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on
"Advances in Tackling Antimicrobial Resistance and Ensuring Food Safety under One Health Perspective"
3-4 February, 2023
at College of Veterinary Science and Animal Husbandry, Kamdhenu University, Anand (Gujarat)

NEWS LETTER
ONE HEALTH

No. 3 03-04 February, 2023

What is One Health

WHO- 'One Health' is an integrated, unifying approach to balance and optimize the health of people, animals and the environment.

OIE- The "One Health" concept is founded on an awareness of major opportunities that exist to protect public health through policies aimed at preventing and controlling pathogens within animal population.

Tripartite and UNEP support OHHLEP's definition of "One Health"

The One Health definition developed by the OHHLEP states: One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.

The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.

"Asia One Health Fukuoka Declaration 2022"

One Health aims to achieve sustainable development of the planet and society by creating a society where animals and people can coexist in harmony, and preserving biodiversity and the environment.

Currently, major health issues in the world are outbreak of emerging and zoonotic diseases such as COVID-19, novel influenza and Severe Fever with Thrombocytopenia Syndrome (SFTS), as well as antimicrobial resistance (AMR).

In this situation, the FAVA member must coordinate and cooperate with each other to practice the idea of One Health.

Based on the outcomes of the 21st Federation of Asian Veterinary Associations (FAVA) Congress held in Fukuoka Prefecture, which is a leading area of One Health, we, the FAVA member veterinary associations and affiliated veterinarians, are determined to develop further the One Health approach based on the "FAVA Strategic Plan 2021-2025" and to disseminate its practical activities from the Asia-Oceania region to the world. We hereby declare the following:

1. We will work to prevent and control emerging and re-emerging zoonotic diseases by establishing a surveillance and research system for controlling the source of infection, transmission route and host, and share the information with others.
2. We will ensure the prudent and appropriate use of antimicrobial agents to tackle antimicrobial resistance (AMR), as antimicrobial-resistant bacteria have posed severe threats to medical and veterinary care.
3. We will actively promote the maintenance of biodiversity and the conservation of the global environment to create a society where animals and people can coexist in harmony.
4. We will foster new veterinary graduates with WOAH(OIE) Day One Competencies (knowledge, skills, and attitudes that veterinarians should possess) through further development of veterinary education and international collaboration in One Health approach.
5. We will promote multisectoral collaboration with medical/ governmental/ civil organizations, universities, and international organizations such as WVA, WOAH(OIE), WHO, FAO, UNEP, etc., to solve issues related to One Health and to accelerate One Health approach.
6. We will develop and strengthen the FAVA activities hub, to conduct research on One Health issues, and to promote One Health education for children, students, and citizens in Asia. November 13, 2022

Please visit: www.favamember.org

Editors

Dr. Rishendra Verma, BSc, BVSc&AH, MVSc, MSc (Immunol, UK), MVM (Biosecruity), New Zealand, PhD, Dip. Journalism (Mysore), FIAAVR, FISVIB, FIVPHS, FAVPHS, FNAVSc, FNAASc, FNASc, Former Joint Director, Centre for Animal Disease Research & Diagnosis, Indian Veterinary Research Institute, Izatnagar, Former Joint Director (Res.), National Dairy Research Institute, Karnal is an eminent veterinary microbiologists in the field of Mycobacteria and other infectious diseases.

Dr. Z.B. Dubal, MVSc, PhD, Principal Scientist, ICAR-Indian Veterinary Research Institute, Izatnagar. Dr Dubal is working on AMR (ESBL & carbapenamase producing E. coli & MRSA) pathogens and their virulence markers from foods of animal origin and its associated environment. Dr Dubal associated with many diagnostic procedure, research programs on AMR in the context of One health.

Dr Ravi Kant Agrawal, MVSc, PhD as Principal Scientist, ICAR-Indian Veterinary Research Institute, Izatnagar and looking after Food Microbiology Laboratory at Division of Livestock Products Technology and Bacterial Vaccine Testing Laboratory at Division of Biological Standardization. Also serving as Coordinator, NADCP-QC. Areas of research include: rapid detection methods for bacterial pathogens, food safety, antimicrobial resistance, alternative to antimicrobials.

