"PARACON'19"

International Parasitology Conference

"Food Safety through Parasite Control"

November 6, 2019

SCIENTIFIC PROGRAM & ABSTRACTS

DEPARTMENT OF PARASITOLOGY

UNIVERSITY OF VETERINARY & ANIMAL SCIENCES, LAHORE

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VICE CHANCELLOR'S MESSAGE

Livestock sector is an important segment of agriculture economy and contributed 60.5% of the agricultural value added and 11.2% of the national GDP during 2018-19. The gross value added of the livestock sector has increased to Rs. 1440 billion during the same period. Historically livestock has been the subsistence sector dominated by the small holder to meet their needs of milk, food security and daily cash income. During the last decade there has been massive investment in poultry, fisheries, dairy and meat sectors to fulfill the demand for food of high biological value in the country and export in the regional markets. Being flagship University in these disciplines in the country, UVAS has fully realized the needs of the sectors and initiated degree programs, research projects, technology centers and services to meet the challenges of growing industries, farming communities and stakeholders. The commercialization of research and expertise from this University generates significant economic growth and business opportunities within country. Our research-focused teaching ensures our students receive the highest quality education, which introduces them to the frontiers of knowledge and provides them with the skills and discipline to contribute fully to whatever career they follow. We have a strong professional orientation with a focus on academic excellence and graduate employability. For these reasons, UVAS graduates are highly sought after both locally and internationally. By working closely with our communities, we are proud to play a leadership role in enhancing economic prosperity, contributing to improvements in the health and wellbeing of our nation. In this connection PARACON'19 will be organized to have a platform for the region so that scientists can collaborate and present their findings. It will be a great opportunity to learn latest cutting edge research designed to offer comprehensive global discussions that address current issues in the field of Parasitology.

Meritorious Prof. Dr. Talat Naseer Pasha *S.I*

Vice Chancellor/ Patron in Chief

PRESIDENT'S MESSAGE

Greetings and welcome from the Pakistan Society of Parasitology (PSP)! PSP is a society which is made up of a diverse group of Parasitologists, researchers from government, industry and academia who are interested in the study, teaching and research related to Parasitology.

It was founded with the aim to have contribution not only in the development of parasitology as a discipline, but also to provide a solution oriented forum for parasitic chanelleges in the field. Since its inception, the society has grown by leaps and bounds, through annual conference, seminars, training programmes with various governmental and commercial organizations, supporting students and teaching of parasitology.

We welcome new members to PSP, and hope you will find the excitement and camaraderie to spur you in the search for knowledge in this field. To all our existing members from academia, governmental and research organizations and industry we wish you continued success in your work and do keep attending our events, giving suggestions to further improve the society. The society also serves as a networking opportunity for professionals and students involved with Parasitology including research, education, control and management of parasitic diseases.

PARACON'19 is the annual highlight where you can update on the latest scientific information via oral, poster and plenary sessions as well as strong linkage with industry and corporate sector through booths showcasing the latest products and technology.

On behalf of the council of PSP, we hope you will be interested in joining our society or collaborate with our members. Once again welcome to our world of Pakistan Society of Parasitology.

Prof. Dr. Kamran Ashraf

President

CONFERENCE PROGRAM
(6th November, 2019)

INAUGURAL SESSION (VENUE: AUDITORIUM, UVAS, LAHORE)

08:00 AM to 09:00 AM	Registration of Participants
09:00 AM to 09:25 AM	Guests to be Seated
09:25 AM to 09:30 AM	Arrival of Chief Guest
09:30 AM to 09:35 AM	Recitation of Holy Quran
09:35 AM to 09:45 AM	Welcome Address by Vice Chancellor, UVAS, Lahore
09:45 AM to 09:55 AM	Aims and Objectives of PARACON'19 by Prof. Dr. Kamran Ashraf, President PSP
09:55 AM to 10:05 AM	Address of Chief Guest
10:05 AM to 10:10 AM	Vote of Thanks by Dean, FVS, UVAS, Lahore
10:10 AM to 10:20 AM	Inauguration of Poster Session/ Stalls Exhibition
10:20 AM to 10:45 AM	Refreshment

PARALLEL SESSION-I

DIAGNOSTICS, CHEMOPROPHYLAXIS AND VACCINES OF PARASITES

Venue: Conference Hall, UVAS, Lahore
Session Chairman: Prof. Dr. Sargison Neil
The Roslin Institute, The University of Edinburgh, UK
Vice Chairman: Prof. Dr. Abdullah G Arijo
Department of Veterinary Parasitology, Sindh Agriculture University, Tandojam
Moderator: Mr. Nauman Rauf (Ph.D Scholar)
Department of Parasitology, University of Veterinary & Animal Sciences, Lahore

10:45 AM to 11:15 AM	**Sustainable Control of Gastrointestinal Nematodes in Ruminant Livestock in the Face of Adaptability to Environmental and Drug Selection Pressures.** Prof. Dr. Sargison Neil (Invited speaker) The Roslin Institute, The University of Edinburgh, UK
11:15 AM to 11:30 AM	**Handling Hydatid Cyst Disease** Prof. Dr. Abdullah G Arijo (Invited Speaker) Department of Veterinary Parasitology, Sindh Agriculture University, Tandojam
11:30 AM to 11:45 AM	**Study on Immunoglobulins Isotypes and Histamine Concentration towards Resistances against *Haemonchus contortus* in Teddy and Beetal Goat Breeds** Dr. Asim Shamim (Invited Speaker) Department of Pathobiology, Faculty of Veterinary and Animal Sciences,

University of Poonch, Rawalakot Azad Kashmir

11:45 AM to 12:00 PM **Genetic Analysis of Benzimidazole Resistance Mutations in *H. placei* and *H. contortus* From Bovine Host.**
Dr. Qasim Ali (Invited Speaker)
Department of Pathobiology, Gomal University, DI Khan

12:00 PM to 12:15 PM **Evaluation of In-Vivo Anthelmintic Efficacy of *Withania Coagulans* Against Trematodes of Sheep**
Dr. Syed Saleem Ahmad (Registered Speaker)
Department of Clinical Medicine & Surgery,
University of Veterinary & Animal Sciences, Lahore

12:15 PM to 12:30 PM **Estimation of Antihelminthic Effect of Silver Nanoparticles on *Fasciola Gigantica* Collected from Dairy Animals**
Dr. Mateen Arshad (Registered Speaker)
Department of Zoology, Lahore College for Women University, Lahore

12:30 PM to 12:45 PM ***In Vitro* and *In Vivo* efficacy of selected medicinal plants against *Haemonchus contortus***
Dr. Hafiz Muhammad Rizwan (Registered Speaker)
Section of Parasitology, Department of Pathobiology, KBCMA College of Veterinary and Animal Sciences, Narowal, sub campus UVAS Lahore, Pakistan.

12:45 PM to 01:00 PM **Molecular Characterization of Eimeria Species from Deer (*Cervidae*) Based on Sequence Analysis**
Miss. Kiran Khalid (Registered Speaker)
Department of Parasitology, University of Veterinary & Animal Sciences, Lahore

01:00 PM to 02:00 PM **PRAYER & LUNCH BREAK**

PARALLEL SESSION-II

ZOONOTIC PARASITIC DISEASES AND VECTOR BORNE DISEASES

Venue: Conference Hall, UVAS, Lahore
Session Chairman: Dr. Alireza Sazmand (Invited Speaker)
Department of Pathobiology, Faculty of Veterinary Science, Bu Ali Sina University of Hamedan, Hamedan, Iran
Vice Chairman: Prof. Dr. Muhammad Fiaz Qamar
Department of pathobiology, College of Veterinary & Animal Sciences, Jhang, Sub campus UVAS, Lahore
Moderator: Miss Rimsha Farooq (Ph.D Scholar)
Department of Parasitology, University of Veterinary & Animal Sciences, Lahore

02:00 PM to 02:30 PM **Zoonotic Parasites of Camels: Time for Revolution in Research**
Dr. Alireza Sazmand (Invited Speaker)

	Department of Pathobiology, Faculty of Veterinary Science, Bu Ali Sina University of Hamedan, Hamedan, Iran
02:30 AM to 02:45 PM	**Vaccination of Babesiosis; scope, challenges and pitfalls.** Prof. Dr. Muhammad Fiaz Qamar (Invited Speaker) Department of pathobiology, College of Veterinary & Animal Sciences, Jhang, Sub campus UVAS, Lahore
02:45 PM to 03:00 PM	**Evaluation of *Aspergillus terreus* as Potential Biological Control Agent For Dengue Vector** Miss. Amina Abrar (Registered Speaker) Department of Environmental Sciences, Lahore College for Women University, Lahore
03:00 PM to 03:15 PM	**Molecular Epidemiology and Prevalence of *Neospora caninum* in Cattle (healthy and aborted) from Punjab, Pakistan** Dr. Muhammad Mudasser Nazir (Invited Speaker) Department of Pathobiology, Faculty of Veterinary Sciences, Bahauddin Zakariya University, Multan
03:15 PM to 03:30 PM	**Prevalence of tick Infestation and their associated risk factors in Exotic Cattle in Tehsil Jhang, Pakistan** Mr. Asfand Yar Khan (Registered Speaker) Department of Clinical Sciences, College of Veterinary and Animal Sciences Jhang, Sub Campus University of Veterinary and Animal Sciences, Lahore
03:30 PM to 03:45 PM	**Development of *Theileria annulata*-infected B cell line and its immune response** Dr. Muhammad Rashid (Registered Speaker) State Key Laboratory of Veterinary Etiological Biology, Key Laboratory of Veterinary Parasitology of Gansu Province, Lanzhou Veterinary Research Institute, Chinese Academy of Agricultural Sciences, Xujiaping 1, Lanzhou, Gansu, People's Republic of China
03:45 PM to 04:00 PM	**Molecular Characterization of *Rhipicephalus (Boophilus) Microplus* in Pakistan** Dr. Faiz Rasool (Registered Speaker) Department of Parasitology, University of Veterinary & Animal Sciences, Lahore
04:00 PM to 04:15 PM	**Molecular Characterization and Phylogenetic Analysis of Trypanosomal Species Infecting Horses in Karachi Region, Pakistan** Mr. Farrukh Bilal (Registered Speaker) Department of Parasitology, University of Veterinary & Animal Sciences, Lahore
04:15 PM to 5:15 PM	**CLOSING SESSION (VENUE: CONFERENCE HALL, UVAS, LAHORE)**

PARALLEL SESSION-III

ROLE OF VETERINARIAN UNDER ONE HEALTH CONCEPT: EPIDEMIOLOGY

Venue: Pasha Academic Block, UVAS, Lahore
Session Chairman: Dr. Umer Naveed Chaudhry
The Roslin Institute, The University of Edinburgh, UK
Vice Chairman: Dr. Muhammad Tahir
Department of Zoology, Government College University, Lahore
Moderator: Mr. Sarfraz-ur-Rehman (Ph.D Scholar)
Department of Parasitology, University of Veterinary & Animal Sciences, Lahore

10:45 AM to 11:15 AM	**Novel genetic approaches to improve understanding of the antimicrobial resistance in neglected livestock and humans parasites** Dr. Umer Naveed Chaudhry (Invited Speaker) The Roslin Institute, The University of Edinburgh, UK
11:15 AM to 11:30 AM	**Epidemiology and diagnosis of tick borne diseases including Crimean Congo Hemorrhagic Fever (CCHF) at Pakistan** Dr. Abdul Razzaq (Invited Speaker) Animal Sciences Division, Pakistan Agricultural Research Council, Islamabad
11:30 AM to 11:45 AM	**Seroprevalence of *Toxoplasma Gondii* Among Female Psychiatric Patients of Lahore, Pakistan** Dr. Asma Abdul Latif (Registered Speaker) Department of Zoology, Lahore College for Women University, Lahore
11:45 AM to 12:00 PM	**Sero-Prevalence of Q-Fever in Aborted Camel Herds of Different Ecological Zones of Province Punjab, Pakistan** Dr. Hafiz Ahsan Raza (Registered Speaker) Remount Veterinary & Farms Directorate, Ministry of Defense, Pakistan
12:00 PM to 12:15 PM	**Harnessing the Parasitism to Treat Allergies, Autoimmunity and Cancers** Dr. Zia-Ur-Rehman (Registered Speaker) Department of Physiology, University College of Veterinary and Animal Sciences, The Islamia University of Bahawalpur, Bahawalpur
12:15 PM to 12:30 PM	**Optimization of Conditions for *In Vitro* Cultivation of *Babesia bigemina* in Bovine Red Blood Cells** Dr. Umber Rauf (Registered Speaker) Department of Parasitology, University of Veterinary & Animal Sciences, Lahore
12:30 PM to 12:45 PM	**An Efficient Way For The Diagnosis Of *Plasmodium Falciparum* In The Blood Slide By Using NLM Malaria Screener** Mr. Aqib Saeed (Registered Speaker) University of Veterinary & Animal Sciences, Lahore
12:45 PM to 01:00 PM	**Seroprevalence, molecular detection and zoonotic potential of**

***Toxoplasma gondii* in selected district of Punjab.**
Miss. Rimsha Farooq (Registered Speaker)
Department of Parasitology, University of Veterinary & Animal Sciences, Lahore

01:00 PM to 02:00 PM **PRAYER & LUNCH BREAK**

PARALLEL SESSION-IV **INTEGRATED PEST MANAGEMENT**

Venue: Pasha Academic Block, UVAS, Lahore
Session Chairman: Prof. Dr. Mohamed Aziz Darghouth
National School of Veterinary Medicine, Sidi Thabet, Tunisia
Vice Chairman: Prof. Dr. Farkhanda Manzoor
Department of Zoology, Lahore College for Women University, Lahore
Moderator: Mr. Zia Ur Rehman (Ph.D Scholar)
Department of Parasitology, University of Veterinary & Animal Sciences, Lahore

02:00 PM to 02:30 PM **Improving the Control of Tropical Theileriosis (*Theileria. Annulata* Infection of Cattle) in Endemic Countries, The Need for Adopting New Research Paradigms Privileging Sustainable Innovative Solutions**
Prof. Dr. Mohamed Aziz Darghouth (Invited Speaker)
National School of Veterinary Medicine, Sidi Thabet, Tunisia

02:30 AM to 02:45 PM **ITS2 Gene Base Identification And Proteins Analysis of *Rhipicephalus microplus* by Using SDS PAGE Method: Possibility of Vaccine Development Against Vector Tick *(R. microplus)***
Prof. Dr. Sultan Ayaz (Invited Speaker)
College of Veterinary Sciences & Animal Husbandry Abdul wali khan University, Mardan

02:45 PM to 03:00 PM **Anti-Tick Activity of Imidocloprid Against *Ixodes* in Sahiwal Cow at Multan, Pakistan**
Prof. Dr. Muhammad Mazhar Ayaz (Invited Speaker)
Department of Parasitology, Cholistan University of Veterinary and Animal Sciences, Bahawalpur

03:00 PM to 03:15 PM **Insight into Tick And Tick-Borne Pathogens of Khyber Pakhtunkhwa, Pakistan**
Dr. Abid Ali (Invited Speaker)
Department of Zoology, Abdul Wali Khan University Mardan

03:15 PM to 03:30 PM **Ultra-structural evaluation of novel synthetic drugs against zoonotic *Leishmania donovani***
Dr. Muhammad Suleman (Invited Speaker)
Department of Microbiology, University of Veterinary & Animal Sciences, Lahore

03:30 PM to 03:45 PM **Comparative Acaricidal Efficacy of Fluralaner *vs.* Oral Ivermectin Against Tick Infestation in Dogs.**

	Dr. Shehla Gul Bokhari (Registered Speaker) Pet Centre, University of Veterinary and Animal Sciences, Lahore
03:45 PM to 04:00 PM	**Acaricidal Efficacy of *Calotropis Procera* (Aiton) Dryand and *Taraxacum Officinale* G.H. Weber Ex Wiggers Against *Rhipicephalus microplus* from Mardan, Pakistan** Mr. Adil Khan (Registered Speaker) Department of Zoology, Abdul Wali Khan University, Mardan
04:00 PM to 04:15 PM	**Molecular Characterization of Ticks Infesting Livestock in Khyber Pakhtunkhwa Province, Pakistan** Miss. Nasreen (Registered Speaker) Department of Zoology, Abdul Wali Khan University, Mardan, Pakistan

CLOSING SESSION (VENUE: CONFERENCE HALL, UVAS, LAHORE)

04:15 PM to 04:20 PM	Arrival of Chief Guest
04:20 PM to 04:25 PM	Recitation of Holy Quran
04:25 PM to 04:30 PM	Views by Foreign Speakers
04:30 PM to 04:40 PM	Views by National Speakers
04:40 PM to 04:45 PM	Concluding Remarks by Organizing Secretary
04:45 PM to 04:55 PM	Remarks by Chief Guest
04:55 PM to 05:05 PM	Souvenir & Certificates Distribution Ceremony
05:05 PM to 05:15 PM	Remarks by VC, UVAS, Lahore

ORAL PRESENTATIONS

Sustainable control of gastrointestinal nematodes in ruminant livestock in the face of adaptability to environmental and drug selection pressures.

*Neil Sargison
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ABSTRACT

Gastrointestinal (GI) nematodes are ubiquitous and limit the production efficiency of farmed ruminants around the world. These parasites have large genomes, with high levels of polymorphism, which when combined with high biotic potential allow them to adapt to opportunities provided by climate change and agricultural management. Their impact is greatest where warm and humid environmental conditions favor both the development and survival of free-living stages and herbage growth; especially under intensive management systems that utilize available pastures and result in highest levels of infectious larval challenge. Consequently, sustainably effective control of GI nematodes is of paramount importance in developed ruminant agriculture in temperate climates, and seasonally in smallholder farming in the Global South. Improved food production efficiency per unit of input that is prerequisite to meeting UN Sustainable Development Goals will inevitably increase the impact of GI nematode parasites causing animal deaths and ill thrift, particularly in the regions in the Global South most sensitive to climate change, unless accompanied by greatly improved control strategies.

Globally, the control of GI nematodes depends on the use of anthelmintic drugs, but due to their genetic adaptability, they have inevitably evolved to become resistant. There is, therefore, a need for practical anthelmintic resistance mitigation strategies for use in specific agricultural contexts; and to explore adjuncts in the control of GI nematodes, in particular grazing management, but also exploitation of host genetic adaption, use of natural xenobiotics and vaccine development. In the absence of empirical evidence, advice on reducing anthelmintic resistance selection pressure is predominantly based on theoretical models (for example, refugia management theory). There has been an unhelpful tendency to draw on expertise arising from clinical field studies in one region, for example relating to control of the peri-parturient rise in faecal egg counts of ewes in UK to inform management in another, for example Pakistan; without accounting for fundamental differences in climatic or animal management drivers of GI nematode ecology, epidemiology, or population genetics.

In presenting our clinical and applied parasitology research at PARACON 2019, our aim is to further develop relationships that will strengthen applications for collaborative funding support to enable us to apply our knowledge and expertise to the sustainable control of helminth parasites where it is most needed by Pakistani smallholder ruminant livestock keepers.

