *Culicoides* spp. (Diptera: Ceratopogonidae) to different colors of light in West Bengal, India

Mazumdar, S.M. & Mazumdar A

The University of Burdwan, Burdwan 713104, West Bengal, India

Three months (June to November, 2017) based study was made to assess the preferential attraction of *Culicoides* to specific wavelength of light. In this context seven colors, viz. UV, blue, green, yellow, pink, red and white were selected and the traps fitted with LED were placed near to the cattle shed to intercept the adult midges. The LED light baited suction traps were designed and fabricated by USIC, University of Burdwan. It was observed that UV lights were most effective during sampling the biting midges usually found to be prevalent in light suction traps. The blue and green LED also attracted good numbers of biting midges. *Culicoides* peregrinus and *C. oxystoma* was dominant followed by *C. fulvus*, *C. anophelis* and *C. huffi*. Although significant variation in midge population was observed across the month but no difference was observed between dusk and dawn collections.

3

Faunistic diversity and ecology of *Culicoides* midges (Diptera: Ceratopogonidae) from the lower Gangetic plain of West Bengal, India

Chatterjee, S. & Hazra, N.

The University of Burdwan, Burdwan 713104, West Bengal, India

Twelve species of the genes *Culicoides* Latreille with immature stages of 4 species, *Culicoides dryadeus* Wirth and Hubert, *Culicoides similis* Carter, Ingram and Macfie, *Culicoides maerens* sp. n. and *Culicoides unguis* sp. n. are collected during the period between December 2016 and June 2018 from the lower Gangetic plains of West Bengal. The pupae and imagine of *Culicoides maerens* sp. n. and *Culicoides unguis* sp. n. are described. The pupa of *Culicoides dryadeus* Wirth and Hubert has been found from tree hole. The pupae of *Culicoides similis* Carter, Ingram and Macfie and *Culicoides unguis* have been taken out of rotting banana stem and those of *Culicoides maerens* are found in the bogged pond fed with the drainage of the cow shed. A seasonal abundance (pre monsoon, monsoon and post monsoon) of the adult *Culicoides* midges of one year from February 2017 to January 2018 has been investigated using white and UV light trap in the University campus, West Bengal, India. Correlation between abundance with temperature and relative humidity has also been made. Seasonal abundance of 3 species of *Culicoides*, (viz., *C. brevitarsis* Kieffer, *C. fulvus* Sen and Dasgupta, and *C. oxystoma* Kieffer) has been studied and a comparative preference of midges in the presence different light sources (white light and UV light) has also been investigated.

4

Systematics of *Dasyhelea* (Kieffer 1911) from the deltaic proper of Gangetic West Bengal, India

Brahma, S. & Hazra, N.

Entomology Research Unit, Department of Zoology, Golapbag Academic Complex, The University of Burdwan, Burdwan 713104, West Bengal, India

The nematocerous family Ceratopogonidae, commonly known as “biting midges”, is an enormously diverse group that inhabits a broad range of aquatic, semi-aquatic and terrestrial habitat types. The genus *Dasyhelea* Kieffer is very much popular due to their role in pollination of cocoa and rubber plants. This genus is widely distributes and is recorded from all zoogeographical regions, except Antarctica. Prior to this study, there were more than 600 species described globally, including ca. 127 species from the Oriental Region; with only 21 species recorded from India. The present study reports on 6 species from India which are new to the science. *Dasyhelea acuta* Brahma, Saha and Hazra, *D. Comosa.* Brahma, Saha and Hazra are reported in 2016. *Dasyhelea trajectura* sp. n., *D. pseudohama* sp. n., *D. barbistyla* sp. n. and *D. scalpra* sp. n. are recently explored from various locality of lower gangetic plain.

5

Systematics of Ceratopogoninae Newman (Diptera: Ceratopogonidae) from Northern plains of West Bengal, India.

Saha, P.

Entomology Research Unit, Department of Zoology, Golapbag Academic Complex, The University of Burdwan, Burdwan 713104, West Bengal, India

There are 15 genera of subfamily Ceratopogoninae have beenrecorded from Northern plains of West Bengal during last 4 years.During our present study, special emphasis have been given not only on Culicoides Latreille, but also on other genera including *Alluaudomyia* Kieffer, *Brachypogon* Kieffer, *Serromyia* Meigen, *Stilobezzia* Kieffer, *Tetrabezzia* Kieffer, *Calyptopogon* Kieffer, *Jenkinshelea* Macfie, *Macropeza* Meigen, *Nilobezzia* Kieffer, *Homohelea* Kieffer, *Leehelea* Debenham, *Sphaeromias* Curtis, *Bezzia* Kieffer and *Phaenobezzia* Haeselbarth. Twelve *Culicoides* species including 5 life stages and 1 new species (*Culicoides pseudosimilis* Saha, Brahma and Hazra) with other species of various genera were collected from various habitats of biting midges like paddy field, stagnant small ponds, water filled tree holes, banana stem, cattlesheds and small bushes in different locations. Of them, *Serromyia trimohiniensis* Saha & Hazra is the first report of extant species of this genus first time from India and *Tetrabezzia dasguptai* Saha & Hazra is the 7th member of that genus which was reported after 100 years from India after Kieffer. Some other new species of the genera viz., *Macropeza* Meigen, *Brachypogon* Meigen, and *Phaenobezzia* Haeselbarth are also recorded in this course. A two year (April 2014 to March 2016) study on seasonal abundance of various genera of the biting midges of the subfamily Ceratopogoninae has been made on the basis of light trap (white, UV 8W tube light and open type, 15W CFL) collection of adult midges from 3 different locations of Dakshin Dinajpur, West Bengal, India. Two ecological parameters, rainfall and temperature are recorded and correlated with the abundance of midges.

6

Epidemiological investigation of Avian Influenza (Bird flu) of household ducks in coastal areas of Chittagong, Bangladesh

Rahman, A.[1], Islam, A.[2], Belgrad, J.[3] & Hoque, A.[4]

[1]Institute of Epidemiology, Disease Control and Research, Mohakhali, Dhaka-1212, Bangladesh
[2]EcoHealth Alliance, New York, NY, USA
[3]Tufts Cummings School of Veterinary Medicine, 200 Westboro Rd. North Grafton, MA 01536, USA
[4]Chittagong Veterinary and Animal Sciences University, Zakir Hossain Road, Khulshi, Chittagong-4225, Bangladesh

A repeated cross sectional study was carried out on 281 households in Anowara and Rangunia upazila of Chittagong district, Bangladesh at two different seasons during 2017 and 2018 to estimate the household level sero-prevalence of Avian Influenza (AI) among ducks, to determine the distribution of H5 and H9 sero subtypes by sites and seasons, to identify potential risk factors that significantly contributing to the sero-prevalence of AI, to ascertain the challenges of household duck rearing and public health measures in handling stationary ducks. Samples and data were collected and evaluated with cELISA and HI to detect AI positive samples (both H5 and H9). The overall household level sero-prevalence of avian influenza (AI) in rural stationary ducks was 57.7% (95% CI:0.5-0.6). Estimated sero-prevalence of AI was 57.5% (95% CI:0.5-0.6) in Anowara and 59.3% (95% CI: 0.4-0.8) in Rangunia. According to seasons the household level sero-prevalence of AI was 57.3% (95% CI:0.5-0.7) in summer and 57.9% (95% CI:0.5-0.7) in winter. In Anowara the H5 sero-prevalence was significantly higher in winter (29%) than in summer (18.8%) ($p \leq 0.05$), contrarily, the H9 sero-prevalence was significantly greater in summer (18.8%) than in winter (6.5%) ($p \leq 0.05$). Household level AI sero-prevalence varied significantly between the categories of duck plague coverage ($p=0.05$), among categories of materials used in duck house ($p=0.18$) and among the systems of dead bird disposal ($p=0.19$). The odds ratio (OR) of household level AI sero-positivity in the house made of category “combined” was 2.2 compared with house made of category “wooden/bamboo” ($p=0.02$). The OR was 2.8 in households having Duck Plague (DP) vaccine coverage with households without DP vaccine coverage ($p=0.01$). Improved management considering above mentioned factors might reduce the level of avian influenza among ducks of Chittagong region.