Our objective in this regard would be to develop a series of guidelines and means for their dissemination for effective and sustainable control of GI nematodes in Pakistani ruminant livestock, within the context of other nematode, helminth, protozoa, arthropod, bacterial and viral co-infections and diseases of management and husbandry. This would allow us to use GI nematodes as a means of

engagement with smallholder livestock keepers and to integrate their control with a health plan to enable better production efficiency. In turn, this would create a platform for longer-term approaches such as livestock genetic improvement and agricultural land management that will be critical to the achievement of each of the UN SDGs, with specific relevance to: 1 no poverty; 2 zero hunger; 3 good health and wellbeing; 8 decent work and economic growth; 12 responsible consumption and production; 13 climate action; 15 life on land; and 17 partnerships for the goals.

Handling Hydatid Cyst Disease

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ABSTRACT:

Hydatid disease (also known as hydatidosis or echinococcosis) is a potentially serious, sometimes fatal, condition caused by cysts containing the larval stages of the Echinococcus granulosus (E. granulosus) tapeworm (Dog Tapeworm). The infection is not un-common in Pakistan, and dogs play role in disease transmission.

Eleven (11) years data (1998 to 2008) from Department of Histopathology, Liaqat University of Medical and Health Sciences, Jamshoro, Sindh-Pakistan were collected and analyzed for human hydatid cyst cases. The data revealed that out of 43656 registered cases, 44 were recorded hydatid cyst cases. The data further revealed that hydatid cyst prevails more in females (30 cases) as compare to male (14 cases). In the recorded data the patient were divided into four age groups A (5-20 years), B (21-40 years), C (41-60 years) and D (61 years - onward), hydatid cyst prevails more in age group B (22 cases) followed by age group A, C and D with 14, 06 and 02 cases of hydatid cyst respectively. The favorable site for hydatid cyst development was liver (29 cases) followed by spleen, abdomen, lung, uterus, thigh, ovary, gallbladder, endometrium, thyroid and thorax (03, 03, 02, 01, 01, 01, 01, 01, 01 and 01 cases respectively).

The disease seems to be on rise and there is dire need of mass awareness aimed at avoiding offal and contact with canines (Dogs in particular) to be at bay from infection. This presentation addresses the issue.

Key words: Hydatid cyst, Hyderabad, *Echinococcus granulosus*

Study on Immunoglobulins Isotypes and Histamine Concentration towards Resistances against *Haemonchus contortus* in Teddy and Beetal Goat Breeds

Asim Shamim[1*], Muhammad Sohail Sajid[2], Muhammad Saqib[3], Muhammad Arfan Zaman[4], Muhammad Imran[2], Hafiz Muhammad Rizwan[4]
[1]Department of Pathobiology, Faculty of Veterinary and Animal Sciences, University of Poonch, Rawalakot Azad Kashmir,
[2]Department of Parasitology, Faculty of veterinary Science,University of Agriculture, Faisalabad, Punjab, Pakistan,
[3]Department of Veterinary Clinical Medicine and Surgery, University of Agriculture, Faisalabad, Punjab, Pakistan,
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ABSTRACT

Haemonchus(H.) contortus, abomasal parasite of goats (*Capra hircus*), which affect health, production and welfare globally. Usually this parasite has been control through anthelmintics. However, development of anthelmintic resistance and concern of drug residues in food products makes use of anthelmintics questionable. Evaluation and selection of goats breeds respond better towards *Haemonchus* infection is an alternate approach to control this parasite. Objective of this study was to evaluate the role/response of immunoglubin isotypes and histamine concentrations in artificially infected goats with third stage larvae of *H. contortus*. Experimental goats (n=60) were divided into two main groups i.e. Teddy and Beetal and further subdivided into six sub-groups containing 5 goats in each sub-groups. Two infection protocols were followed to infect goats i.e. early and late. Goats received dose of 12000 and 18000 *H. contortus* larvae. Adult *H.contortus* antigen was prepared for performing enzyme linked immunosorbent assay (ELISA). Indirect ELISA was performed to evaluate the response of immunoglobulins and histamine concentrations against *H.contortus*. Two major immunoglobulins IgG and IgE were found evidently. There was significant ($P<0.05$) difference observed in the levels of IgG and IgE at different time interval post exposure of infections. Concentration of histamine was persistently present in the plasma of experimentally infected goat breeds throughout trial duration. However, it was significantly different at 4^{th} and 6^{th} week of post infection. Up and down regulation of levels of immunoglobulins and histamine concentration during post infection periods makes Teddy goats to respond better than Beetal goats.

Key words: *Haemonchus contortus*, Teddy, Beetal, Goats, Histamine, Immunoglobulins, ELISA.

Genetic analysis of Benzimidazole resistance mutations in *H. placei* and *H. cotortus* from bovine host.

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[2]Department of Parasitology, University of Veterinary and Animal sciences Lahore, Pakistan
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ABSTRACT

Gastrointestinal (GI) parasitic nematodes are the main reason of morbidity and productivity loss in grazing livestock worldwide. *Haemonchus* is the blood sucking parasite infecting ruminants and produced high economic losses to the livestock industy. *Haemonchus contortus* and *Haemonchus placei* are the most important species reported in large ruminants. Total 12 *Haemonchus* populations (nine from cattle and three from buffalo) were collected from the abattoir of six different district of the Punjab. Total 240 worms (20 worms from each population) were used for the amplification of the ITS-2 region of the rDNA. *Haemonchus species* were identified on the base of polymorphism at position P24. Sixty seven *H. contortus* (homozygous A at P24), 151 *H. placei* (homozygous G at P24) and three hybrid (heterozygous A/G at P24) worms were identified. Pooled lysate of *H. contortus* and *H. placei* populations was further used for the analysis of isotype-1 locus of β-tubulin to measure the emergence and spread of benzimidazole resistance mutations. Illumina MiSeq deep amplicon sequencing was used to amplify the isotype-1 β-tubulin locus. Miseq data was arranged and align with Genious-pro software by using consensus sequence construct from NCBI. Three SNPs [F200Y (TAC), F167Y (TAC), and E198A (GCA)] are responsible for benzimidazole resistance. The F200Y (TAC) SNP was observed in all *Haemonchus* populations with the frequency of 0.4% to 5% in the case of *H. placei* and 7% to 57.3% were observed in *H. contortus*. Split tree analysis of *H. contortus* populations shows the multiple emergences of F200Y (TAC) resistant mutations and *H. placei* populations shows the single emergence. Madian joining network analysis of the *H. contortus* showed multiple benzimidazole resistant haplotype emergence and transfer to multiple populations. Madian joining network analysis of *H. contortus* showed multiple benzimidazole resistant haplotype spread in different locations and *H. placei* shows single resistant haplotype spread to the multiple locations. Overall hard selective sweep pattern of emergence and spread was observed in case of *H. placei* and soft selective sweep pattern of emergence was observed in *H. contortus*

Key words: *H. placei*, *H. contortus*, Deep amplification, buffalo, Benzimidazole

Evaluation of in-vivo anthelmintic efficacy of *Withania coagulans* against Trematodes of Sheep

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ABSTRACT

Gastrointestinal trematodes control has been performed through use of anthelmintic. However, the development of resistant populations has required research into new alternatives. There are popular reports about anti-parasitic activity of *Withania coagulans* in animals.This study aimed to evaluate the efficacy of Withania *coagulans* as anthelmintic against trematodiasis in sheep. The findings help in treatment of this condition. Trematode eggs were extracted from fecal samples collected from sheep. The eggs were examined using the flotation technique, and the method of Zajac was used for Egg per Gram (EPG) count. Sheep being screen positive for Trematodes were treated with methanol extract and crude powder of Withania *coagulans.* Commercial anthelmintic *Triclabendazole was also tested and was compared with the plant's activity.*

In this experiment, 24 sheep were allotted into four treatment groups. (each comprised of six animals) A, B, C and D. Each group was treated with methanol extract, crude powder, Triclabendazole and control untreated respectively. To compare treatment effects, decrease in the level of Egg per Gram parameter were evaluated. A significant decline was noted from group A (30%) on 28th day post treatment as compared to control group D. There was no significant difference between the group A (31.50%) and group B (32%) while group C treated with Triclabendazole showed most significant decline (78.57%) in EPG on 28th day post-treatment. When compared the results, demonstrated that, Triclabendazole still a drug of choice against ovine trematodiasis though it has a strong anthelmintic effect.

Keywords: *Withania coagulans*, In-vivo, EPG, Trematodes, Sheep

Estimation of antihelminthic effect of silver nanoparticles on *Fasciola Gigantica* collected from dairy animals

Mateen Arshad**[1], Farkhanda Manzoor[1], Ghazala Jabeen[1], Zakia Kanwal[1] and Iqra Ashraf[1]
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ABSTRACT

Fasciolosis is a disease mainly caused by *Fasciola hepatica* and *Fasciola gigantica* of public health and economic importance. It causes serious disease of cattle, sheep, goats, buffalo and other grazers. In dairy animals this disease is debilitating, decreasing production of milk and result in losses due to condemned livers. In the present study, the effect of silver nanoparticles was checked on *Fasciola gigantica* collected from infected liver of different dairy animals. Livers were collected from slaughter abattoir of Lahore and butcher shops. Samples were stored at 4 °C and were analyzed. Livers were visually scored for fibrosis. Parasites were recovered at liver necropsy. The infected livers were then dissected and adult flukes were collected in saline solution. The maturity of the flukes was determined based on their size and the development of the vitelline glands. Three experimental groups of flukes were incubates at 37 degree centigrade in three different concentrations of silver nanoparticles were under examination for the estimation of anthelminthic effect of nanoparticles. The experimental groups were examined for 24 hours after 2 hours of time interval. The mortality and mobility of flukes was periodically recorded up to 12 hours and finally at the 24th hour of incubation in different concentrations of the silver nanoparticles along with controls. The experimental group with least concentration showed least mortality rate while the group with highest concentration showed highest mortality rate. Present study will help to minimize the parasitic burden in dairy animals to improve general public health by introducing drugs based on nanoparticles.

In Vitro and *In Vivo* efficacy of selected medicinal plants against *Haemonchus contortus*

Syed Nadeem Badar[1], Zafar Iqbal[2], Muhammad Sohail Sajid[2,3], Hafiz Muhammad Rizwan[4*]

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ABSTRACT

In present study anthelmintic activity of *Arundo (A.) donax* L., *Areca (Ar.) catechu* L and *Ferula (F.) assa-foetida* L. was determined. Leave of *A. donax* L., latex of *F. assa-foetida* L. and seed of *Ar. catechu* L. in different solvent fractions were subjected to *in vitro* (egg hatch assay or EHA and adult motility assay or AMA) and *in vivo* (faecal egg count reduction test or FECRT) anthelmintic activity testing protocols using *Haemonchus (H.) contortus* as an experimental model. Statistical analysis of the results of EHA, AMA and FECRT were determined through linear regression, Duncan multiple range test and one way analysis of variance, respectively. In AMA, crude aqueous methanol extracts (CAME) and Ethyl acetate fraction of *F. assa-foetida* at 10 hours post treatment showed maximum mortality of *H. contortus* at 12.5-50 mg mL^{-1}. In EHA, CAME of *F. assa-foetida* was identified a better ovicidal based on its lower LC_{50} (16.9126 µg mL-1) followed in order by *Ar. catechu* and *A. donax*. FECRT also indicated *F. assa-foetida* L. more effective than *Ar. catechu* L. and *A. donax* L., against natural infection of gastrointestinal (GI) parasites. In *in vitro* assays Chloroform and ethyl acetate fractions showed better anthelmintic activity against adult worms, while, in *in vivo* assay, CAME of the study plants were better than crude powders. It is recommended to document the indigenous knowledge to regular scientific trials for their endorsement. Farmers may be suggested to make a better choice of cultivation of the indigenous plants in view of their varying efficacies as a preventive approach against the GI parasitic infections.

Keywords: *Arundo donax* L.; *Areca catechu* L.; *Ferula assa-foetida* L.; *Haemonchus contortus*; *In vivo* and *in vitro* assay.

Molecular characterization of Eimeria species from deer (*cervidae*) based on sequence analysis

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ABSTRACT

Coccidiosis is caused by protozoan parasite belonging to Eimeria. The current study targets the Molecular Characterization of *Eimeria* isolates in captive deer from Lahore region. Host species was *Cervidae* family such as Hog deer (*Axis porcinus*), Punjab urial (*Ovis aries vignei*). A total of 200 fecal samples were collected from different captive regions. The samples were subjected to conventional as well as molecular methods for the confirmation of Eimeria species. The micrometery reflected Oocyst residuum, polar granule, micropyle. Oocysts measured 28.4 -23.5µm. Sporulated oocysts found to be spherical to subspherical, with a rough bilayered oocyst wall 1.5µm thick. Molecular characterization of Eimeria from deer was also performed firstly in Pakistan. Out of 200 samples, eleven samples were found positive for PCR and twenty seven samples found positive microscopically. Universal COX-I primers 1202 and 400 were used to amplify DNA of *Eimeria spp*. for confirmation. A significant difference (P= 0.00634) was observed with two different techniques. 98.0% genetic similarity with *Eimeria crandallis* and 97 % with *Eimeria arloingi* as reflected in phylogenetic analysis. These new isolates *E. arloingi* and *E. crandallis* grouped together in the same clade. Based on the morphological and molecular data, these isolates are a new species of coccidian parasites from deer.

Keywords: Coccidia; Deer; PCR; DNA sequencing; Phylogenetic analysis

Zoonotic Parasites of Camels: Time for Revolution in Research

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ABSTRACT

Camels have a global population of about 35 million and are distributed in 47 countries. They play a crucial role as livestock in the economy of arid and semi-arid areas of the world. Camel can lose a quarter of body weight without impairing its normal functions and can survive almost 1 week with little or no food and water. So they can be used for providing food (meat and dairy products) with great nutritional value and fiber (wool, leather) in regions of the globe where the common livestock species –cattle, sheep and goat– cannot be used for these purposes. In the year 2017, camels produced 2,852,213 tons of milk and 630,210 tons of meat. According to the FAO Statistics Division, the total population of the OWCs in the period 1997 to 2017 increased by about 82%. Although camels have a close association with humans, apart from the Middle East respiratory syndrome coronavirus (MERS-CoV), brucellosis and Rift Valley fever information about camels' infections with zoonotic agents are scarce. Considering the importance of camel parasitic infections in terms of animal and public health, a focus on parasites from one-humped camels (*Camelus dromedarius*) especially species and genotypes with zoonotic potential is necessary.

Camels get infected and infested with almost 300 species and genera of endo- and ectoparasites. Over 50 species and genotypes of protozoa and helminths have the potential of infecting humans. Also majority of arthropods attached to or flying around camels are vectors of various zoonotic viruses, bacteria and parasites.

Although *Trypanosoma evansi*, *Toxoplasma gondii*, *Echinococcus granulosus* sensu lato, *Fasciola hepatica* and mange mites of camels are well-known as parasites with zoonotic potential, there are still gaps in our knowledge about their protozoan, helminths and arthropods. A fast and powerful action in camel parasitology research with the aid of advanced molecular-based techniques is recommended.

Key words: Parasite, Zoonoses, One Health, *Camelus dromedarius*, one-humped

Vaccination of Babesiosis; scope, challenges and pitfalls

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ABSTRACT

Babesiosis, also known as tick fever or red water disease, is economically the most important tick-borne disease caused by protozoa *Babesia*. Almost 111 species of *Babesia* exist, but in cattle mostly 3 species (*Babesia bovis, Babesia bigemina, Babesia divergens)* are causing the effects of bovine babesiosis. *Babesia bovis* has badly been effecting the development of livestock sector over several years' even decades. The morbidity and mortality of babesiosis are very high and its prevalence in Pakistan is up to 29%.

The mining of available parasite genomes is continuously enlarging the array of potential vaccine candidates and, additionally, the recent development of a transfection tool for *Babesia* can significantly contribute to vaccine design. However, the complication and high cost of vaccination trials hinder the *Babesia* vaccine research. Furthermore, the adverse vaccine reactions, incorrect handling or storage of the vaccine, concurrent disease, stress and immunity, vaccination following the use of chemotherapeutic agents, high cost in maintaining cold chain for live vaccine, are the major challenges in the progress of vaccine usage. Moreover, the use of live, blood-derived vaccines entails some problems, including: (i) the possible spread of silent pathogens such as bovine leukemia virus (ii) difficulties in standardizing the vaccine dose (iii) the risk of reversion of virulence (iv) maintenance of carrier animals, which might serve as reservoirs for tick transmission (v) quality control of vaccine production, maintenance and transportation to the end user, including the necessity for a cold chain. Other factors contributing to the lack of progress in vaccine development such as the small size of the market and the inability or unwillingness of a farmer to pay a proper price for the vaccine could mean that, in certain situations, there is insufficient economic incentive for a manufacturer to produce, register and distribute a vaccine.

Certain vaccines have a short shelf-life and a cold-chain is often needed for distribution, which could affect the cost–benefit balance negatively. The sentiment that the current anti-parasitic drugs are good enough for most purposes, are cheap to produce and show broad-spectrum efficacy could suggest that the need for parasitic vaccines is rather low. Prophylactic therapy is accepted as necessary and, with the high efficacies achieved by drugs in the past, there will be a problem to persuade the user that a vaccine that is 100% effective can control the disease.

Evaluation of *Aspergillus terreus* as potential biological control agent for Dengue vector

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ABSTRACT

Vector control of dengue is widely used in preventing the disease transmission worldwide. The growing demand in reducing the use of chemical insecticides has provided imputes to explore safer alternatives. Biological control of dengue vector is the suitable approach to this problem. Myco-biocontrol using *Aspergillus terreus* was evaluated for its potential larvicidal activity against *Aedes aegypti* and safety to environment. Local strain of *Aspergillus terreus* was isolated from Jallo forest, Lahore, and its efficacy against 4th instar larvae of *Aedes aegypti* was assessed. Fungal suspension was applied against the larvae and the mortality rate was observed after 24, 48 and 72 hours. The LC_{50} values after 24, 48 and 72 hours were recorded as 8.1E+6, 4.27E+5 and 1.99E+4 respectively. Besides the efficacy of *Aspergillus terreus* against dengue vector the current paper evaluates its safety against plants, fish and indoor air. *Aspergillus terreus* showed no significant side effects on fish, plants and indoor air proving it safe for the environment.