7

Eco-epidemiology of Antimicrobial Resistant of Salmonella & Enterococcus Isolated from Free Ranging Rhesus Macaques (Macaca mulatta) at High risk Human-wildlife Interface in Bangladesh

Rahman, K., Hassan, M.M., Samad, A., Islam, S., Uddin, H., Flora, M.S. & Islam, A.

Institute of Epidemiology, Disease Control and Research, Mohakhali, Dhaka-1212, Bangladesh

Antimicrobial resistance (AMR) is a global health threat both for human and animal owing to indiscriminate use of antimicrobials. This study aims to better describe the eco-epidemiology of AMR in Enterococcus and Salmonella spp. from rhesus macaques. A six-month cross-sectional study was done to collect fecal samples from the macaques and observations of macaque-Human-Livestock interactions were recorded daily for 4 hours from each sites. Samples were cultured and isolates were confirmed by biochemical characteristics and PCR. Antimicrobial susceptibility testing (AST) was done by Kirby-Bauer Disc diffusion method. Result yielded 5% (18/399; 95%CI: 3-7) were positive for Salmonella spp and 61% (66/109; 95%CI: 51-70) macaques were positive for *Enterococcus* spp. In case of *Enterococcus* spp; *Enterococcus faecalis* and *Enterococcus faecium* were positive 36% (39/109; 95%CI: 27-46) and 33% (36/109; 95%CI: 24-42) respectively. Salmonella spp. was significantly more common among macaque from urban areas (8%) and adult was more infected (6%) than pre-adult & babies. In case of Salmonella, tetracycline (89%), azithromycin (83%), sulfamethoxazole-trimethoprim (50%), nalidixic acid (44%). *E. faecalis* is significantly higher in peri-urban area (80%) and *E. faecium* significantly more in urban area (53%). Among the antimicrobials, 96% were resistant to streptomycin followed by tetracycline 63%, erythromycin 61%, linezolid 30%, ampicillin 29% and ciprofloxacin 25%. Direct contact (within 15-20 min and <20m) with macaque-human-livestock interactions and sharing same resources for feeding/watering might be possible source of AMR in macaques. Study suggests the virulent genetic analysis and proper disposal of wastages to prevent the spread of resistant organisms in the environment.

8

Prevalence of mosquitoes (diptera: culicidae) in and around Bangladesh Agricultural University campus of Mymensingh in Bangladesh

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Mosquitoes are the small insects belonging to the order diptera. They are familiar parasitic vectors of a number of transmissible and life menacing diseases. The study was conducted at the Bangladesh Agricultural University (BAU) campus and its surrounding areas in Mymensingh, Bangladesh from January to June, 2013 detect adult mosquito species and their status. Adult mosquitoes were collected using light traps (LTs), insect collecting nets, and human bait (HB) from households, cattle sheds, rice field, botanical garden, dairy farm and poultry farm and staff residential quarters. A total of 2,750 adult mosquitoes were collected from these places. Ten species of mosquitoes under two genera were identified. Among the two genera *Culex* (84.3%) was the leading group dominated over *Anopheles* (15.7%) in all areas. In case of *Culex* species, the most prevalent mosquito species was the *Cx. quinquefasciatus* (39%) followed by *Cx. fuscocephala* (23.7%), *Cx. tritaeniorhynchus* (15.8%), *Cx. gelidus* (4.0%), *Cx. whitmorei* (1.2%), *Cx. vishnui* (0.3%) and *Cx. whitei* (0.3%). On the other hand, among *Anopheles* species, *An. bengalensis* (11.1%) was found in the highest percentage followed by *An. vagus* (3.8%) and *An. jayporiensis* (0.8%). Among the studied areas, the highest prevalence of mosquitoes were collected from cattle sheds (40.7%), followed by households of Balashpur (16.2%), Boyra (14.9%) and Kewatkhali (12.4%). Though *Culex* species was found as dominant species in all areas, the highest percentage (96.7%) was found in staff residential area in BAU campus, whereas, the highest prevalence of *Anopheles* species (28.7%) was found in cattle shed. We found that two genera were prevalent together in almost all areas, however, though *Culex* was the dominant one. In conclusion, our survey provided useful information on the prevalence of mosquito species regarding the distribution and diseases control.

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In vitro and *in vivo* evaluation of effect of antibiotic combination against imipenem resistant Pseudomonas aeruginosa isolated from burn wound of DMCH

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This study was conducted to detect the imipenem resistant Pseudomonas aeruginosa isolates and to make an effective combination of antibiotics for these multidrug resistant organ-isms. Burn wound swab were collected from different patients of Dhaka medical college hospital and cultured in Blood agar and MacConkey agar media. Minimum inhibitory concentration (MIC) of imipenem was determined by agar dilution method. MBL producers were phenotypically detected by double disk synergy test and combined disk assay. The fractional inhibitory concentration indices of imipenem in combination with other antimicrobial agents for the organisms tested were generated on checkerboard broth microdilution plates. Among 32 imipenem resistant *Pseudomonas aeruginosa*, 24 (75.00%) MBL producers were detected by DDS test, 27 (84.38%) MBL producers were detected by CD assay and 6 (18.75%) were detected by MHT. The proportions of synergy observed in imipenem-ceftazidime, imipenem-amikacin, imipenem-tigecycline and amikacin-piperacillin/tazobactam combinations were 28.13%, 56.25%, 12.50% and 93.76% respectively by checkerboard method in vitro and synergy in imipenem-amikacin and imipenem-ceftazidime combinations were 80% and 40% respectively *in vivo* (rat model). Overall, the *in vitro* and *in vivo* data demon-strated that, imipenem and amikacin is the most effective com-bination for imipenem resistant *P. aeruginosa in vivo*, the second best combination is imipenem and ceftazidime. Piperacil-lin/tazobactam plus amikacin is the most effective combination *in vitro* followed by imipenem and amikacin combination.

10

Checklist and species diversity with seasonal texture of Odonata (dragonflies and damselflies) in National Botanical Garden of Dhaka, Bangladesh.

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Diversity of Odonates was studied in the National Botanical Garden of Dhaka, Bangladesh during March'2015 to February'2016 .A total number of 39 species of Odonata(dragonflies and damselflies) belonging 26 genera and 4 families are recorded .Among the total species of Odonates 61.5% of dragonflies and 38.5% of damselflies. In the study, the highest 1651 individuals were observed in the pre-monsoon (March'2015 to May'2015). The lowest 1580 individuals were observed in the Monsoon (June'2015 to August'2015). Highest species of dragonflies 1064 individuals were observed in the Post-monsoon (September'2015 to November'2015) and the lowest 846 species were observed in the Winter (Dec'15 to Feb'16). On the other hand, highest 797 individuals species of damselflies were observed in the Winter (December'2015 to February'2016) and lowest 569 individuals species were observed in the Post-monsoon (September'2015 to November'2015). Among the total species of dragonflies and damselflies , 60% under the Libellulidae, 2.6% Gomphidae, 32% Coenagrionidae and 5.4% Platycnemididae family. Libellulidae and Gomphidae families are under the sub-order Anisoptera (dragonfly). Moreover, Coenagrionidae and Platycnemididae families are under the sub-order Zygoptera (damselfly).

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A Study on Clinical Findings of Fibrous Osteodystrophy in Goat

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This study was conducted at SAQ Teaching Veterinary Hospital in (CVASU) to observe the clinical signs and changes in blood Ca, P and ALP in the suspected fibrous osteodystrophic (FOD) goats that were analyzed by using serum chemistry assay kit (Randox, UK). Demographic characteristics of the FOD goats along with other management factors were also recorded. The confined management system and concentrate feeding were the major case history in most of the FOD goats. 50% osteodestrophic cases were found in August. The Jamunapari and cross breeds were more commonly affected breed (40%) than other breeds. Among the affected animals, 67% were male goats. The main clinical symptoms were swollen jaw (50%), leg deformity (10%), swelling of joints (10%), protruding tongue (20%) and lameness (10%).