Key Words: Biocontrol; Entomopathogenic fungi; Efficacy; *Aedes aegypti*, Safety; Persistence

Molecular Epidemiology and Prevalence of *Neospora caninum* in healthy and aborted Cattle from Punjab, Pakistan

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ABSTRACT

Neospora caninum a tissue cyst forming protozoan parasite with a cosmopolitan distribution and it is considered as one of the most important causes of bovine abortion and neonatal mortalities. The current study was designed to estimate the molecular prevalence of *N. caninum* in cattle from Punjab province Pakistan using polymerase chain reaction (PCR). We hypothesized that *N. caninum* prevalence would be higher in aborted (n=72) cattle than in healthy (n=95) animals. One hundred and sixty-seven blood samples from cattle were examined and the prevalence of PCR positive samples was 24.5% (95% confidence interval [CI] =±3.73) 41 of 167 samples. Prevalence was observed significantly ($P < 0.05$) higher in aborted cattle 31.9%, 95% CI = ±4.61 (23 of 72) compared to healthy animals 18.9%, 95% CI = ±7.35 (18 of 95). Thirty-five (27.3%, 95% CI = ±5.17) of 128 dairy cattle and 6 (15.4%, 95% CI = ±9.61) of 39 beef cattle were found to be positive for *N. caninum* infection with a significant ($P < 0.05$) difference of prevalence among dairy and beef cattle. No statistical difference ($P > 0.05$) of positivity to *N. caninum* was recorded among three age groups of ≤ 3 years (23.4%, 95% CI = ±3.85), 3-5years (33.4%, 95% CI = ±6.47) and ≥ 5years (19.1%, 95% CI = ±8.36) animals examined. Infection was more often in pure breed cattle 27.6%, 95% CI = ±4.83 (29 of 105) than the cross breed animals 19.3%, 95% CI = ±5.93 (12 of 62) with a no statistical ($P > 0.05$) difference among breeds of cattle. The current findings provide the molecular evidence to *N. caninum* infection in cattle in this region and suggested further molecular investigations on this parasite.

Key words: Cyst forming, Polymerase chain reaction, aborted, dairy cattle, beef cattle

Prevalence of ticks Infestation and their associated risk factors in Exotic Cattle in Tehsil Jhang of Pakistan

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ABSTRACT

Ticks are the second to mosquitoes as vectors of a number of pathogens like viruses, spirochetes, bacteria, rickettsia, protozoa and filarial nematodes etc. that cause mortality in human and Animals. So, this study was carried out to check the prevalence of ticks Infestation and their associated risk factors involve in Exotic Cattle in Tehsil Jhang of Pakistan. To know the prevalence of ticks infestation two hundred Exotic crossbred cattle were thoroughly inspected for ticks presence and their associated risk factors, factors of age, breed, coat color, predilection sites, herd size, housing type, raising system, feeding type, removing of manure, from a infested animal were also noted on a pre-designed questionnaire. Overall prevalence of ticks infestation were found to be 45.5% where 91 cattle out of 200 were having ticks. 20% cattle were infested with *Boophilus*, 11% *Hyalomma* and 14.5% were with mixed infestation of *Boophilus* and *Hyalomma*, Two genus of ticks namely *Rhipicephalus (Boophilus) microplus spp.* and *Hyalomma spp*. were identified on the basis of their morphological characteristics. Risk factors analysis namely Predilection site, floor type, age, and method of control were significantly associated with tick infestation. It was concluded that ticks infestation were prevalent in study area and are a source of continuous animal infestation. Our results also showed evidence for *Rhipicephalus (Boophilus) microplus spp*. and *Hayalomma spp*. which are a constant source of Anaplasmosis, Babesiosis and Theileriosis infections in animals.

Development of *Theileria annulata*-infected B cell line and its immune response

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ABSTRACT:

The current study aimed to develop a pure *Theileria annulata* (*T. annulata*)-infected B cell line for the evaluation of cytokine production from lipopolysaccharide (LPS)-stimulated and transformed cells. Numerous studies have conducted to for phenotypic changes in *T. annulata*-transformed cells; however, no evidence on cytokine production from these cells is available. To examine the potential of the transformed cells for cytokines production and their potential responses to antigen-stimulation, B cells (CD21) were purified from the whole blood of cattle experimentally infected with the *T. annulata* (Kashi strain) by magnetic separation. The specificity and purity of the established cell line was evaluated from identification of several specific cell surface markers (CD21, IgM, and WC4) by flow cytometry analysis. The transcript levels of the cytokines IL-1A, IL-1B, IL-2, IL-4, IL-6, IL-8, IL-10, IL-16, TNF-α, IFN-α, IFN-β, LT-α, and TGF-β1 in antigen-stimulated, transformed, buparvaquone (BW720c)-treated cells were analyzed by real-time polymerase chain reaction (RT-PCR) using cDNA from these cells. A *T. annulata*-infected bovine B cell line was successfully developed with a purity of ~98.8% (CD21). IL-4 and IL-12A were significantly ($p<0.01$) up-regulated in the transformed cells. In BW720c-treated transformed cells, TGF-β1, IL-12β and IFN-β were significantly ($p<0.01$) up-regulated. Particularly, no significant ($p>0.05$) up-regulation of cytokines was detected in LPS-stimulated transformed cells. Moreover, IL-1α, IL-1β, IL-8, and IL-16 were significantly ($p<0.01$) up-regulated in LPS-stimulated normal B cells. Our data indicate the potential use of these transformed cell for cytokine production, observation for production of immunoglobulin's, and an attenuated vaccine against tropical theileriosis.

Keywords: *Theileria annulata*; B cell line; transformation; antigenic stimulation, cytokines;

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Molecular characterization of *Rhipicephalus (boophilus) microplus* in Pakistan

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ABSTRACT

Ticks transmit a number of bacterial, protozoal and viral pathogens that cause many diseases like Ehrlichiosis, Hemmorrhagic fever, Theileriosis, Babesiosis and Anaplasmosis in livestock. About 80 % of the world cattle are infested with the ticks. In this study, the Bm86 gene was targeted. For amplification in vitro specific forward and reverse primers flanked by sequences of restriction enzyme sites were used. The molecular prevalence of *Rhipcephalus* (*Boophilus) microplus* was studied in three districts belonging to different ecological zones in the province of Punjab, Pakistan. A total (n=2500) ticks' samples were collected and initially screened through microscopy and further analyzed by PCR methods. For the confirmation of 248 bp of Bm86 gene, PCR products were loaded in 1.5 % agarose gel stained with SYBER green safe dye and observed under the Ultra-violet light to declare positive against 100 bp ladder, as shown in figure. PCR products of *Rhipicephalus (Boophilus) microplus* were sequenced along with the primers. The quality of the sequences was analyzed through Geneious software. Consent sequences obtained from Geneious software were aligned with MUSCLE software and further confirmed manually by using MESQUITE software. Finally, the phylogenetic tree was generated by using the MEGA 7 through Neighbor Joining method. For phylogenetic tree, best model was selected showing the phylogenetic analysis of *Rhipicephalus (Boophilus) microplus* through MEGA 7.0. Pairwise comparisons of nucleotide sequences showed nucleotide differences ranging between 0.007 and 0.01%.

Keywords: *Boophilus microplus*, Bm86, Buffalo. Punjab

Molecular characterization and phylogenetic analysis of Trypanosomal species infecting Horses in Karachi region, Pakistan

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ABSTRACT

Trypanosomiasis commonly known as Surra caused by *Trypanosoma evansi*, is regarded as one of the most economically important parasitic pathogen globally and in Pakistan. The current study aims at genetic characterization and phylogenetic analysis of Trypanosomal isolates from naturally infected local and imported horses using for racing and breeding purpose in Karachi, Pakistan. The study was initially started with parasitological and molecular surveillance on 200 horses. The prevalence was recorded as 2.5 percent with microscopy and 9.5 percent with RoTat 1.2 and universal COX-I primers 1202 and 400. A significant difference (P=0.00318) was observed with two different techniques. Molecular characterization and sequencing were achieved on positive samples. Product sequences were aligned against the corresponding GenBank sequences of known isolates of *T. evansi* and subjected to phylogenetic analysis. Results revealed that *T. evansi* was present in horses. Basic Local Alignment Search Tool (BLAST) data of the obtained PCR VSG gene sequences revealed that they corresponded to those of *T. evansi*, with the homology of 97% to 99%. Present study revealed that PCR amplification for the diagnostic purpose may serve as a quick and sensitive tool as well as for phylogentic anlysis of different trypanosomal species from horses in Pakistan.

Keywords: *Trypanosoma evansi*; PCR; DNA sequencing; Phylogenetic analysis; Horses

Novel genetic approaches to improve understanding of the antimicrobial resistance in neglected livestock and humans parasites.

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ABSTRACT

Parasites are ubiquitous and amongst the most successful organisms in the biosphere, possessing an incredible ability to adapt different environments and niches. Among these, *Theleria annulata, Trypanosoma evansi, Haemonchus contortus, Plasmodium falciparum,* and *Plasmodium vivax*, which cause theileriosis, trypanosomiasis, haemonchosis, and malaria, are amongst the most economically important neglected tropical parasites of livestock and humans. They are highly pathogenic and widely distributed throughout the low- and middle-income countries (LMICs), where human health and livestock production is critically important and efficient agriculture is a priority in accordance with UN Sustainable Development Goals. The control of parasites depends on the prophylactic and therapeutic use of antimicrobial drugs. In livestock, buparvaquone is the only commercially available drug for the treatment of theileriosis, diminazene is a widely used compound for the treatment of trypanosomiasis and benzimidazole has been routinely use for the control of haemonchosis and other helminth parasites for decades. In humans, artemisinin, pyrimethamine-sulphadoxine, and chloroquine drugs are one of the mainstays of global efforts to control malaria. The current drugs have been available for decades, but their use is now severely compromised by the development of resistance and considered to be a serious challenge threating the human health and the viability of livestock production in LMICs. Overall, my project will lead to significantly increased understanding of the antimicrobial resistance of the most important and yet neglected tropical parasites (*T. annulata, T. evansi, H. contortus, P. falciparum,* and *P. vivax*), with outcomes having potential to inform enhanced human health and improved global food security and poverty alleviation through reduced livestock production losses in line with BBSRC-GCRF strategic priorities in "One Health, Agriculture and Food Security".

Epidemiology and diagnosis of tick borne diseases including Crimean Congo Hemorrhagic Fever (CCHF) at Pakistan

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ABSTRACT

Pakistan is an agriculture country and livestock play very important role especially uplifting the socioeconomic status of poor farming communities and relieving poverty to the 70% population belongs to rural zones. One of the greatest threats to livestock sector is ecto-parasites, among which ticks are the most prevalent one. In this regard, Pakistan Agricultural Research Council funded (2018-20) four projects on ticks and ticks born diseases as coordinator approach through Agriculture Linkage Program. These are i. Development of diagnostic capacity for the detection of Crimean Congo Hemorrhagic Fever in animals at NARC, Pakistan, ii. Spatial epidemiology, molecular identification and detection of ticks and tick-borne diseases in Punjab, Pakistan, iii. Epidemiological study, molecular characterization and risk mapping of tick borne diseases (Theileria and Babesia) for rapid diagnostic assay development and iv. Screening of Livestock population for ticks and tick borne diseases in some selected districts of Azad Kashmir, Pakistan. PARC also collaborating in another NUST funded project on Molecular Surveillance and Risk Factor Evaluation of Crimean Congo Haemorrhagic fever (CCHF) in Pakistan. Main objectives of these projects comprised investigation of spatial distribution of tick's species in different ecologies of Pakistan, Molecular detection (using PCR) of ticks-borne diseases from ticks and human, establishment of prevention and control model farms and capacity building of Vets/Scientists. The achievements so far received in these projects includes standardization of indirect ELISA at NARC by using the recombinant nucleo-capsid protein of CCHFV obtained from the Department of Infectious Diseases, Japan and Public Health England, UK. Various antigen concentrations, serum dilution of suspected sera and conjugate were standardized. Besides this substrate and reaction time were optimized. The validation process of this developed ELISA is in progress The validation process of this developed ELISA is in progress with archival as well as fresh animal serum samples collected from Punjab, KP and Baluchistan.. Three districts were selected from Punjab and 71 livestock farms were investigated for ticks' prevalence. Five tick's genera (*Hyaloma*, *Boophilus*, *Ixodes*, *Rhicephalous*, *Haemaphysaly*) were identified from these areas. Five tick genus were identified including *Hyalomma*, *Rhipicephalus*, *Boophilus*,

Heamaphysalis, Ixodes infecting sheep and goats in Balochistan. Four sites from Rawalakot and three sites from Faisalabad were selected for prevalence of ticks the identification is in progress. These projects will be completed during next two years and hopefully contribute towards proper control of ticks and ticks borne diseases in Pakistan.

Keywords: Epidemiology, Ticks, protozoan diseases, control

Seroprevalence of *Toxoplasma gondii* among female psychiatric patients of Lahore, Pakistan.

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ABSTRACT

Toxoplasmosis is a cosmopolitan zoonosis, caused by an obligate intracellular protozoan parasite, *Toxoplasma gondii*. It is worldwide in distribution. The unusual and abnormal behavior of psychiatric patients increases the risks of getting the infection of *Toxoplasma gondii*. The present study was conducted to find out the seroprevalence of *Toxoplasma gondii* among female psychiatric patients in Lahore, Pakistan. Blood samples were taken from 60 female psychiatric patients while blood samples of 60 non-psychiatric females were collected too in order to make comparison. After collection of blood samples, serum was separated by centrifugation. The data regarding the gender, age, weight, socioeconomic status, educational level, occupation and presence or absence of cat as pet animal was recorded with the help of especially designed questionnaire. ELISA technique was used to determine the index of IgG *Toxoplasma gondii* antibodies. Data was evaluated on the basis of results. The results showed that seroprevelance of *Toxoplasma gondii* in psychiatric females (case subjects) was 53.3% while in non-psychiatric females (control subjects) was 28.3%. Among psychiatric patients, the seroprevalence was highest in schizophrenic patients (52.9%) while aggressive patients have least seroprevalence (42.8%). The results suggested that risk factors such as contact with cat, unhygienic conditions are responsible for the transmission of infection. Other factors include unawareness, low socioeconomic status, and illiteracy rate play an important role in the transmission of infection. The results highlight the importance of awareness in the prevention of toxoplasmosis.

Sero-prevalence of Q-Fever in aborted camel herds of different ecological zones of Province Punjab, Pakistan

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ABSTRACT

Q fever is caused by *Coxiella burnetii*, which is a Gram negative intracellular bacterium. It has zoonotic importance. It causes disease in almost all domestic animals and lead to subsequent economic losses in the form of metritis, infertility, abortions, low reproductive efficiency and still birth. The current study was planned to investigate the seroprevalence of Q fever and its associated risk factors in camels of five districts (Jhang, Chiniot, Bhakkar, Layyah and Muazaffargarh) of province Punjab, Pakistan. For this purpose, a total of 184 samples were collected from different camel herds with history of abortion. Animals and management related data were recorded on a pre-designed questionnaire. The commercially available ELISA kit (ID VET, France) was used to check the level antibodies of Q fever.

The overall prevalence was recorded 39.67% (73/184). The prevalence was found significantly ($p<0.01$) high in she camels (49.55%) than he-camels (24.66%). It was recorded significantly ($p<0.01$) high in camels having age group 5.1-10 years (58.06%) and low in animals of ≤ 2 years age group (5.56%). The pregnant camels were found more positive (73.58%) than non-pregnant camels (27.59%; $p<0.01$). It was recorded more in camels of poor body condition than camels having good body condition ($p>0.05$). It was found significantly ($p<0.01$) high in camels having tick infestation. The non-significant relation was found in camels having history of abortion and retained fetal membranes. The results of current study indicated that Q fever is endemic in camel population of province Punjab; hence there is dire need to implement immediate preventive and therapeutic measures.

Key words: Sero-prevalence, Camel, Q fever, Risk factors, Punjab, ELISA

Harnessing the parasitism to treat allergies, autoimmunity and cancers

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ABSTRACT

Helminths are master immunomodulators of the host to ensure their establishment and long-term existence in unsympathetic milieu. Several immunoregulators/immunomodulators have been identified in excretory secretory (ES) products of different life cycle stages of helminthes, including some acting on host immune and antigen presenting cells. Hygiene hypothesis and immunosuppressive therapies for inflammatory diseases in humans are based on the ability of helminths to induce regulatory immune responses by suppressing the overreacting T_H1/T_H17 and T_H2 responses that mediate autoimmunity and allergy respectively. Purified and/or recombinant helminth molecules showed promising outcomes, some examples include but not limited to LNFPIII from *Schistosoma mansoni,* AvCystatin from the filarial nematode *Acanthocheilonema viteae* and ES-62 from *A. viteae.* We previously described direct immunomodulation by *Haemonchus contortus* (abomasal nematode of small ruminants) ES products of human monocyte-derived dendritic cells (mdDcs) resulted in their semi-maturation, increased surface expression of tolerogenic markers (CD32, CD305 and galectin-1) and weak up-regulation of co-stimulatory molecules (CD40 and CD80). Huge variation in responses of individual human donor cells suggested that therapies based on helminth immunomodulators may need careful patient evaluation, depending on their clinical history, genetic makeup and social habits, as some may not respond as predicted to worm therapies and either failures in the treatment or adverse reactions could occur. Further investigations are required for synthetic analogues of helminths' potent products that mimic the parasite-mediated immunomodulation. Great number of evidences is indicating the carcinogenic impact of helminthes; however the specific role of helminths in cancer is only now starting to unravel. Helminth induced immune-mediated changes, can be potentially beneficial for cancer prevention/ regression in the host or to improve quality life of cancer patients and should be investigated in further detail.

Key words: Immunoregulators, Hygiene hypothesis, Worm therapy and Individual variation

Optimization of conditions for *in vitro* cultivation of *Babesia bigemina* in bovine red blood cells

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ABSTRACT

Babesia bigemina is the main cause of bovine babesiosis in Pakistan. *B. bigemina* is cultivated *in vitro* for attenuation to be used as vaccine in cattle. The purpose of this study was to perform *in vitro* cultivation of *B. bigemina* in three different culture media (M-199, RPMI 1640, and DMEM), isolated from splenectomized and non-splenectomized crossbred cattle calves. Hematological profile and catalase activity in Babesia-infected animals were performed to find out the effect on the health status. Additionally, lipid profile (cholesterol, high-density lipoprotein (HDL) and triglyceride) and osmotic fragility were measured in *in vitro* cultured infected RBCs.

Among these cultured media, M-199 was the most appropriate for the *in vitro* cultivation of *B. bigemina*. Highest Percentage Parasitic Erythrocytes (PPE) level was found up to 6.0 % on 72 h post-cultured with M-199 medium. Furthermore, no significant difference in catalase activity, while significant difference in osmotic fragility were observed among the groups. However, lipid profile (cholesterol, triglycerides and HDL) were significantly less in infected groups except in Babesia-infected group.

Our findings for optimized culture medium and conditions are helpful for *in vitro* cultivation of babesia-infected RBCs for vaccine development. The lipid profile (cholesterol and triglycerides) of *in vitro* cultured RBCs shows that lysis rate of Babesia-infected RBCs was not significantly different that can be easily processed for the attenuated vaccine production.

Babesia bigemina, *in vitro* culture, percentage parasitemia erythrocytes (PPE), culture medium, lipid profile

An efficient way for the diagnosis of *Plasmodium falciparum* in the blood slide by using NLM malaria screener

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ABSTRACT:

Malaria is a life threatening-disease that is caused by a parasite named plasmodium and is transmitted to the people by the bite of female Anopheles mosquitoes. It is one of most important parasitic malaises in the whole world. According to the report of WHO 2017, an estimated 219 million cases of malaria were reported worldwide and an estimated 435,000 deaths occurred due to malaria in 2017. To find the plasmodium in the blood slide is very difficult. A lot of skills and expertise are required to find the plasmodium and its stage in the blood slide. Innovations are being added in the diagnostics for the better and quick detection of Plasmodium in the blood slide. One such gadget is a malaria screener that is developed by National Library Medicine (NLM), National Institute of Health, USA. Malaria screener is an algorithmic based smartphone application that counts malaria-infected cells in the blood slide image which is taken by the smartphone camera through the eyepiece of microscope. For the detection and counting of malaria infected cells, malaria screener applies image analysis and machine learning techniques. Dr. Stefan Jaeger et al. have trained the malaria screener for the detection of *Plasmodium falciparum*. In a study to optimize the malaria screener in Pakistan, ten samples were collected from a local hospital in Pakistan in April 2019. All samples were declared negative by the technicians in laboratory for any kind of malaria. 1000 cells per slide were scanned by malaria screener which showed 80% of sample slides as positive for *P. falciparum*. To confirm the accuracy of results by NLM malaria screener, molecular technique such as PCR (Polymerase Chain Reaction) was also performed by using *P. falciparum*-specific primers. PCR results revealed the presence of *P. falciparum* in 7 samples that showed the high sensitivity and specificity of the NLM malaria screener. By using NLM malaria screener, we also find resistance to malarial drugs in the follow-up cases of patients infected with *P. falciparum*. Thus, NLM malaria screener is an effective and friendly gadget that detects the *P. falciparum* very quickly and efficiently in the blood slide.

Key words: *Plasmodium falciparum*, Malaria screener, Diagnosis, PCR, microscopy

Seroprevalence, molecular detection and zoonotic potential of *Toxoplasma gondii* in selected district of Punjab.

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ABSTRACT

Background: Toxoplasmosis is a disease of warm blooded animals caused by an opportunistic parasite *Toxoplasma gondii*. **Objective:** Seroprevalence and molecular characterization of *Toxoplasma gondii* in, sheep, Goat, cat and human beings in two districts of southern Punjab namely Khanewal and Sahiwal was determined **Methods:** Blood samples were collected from 1000 sheep and Goats each 200 Human blood while 200 fecal samples from cats were also collected from Khanewal and Sahiwal. Seroprevalence was determined by ELISA carried out by using Vircell-Kit Spain. Hematological parameters were assessed by using Blood Chemistry Analyzer. Molecular Characterization was proceeded by PCR using universal primers 1202 and 400. **Results:** In Khanewal, Goat 292 out of 1000 (29.2%), Sheep 265 out of 1000 (26.5%) and in cat 6 (3%) out of 200 fecal samples were found positive. Out of 200 blood samples 52 found positive in Human with seroprevalence 26%. In Sahiwal district 49 Human samples were found positive with seroprevalence 24.5%, Sheep 235 with seroprevalence 23.5%, Goat 248 positive samples with 34.8% seroprevalence and in cat 7 (3.5%) fecal samples were found positive. Data was significant using chi- square. Amplified Product of 800bp was obtained from PCR. **Conclusion:** The present study reflected the zoonotic potential of toxoplasmosis, a vastly endemic threat to small ruminants, humans as well as the role of cats in transmission of the disease.

Key Words: *Toxoplasma gondii*, seroprevalence, ELISA, Molecular Characterization, Punjab

Improving the control of tropical Theileriosis (*Theileria. Annulata* infection of Cattle) in endemic countries, the need for adopting new research paradigms privileging sustainable innovative solutions

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ABSTRACT

Tropical theileriosis is an economically important tick-borne disease due to the protozoan *Theileria annulata*, which is affecting cattle over a large geographic area covering Asia, Africa and Southern Europe. This protozoosis represents up to date one of the major constraints to the development of the cattle industry in several endemic regions. The control of tropical theileriosis is currently based on several measures: theilericidal treatment of diseased cows; application of chemical acaricides to reduce risks of *T. annulata* transmission by vector ticks; and finally the use, in several endemic countries, of live attenuated vaccines. Unfortunately, these tools are unable to provide a satisfactory and sustainable control of tropical theileriosis due to the occurrence of several constraints limiting their use and efficacy, and in particular, the emergence of resistance of *T. annulata* to buparvaquone and of vector ticks to chemical acaricides; the limited efficacy of live attenuated vaccines under heavy infection pressure, and finally the presence of technical constraints related to the use of liquid nitrogen chains for delivering attenuated vaccines to the field. Furthermore, sub-unit vaccine candidates tested up to date against *T. annulata* were unable to reach the efficacy levels provided by classic live attenuated vaccines. This highly challenging context for tropical theileriosis could not be overcome using classic research approaches, emphasizing the needs for changing our way to develop research problematics. Accordingly, we present a reflection, framed by technology transfer methodologies on how to capitalize previous research outputs and to approach differently the problem with the aim of identifying new avenues for applied research that may result in the development of innovative control tools that are coherent with stakeholder's needs and expectations (farmers, veterinarians and pharmaceutical industry). Furthermore, a specific attention has also been given to environmental and human health issues for developing solutions coping with the One-Health and Eco-Health concepts and the Sustainable Development Goals.

ITS2 gene base identification and proteins analysis of *Rhipicephalus Microplus by using SDS PAGE method: Possibility of vaccine development against vector tick (R.Microplus)*

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ABSTRACT

The aim of this study was to identify the Ixodid ticks fauna infesting the cattle population in the project areas based on the PCR-based amplification of a conserved segment of internal transcribed spacer (ITS2). Furthermore, the identified and confirmed ticks were further processed for differential protein analysis and antigenic characterization. A total of 500 cattle were examined and high tick infestation was recorded with prevalence of 425 (85%). Two genera and four species of the ixodid ticks were identified. Among these *Rhipicephalus microplus* (75%) was the most prevalent ixodid tick species followed by *Hyalomma impeltatum* (13.6%),*Hyalomma anatolicum* (9%)and *Hyalomma rufipes* (3%) The relationship between hosts' related factors (age, sex and body condition score) and tick burden was also evaluated. Analysis of proteins extracts of different organs of *R. microplus* through SDS page analysis showed that 40 kDa, 60 kDa, 70 kDa, 100 kDa, 120 kDa of dominant proteins were found its different organs. These proteins are currently under investigation for its antigenic properties. In conclusion, our study records a heavy ticks' infestation in the under study population of cattle, and that can hamper cattle productivity by causing physical damage to their hides , hence development of a potent vaccine should be developed in order to properly control ticks infection.

Key words; *R.microplus*, PCR, SDS page and ITS 2.

Anti-Tick Activity of Imidocloprid against *Ixodes* in Sahiwal Cow At Multan, Pakistan

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ABSTRACT

Anti-tick activity of imidocloprid (18.20% w/v) commercially available was assessed against *Ixodes* in sahiwal cattle at Multan, Pakistan. Various concentrations i.e. 0.01% and 0.02% of imidocloprid (18.20% w/v) were prepared. The live ticks were obtained from cattle with no history of any acaricidal drug prior 60 days and beyond. The tick(s) male and females were identified as *Ixodes* on the basis of pictorial key and morphology and their photograph were preserved and saved for further study. The live tick(s) were immersed in preparation(s) 0.01% and 0.02% in petri-dish(s). Anti-tick activity of imidocloprid against ticks *Ixodes* was observed in 3-5 minutes after application and immersion. There was no any significant difference of anti-tick activity of various concentrations of imidocloprid on *Ixodes*. The treatment was highly effective against the ticks in Sahiwal cattle.

Keywords: Anti-tick activity, imidocloprid, *Ixodes*, Sahiwal Cattle

Insight into tick and tick-borne pathogens of Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Ticks and tick-borne pathogens are major constraint to public health and veterinary sector, as they are carrier of several pathogens which cause numerous infectious diseases after transmission during blood feeding. They are obligate hematophagous ecto-parasites of vertebrates distributed from arctic to tropical regions throughout the world. In Pakistan, direct losses of tick and tick-borne diseases have not been estimated however, expected estimated losses maybe more than combined losses from all other cattle diseases. Information based on molecular approaches about tick and tick-borne pathogens in Khyber Pakhtunkhwa (KP) Pakistan are lacking. We aimed to collect ticks (11,000) from numerous hosts including human, cattle, equine, buffalo, sheep, goat, dog, domestic poultry, wild rodent and reptile across KP for tick and tick-associated pathogens identification. Ticks were collected across KP and morpho-taxonomically categorized into eight genera comprising 27 species, *Rhipicephalus microplus, R. turanicus, R. haemaphysaloides, R. sanguineus, R. annulatus, R. geigyi, R. camicasi, R. pravus, R. senegalensis, Hyalomma anatolicum, Hya. impeltatum, Hya. marginatum, Hya. scupense, Hya. scupense, Hya. dromedarii, Hae. longicornis, Hae. montgomeryi, Hae. punctate, Hae. sulcata, Ixodes persulcatus, Argas persicus* and *Otobius* spp.(?). Ticks infesting wild animals were *Amblyomma gervaisi, Amb. exornatum, Amb. latum, Dermacentor marginatus* and *Hae. indica*, while ticks infesting human were *R. microplus, R. annulatus, Hya. anatolicum, Hya. marginatum* and *Hae. punctata*. The phylogenetic analysis based on partial mitochondrial cytochrome oxidase subunit I (COX1), 16S ribosomal RNA (16S rRNA) and internal transcribed spacer 2 (ITS2) sequences of R. microplus revealed that R. microplus in this region belongs to clade C which include ticks originating from Bangladesh, Malaysia and India. Along tick vectors, tick-borne pathogens such *Theileria* and *Anaplasma* were also characterize by using molecular methods. Out of five genotypes of *T. orientalis*, only *chitose* and *ikeda*, were identified on the basis of *MPSP* and *P23* gene while none of the other genotypes i.e, *buffeli*, type 4 & 5, were found. In case of anaplasmosis obtained molecular results suggested that the prevalence of *A. marginale* infection in ruminants were 27.7%. Further investigation on large scale using molecular approaches to draw phylogenetic relationship of these parasites should be encouraged to get detail information that will further help in designing better control measures to prevent tick-borne diseases.

Key Words: ticks, tick-borne pathogens Khyber Pakhtunkhwa, Pakistan.

Ultra-structural evaluation of novel synthetic drugs against zoonotic *Leishmania donovani*

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ABSTRACT

Leishmaniasis is ranked as second most important protozoan disease by WHO after malaria with over 2 million cases per year worldwide. Conventional treatment is long with high risk of drug toxicity and resistance. No vaccine against visceral leishmaniasis is available yet, hence novel therapeutic agents are highly demanded to lower the disease losses. We evaluated the in vitro activity against *Leishmania donovani* of four alkyl-galactofuranoside derivatives, i.e., octyl--D-galactofuranoside (Drug 1), 6-amino--D-galactofuranoside (Drug 2), 6-N-acetamido--D-galactofuranoside (Drug 3), and 6-azido--D-galactofuranoside (Drug 4). We performed electron paramagnetic resonance spectroscopy (EPR) and nuclear magnetic resonance (NMR) for mechanistic studies, and explored ultrastructural alterations by transmission electron microscopy (TEM). Flow cytometry (FCM) was used to determine the apoptosis and reactive oxygen species (ROS) production. We found very low toxicity of now drugs on human macrophages. Out of all four tested, drug 1 worked best in inhibiting promastigote growth at a 50% inhibitory concentration (IC50) of 8.96 2.5 μM and had a higher selectivity index than commercial drug miltefosine (159.7 versus 37.9). EPR of parasites treated with drug 1 showed significantly reduced membrane fluidity compared to control promastigotes. NMR showed a direct interaction of all drugs with the promastigote membrane at different levels. TEM based structural analysis of promastigotes treated with drug 1 showed profound morphological alterations in the parasite membrane and organelles. FCM analysis confirmed induction of apoptosis in >90% of drug 1 treated promastigotes.

The effect of drug 1 was also assessed on reduction in intramacrophagic amastigotes after drug 1 treatment was observed which was linked with a significant increase of ROS production.

Comparative acaricidal efficacy of Fluralaner *vs* oral Ivermectin against tick infestation in dogs.

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ABSTRACT

In Pakistan, dogs are commonly infested with ticks especially in summers, causing not only dermatological issues but also systemic problems. Persistence of tick infestation often leads to heavy losses. Different acaricides are locally available with variable efficacy, however, recurrence of infestation is commonly reported. The present study was thus designed to compare the efficacy of a novel drug Fluralaner and conventionally used Ivermectin against tick infestation. Dogs positive for tick infestation were randomly divided into 2 groups viz, Groups A and B having 8 dogs each. Ticks were enumerated manually from the whole body of dogs at day 0 before the administration of drugs Dogs in Group A were treated with Fluralaner at day 0 and dogs in Group B were treated with Ivermectin. Post-treatment, ticks were counted again at days 7, 14, 21, 28 and 35. At day 07 of the study, no tick was found on the dogs treated with Fluralaner while many ticks were present on the dogs treated with Ivermectin showing an efficacy up to 50%. On the consecutive follow-up evaluations similar results were found for Fluralaner while the efficacy of Ivermectin was further reduced to less than 50%. Furthermore, Fluralaner treated dogs had better RBC counts, PCV, Hgb concentration, LFTs, RFTs post-treatment than the dogs treated with Ivermectin. Statistically, oral Fluralaner proved a more effective drug ($P \leq 0.05$) than oral Ivermectin against tick infestation in dogs.

Acaricidal Efficacy of *Calotropis procera (Aiton) Dryand* and *Taraxacum officinale G.H. Weber ex Wiggers* against *Rhipicephalus microplus* from Mardan, Pakistan

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ABSTRACT

Medicinal plants are used extensively by traditional folk healers, modern physicians, and veterinarians as an alternative to conventional drugs to treat a wide range of diseases and disorders. Compounds from some of these plants have also proven effective as acaricides and arthropod repellents. The Asian blue tick, *Rhipicephalus microplus*, is one of the most destructive species in the world to the livestock industry. The development of herbal acaricides for efficient control of *R. microplus* infestations is critical in maintaining cattle herd productivity, reducing economic losses, and curtailing the overuse of chemical acaricides. *Calotropis procera*, the apple of Sodom, and *Taraxacum officinale*, the common dandelion, were evaluated for potential acaricidal activity against *R. microplus* larvae and adults *in vitro*. Both plant species tested are common indigenous species of Pakistan where *R. microplus* infestations are rampant on many different livestock species including cattle, sheep, and goats. Whole-plant extracts derived from *C. procera* and *T. officinale* significantly reduced the index of egg laying (0.24 ± 0.002 and 0.28 ± 0.001, respectively) and percent inhibition of oviposition (35.68% ± 0.565 and 33.40% ± 0.311, respectively) of adult female ticks at a concentration of 40 mg mL^{-1} when assessed by the adult immersion test (AIT). *C. procera* and *T. officinale* treatments at the same concentration also resulted in a percent larval mortality of 96.00% ± 0.570 and 96.66% ± 0.880, respectively, as measured using the larval packet test (LPT) method. An increasing range of extract concentrations was tested to determine LD_{50} and LD_{90} values for both plants (LD_{50}: 3.21 mg/mL (*C. procera*), 4.04 mg/mL (*T. officinale*); LD_{90}: 21.15 mg/mL (*C. procera*), 18.92 mg/mL (*T. officinale*). Further studies should be carried out to determine which phytochemicals from these whole-plant extracts exhibited the strongest acaricidal properties before *in vivo* testing can be conducted, but both plants show much promise as natural control methods.

Keywords: natural acaricide, *C. percora, T. officinale*, tick control, *Rhipicephalus microplus*, botanical, plant-derived, arthropod

Molecular characterization of ticks infesting livestock in Khyber Pakhtunkhwa Province, Pakistan

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ABSTRACT

In recent decades, climatic change has significantly affected animal association with parasites. Parasitism in livestock has risen especially in terms of ticks and tick-borne diseases (TTBDs). Such ectoparasite and associated diseases have a major problem for dairy based economy like Pakistan where livelihood of farmers is deeply associated with marketing of milk and milk products. A cross-sectional study was designed to investigate the distribution of ticks infesting household large ruminants (cows and buffaloes) from Khyber Pakhtunkhwa province (KPK), Pakistan. A total number of 649 ticks were collected from cattle (277) and buffaloes (372) from five districts of KPK during February-June 2018. Collected ticks were morphologically identified using standard keys followed by molecular confirmation targeting Cytochrome c oxidase (COX-1) gene. Regression model and Pearson Chi-square tests along-with descriptive analysis were used for risk factor analysis and prevalence of ticks. Phylogenetic tree was constructed for COX-I gene sequence of ticks collected from livestock in Khyber Pakhtunkhwa Province. Data generated found *Rhipicephalus* (97.22%) is the most prevalent tick genera infesting livestock in KPK followed by *Hyalomma* (2.77%) species. The study provides the data of most prevalent tick's species in the province that would be helpful to adopt the strategies for tick control taking into account the bionomics of the tick.

Keywords: ticks, *Rhipicephalus*, *Hyalomma*, Khyber Pakhtunkhwa

Defining the link between alpha-gal-containing antigens in North American ticks and red meat allergy

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ABSTRACT

Development of specific IgE antibodies to the oligosaccharide galactose-α-1, 3-galactose (α-gal) following tick bites has been shown to be the source of red meat allergy. In this study, we investigated the presence of α-gal in four tick species: the lone-star tick (*Amblyomma americanum*), the Gulf-Coast tick (*Amblyomma maculatum*), the American dog tick (*Dermacentor variabilis*), and the black-legged tick (*Ixodes scapularis*) by using a combination of immunoproteomic, carbohydrate analysis, and basophil activation approaches. Using anti-α-gal antibodies, α-gal was identified in the salivary glands of both *Am. americanum* and *Ix. scapularis*, while *Am. maculatum* and *De. variabilis* appeared to lack the sugar. PNGase F treatment confirmed the deglycosylation of N-linked α-gal-containing proteins in tick salivary glands. Immunolocalization of α-gal moieties to the salivary secretory vesicles of the salivary acini also confirmed the secretory nature of α-gal-containing antigens in ticks. *Am. americanum* ticks were fed on human blood (lacks α-gal) using a silicone membrane system to determine the source of the α-gal. N-linked glycan analysis revealed that *Am. americanum* and *Ix. scapularis* have α-gal in their saliva and salivary glands, but *Am. maculatum* contains no detectable quantity. Consistent with the glycan analysis, salivary samples from *Am. americanum* and *Ix. scapularis* stimulated activation of basophils primed with plasma from α-gal allergic subjects. Together, these data support the idea that bites from certain tick species may specifically create a risk for the development of α-gal-specific IgE and hypersensitivity reactions in humans. Alpha-Gal syndrome challenges the current food allergy paradigm and broadens opportunities for future research.