12

Immunological functionality of fermented pickled juice to enhance gut immunity, growth and meat quality in post-weaning pigs

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The aim of this study was to determine the fermentation dynamics of pickled juice inoculated with *L. plantarum* N14 and the effect of fermented pickled juice (FPJ) on growth, gut immunity and carcass characteristics of post-weaning pigs. The pigs were fed on basal diet without FPJ (control group), basal diet with 5% FPJ (mixture), basal diet with 20% FPJ (mixture) and basal diet with 20% FPJ (each). Average daily gain was observed in the 5% FPJ group throughout the growth period. The white blood cell and granulocyte count were highest in control group compared to FPJ groups whereas the macrophage activity showed nearly equal in all the treatment groups. Plasma CRP was highest in control group whereas complements activity was dominated in 5% FPJ. The load of *E. coli* K99 was significantly higher between 15 and 16 weeks in control group than those of FPJ supplemented group. The load of *E. coli* strains K88 and ETEC 987 varied insignificantly. Prevalence and severity of diarrhoea were greater in control group but in FPJ supplemented group, the feces were quite normal. The study showed that feeding with FPJ significantly reduced blood complement activity and C reactive protein concentrations while no changes were observed in blood leukocytes, ratio of granulocytes to lymphocyte numbers, macrophages' activity and antibody levels. We demonstrated that the FPJ could be used as a superior immunologically functional feed to maintain and improve gut immunity; that is important for the development of health and performance of the pig throughout the productive life.

Keywords: Pig, immunological functionality, *Escherichia coli*, growth, fermented pickled juice

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Abundance of mosquito larvae at the Jagannath University area

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In the last few years many people of Dhaka city were infected by mosquito borne diseases. So, an entomological survey on the abundance of mosquito larvae was conducted at the Jagannath University campus and its adjacent areas from October 2017 to December 2017. Six spots were identified as mosquito breeding sites under this area. Altogether 1049 mosquito larvae were collected and 3 types of species were identified belonging to 2 genera; *Culex quinquefasciatus*, *Aedes aegypti* and *Aedes albopictus*. A total of 601 *Culex* and 448 *Aedes* mosquito larvae were found. *Culex quinquefasciatus* larva were abundant in the polluted ground water sites like blocked drains or blackish water. *Aedes aegypti* and A*edes albopictus* were abundant in comparatively clean water like stagnant rain water, construction sites etc. It was found that the highest *Culex* larva were found in the month of November and lowest in the month of December and highest number of *Aedes* was found in the month of November and lowest in the month of October. According to the collected data, The highest temperature was recorded in the month of October which was 34.9°C and lowest temperature was recorded in the month of December which was 28.1°C. On the other hand the highest humidity was recorded in the month of October which was 64% and the lowest humidity was recorded in the month of December which was 46%.

14

Epidemiology of *Brucella* sp. antibody in cows of Chittagong Metropolitan Area, Bangladesh: A Prioritized Zoonotic Disease

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Brucellosis is endemic both in humans and animals in Bangladesh. Little information regarding the prevalence of and risk factors for brucellosis in the dairy intensive Chittagong Metropolitan Area (CMA) is available. From February to November, 2015, 158 serum samples were collected from six randomly selected dairy farms of CMA to understand the epidemiology of sero-prevalence of anti-brucellosis. The Rose Bengal plate test (RBPT) and competitive ELISA (cELISA) were used for screening and confirmation, respectively. Farm and animal-level demographic data and exposure to risk factors were collected. Mixed effect multiple logistic regression model was used to identify animal-level risk factors, with herd considered as random effect and demographic and other explanatory variables as fixed effects. Twenty percent (n=32, N=158) of animals were seropositive by RBPT and 9% (n=4) by cELISA. The farm level prevalence ranged from 10-26% and 5-21% by RBPT and cELISA, respectively. Multiparous cows had significantly higher sero-positivity levels than heifers (22%;OR=5.76;95%CI:1.86-17.82;p=0.002). Cows in their first trimester were more likely to be seropositive (23%;OR:3.27;95%CI:1.17-9.23;p=0.024) and cows with a history of reproductive disorders were 3 times more seropositive (38%;OR:3;95%CI:1-8;p=0.031) than those without reproductive disorders. The sero-positivity of brucellosis varied significantly ($p<0.05$) according to the amount of milk production at the animal level and two-third of the farm owners were unaware about Brucellosis. Occupationally exposed people in the study area may be at risk for this zoonosis. Control of brucellosis in cattle and awareness building among the owners will reduce the exposure of people at high risk and thereby the disease.

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Prevalence and seasonal distribution of haemosporidian parasites in pigeons of Mymensingh and Rangpur districts, Bangladesh

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The present epidemiological investigation was carried out to investigate the status of pigeon haemosporidian parasites in two districts (Mymensingh and Rangpur), Bangladesh. In total, 300 blood samples of pigeons were examined from January to November, 2016. Blood samples were collected from wing vein and thin smears were prepared from them. All smears were stained with Giemsa stain and examined under microscope. The overall prevalence of haemosporidian parasites was 28% (84 /300) in pigeons. Of those, 22.3% (67/300) of birds were infected with Haemoproteus spp., 5.7% with Plasmodium spp. (17/300) and 2.7% with both genera (8/300). The prevalence rate was insignificantly (p = 0.050) higher in Mymensingh (34.7%) than in Rangpur (24.2%). Male were more susceptible (30.8%) than female (25.3%). Adults (29.5%) were more prone to infection than young (19.6 %). The prevalence was significantly (p = 0.000) higher in the rainy season (56.1%) followed by summer (33.8%) and winter (10.0%). From this study, it was ascertained that avian malaria in pigeons was prevalent in Bangladesh. Therefore, further investigations with a larger sample size and molecular characterization of avian malaria species in pigeons of Bangladesh is warranted.

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Assessing the Risk of Disease Emergence from Indian Flying Fox (*Pteropus Medius*) Hunting at High-Risk Interfaces in Bangladesh

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Understanding hunting, trading, and consumption of wildlife at the community level in Bangladesh is limited. This qualitative study purposes to understand hunting behavior, wildlife consumption patterns, and the wildlife value chain assessing the risk of zoonotic disease transmission in Faridpur communities. Participant observation and 15 targeted ethnographic interviews were conducted between October-December 2015. Participants included wildlife hunters, collectors, transporters, vendors, and consumers. “Sharder” communities hunt wild animals as traditional practice and key protein source. This community is dependent on various sources of income, including: day labor, potter, barber, and cobbler. Hunting provides an additional source of income in the community. Hunters are mostly illiterate and unaware of zoonotic disease risk, such as Nipah from bats (*Pteropus medius*). All hunters were male, whereas women were primarily involved in butchering. The wild animal value chain is centered in Sharder communities, though some neighboring Muslim communities reported hunting wild animals as a free protein source. Participants were observed using bat bones to remedy joint pain and asthma. Hunters reported declining local bat populations due to over-hunting and ecological changes. A shared human and animal dependence on limited natural resources amplified biodiversity declines, however to be successful communities need sustainable alternative livelihoods solutions and protein sources. Unprotected hunting practices and limited or no hygiene measures can yield greater risk of zoonotic disease spillover. Hunting flying foxes in Bangladesh may represent a previously unrecognized pathway for Nipah emergence. The dearth of disease transmission knowledge posed by wildlife may facilitate zoonotic spillover.

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Sero-prevalence of Bluetongue in sheep in some selected areas of Bangladesh

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Bluetongue is a non-contagious, infectious, arthropod transmitted viral disease of domestic and wild ruminants that is caused by the bluetongue virus (BTV). A cross sectional study is continuing on sheep since Jan 2018 in some selected areas of Chittagong to estimate the sero-prevalence of BTV and to investigate the potential risk factors associated with the sero-prevalence as well as to detect BTV antibody in blood samples collected from the suspected animals. A total 200 serum samples were collected from sheep and stored to the PRTC (Poultry research and training center) laboratory. A pre tested questionnaire was administered on sheep owner. Currently, serum samples are being testing to detect BTV-specific immunoglobulin G (IgG) antibodies by iELISA (Indirect enzyme linked immunosorbent assay). Statistical tests like frequency distribution, univariate chi-square test and multivariate logistic regression model will be fitted for identifying potential risk factors. Finally, the necessary recommendations will be suggested to reduce control BTV in that region.