POSTER PRESENTATIONS

Prevalence of *Plasmodium falciparum* infection in relation to hematological changes

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ABSTRACT

Malaria is known in human history for its outbreak and damage caused in different era. Abnormalities of Red Blood Cells (RBCs), Platelets and White Blood Cells (WBCs) are reported in malarial patients. Changes of hematological parameters are crucial in pathogenesis process and immune response of the patients. The present study was conducted in hematology laboratory of Kahna Nau Hospital and Parasitology Laboratory of LCWU, Lahore. The data was collected and blood samples were collected from 60 subjects malarial and non-malarial patients in which 42 were positive for *falciparum* infection whereas 18 subjects had no malarial infection. The gender wise prevalence of *P. falciparum* in male was (64.3%) as compared to female (35.7%). The age wise prevalence revealed that *P. falciparum* infection was more in male (27%) as compared to females (15%). The hematological parameters were determined in blood through CBC analyzer. It was found that neutropenia (23.8%) and neutrophilia (2.4%) were present in malarial patients. Lymphopenia, lymphocytosis, Leukopenia and leukocytosis were also detected with 69.0% and 4.8% 19.0% and 4.8% prevalence rate respectively. Prevalence rate for microcytosis and normicrocytosis were also determined as 26.2% and 73.8% respectively. Whereas the percentages for severe, moderate and mild thrombocytopenia were found to be as 11.9%, 50.0% and 35.7% respectively.

Zoonosis and its importance in public health

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ABSTRACT

Zoonosis has a very important part in global health program of the World Health Organization. Human being can acquire more than 250 zoonotic diseases directly or indirectly from the animals. About four-fifth diseases in human are infectious zoonotic diseases that cause a huge loss to human health. Human population faces too much economic losses due to these type of diseases and they cause high morbidity and mortality all over the World. In primary health system, control and treatment of zoonotic diseases have major importance. Many emerging zoonosis pose a continuous threat to human being and become more dangerous day by day and effect the human population badly, like Babesiosis is a new infectious emerging zoonotic disease that cause considerable loses Worldwide. The reoccurrence of many zoonotic diseases like Plague in India and Bovine Tuberculosis in USA is alarming situation for today's scientists. Changes in environment become favorable in the spread of different zoonotic diseases. Full eradication of different zoonotic diseases now becomes a difficult task because of complex epidemiology. However, in time identification of disease and proper treatment can be helpful for decrease the loses. By taking personal hygiene, immunization, food hygiene, better environmental condition, health education, better animal husbandry and close contact between veterinary and medical departments can be helpful to prevent and eradicate the disease. That's the reason now World move towards ONE HEALTH CONCEPT. According to this concept scientists treat the animals, environment, and human beings together. Every aspect has the same impotence and are inter related, so in this way we can prevent and eradicate the zoonotic diseases.

Cytoplasmic incompatibility of *Wolbachia* strains to halt Dengue virus

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ABSTRACT

In 1789 Benjamin Rush confirmed first case of dengue fever and used the term 'break bone fever' due to its symptoms of arthralgia and myalgia. Since then millions of its laboratory confirmed cases and deaths, reported yearly all over the world. According to World Health Organization 3.9 billion people from 128 countries are at peril to get infected with dengue viruses. Similarly, until now no specific drug or vaccination is prepared to treat dengue fever, in this scenario genetic strategy proven to reduce or halt capability of mosquitoes to transmit vector borne diseases. *Wolbachia* is a Gram-negative, endosymbiotic bacterium which reduce or block the capability of mosquitoes to transmit dengue virus to human. Many *Wolbachia* strains proven to induce cytoplasmic incompatibility in mosquitos such as Wolbachia strain, wMelPop-CLA induce complete cytoplasmic incompatibility in *Aedes aegypti* and *Wolbachia pipientis* also known as *w*AIbA and *w*AIbB can introduce CI in *Aedes albopictus.* Transfection of *Wolbachia* in mosquitoes done by embryonic microinjection. Localization of *Wolbachia* in mosquitoes observed by Fluorescence in situ hybridization in different tissues of mosquito represent its presence in the anterior parts of the digestive system as in salivary glands, cardia , thoracic ganglion , fat tissues surrounding gut and ovaries, meanwhile induce suppression of dengue virus replication in midgut, thorax and head region. These *Wolbachia* strains induce abnormalities in the reproductive system of mosquitoes , when infected male mated with non-infected female results in early embryonic deaths, but when infected female mates with non-infected male or infected male in both situations they successfully mate and inherited this *Wolbachia* to next generations completely. In a nutshell, dengue virus inhibition, embryonic death when *Wolbachia* infected male mates with uninfected female and mechanisms of self- spreading ultimately attractive approach for the control of dengue virus.

Cause of food transmitted parasitic zoonosis and control

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ABSTRACT

Every parasitic disease that comes under the meaning of zoonosis, has five components. First is parasite itself, then reservoir host, intermediate host, potential host and environmental Zoonosis. Food-borne zoonosis are the most important component of parasitic zoonosis because it directly affects human by different ways. In general, Food-borne zoonosis are due to both helminths, protozoa and they are causing 'Helminthozoonosis and Protozoonosis'. Its fallacy in general that food-borne diseases are due to contamination of microbial organisms with food, but on the ground reality titanic health hazard and direct or indirect economic losses is due to food-borne parasitic disease. Food-borne parasitic diseases can transmit to humans by meat and fish-borne zoonosis, Vegetation-borne zoonosis, Snail and Crustacea-borne Zoonosis. These all types of zoonosis can halt by taking some precautions just like not to consume raw or under-cooked food, always use boiled water or treated water, Stop mixing of fecal material with the drinking water stream, river or pond, take care of personal hygiene and living conditions .Diagnosis of these food-borne parasitic diseases can easily done by conventional diagnostic techniques through the examination of feces, urine, sputum, nasal secretions , blood examination, lymph, X-ray, CT scans, various serological tests, Molecular Diagnostic techniques, sometime spinal fluid also examine for the diagnostic purpose and many more.

Strategic parasite control for Pakistan's dairy and meat farms

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ABSTRACT

In typical Pakistan's farming conditions dairy and meat animals frequently infected by the parasitic infections of various species of it just due to poor management, blind use of Dewormers, use of Dewormers in multiple combinations and under dosing results super worms which developed resistance against drugs. The only way to control at farm level is by best strategy which can be slightly change by country to country or farm to farm, but the basic concept will be the same. Grazing management by which you can minimize the exposure of parasites to animals. Selection of animals on genetic basis, which can resist parasitic growth internal parasites and can prevent osteoporosis. Biological control of parasites using various species of beetles, ants, mites, reptiles, birds, earthworms, various viruses, bacteria, protozoa, entomopathogenic and nematopathogenic fungus, pasture management to stop parasitic growth in them and exposure of infected animal pasture to other animals. Vaccination according to season, area and animals. Treatments with relation to seasonality of parasite which can be different in tropical and subtropical countries and quarantine period for newly import animals in relation to parasitic infection. By these some managemental changes farmers can easily control parasites at dairy and meat farm and can halt the development of multiple drug resistant parasites.

Epidemiological changes of malaria in Pakistan and new challenges for its elimination

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ABSTRACT

In Pakistan, like other parts of the world, malaria is a prime cause of morbidity and mortality. *Plasmodium falciparum* (36%) and *P. vivax (64%)* are more prevalent in Pakistan being transmitted by vectors *Anopheles culcifacies* and *Anopheles stephensi*. After the contributions of the Directorate of the Malaria Control Program, the burden of disease is slightly decreasing in many regions of Pakistan but it is still a leading problem. Its prevalence varies according to province and area. Among all provinces, KPK is highly endemic. Although *P*. vivax is more prevalent but in Baluchistan *P. falciparum has more cases. Mixed Plasmodium infection is endemic in Sindh and* Baluchistan Due to variability in the characterization of this species, new challenges for the malaria control program are being evolved. To lower its burden, continuous changes in strategies are required specifically targeting its transmission. A robust surveillance method is needed to find out more about the epidemiology of this problem and its control measures, instead of just estimation of the reported cases all around the country. We review this fascinating issue development, its causes, and proposed threats and make a case that strict surveillance measures should be taken to eliminate this problem by proper surveillance, literacy, and cooperation, which are crucial for Pakistan as she is struggling to eliminate malaria.

Molecular epidemiology and associated risk factors of *Anaplasma marginale* and *Theileria annulata* in cattle from North-western Pakistan

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ABSTRACT

Ticks and tick-borne diseases are one of the major threats to livestock production worldwide. The aim of this study is to specify the molecular epidemiology and its associated risk factors of two of well-distributed tick-borne pathogens (*Theileria annulata* and *Anaplasma marginale*) in cattle from North-western Pakistan. Cattle blood samples were heterogenous with 60 (32.6%) from local Pakistani breed, 101 (54.9%) from crossbreed, and 24 (13.0%) from exotic breed in total of 184 blood samples collected on 40 cattle farms from study area represent the sub-tropical dry mixed deciduous scrub forest and dry sub-tropical temperate semi-evergreen scrub forest. Species-specific PCR assays were performed to detect the presence of 18S rRNA genes of *T. annulata* and 16S rRNA genes of *A. marginale* to reveal an overall prevalence of 29.9% infection rate of *T. annulata* and 16.3% of *A. marginale* in total overall infection rate of 75(40.7%) of the tested samples. Dir Upper district had the highest infection rate with 56.1%, whereas the lowest observed in Chitral district by 30.7%. Univariable analysis approved the involvement of all independent variables, such as breed, age, gender, grazing practice, and acaricidal treatment as potential determinants ($P < 0.05$) for *T. annulata* infections, however, only breed and acaricidal treatments were the only determinants in case of *A. marginale* ($P < 0.05$). Multivariable analysis correlated the acaricidal treatments to be a significant determinant for the infection by *T. annulata* ($P < 0.05$), whereas both breed and acaricidal treatments were considered as risk factors in case of *A. marginale* ($P < 0.05$). Phylogenetically, sequences of five isolates of *T. annulata* 18S rRNA and four isolates of *A. marginale* 16S rRNA from NW Pakistan showed high homologies to isolates from other Asian countries. This is the first molecular study on the epidemiology and risk factors of *T. annulata* and *A. marginale* infections in cattle populations from all districts of North-west Pakistan to recommend the essentiality of taking the needful actions and strategies for at least decreasing these infections and control either of the pathogens or the ticks transmitting them to cattle to improve livestock production and profitability of cattle farming in the country.

Keywords: *Anaplasma marginale, Theileria annulat,* Cattle, Pakistan, Epidemiology

Limitations and scope of vaccine development in parasitic diseases

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ABSTRACT

Until now, chemotherapeutic drugs have shown predominance over vaccines for the prevention and control of parasitic diseases of livestock. Although, today's market has continuous flow of vaccines for infectious diseases but this trend is discouraging in anti-parasitic vaccines. It is a fact that chemotherapeutic drugs were being developed much earlier than vaccines, there are multiple factors that hinder the development of vaccines against parasitic diseases. Shelf life, storage and transportation, and production and development costs are some of the vital factors for commercial viability of vaccines. Current commercial drugs have 100% efficacies which might be the biggest hindrance to develop a vaccine. In this scenario, this will never be an easy job to convince a user that vaccine with less than 100% efficacy is beneficial as compared to other commercial drugs. By far, most of the economic losses by parasites are sub-clinical, while these anti-parasitic drugs are mostly used to treat the clinically sick animals and to maximize the profits. These practices are expected to be threatened in the coming future due to increased awareness about emergence of drug resistant parasites. Consequently, there is an increasing trend to reduce the extensive use of commercial drugs and to find some reasonable alternatives of disease prevention where vaccines can play a pivotal role. So it can be reasonably assumed that more parasitic vaccines will find their way to control the parasitic diseases in near future.

Keywords: Vaccines, Drugs, Parasites, Efficacy

Traditional *Materia medica* in the age of modern allopathic drugs

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ABSTRACT

Modern allopathic medicine has its roots in ancient medicine, and it is likely that many important new remedies will be discovered and commercialized in the future, as it has been till now, by following the leads provided by traditional knowledge and experiences. Traditional medicine often aims to restore balance by using chemically complex plants, or by mixing together several different plants in order to maximize a synergistic effect or to improve the likelihood of an interaction with a relevant molecular target. The vast majority of people on this planet still rely on their traditional *materia medica* (medicinal plants and other materials) for their everyday health care needs. It is also a fact that one quarter of all medical prescriptions are formulations based on substances derived from plants or plant-derived synthetic analogs, and according to the WHO, 80% of the world's population, primarily those of developing countries, rely on plant-derived medicines for their healthcare. The potential for finding more compounds is enormous as to date only about 1% of tropical species have been studied for their pharmaceutical potential. This proportion is even lower for species confined to the tropical rain forests. To date about 50 drugs have come from tropical plants. In the developing world, if a plant is readily available and has the potential to provide inexpensive therapy for the treatment of a disease, then a product may well be developed. Close collaboration is expected between clinical and scientists with a common endeavor- production of safe, quality and efficacious products.

Keywords: Allopathic medicine, Traditional medicine, Plants, Drugs

Onchocerciasis: A momentous parasitic disease of public health importance

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ABSTRACT

Onchocerciasis, fly-borne (*Simulium*) filariasis, is caused by nematode (*Onchocerca volvulus*) whose adults reside in subcutaneous tissues but their larvae (microfilariae) migrate to eyes and cause blindness in humans (commonly: river blindness). Different species of black flies (*Simulium damnosum* sensu lato, *S. ochraceum*s, *S. exiguum*s, *S. metallicum*s, and *S. guianense*s in Africa, Mexico, Guatemia, Colombia and Eucador respectively) are involved in transmission. Microfilari affect both skin and eyes but in eyes they lead to atrophy which ranges from anterior region to optic nerve. Involvement of eye chamber leads to stimulation of inflammatory cascade which further by filarial Filarial worms and their endosymbionts (*Wolbachia:* releasedfrom dying filarial worm) are involved in development of corneal opacity. *O. volvulusis*, endemic in Africa (in sub-Sharan regions; Yemen), infected more than 18 million people worldwide (99% from Africa; 37 million carry onchocercosis). Higher number of cases observed in male than female just because of their frequent exposure. Mainly in the community reside on the basin of fast-flowing river and pest control program absent or minimum. In Pakistan, overall about 1.14 million cases of blindness have been reported in 2003. In case of eye lesions normally there is no mortality except in severe cases along with involvement of other body parts. Because of onchocercosis about 0.5 million cases of dim-sightedness and more than 0.27million cases of blindness have been reported. For control of river blindness different strategies used *viz;* biannual community directed therapy with ivermectin, use of larvicidal drugs for vector control, control of endosymbiotic bacteria and involvement of drug regulation authorities (to minimize resistance) etc. For control adjunct therapy with ivermectin and moxidectin and development of vaccine need to be performed.

Key words: Onchocercosis, *Simulium* larvae, Blindness, Adjunct therapy

Crimean–Congo Hemorrhagic Fever: Current scenario and future perspectives in Pakistan

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ABSTRACT

Crimean–Congo hemorrhagic fever (CCHF) caused by CCHF virus, a member of the family *Bunyaviridae*, genus *Nairovirus*, is a tick-borne acute viral hemorrhagic fever with a high case–fatality rate. Pakistan is being hit by communicable and no communicable diseases over time. Among these tick-borne viral diseases, CCHF is one of the most fatal infections. Rapid climate change evoked occupational, industrial, and agricultural activities to support ever-growing human population has been considered the single most causative basis for emergence or re-emergence of CCHF in Pakistan. Many factors, including poor sanitation at farms, cities and villages, unhygienic transportation and slaughter of animals at numerous sites within a city, inefficient tick-control programs, post-slaughter piles of animal remain other than meat, nomadic lifestyle, and lack of trained animal and human healthcare staff, are contributing to the spread of CCHF. Pakistan has confirmed cases of CCHF in almost every province. The root cause behind the spread of CCHF in Pakistan seems to be the absence of an effective disease surveillance system in the human as well as the animal populations. There is a need to educate the general public, farmers, and healthcare workers about the causes, transmission, and dangers of CCHF. An immediate plan for the implementation of a surveillance system, standard preventive measures, early detection, proper treatment, and timely response is urgently needed. It is expected that effective therapeutics and preventive measures will be developed in the future.

Key Words: Crimean-Congo Hemorrhagic Fever, Tick, Surveillance, Therapeutic, Preventive

Successful behavior of *Rhipicephalus microplus* to develop acaricide resistance

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ABSTRACT

Rhipicephalus (*R.*) *microplus* is considered to be of great economic significance and has become resistant to many classes of acaricides available in the market. The impact and success of invasive behavior of *R. microplus* is attributed to various factors, and the most important is high adaptability because it has the ability to displace prevalent species. Resistance in *R. microplus* has been reported from many countries against arsenic, amidine, organochlorines, and organophosphate and other acaricides. Since then, the development of acaricide resistance has been increasingly problematic. *R. microplus* has the ability to gain resistance in the field within two years. This is because of higher reproductive potential of this species with a shorter life cycle in which it can produce four to six generation in a year along with the irrational use of acaricides. An ever increasing number of reports of development of acaricide resistance in *R. microplus* is a challenge to search for some alternate and effective methods. The severity of resistance in ticks has reached a stage where it is expected that ticks will be resistant to acaricides after 5-10 years of their introduction and *R. microplus* is the tick species with most studies regarding acaricide resistance. Due to undeniable significance of cattle tick, many reports about the development of acaricide resistance have been documented from South East Asia, Australia, the Caribbean and Central America. Acaricide resistance can be severe in communal farming systems which can be characterized by: no acaricide rotation policy, weak surveillance programs of resistance to acaricides, indiscriminate selling of acaricides without mentioning the active ingredients, and no training about the rationale use of acaricides. In this scenario, effective tick management relies on the ability to conduct surveillance programs and to periodically detect development of acaricide resistance.

Keywords: *Rhipicephalus microplus*, Resistance, Acaricide, Surveillance

Myiasis in humans; an update on its global distribution

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ABSTRACT

Myiasis is the parasitic infestation caused by maggots (fly larvae) which tend to feed on the live or necrotic host tissue of humans and warm-blooded animals, particularly, in tropical and subtropical areas of the world. It occurs in different forms like cutaneous, subcutaneous, urogenital, intestinal and nasopharyngeal based on the location of infestation. Besides natural orifices, uncovered or untreated wounds in necropsy and diabetes are other routes of transmission where flies can easily get access and lay eggs. Furthermore, their larvae are also capable of piercing the skin where they make a lump as they grow. Secondary infections are most common in case of myiasis. In between 1997-2017, a total of 464 cases have been reported in 79 different countries. Asia bears the maximum burden of this disease i.e. 32.2% with total cases of 150. If we focus on their causative agents, twelve myiasis causing fly families have been documented in which four fly families are of greater importance including bot flies; *Oestridae* (41.2%), blow flies; *Calliphoridae* (38.8%), flesh flies (10.3%) and house flies; *Musca domestica* (3%). The important predisposing factors documented so far are poor hygiene, poverty, rural background and homelessness. Now days, changing climate is also a major contributing factor in the occurrence of myiasis. This changing climate is directly influencing the population of flies due to increasing temperature, humidity and the migration of new fly species in the environment. Though sterile insect technique is the best method to overcome this situation, but it is very costly. So, a way forward to completely eradicate this disease, vaccine development is the need of hour which is being trialed in Malaysia.

Key Words: Myiasis; Maggots; Global Burden; Climate Change; Poverty

Biological control model of ticks and tick-borne diseases

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ABSTRACT

Livestock sector is considered to be a secure and economical way in helping poverty alleviation and uplifting nutritional status of masses. However, parasitic species have been found to be a continuous hazard towards animal productivity especially in the scenario of changing climate. Among these, ecto-parasites especially ticks (Acari: Ixodidae) are known to cause lowered productivity through direct and indirect losses. At direct interface of losses, ticks serve as vectors of many diseases including Babesiosis, Theileriosis, Anaplasmosis, Crimean Congo Haemorrhagic Fever, and Q fever that are transmitted during hematophagous feeding. Indirect losses include, biting stress leading to production and reproduction losses. Difficulties in development of vaccines against ever changing antigens of parasites, development of acaricidal resistance, and residual effects of these acaricides in milk and meat lead the basis to use alternate methods to control these deadly vectors. Biological control is an alternate or a component of integrated pest management (IPM) strategy for the control of resistant tick populations. The proposed study not only provide the data of diversity and abundance of tick species in the two representative districts but also the base line information on the development of acaricidal resistance in the prevalent tick population as well as comparative efficacy of the EPF and EPN for their suitability and mass application as an entity of IPM at enzootic or epizootic levels in their host populations. So far, the predesigned questionnaire-based surveillance has been initiated in the study districts (Layyah, Bhakkar and Faisalabad).

Key Words: Ticks, Entomopathogenic, Fungi, Nematodes

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GIS based spatial distribution and alternative control of ticks and tick-borne pathogens in the neglected districts of different agro-geo climatic zones of Punjab, Pakistan

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ABSTRACT

Ticks (Acari: Ixodidae) are notorious vectors for the transmission of several animal and human diseases. The public health significance of ticks in the global scenario signaled the need to devise appropriate control programs. In this regard, the use of alternative control methods (methods other than chemical acaricides and conventional control) like the use of molecular tools like RNAi and metallic stressors (elemental forms, nano-particles, nano-bioparticles) on tick physiology have been established. The geographical information system (GIS) based distribution of ticks across different agro-geoclimatic areas including Jhang, Sialkot, Bahawalpur, D.G. Khan would be recorded. Multi-stage cluster sampling approach will be adopted for sample collection. The proteins that are crucial for tick survival e.g. Cyclophilins, Syntaxins, Actin, Tropomyosin, Tubulin, etc. will be silenced using RNAi. The validation of results from RNAi will be done using qPCR and Western-blot analysis. The use of nano-particles for hampering tick physiology will also be checked. The copper, sulphur, silver and other plant-based nano-particles and nano-bioparticles will be tested for their *in vitro* efficacy against ticks. The taxonomy of ticks would be done using stereomicroscope and further validated using DNA barcoding. The parametric data will be analyzed for variation using Student Newman Keuls (SNK) test with 5% significance. The non-parametric data will be statistically analyzed by student's t-test with 5% significance. The lethal concentrations (LC) would be calculated as per Finney Table, probit method using SPSS statistical package. This study would pave the way for further research and application of alternative methodologies to control ticks and tick-borne diseases.

Key Words: Ticks, GIS, Nano-particles, Control

Mosquitoes and mosquito-borne diseases: Current and future scenario in Pakistan

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ABSTRACT

Since 1947 exceptional changes have been observed in most of cities of Pakistan regarding population demography. Very less effort have been taken to control vector-borne diseases in livestock and people that's why they are still very common in this region. Dengue Fever Virus is a result of immigration of livestock and people, as this migration results in evolution of hazardous pathogens. Among human and animal parasitic diseases mosquito borne diseases (MBD) have a great proportion due to which both human health and livestock productivity along with livestock health is on alarming side. On yearly basis there are 177 million cases of malaria in Pakistan out of which 3.5 million are presumed and confirmed cases. In 2011-14 from Lahore alone, we have 16,580 confirmed cases of malarial dengue fever that accounts for 257 deaths, while from the rest of country we have 5000 cases of malaria and 60 deaths. Dengue Fever is an important epidemic of Pakistan currently. West Nile Virus, human and animal filariasis are some other mosquito borne diseases of Pakistan. It is assumed that seasonal shifts in population of human and livestock in terms of density and diversity may be a cause of emergence and maintenance of deadly pathogens in the region that results in mixture of infected and susceptible individuals that in turn are major cause of transmission. Moreover, mosquito physiology can be interrupted by functional genomic tools like RNAi. The mosquitoes and MBD could be controlled through bilateral scientific corporation with the laboratories working worldwide that are specialized in vector genomics for pathogen detection in vector and finding genomic tools for controlling vector population. This will uplift scientific capacity of scientists from Pakistan and that of other countries by highly technical pathogen detection systems (qPCR). Further, it will help in promoting One Health concept by explaining the relation between health of people and of livestock and environment and devising control measures and policy making accordingly.

Keywords: Vector control, mosquitoes, dengue, malaria, genomics

Mosquito borne parasites: A grim menace to animal and human health

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ABSTRACT

Mosquitoes are arthropods of medical importance as they act as vectors for various agents affecting animals and millions of humans annually. Keeping in view the parasites, filarioid nematodes (Genus *Dirofilaria*) and *Plasmodium* (order *Haemospororida*; family *Plasmodiidae*) are transmitted by mosquitoes. The former parasite spreads through the following genera of the mosquito vector: *Aedes, Mansonia, Culex, Coquillettidia, Armigeres, Anopheles, Ochlerotatus* and *Stegomyia.* About 27 *Dirofilaria* species have been reported as valid (to date) prevailing among canines, felines and other mammals, globally and 15 species are still questionable. The *D. immitis* and *D. repens* are two important species which cause dirofilariosis in dogs and other carnivores. These two filarial nematodes have been found to be the cause of zoonotic human dirofilariosis with humans as dead-end hosts. The distribution of *D. immitis* is worldwide while Africa, Europe and Asia are the only regions where *D. repens* is prevalent currently. Prevalence of canine dirofilariosis in various eastern European countries has been reported as 02% to 2% (*D. immitis*) and 7% to 20% (*D. repens*). About 110, 277 and 25 human cases of *D. immitis* were reported during last few years in US, Japan and Europe, respectively. In Europe from 1977 to 2016, approximately 3500 human cases of *D. repens* have been reported. Data on prevalence of *Dirofilaria* spp. in Pakistan is lacking although its distribution in India goes beyond the Pakistani border in the west. This parasite escapes the host innate immunity due to harbored endosymbiont bacterium (*Wolbachia*) resulting in long-term survival. Another parasite transmitted by mosquitoes (*Anopheles* spp.) is *Plasmodium*, causative agent of malaria. Malaria is the disease in humans due to *Plasmodium* spp. and have higher mortality rate. It has been found that *P. malariae, P. knowlesi, P. falciparum* and *P. ovale* are among the *Plasmodium* sp. prevalent in sub-tropics and tropics of the globe. In Pakistan, 177 million people are at risk of malaria with 3.5 million presumed and confirmed malaria cases annually. Moreover, risk rate of world's population for malaria is not less than 40%. The knowledge update about parasite-vector-host relationship can help in better control and prevention of these diseases ultimately reducing the public health risk.

Keywords: Mosquitoes, *Dirofilaria*, *Plasmodium*, Zoonosis

Nano-vaccinology for prophylaxis of parasitic diseases

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ABSTRACT

Nanotechnology is the science of manipulating atoms and molecules having dimensions less than 100nm. Nanoparticles have been successfully applied in many fields of biomedical science including therapeutics (drug screening and targeted delivery), diagnostics, vaccine production, surgical intervention, gene delivery, theranostic, biomarker mapping, toxicity of pathogenic organisms, etc. The development of nano-particle based vaccines has shown large promise in the prophylaxis of various parasitic diseases including malaria, leishmaniasis, toxoplasmosis, East Coast fever, etc. The nano-carriers like liposomes, emulsions, synthetic polymeric nanoparticles, nano-beads, biological polymeric nano-particles and graphene oxide nano-sheets have been utilized in nano-vaccinology. The efficacy of nano-based vaccines may be attributed to the improved antigen stability, minimum immuno-toxicity, sustained release, enhanced immunogenicity and the flexibility of biophysical features (size, morphology, surface characteristics) of nano-particles. Based on these features, the nano-based vaccines have potential to evoke both cellular and humoral immune responses. Recently, epitope based nano-vaccine, using Self-Assembling Protein Nanoparticle approach (SAPN) has been successfully developed against toxoplasma sp. This approach is malleable, having the ability to present the antigen in a repetitive manner leading to stable immunogenic properties. The ease of surface modification and ability to effectively co-deliver the adjuvants makes nano-particles potential candidate for commercial vaccines. The challenge areas to nano-vaccines are use of high precision tools and the fate of nano-particles regarding bio-distribution which need to be addressed. However, the prevention of infectious and vector-borne parasitic diseases of humans, animals and the diseases shared at human-animal interface could be made possible using nano-vaccinology.

Key words: Nano-vaccine, Immunogenicity, Parasitic diseases.

Nanotechnology: An alternate control method for ticks and mosquitoes

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ABSTRACT

The size of the nanoparticle (NP) ranges from 1-100 nm which can be well imagined from the measurement that an inch consists of 25,400, 000 nanometers. There are various NPs which are being used and modified to achieve advanced effects, as preparation of oxides and hybrid nanomaterials (e.g. Zn oxide, silica oxide, titanium oxide, Mesoporous Silica Nanoparticles etc.). Magnetic iron oxide NPs are used as contrast agent in magnetic resonance imaging (MRI). Fe_3O_4 nanomaterials are also being used in target drug delivery systems. Moreover, there are some chitosan-based hybrid nanomaterials. Their modified applications (mesoporous silica nanomaterials) have potential in biotechnology, protein immobilization and catalysis. Silver ($AgNO_3$) NPs have aptitude for biomedical applications, commonly used as antibacterial, antiviral and antifungal. Ag NPs bind to the surface of the cell membrane of bacteria, penetrate into it and distress its function. They are also used in wound healing. Moreover, the NPs have been reported to be used against arthropods (ticks and mosquitoes) around the globe. AgNPs ($AgNO_3$) extracted from various flowers (e.g. *Tinospora cordifolia*, *Mimosa pudica*, *Nelumbo nucifera*) have larvicidal activity against mosquitoes (*Aedes Subpictus*, *Culex quinquefasciatus*) and ticks (*Boophilus microplus)* and had been used as promising control agent. Least attention has been given so far in Pakistan. The *in vitro* efficacy trials of different NPs (Silver, Copper, Sulphur etc.) are in the pipeline. The positive results may prove helpful in identification of suitable candidate for alternative control of arthropods.

Keywords: Magnetic resonance imaging (MRI), Hybrid nanomaterials, Nanotechnology, Mesoporous silica nanomaterials

Laboratory transmission of parasites from dissected stray dogs to humans

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ABSTRACT

The dog serves as a definitive host for several zoonotic parasites of public health importance. Stray dogs might be potential source causing serious health issues due to transmission of fatal diseases like Toxocariasis, Hydatidosis and to both animals and humans. In developing countries such as in Pakistan, scientific reports or surveys regarding spread of parasitic infection from preserved dog specimen to humans are still scarce. Veterinary anatomy professionals are at a high risk of laboratory transmission of such parasites. Keeping in view the above facts, current investigation was designed to figure out prevalence of parasitic infection in personnel related to dissection of major domestic animals specially dogs in veterinary anatomy laboratories of Pakistan. The current study is in its pilot project phase, the initial results confirmed slight parasitic infestation in veterinary anatomy laboratory staff. Nevertheless, the particular underlying mechanism needs further studies. Hence, the findings of the full-length study will offer clear picture of the precise risk factor associated with laboratory transmission of parasites from dissected stray dogs to humans.

Key Words: Stray dogs, parasitic infestation, laboratory transmission

Surface glycans: A therapeutic approach for Chagas disease

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ABSTRACT:

Chagas Disease is a vector borne disease, caused by intracellular parasite *Trypanosoma Cruzi*, spread by triatominae or kissing bug, having more prevalence in tropical areas. The disease causes fever, lymph node swelling, headache, swelling at the site of bite and may also lead to heart attack in chronic phase. Chagas disease is endemic in Latin America but its vector kissing bug has been found from Middle East and Southeast Asia and is a new challenge for There has been a lot of progress regarding control of Chagas disease during recent 15 years and surface glycan approach is one among these. Post-translational glycosylation of protein plays an important role in functioning and stability of parasite in the host. The purpose of surface glycoprotein is to protect the parasite from host immune system. The nature of parasite surface glycans is highly dynamic and changes during differentiation and in response to different stimuli through the action of glycosyltransferases and glycosidases. The establishment of infection is dependent on host receptor and parasite glycan interaction. The agents that can interfere with surface glycoprotein dynamics by binding with surface glycan is the best alternate to drug discovery. These carbohydrate-binding agents cause cell lysis which ultimately block the parasite invasion. In future there is also a need of multinational control initiatives.

Keywords: Intracellular, Surface glycan, Glycoprotein, Glycotransferases

Clinical Parasitology: Recent advances and future challenges

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ABSTRACT

Previously, microscopes were commonly used for the diagnosis of parasitic infections but this technique has certain limitations like expertise, poor sensitivity and specificity. To combat such challenges, require new advanced techniques. In few decades, use of nucleic acids amplifications tests were developed specially PCR which revolutionized the clinical aspects of infectious disease diagnosis. Other category of diagnostic tests called rapid diagnostic tests and have basic principle of immuno-chromatography. These tests are simple, rapid and cheap and are commonly used for field surveillance of various infectious diseases. In recent times, proteomics is a new technique emerged to identify the biomarkers which are specific in a disease condition due to host pathogens interactions. These biomarkers are very important in the early diagnosis and treatment of such infections. The addition of these recent techniques for clinical diagnosis in the field of parasitology is slower. Although, modern techniques are rapid and more accurate than traditional microscopy but these are expensive and require more care and proper applications. Climate change is an important factor that favors the occurrence of emerging and re-emerging of parasitic diseases at high speed that result in development of new anti-parasitic drugs which ultimately produce drug resistance. These challenges are threatening and can be handled through different means like more research work, development of advanced technologies, proper application of techniques, accurate use of drugs, biological control of pathogens, genomic alterations, sharing of scientific data and collaborations between higher authorities, governmental bodies, scientific institutes and researchers from different fields to provide comprehensive and detailed solutions for the control and prevention of these diseases.

Key words: Clinical, challenges, PCR, diagnosis, parasitic, techniques.

Apicomplexan parasites and genome editing for disease resistance

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ABSTRACT

There are two important factors like adverse climate changes and globalization that favor the prompt growth and expansion of already controlled parasitic diseases that mainly transmitted through different vectors like ticks and mosquitoes. These include Theileriosis, Babesiosis, malaria, cryptosporidiosis, toxoplasmosis and Eimeriosis which are mainly caused by *Theileria*, *Babesia*, Plasmodium, *Cryptosporidia*, *Toxoplasma* and *Eimeria*, respectively. These parasites are mainly called Apicomplexan parasites because intracellular obligate parasites due to apical complex structure. These parasites are mainly responsible for life threatening diseases in livestock including food and domestic animals. In last twenty years, Apicomplexan parasites are estimated to cost livestock up to 17 billion US dollars. These parasites have complex life cycles and can infect large number of hosts and cells that pose serious threats to control these pathogens. Due to recent developments in the field of biotechnology, researches are made to understand their complex life cycles, role of specific genes, involvement of molecular mechanisms and host cellular transmission. Recently, genome editing is an important tool that can be used to make desired changes in the genome to obtain desired characteristics in the target population and this technique can be used to make genetic manipulations for the control of these pathogens. CRISPR/Cas is an important and promising technique most commonly used for genome editing to identify and edit the virulence factors of these parasites which are responsible for disease induction. Other editing techniques include Zinc Finger Nucleases (ZFN) and Transcription Activator-Like Effector Nucleases (TALENs) etc. So, use of these recent genome editing techniques are helpful in the development of new advanced therapeutic methods for the control and prevention of such parasitic infections.

Key words: Genome, biotechnology, parasitic, virulence factors, control.

Molecular epidemiology and associated risk factors of *Anaplasma marginale* and *Theileria annulata* in cattle from North-western Pakistan

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ABSTRACT

Ticks and tick-borne diseases are one of the major threats to livestock production worldwide. The aim of this study is to specify the molecular epidemiology and its associated risk factors of two of well-distributed tick-borne pathogens (*Theileria annulata* and *Anaplasma marginale*) in cattle from North-western Pakistan. Cattle blood samples were heterogenous with 60 (32.6%) from local Pakistani breed, 101 (54.9%) from crossbreed, and 24 (13.0%) from exotic breed in total of 184 blood samples collected on 40 cattle farms from study area represent the sub-tropical dry mixed deciduous scrub forest and dry sub-tropical temperate semi-evergreen scrub forest. Species-specific PCR assays were performed to detect the presence of 18S rRNA genes of *T. annulata* and 16S rRNA genes of *A. marginale* to reveal an overall prevalence of 29.9% infection rate of *T. annulata* and 16.3% of *A. marginale* in total overall infection rate of 75(40.7%) of the tested samples. Dir Upper district had the highest infection rate with 56.1%, whereas the lowest observed in Chitral district by 30.7%. Univariable analysis approved the involvement of all independent variables, such as breed, age, gender, grazing practice, and acaricidal treatment as potential determinants ($P < 0.05$) for *T. annulata* infections, however, only breed and acaricidal treatments were the only determinants in case of *A. marginale* ($P < 0.05$). Multivariable analysis correlated the acaricidal treatments to be a significant determinant for the infection by *T. annulata* ($P < 0.05$), whereas both breed and acaricidal treatments were considered as risk factors in case of *A. marginale* ($P < 0.05$). Phylogenetically, sequences of five isolates of *T. annulata* 18S rRNA and four isolates of *A. marginale* 16S rRNA from NW Pakistan showed high homologies to isolates from other Asian countries. This is the first molecular study on the epidemiology and risk factors of *T. annulata* and *A. marginale* infections in cattle populations from all districts of North-west Pakistan to recommend the essentiality of taking the needful actions and strategies for at least decreasing these infections and control either of the pathogens or the ticks transmitting them to cattle to improve livestock production and profitability of cattle farming in the country.