Keywords: Bluetongue, Sero-prevalence, Sheep, Confidence interval (CI), Odds ratio (OR)

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Isolation and Identification of *Escherichia coli* from the fecal samples of Rhesus macaque with their antibiogram

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The aim of this study was to determine the resistance of different antimicrobial agents to *Escherichia coli* isolated from nonhuman primates at a wildlife-human interface. Bacterial isolates from fecal samples of wild non-human primates at Bangabandhu Sheikh Mujib Safari Park, Cox's Bazar (Dulhazra Safari Park) were screened for the presence of *Escherichia coli*. A total of 13 samples were tested during March, 2017 to May, 2017 at Poultry Research and Training Centre, Chittagong Veterinary and Animal Sciences, where 12 (92.3%) samples were positive for *E. coli* in bacteriological tests. Isolated *E. coli* were tested for resistance with five different antimicrobial agents (Amoxicillin, Ampicillin, Ciprofloxacin, Sulfamethoxazole, Colistin sulphate) which were carried out by the Kirby-Bauer disc diffusion method as per recommendation of CLSI (Clinical and Laboratory Standards Institute) and efficacy of antibiotics was determined by measuring the diameter of the zone of inhibition that results from diffusion of the agent into the medium surrounding the disc. The *E. coli* were found 100% resistant to Amoxicillin, Ampicillin, Sulfamethoxazole. Conversely, 100% sensitivity was observed in Colistin sulphate followed by Ciprofloxacin (41.67%). All of the isolates showed multiple antimicrobial resistances in non – human primates may be a continuing threat to the effectiveness of antibiotic therapeutic agents. Therefore, it is important to monitor the occurrence of antimicrobial resistance in wild non-human primates at Bangabandhu Sheikh Mujib Safari Park, Cox's Bazar which is very essential for public health context.

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Prevalence and Antimicrobial Resistance profile of *Salmonella* spp. in retail meats of Super Shop: a food safety risk

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Salmonella spp has represented as the primary cause of foodborne diseases in human. Immunocompromised people and infants are mainly vulnerable to Salmonellosis. *Salmonella* spp can be found in many foods and food products including retail meat where multi-drug resistant *Salmonella* spp evolves a robust challenge to food safety. The aim of this study was to determine the prevalence and antimicrobial resistance profile of *Salmonella* spp in retail meat of super shop at Dhaka City, Bangladesh. During July 2015 and June 2016, a total of 476 samples were collected from 10 super shop of Dhaka city; categorized in chicken meat (n=170), beef (n=68), mutton (n=34) and environment (n=204). *Salmonella* spp. Were isolated from the samples by using selective enriched media and confirmed by real-time PCR. Phenotypic resistance was determined by disk diffusion method. Extended-spectrum B-lactamases (ESBLs) and quinolone resistance genes were determined by PCR. The overall prevalence of *Salmonella* spp. was 18.5% (n=88; 95% C.I.15-22%) comprising in chicken meat 26% (n=44; 95% C.I.19.5-32.5%), beef 15% (n=10; 95% C.I.7-23%), mutton 18% (n=6; 95% C.I.6-30%) and environment 14% (n=28; 95% C.I.9.5-18.5%). In antimicrobial assay, 55% isolates were found multi-drug resistant (MDR). Among 22 tested antibiotics, extreme level of resistance was observed against Tetracycline and Trimethoprim/Sulfamethoxazole 75%, Ciprofloxacin 53.4% and Streptomycin 49.6%. Nevertheless, only Ceftriaxone, Cefotaxime, Imipenem, Amoxicillin/Clavulanic acid showed good level of sensitivity as 82%, 73%, 73% and 68% respectively. In minimum inhibitory concentration (MIC) assay, high level of MIC50/MIC90 were observed against Amoxicillin (512/>1024), Flucloxacillin (512/1024), Cephradine (256/1024), Cefixime (2/512), Gentamycin (4/512), Chloramphenicol (32/512), Azithromycin (512/1024), Erythromycin (1024/>1024), and Sulfamethoxazole (512/>1024). Among the phenotypically resistant isolates, ESBL encoding genes were observed as bla (TEM) 80% (n=40/50), bla (shv) 10% (n=5/50), bla (ctx) 34% (17/50), bla (cmy) 8% (4/50); and Quinolone resistance genes qnrA 10.63% (5/47) gyrA 57.45 %(27/47) and gyrB 23.40%(11/47). High level prevalence of MDR *Salmonella* spp in retail meat which could cause foodborne illness is a great alarming issue for public health.

Notes:

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