Keywords: *Anaplasma marginale, Theileria annulata*, Cattle, Pakistan, Epidemiology

In-vivo efficacy of aqueous and alcoholic extracts of *Hedera helix* (IVY plant) against Fasciolosis in sheep

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ABSTRACT

Fasciolosis is a common disease of ruminants in many countries in the temperate climates and often causes severe economic losses. This study was carried out to evaluate the *in-vivo* efficacy of aqueous and methanolic extracts of *Hedera helix* against fasciolosis in sheep. For this purpose, 30 sheep positive suffering from fasciolosis were divided into 5 groups (A-E). Sheep in groups A and B were given single dose of aqueous extract of *H. helix* at concentrations of 1.13 gm/kg and 2.25 gm/kg body weight per oral, respectively. Animals in groups C and D were treated with methnolic extracts of *H. helix* at 1.13 gm/kg and 2.25 gm/kg body weight per oral, respectively. Sheep in E group were given Triclabendazole at 10mg/kg body weight per oral. Fecal samples from each animal ware collected at day 0 (pre-treatment) and then at days 4, 7 and 14 (post-treatment) for EPG count. During *in-vivo* experiment, all the treatments showed significant reduction in EPG. The reduction in EPG was 20% by aqueous extract when given at 1.13 gm/kg while it was 40.47 % at 2.25 gm/kg. EPG count was further decreased to 45.24 % at day 7. Reduction in EPG by methanolic extract at dose rate of 1.13 gm/kg at day 4 was 29.54 %. At day 7 post treatment, the reduction in EPG was 40.09 % and at day 14 the reduction was 43.18%. Reduction in EPG by methanolic extract at 2.25 gm/kg at day 4 was 56.09 %. At day 7 post treatment the reduction of EPG was 64.85 % and at day 14 post treatment the reduction was 68.29 %. The positive control group treated with Triclabendazole showed the maximum reduction of 97.5 % in EPG. It was concluded that extracts of *H. helix* have the anthelmintic efficacy against liver fluke.

Effective control of Coccidiosis using herbal products

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ABSTRACT:

Proteins are an essential part of human diet. It is the poultry industry which fulfills a major portion of their demand especially the chicken. Coccidiosis is major parasitic disease of chicken caused by *Eimeria*. It not only affects the growth but also causes high mortality in chicken. There are several drugs that are used against Coccidiosis. However, resistance is reported owing to the extensive use of these drugs. A drug residue is another major problem. So, there is need for alternative control of these parasites. There are different plants which are tested for their effect against coccidiosis like *Moringa stenopetala*, *Moringa oleifera*, *Artemisia annua*, *Sophora flavescens*, *Ulmus macrocarpa* and many others. These plants contain different antioxidants like Vitamin A and Vitamin C etc. These plants decrease the shedding of oocysts in the feces. Lower the number of oocysts in feces, the lesser is the damage to intestinal lining. They not only improve the lesions score but also increase the feed conversion ratio. There are some plants which not only kill the sporulated oocysts but also prevent the unsporulated oocysts from maturing. These plants can be added to chicken feed for prophylactic prevention. So, we can say that herbal products are not only safe to use but also economical and thus have a promising use in future.

Key Words: Coccidiosis, Oocyts, Herbal Products, Poultry

Most neglected & most pathogenic food born parasites

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ABSTRACT

Foodborne parasites (FBP) are a disregarded theme in sanitation, because of absence of consciousness of their significance for public health, their biological diversity and lack of standardized detection methods, which entangles identification of the infection vehicle. Although parasitic food-borne ailments are commonly under- perceived, however, they are more common. Contaminated water and meat of beef, fish, crabs, and molluscks can be infected with a variety of parasites, including protozoa (*Cryptosporidium, Giardia intestinals, Entamoeba histolytica, Cyclospora cayetanensis, Toxoplasma gondii*), nematodes (*Trichinella spp., Gnathostoma, spp., Dracunculus medinensis, Anisakine* parasites), trematodes (*Opisthorchis spp, Clonorchis sinensis* and minute intestinal flukes), cestodes (*Diphyllobothrium spp, Echinicoccosis spp, Taenia spp*), trematodes (*Schistosomiasis spp, Paragonimus spp*.) and *pentastomids* that can cause zoonotic infections in humans when consumed raw or undercooked flesh of infected animal. Traditionally, these parasitic zoonoses are most common in Asia because of the particular food practices and the importance of aquaculture. Notwithstanding, a portion of these parasites may come up in other continents through globalization of the food supply, aquaculture, increased international travel, increase of the population of highly susceptible persons, change in culinary habits, improved diagnostic tools and communication are some factors associated with the increased diagnosis of food-borne parasitic diseases worldwide. Because of inadequate systems for routine diagnosis and monitoring or reporting for many of the zoonotic parasites. The rate of human disease and parasite circumstance in food is underrated. The escalated ultimatum for animal proteins in developing countries will lead to an intensification of the production systems in which the risk of zoonotic infections needs to be assessed. It is concluded that food quality and safety are central issues in today's food economics, so there is a need for increased awareness of the impact of parasites on the food supply. Safe handling of food, good kitchen hygiene and thoroughly cooked food can prevent or disrate the risk posed by contaminated foodstuffs. Overall, there is an imperative need for better monitoring and control of food-born parasites by using new technologies.

Parasites: A potential threat in sewage based agriculture cultivation.

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ABSTRACT

The lack of wastewater treatment is an environmental and public health problem. Wastewater is being used in agriculture practice without treatment and lead to many waterborne diseases. Among the pathogenic agents that cause waterborne diseases, protozoa (*Giardia spp, Naegleria fowleri, Acanthamoeba spp., Entamoeba histolytica, Cryptosporidium parvum, Cyclospora cayetanesis, Isospora belli, and the microsporidia*) and helminthes (*Ascaris lumbricoides, Ancylostoma duodenale, Necator americanus and Trichuris trichiura*) the *Giardia (G.) duodenalis* is more prominent. *G. duodenalis* is the most isolated parasite in the human gastrointestinal system. Approximately, 20% of world population is parasitized by this protozoan. The amount of people parasitized by helminths is also high. It is estimated that 1.2 billion people worldwide are infected by *Ascaris lumbricoides*, 800 million by *Ancylostoma duodenale* and *Necator americanus*, and 700 million by *Trichuris trichiura*. A significantly higher morbidity and mortality are observed in developing countries, particularly among children, where many communities still lack access to improved sanitation facilities. Acquisition of parasites occurs through a faecal-oral route, foodborne or through contaminated water (drinking water or during recreational activities). Thus, proper treatment of wastewater is only solution for this problem. However, the public awareness level due to lack of knowledge and low financial resources is critical in the understanding of this issue. An economical method is dire need of time. A water treatment system is recently composed by anaerobic filters and intermittent sand filters. The anaerobic filter can remove about 99.7 % cysts in the sewage water. The sand filter removed 38 % of *Giardia* spp. cysts. The system can also remove 100% of helminth eggs. By adopting a method having anaerobic filter and sand filter the waste can be treated to reuse and the risk of parasite can be reduced.

Keywords: Parotozoa, Helminthes, Risk factor, Sewage water.

How to treat parasites in sushi food (Japanese Food) to make it safe food

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ABSTRACT

Sushi is Japanese sea-food made up of raw fish coated with fermented rice, cucumber, vinegar, some spices and toasted with nori sheet (seaweed). It is trending food now-a-days in all over the world including Pakistan. It is potentially human health threat due to use of raw fish that may harbor many parasites. For example, Tapeworms of genus Diphyllobothrium cause Diphyllobothriasis (human intestinal infection) which is characterized by diarrhea, fatigue, stomach pain, loss of appetite, unintended weight loss and weakness. The larvae grow in the intestines of human. Incubation period is 3 to 6 weeks. An adult tapeworm can grow up to 30 feet long. It is largest human parasite transmits by eating an infected fish in sushi. Also, raw vegetables like lattice and cucumber can possibly infected with Cryptosporidium and Giardia. It has considered as a problematic and un-safe food for human consumption according to FDA (Food and Drug Administration) USA. Therefore, it is need to make it more hygienic through different procedures. For this purpose, if the prepared sushi is steamed at 145ºF (63^{0}C) or freeze at -31ºF (-35^{0}C) then it can kill the eggs and larvae of the tapeworm and other parasite eggs and preserving its natural taste.

Key words: Sushi, Food-borne Parasites, Tapeworms, Humans, Awareness, Control

Babesiosis: A threat to human beings

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ABSTRACT

Babesiosis is caused by an intraerythrocytic Protozoa i.e. genus *Babesia*. The disease was first discovered in cattle in 1888. Babesia majorly cause febrile Hemoglobinuria and leads to anemia. Different species of Babesia are involved in causing Babesiosis with major *Babesia divergens* in Europe and *Babesia microti* in USA. It's a malaria like disease having effect on Red blood cells (RBCs). Babesiosis is a zoonotic disease transmitted by arthropods i.e. Ticks of various genus. It causes destruction of RBCs resulting in severe Anemia, this disease causes severe economic loses in all over the world including Asia, Africa, Australia and America and large no of animals approximately 900 million cattle are at the risk of that disease which is the major risk factor of its zoonosis from cattle to humans and gain attention as a new emerging zoonotic disease. The chances of the disease in human are more during the breeding season of cattle specially in France and Ireland and splenectomised patients are more prone to disease as compared to patients having spleen, with its peak during April, June and August to October.

Ticks which are the vector for that parasite can be transmitted from animal to human or infected individual to healthy individual or the parasite is transmitted by blood transfusion. *Babesial* parasite enter in the tick gut during sucking of blood from infected animal or individual and undergo some developmental stages (up to sporozoites) and transmitted to the some other individual during feeding, in the host cell parasite go to the blood circulation under go some developmental stages and then infects the RBCs or lymphocytes depending upon the specie and this carry on resulting in the destruction of RBCs. Disease in animals is more severe while in humans Disease may be symptomatic or Asymptomatic, in the start mild symptoms like fever, headache, profuse sweating diarrhea or abdominal pain but in severe cases hemoglobinuria due to destruction of RBCs, renal failure and pulmonary edema can also be seen.

Diagnosis can be based upon the history i.e. present of ticks on the body surface, high temperature and typical sign hemoglobinuria however laboratory diagnosis can also be performed like hematological examination i.e. by making the blood slides, ELISA and PCR can also be performed for diagnosis of disease.

Chemotherapy of human Babesiosis is also problematic and antimalarial drugs are not effective against it however clindamycin may be the drug of choice against it in humans. Massive blood transfusion of blood can also be the line of treatment in infected patients, but best is to prevent the disease.

Distribution of ticks and association of risk factors with the occurrence of ticks in horses of Punjab, Pakistan

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ABSTRACT

Tick infestation is the main burden on animal health that causes significant economic damage. To better understand the spatial and temporal distribution of tick species and risk factors associated with tick prevalence, a total of 500 horses in two districts (Sargodha and Lahore) of Punjab were screened for the presence of ticks. The identification of ticks was done to the species level under the stereo microscope. 95 ticks representing six species were collected from study area: *Hyalomma impeltatum* (*n*=52), *H. impressum* (*n*=25), *H. anatolicum excavatum* (*n*=9), *H. anatolicum anatolicum* (*n*=3), *H. detritum detritum* (*n*=3) and *H. dromedarii* (*n*=3). Sex ratio of the collected tick specimens showed 63 (66.32%) male and 32 (33.68%) female. *Hyalomma* (*H.*) *impeltatum* was the predominant specie in horses of both districts. All infested horses had more than one tick species. The overall proportion of tick infested horses was 7% (35/500). It was high in district Lahore (8.15%) than district Sargodha (5.99%). Summer, ≤ 3 body condition score, satisfactory status of nutrition, same breed rearing system, use for work, presence of dogs and absence of birds at the farm were important risk factors associated with high tick infestation in horses. This is the first report regarding the presence of *H. dromedarii* in the horses of Punjab. This study will be helpful to design control strategies against ticks and tick-borne diseases in horses of Pakistan.

Keywords: Ticks, Risk factors, Prevalence, Horses, Punjab, Pakistan

Tick-pathogen-host interaction and metabolism

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ABSTRACT

Ticks are obligate blood sucking parasites acting as biological vector of various pathogens. Under challenging environmental conditions, tick performance increases by different metabolism in tick pathogen infection. The proliferation and elimination of pathogen within the cell is promoted by metabolic adoption in mammalian cell-pathogen system. Physiological changes occur in both interacting members due to interactions between intracellular bacterial pathogens and the host cells that ultimately benefit both ticks and pathogens. Pathogens use tick metabolism to modulate tick physiology and tick cell processes to take over immunity and apoptosis. Ticks, hosts, and pathogens interaction involves many metabolic pathways including lipid, protein, carbohydrate, and redox pathways. However, the mechanisms of modifying the level of hundreds of tick proteins and thousands of tick genes by pathogen infection are not fully characterized. The application of omics technologies together with data integration algorithms for investigation of tick interactome, regulome, miRNAome, epigenome, and metabolome and their interactions to advance the metabolic perspective on tick–pathogen interactions are needed. Identification of the metabolic adaptations during tick-pathogen interactions that support pathogens survival in tick, infection and transmission could provide new therapeutic targets for the prevention and control of tick-borne diseases. Manipulation of this major metabolic pathway can also be detrimental for the host. Interactions between the pathogen-host lipid metabolism can help to identify potential targets for the development of vaccines against health threatening pathogens. A better understanding between ticks- pathogens interactions with host cell lipid metabolism could provide new therapeutic targets to control infections by tick-borne pathogens.

Keywords: Ticks, metabolism, host, pathogen.

Impact of ticks and tick-borne diseases on livestock enterprises

Muhammad Hunain Ahmed[1*], Muhammad Tariq Javed[1], Sami Ullah Khan Bahadur[1], Narmeen Tariq[2], Shaza Zarnab[1], Iram Hina[1], Aira Tariq[3], Muhammad Usman Naseer[4]

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ABSTRACT

Ticks are the obligate blood sucking parasites with greater economic significance. They do not only cause zoonotic diseases but are also a threat to livestock enterprises in terms of direct and indirect losses. There are number of tick-borne diseases identified and prioritized on the basis of prevalence, distribution, risk factor and mitigation. These include Theileriosis, Anaplasmosis, Babesiosis, Ehrlichiosis, Spirochetes, etc. These conditions are present in the areas of high tick infestation. The condemnation of infected/necrosed organs or tissue damage leads to high economic losses in terms of reduction in meat production, prevention and treatment cost. Tick bites are responsible for blood loss, damage to hides/skins and teats, abscesses, screw worm infestation and wounds. Tick burden is high in spring and summer season, when conditions are favorable for tick multiplication. The longer mouth parts of the *Hyalomma* and *Amblyomma* penetrate deeper into the tissues than short mouth parts genera like *Boophilus*. They tear the muscles that lead to tissue necrosis which then rupture to produce open wounds, and are predispose to secondary bacterial infection. The main tick control method is the use of commercially available acaricides. The effects of these acaricides are unpredictable and dependent on the prevalence of infection in ticks and cattle at the time of application. However, various other methods are also effective in controlling the ticks which include household disinfectants, engine oil, chickens, manual removal, pouricides and natural plants extracts. Thus, there is an urgent need to find the ways for proper mitigation of ticks and tick-borne disease to support the livestock industry and resource-poor farmers.

Keywords: Ticks, livestock, acaricides, tick-borne diseases

Meat allergy by tick bite and pest management

Muhammad Hunain Ahmed[1*], Muhammad Tariq Javed[1], Sami Ullah Khan Bahadur[1], Narmeen Tariq[2], Shaza Zarnab[1], Iram Hina[1], Aira Tariq[3], Ayesha Ahmed[4]

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ABSTRACT

Ticks induced allergy is composed of many local immunologic reactions. The most severe demonstration of tick induced allergy is anaphylaxis, which can lead to death. Tick anaphylaxis is an immediate IgE-mediated reaction present against a protein injected into the host by the tick during feeding. All types of allergic reactions rely on IgE but behave differently. Both meat allergy and tick anaphylaxis do not develop without having a tick bite. Meat allergy after tick bite is driven by genetic predisposition, environmental change and parasite-induced host immune changes. In response to allergy, histamine is released that triggers immediate and profound effects which leads to dilatation of blood vessels and activate mucus producing cells. It can cause severe allergic reactions, angioedema, gut symptoms and life-threatening anaphylaxis. Symptoms are stomach pain, itching, fainting, shortness of breath, constriction of the throat and tongue swelling. Increase in number of ticks causes anemia, reduction in live weight gain and affect the quality of hides. Diagnosis of meat allergens is based upon the history, presence of ticks, clinical signs and laboratory testing. The identification of tick proteins is useful in diagnosis and immunotherapy purpose against tick-induced allergens. At present, the management of tick anaphylaxis is relied on prevention and killing of ticks. The application of acaricides, DEET dipping and spraying with permethrin help in controlling the risk of infection from ticks. There is a need to control the ticks to avoid ticks-borne allergy.

Keywords: Ticks, IgE, meat, allergy, ticks

Emerging Zika virus infection in Pakistan: diagnosis and treatment

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ABSTRACT

Zika virus (ZIKV) is the emerging mosquito borne zoonotic disease caused by flavivirus, a positive sense single stranded RNA virus. The mosquito vector, *Aedes aegypti* is responsible for the transmission of this infection. More than 86 countries and territories have reported evidence for ZIKA viral infection. The largest province of Pakistan, Punjab is the home for carrying vector having virus. As disease is spread by trans-boundary pathogen from mosquito; analysis of climate change, travelling pattern, and life cycle of mosquito helps us to predict the next path of landing. People living in slums are more susceptible to get infection due to stagnant water and open sewage drains, are breeding places for *Aedes* mosquito. Virus replicates in the epithelial lining of salivary gland and mid gut. It affects epidermal keratinocytes, fibroblast and the langerhan cells. Monocytes have potential to infiltrate into immune sanctuary sites. People affected with ZIKV do not show pathognomonic clinical signs and symptoms. However, mild fever, rash, muscle pain, headache, conjunctivitis and neurological signs have been reported. The ZIKV infection can lead to miscarriage and microcephaly during pregnancy. Once the virus starts spreading, it is difficult to eradicate. There is lack of proper detection system for screening that's why there is no confirmed report of ZIKV in Pakistan. The gold standard diagnostic method of ZIKV infection is based on the detection of antigenic RNA from clinical specimens. Viral genome detection by RT-PCR is one of the best diagnostic methods. There is no specific medicine and vaccine but symptomatic treatment is used to recover ZIKV. Researchers are working on vaccine of ZIKV. Regular active surveillance of ZIKV is needed in Pakistan to determine the spectrum of disease.

Keywords: ZIKV, infection, vector, RNA, virus

Malaria: symptoms, diagnosis and control

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ABSTRACT

Malaria is a life-threatening disease caused by plasmodium parasite. This parasite is transmitted to people by the infected female *Anopheles*, *A. culicifacies* and *A. stephensi*. According to the World Malaria Report, there were 219 million cases of malaria globally in 2017. In Pakistan out of 180 million inhabitants, 177 million are at risk and 3.5 million confirmed malaria cases annually. The risk factor for malaria include low immune status, poor socio-economic condition, mass population movement across international borders, floods and heavy rain fall. Clinically malaria is characterized by fever, chills, headaches, diaphoresis, malaise, vomiting, diarrhea, and myalgia. The complication of severe malaria includes cerebral malaria, pulmonary edema, acute renal failure, and severe anemia. Thick and thin blood smear examination is the "Gold Standard" method for diagnosing malaria; however, other important advances have been made in diagnostic testing including rapid dipstick immunoassay, Fluorescent microscopy and PCR. Control measures depend upon early diagnosis and treatment. Adapt preventive measures like promotion of insecticides treated bed nets, targeted use of insecticides, vector management approaches, public education and developing viable public and private partnership in country to combat malaria. Quinine is a drug of choice for malaria.

Keywords: Malaria, symptoms, diagnosis, control

Genetic manipulation: A way to control arthropod-borne diseases

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ABSTRACT

Arthropod-borne diseases have a major impact on animal and human health. Different methods are applied to control the transmission of pathogen by arthropods. Now a day, use of synthetic chemical insecticides for vector control is decreasing due to their high cost, development of resistance in target population, harmful effects on beneficial organisms and risk to the environment and human health. Approximately 125 arthropods species are resistant to at least one, and often two or more insecticides. These important concerns, related to the use of insecticides, have led to use of alternative approaches for reducing disease transmission by arthropods. Among these, one approach is to produce transgenic arthropod. In this technique the gene is inserted in the germ line of insect derived from another organism. It may alter the vectorial capacity of insect to transmit disease. For example, it may produce strains which are resistant to pathogen or a strain of vector which have reduced vector competence or reproductive potential. Another genetic approach of reducing disease transmission by arthropods is to genetically modify symbiotic bacteria of arthropod vector to prevent the arthropods from transmitting pathogens. In this technique, the normal arthropod symbionts can be replaced with genetically modified symbionts, resulting in a vector that can no longer transmit the disease. This type of technology and molecular biology can be used as analytical tool to dissect the relationship between the insect vectors and disease-causing organism that they transmit. Eventually, also consider the biological consequences by the release of transgenic insects and balance the possible benefits against the potential hazards. So to overcome potential hazards, utilize caged population and control release of transgenic insects.

Keywords: Arthropod-borne diseases, Transgenic insects, Control

Inclusion of Biological Control for Integrated Vector Management

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ABSTRACT

The arthropod vectors (e.g. mosquitoes, ticks, lice, flies, fleas, bugs, mites) are known for their potential to spread animal, human and zoonotic diseases globally. Various conventional strategies like isolation, use of fire, birds, rotational grazing, chemical insecticides, botanicals etc. have been utilized to combat vector populations. The use of chemicals against vectors has led to the development of tolerance and resistance towards several drug classes. Additionally, the drug residues, environmental hazards, toxicities, severe drug reactions/ allergies indicate the need of a multi-pronged approach for vector control. The concept of integrated vector management highlights the need of using various economical, least toxigenic and practical measures. The use of living organisms for the control of vectors has gained considerable importance in the past few decades. Various plant (citrus, mangoes, neem, basil, turmeric etc.) extracts in crude form, essential oils and active ingredients have been tested successfully against mosquitoes, ticks, bugs, cockroaches and flies of public health significance. The uses of entomopathogenic fungi (*Beauveria* sp., *Metarhizium* sp.), entomopathogenic nematodes (*Steinernema* sp., *Heterorhabditis* sp.), entomopathogenic viruses, and entomopathogenic bacteria (*Pseudomonas* sp., *Chromobacterium* sp.) to control vectors have been trialed. It has been found that these biological control methods are non-pathogenic and non-virulent strains in the animals and humans have potential to colonize and disrupt arthropod vectors efficiently. The concept of generating nano-bioparticles using the botanical parts like leaves, stems, roots, fruits, fruit peels, bark etc. have also shown widely successful applications in vector control. The use of biological resources for combating vector populations is a potential area of research and its field applications can be of large promise. The efficacious control of vectors however, relies on the commercial availability and farmers' accessibility towards the products derived from biological origin.

Key Words: Biological control, Vectors, Integrated vector management

Clinico-therapeutical trials against endoparasites of Ostrich in Lahore

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ABSTRACT

This is the first study conducted in Pakistan to find the prevalence of endoparasites in ostriches and to evaluate the comparative efficiency of levamisole, piperazine and Methanolic extract of the Hedera helix against these parasites. Among eighty ostrich fecal samples collected, forty three fecal samples were found positive for egg per gram of *Cappilaria, Ascaridia* and *Eimeria* species. Among forty three birds, nineteen were positive for adult parasites of *Cappilaria, Ascaridia* and *Eimeria* specie with prevalence of 7.50%, 6.25% and 10.00% respectively. Chemotherapeutic trials on the birds positive for endoparasites were done. The maximum efficacy of methanolic extract of *Hedera helix* was 87.01% and 81.01% against *Cappilaria* and *Ascaridia* species respectively. Comparatively, levamisole was more effective (93%) against *Cappilaria* species and less effective (87%) against *Ascaridia* species while piperazine was more effective (97%) against *Ascaridia* species and less effective (84%) against *Cappilaria* species. Control group birds showed increased number of egg per gram. It is concluded that as the efficacy of methanolic extract of Hedera helix was very close to levamisole and piperazine, so the seeds of Hedera helix plant can be given to ostriches as a routine feed once or twice a month to avoid parasitism because it is very difficult to handle large birds for routine deworming.

Key words: Ostrich, endoparasites, Chemotherapeutical trials, Pakistan.

ORGANIZING COMMITTEE

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15	Dr. Haroon Akbar Associate Professor, Department of Parasitology	Member
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17	**Dr. Muhammad Oneeb** Assistant Professor, Department of Parasitology	**Organizing Secretary**

TORs: This committee will be responsible for planning, arrangement, management, and organization of one day International Conference PARACON'19

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3.	Dr. Nisar Ahmad	Member

	Associate Professor, Department of Parasitology	
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TORs: This committee will be responsible for generation of resources for conference, and advertisement of materials.
Members will contact industry to gather resources for conference.

3) INVITATION COMMITTEE

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4	Dr. Mian Abdul Hafeez Associate Professor, Department of Parasitology	Member
5	Dr. Haroon Akbar Associate Professor, Department of Parasitology	Member
6	Dr. Muhammad Oneeb Assistant Professor , Department of Parasitology	Member
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10	Mr. Shafqat Shabir Ph.D. Scholar (Department of Parasitology)	Member
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TORs:
Draft invitation letter for Chief Guests for inaugural, concluding and other sessions and proceed for confirmation
This committee will Draft invitation letter and communicate with all National and International Invited Speakers
Preparation of invitees, i.e., alumni members of syndicate, other statutory bodies, Members of Pakistan Society of Parasitology and Govt. officials in consultation with Organizing Secretary.
Provide list of special guests to hall management committees for the arrangement of seats
Provide list of guests to accommodation committee to make necessary arrangement for their accommodation

4) PROCTORIAL AND HOSPITALITY COMMITTEE

1	**Prof. Dr. Muhammad Imran Rashid** Department of Parasitology	**Convener**
2	Dr. Hafsa Zanib Chairperson, Department of Anatomy and Histology	Member
3	Dr. Ali Raza Awan Associate Professor, Institute of Biochemistry & Biotechnology	Member
4	Dr. Muhammad Lateef Associate Professor, Department of Parasitology	Member
5	Dr. Nisar Ahmad Associate Professor, Department of Parasitology	Member
6	Dr. Mian Abdul Hafeez Associate Professor, Department of Parasitology	Member
7	Dr. Haroon Akbar Associate Professor, Department of Parasitology	Member
8	Dr. Muhammad Oneeb Assistant Professor, Department of Parasitology	Member
9	Dr. Muhammad Faiz Rasool Assistant Director Research (ORIC)	Member
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16	Mr. Naeem Yar Khan M.Phil. Scholar (Department of Parasitology)	Member

17	**Ms. Rafia Kiran Zahid** Lecturer, Department of Social Sciences	**Secretary**

TORs:

Proctorial duties will be inside and outside conference hall and near registration desk
Proctors shall perform their duties in following categories:-
For participants
For delegates
Proctors will guide delegates and participants and will escort them to conference venue
Get the rosettes, tags and stickers etc. prepared

5) REGISTRATION COMMITTEE

1	**Dr. Nisar Ahmad** Associate Professor, Department of Parasitology	**Convener**
2	Prof. Dr. Muhammad Imran Rashid Department of Parasitology	Member
3	Dr. Muhammad Lateef Associate Professor, Department of Parasitology	Member
4	Dr. Mian Abdul Hafeez Associate Professor, Department of Parasitology	Member
5	Dr. Haroon Akbar Associate Professor , Department of Parasitology	Member
6	Dr. Saima Masood Associate Professor, Department of Anatomy and Histology	Member
7	Dr. Saima Ashraf Assistant Professor, Department of Anatomy and Histology	Member
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13	Ms. Maria Munir M.Phil. Scholar (Department of Parasitology)	Member
14	Muhammad Akif Rehman M.Phil. Scholar (Department of Parasitology)	Member
15	**Dr. Muhammad Oneeb** Assistant Professor, Department of Parasitology	**Secretary**

TORs:

This committee will keep record of registration
It will decide number of registrations

It will decide what type of written material to be distributed among summit participants
It will be responsible for timely distribution of registered entitlement to participants
It will prepare name tags for already registered members and on desk registration of members

6) SCIENTIFIC COMMITTEE

1	**Prof. Dr. Tahir Yaqoob** Department of Microbiology	**Convener**
2	Dr. Hafsa Zanib Chairperson, Department of Anatomy and Histology	Member
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7	Dr. Muhammad Lateef Associate Professor, Department of Parasitology	Member
8	Dr. Nisar Ahmad Associate Professor, Department of Parasitology	Member
9	Dr. Mian Abdul Hafeez Associate Professor, Department of Parasitology	Member
10	Dr. Haroon Akbar Associate Professor , Department of Parasitology	Member
11	Dr. Muhammad Oneeb Assistant Professor , Department of Parasitology	Member
12	Dr. Muhammad Faiz Rasool Assistant Director Research (ORIC)	Member
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27	Ms. Nosheen Tabassum M.Phil. Scholar (Department of Parasitology)	Member
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TORs:

This committee will call and manage submitted abstracts
It will be responsible for acceptance and rejection of abstracts
It will plan technical session
It will formulate conference technical schedule
It will decide conference Chair, Co-Chair and Moderator
Committee will have powers to change conference theme and mode of presentation
It will collect all scientific presentations and poster before conference

7) POSTER AND STALL EXHIBITION COMMITTEE

1	**Dr. Muhammad Lateef** Associate Professor, Department of Parasitology	**Convener**
2	Dr. Muhammad Ovais Omer Professor, Department of Pharmacology & Toxicology	Member
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8	Mr. Muhammad Shoaib Ph.D Scholar, Department of Parasitology	Member
9	Ms. Umber Rauf	Member

	Ph.D Scholar, Department of Parasitology	
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14	Mr. M. Salahudin M.Phil. Scholar (Department of Parasitology)	Member
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18	Mr. Ahmad Raza 3rd Semester DVM	Member
19	**Dr. Muhammad Oneeb** Assistant Professor, Department of Parasitology	**Secretary**

TORs:

This committee will be responsible for collection of posters from scientists
This committee will be responsible for selection of poster format and dimensions.
It will decide venue of poster display
It will have powers of rejection of any poster which will not be according to the format.
This committee will also upload Poster format on conference website
The Committee will be responsible for allotment of stall

8) ACCOMMODATION COMMITTEE

1	**Dr. Nisar Ahmad,** Associate Professor, Department of Parasitology Hall Warden, UVAS, Lahore	**Convener**
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	Assistant Director, University Advancement	
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13	Mr. Muhammad Abubakar M.Phil. Scholar (Department of Parasitology)	Member
14	Mr. Muhammad Shahzad Rafiq M.Phil. Scholar (Department of Parasitology)	Member
19	**Mr. Shahid Abbas** Assistant Professor, IBBT	**Secretary**

TORs:

This committee will make arrangements for stay of national and international speakers, students and other guests in university rest house, foreign faculty, and other hotels

This committee will communicate with speakers and transportation committee for receiving of guests at airport till their accommodation place

9) REFRESHMENT COMMITTEE

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2	Prof. Dr. Muhammad Imran Rashid Department of Parasitology	
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4	Dr. Muhammad Tayyab Assistant Professor, IBBT	
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8	Dr. Muhammad Awais Associate Professor, Department of CMS	Member
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15	Dr. Muhammad Lateef Associate Professor , Department of Parasitology	Secretary

TORs:

Proposal and approval of Venue and Menu

To estimate approximate number of guests who will attend meals in coordination with invitation and registration committees

Magnificent arrangements should be made and Caterers / Firms of outstanding performance should be indentured.

To ensure proper timings of meals (Tea, Lunch and Dinner)

To ensure mineral water bottles for guests

To prevent the entry of irrelevant persons in the venue

10) PRESS, MEDIA AND ADVERTISEMENT COMMITTEE

1	**Dr. Mian Abdul Hafeez** Associate Professor, Department of Parasitology	**Convener**
2	Dr. Hafsa Zaneb Chairperson, Department of Anatomy and Histology	Member
3	Dr. Adeel Sattar Assistant Professor, Department of Pharmacology & Toxicology	Member
4	Dr. Muhammad Awais Asif Assistant Director Career Services	Member
5	Dr. Muhammad Adnan Aslam Assistant Director University Advancement	Member
6	Mr. Muhammad Nouman Public Relation Officer, UVAS	Member
7	Mr. Bashrat Ali Khan Photographer	Member
8	**Dr. Muhammad Oneeb** Assistant Professor, Department of Parasitology	**Secretary**

TORs:

To communicate with press and media partners and ensure their availability at the time of conference

To provide them access to conference hall and expo

To communicate with press and provide them sufficient proper space

To provide them timely and adequate information regarding conference

To record video of all events of conference

11) TRANSPORT AND PARKING COMMITTEE

1	**Dr. Muhammad Ijaz** Associate Professor, Department of CMS	**Convener**
2	Dr. Nisar Ahmad Hall Warden, UVAS, Lahore	Member
3	Dr. Liaquat Ahmad P.O. Estate Management , UVAS	Member
4	Mr. Muhammad Zahid Pervaiz, Transport Officer R/C	Member
5	Mr. Muhammad Riaz, Transport Officer UVAS Lahore.	Member
6	Subedar, Muhammad Nawaz Security Officer UVAS Lahore.	Member
7	Col. (Retd.) Muhammad Ilyas Alam, Estate Management Officer, UVAS Lahore.	Member
8	Mr. Muhammad Sajid Ramzan Ph.D. Scholar (Department of Parasitology)	Member
9	Mr. Naimat Ullah Ph.D. Scholar (Department of Parasitology)	Member
10	Mr. Sarfraz-Ur-Rehamn Ph.D. Scholar (Department of Parasitology)	Member
11	Dr. Ghulam Yasein Ph.D. Scholar (Department of Parasitology)	Member
12	Hafiz Muhammad Naeem Ph.D. Scholar (Department of Parasitology)	Member
13	Mr. Waseem Khan Ph.D. Scholar (Department of Parasitology)	Member
14	**Dr. Muhammad Oneeb** Assistant Professor, Department of Parasitology	**Secretary**

TORs:

To make appropriate schedule of transportation.
To make appropriate arrangements for transport of special guests to and from hotel and summit venue.
To arrange and provide transport facilities to participants when requested.
To ensure transport facilities one prior and post event.
To care for parking facilities of participants.

12) IT MANAGEMENT COMMITTEE

1	**Mr. Muhammad Rizwan Saleem,** Director IT, UVAS, Lahore	**Convener**
2	Mr. Imran Younas Chohan Network Manager IT Center	Member
3	Mr. Yasir Ameen Network Manager IT Center	Member

4	Mr. Farhat Siddiqeu Hardware, IT Center	Member
5	Mr. Muhammad Atif IT Lab. Assistant	Member
6	Mr. Shahid Mughal IT Administrator	Member
7	Muhammad Rizwan Qamar Assistant, Department of Parasitology	Member
8	Mr. Asif Fiaz Ph.D. Scholar (Department of Parasitology)	Member
9	Mr. Zia Ur Rehman Ph.D. Scholar (Department of Parasitology)	Member
10	Mr. Nauman Rauf Ph.D. Scholar (Department of Parasitology)	Member
11	Mr. Muhammad Shoaib Ph.D. Scholar (Department of Parasitology)	Member
12	Mr. Matiullah Khan Ph.D. Scholar (Department of Parasitology)	Member
13	Mr. Muhammad Qasim Ph.D. Scholar (Department of Parasitology)	Member
14	Mr. Shafa Ul Haq Ph.D. Scholar (Department of Parasitology)	Member
15	**Dr. Muhammad Faiz Rasool** Assistant Director Research (ORIC)	**Secretary**

TORs:

To upload information regarding PARACON on University Website.
To manage ALL IT related issues (sound system/multimedia etc.) during conference.
To take presentations from Scientific Committee in time.
To ensure spreading information through social media etc.

13) SECURITY COMMITTEE

1	**Dr. Liaquat Ahmed** PO Estate Management	**Convener**
2	Dr. Muhammad Ovais Omar Professor, Department of Pharmacology and Toxicology	Member
3	Prof. Dr. Aqeel Javed Chairman, Department of Pharmacology and Toxicology	Member
4	Col. (Retd.) Muhammad Ilyas Alam, Estate Management Officer	Member
5	Subedar Muhammad Nawaz Security Officer, UVAS, Lahore	Member
6	**Dr. Muhammad Faiz Rasool** Assistant Director Research (ORIC)	**Secretary**

TORs:

To ensure security of all national and international delegates attending conference
To ensure all event safely and security clearance of foreign delegates

14) FINANCE MANAGEMENT COMMITTEE

1	**Dr. Nisar Ahmad** Associate Professor, Department of Parasitology	**Convener**
2	Dr. Mian Abdul Hafeez Associate Professor, Department of Parasitology	Member
3	Dr. Syed Anwar Hussain Rizvi	Member
4	Dr. Muhammad Faiz Rasool Assistant Director Research (ORIC)	Member
5	Muhammad Rizwan Qamar Assistant, Department of Parasitology	Member
6	**Dr. Muhammad Oneeb** Assistant Professor, Department of Parasitology	**Secretary**

TORs:
This committee will be responsible for all finance management
This committee will maintain record of all expenditures and fill the Performa of different funding agencies
This committee will meet different private companies and generate resources for conference
The committee will be solely responsible for release of funds to different committees

15) SOUVENIR COMMITTEE:-

1	**Dr. Mian Abdul Hafeez,** Associate Professor, Department of Parasitology	**Convener**
2	Dr. Haroon Akbar, Associate Professor, Department of Parasitology	Member
3	Dr. Raheela Akhtar, Associate Professor, Department of Pathology	Member
4	Dr. Muhammad Faiz Rasool Assistant Director Research (ORIC)	Member
5	**Dr. Muhammad Lateef,** Associate Professor, Department of Parasitology	**Secretary**

TORs:
Arrangement of Souvenirs/shields for all related events.
To arrange/design appropriate souvenirs for all conference participants
To ensure souvenirs/shields are ready at least one week before conference
To coordinate with registration and invitation committee to ensure number of participants, chief guest, other national and international delegates
To arrange display of awards at the events and assisting in award distribution.
To decide which award to be given in which session.