Dr. Harshit Verma, MVSc, PhD, Senior Assistant Professor, Veterinary Microbiology, College of Veterinary & Animal Science, Meerut. Dr. Verma is engaged in research on AMR in *E.coli* from poultry and investigation of other animal infectious diseases.

HON'BLE PRIME MINISTER, GOVERNMENT OF INDIA LAID FOUNDATION STONE DOWN FOR NATIONAL INSTITUTE FOR ONE HEALTH

ICMR-National Institute for One Health, Nagpur

Foundation stone of ICMR-National Institute for One Health, Nagpur was laid by Hon'ble Prime Minister Shri Narendra ModiJi through virtual mode on 11th December 2022. The institute will be constructed in the area of 04 hectares provided by MAFSU, Nagpur. Bhumi-Pujan was also organized at the site of the institute in the presence of Dr. Rajiv Bahl, Secretary, Department of Health Research and Director General, ICMR, New Delhi; Dr. Ashish Paturkar, Hon'ble Vice-Chancellor, Maharashtra Animal and Fishery Sciences University (MAFSU), Nagpur, Dr. R. Lakshmi-Narayanan, Deputy Director General (Admin), Indian Council of Medical Research, New Delhi; Dr. Sheela Godbole, Director-in-charge, ICMR-National Institute of Virology, Pune; Shri. Jagjeevan R. Meena, Chief Engineer (Civil) Additional Charge, CPWD, Nagpur and Dr. Shirish V. Upadhye, Director of Instruction and Dean (Vet). Dr. N.V. Kurkure, Director of Research, MAFSU was also present on the occasion. The institute is mandated to diagnose and strengthen surveillance of various zoonotic diseases resulting due to human-animal interface. The institute will also focus on capacity building and human resource development for country wide research focusing zoonotic infections. [Courtesy: Dr. Nitin Kurkure, Dr Sandeep Chaudhary, MAFSU]

Journey towards National Institute of One Health in India

Source: Indian J. Med. Res. 2021, 153:316-322.

In animals, the seropositivities for listeriosis (7.66%) and brucellosis (11.69%) were recorded. The occurrence of tuberculosis (3.8%) and leptospirosis (6.33%) was detected by PCR. Through cross-sectional studies from suspected human population with associated risk factors for zoonotic diseases, the seropositivity of brucellosis (1.83-11%), listeriosis (1.01-10.18 %), leptospirosis (8.14-12.67%) and scrub typhus (1.78-20.34%) was recorded. The investigations on scrub typhus indicated bimodal pattern during the months of pre-monsoon and post-monsoon season with a peak in post-monsoon in human cases. *Ornithonyssus bacoti* mites were identified from the rodents as a vector harbouring *Orientia tsutsugamushi*. The bovine tuberculosis was detected in 1.43% human cases employing molecular assay. The data indicated the occurrence of important zoonotic diseases adversely affecting the livestock health and human wellbeing. The scientific collaboration between veterinary and medical faculties has set an example for effective implementation of One Health (OH) programme for the establishment of National Institute of OH.

What do experts says about One Health

Dr Bruce Kaplan
Retired Veterinarian and is managing editor of the One Health Initiative
www.onehealthinitiative.com

Dr. Kaplan currently devotes his time to promoting the national [U.S.] and international "One Health concept/approach" movement with his One Health Initiative Autonomous pro bono Team colleagues. Laura Kahn, Co-Founder of One Health Initiative interested in global sustainability, food safety and security, antimicrobial resistance, emerging diseases, vector-borne diseases, climate change, human, animal, and environmental health (i.e. One Health), and leadership during epidemics and other public health crises. One Health news, publications, events and postings related to animal, human and environmental health have been published in the website of one health to strengthen the world-wide circulation of One Health news. Currently, the website is estimated to be accessed each month by thousands of individual visitors from over 160 countries. Two pertinent examples include a recently posted article entitled "Antimicrobial resistance in The United States, The European Union, and Canada: A comparative analysis of policy approaches and promising solutions" on September 30th, 2021. In addition, a co-founder of the OHI, Dr. Laura H. Kahn has written the book, "One Health and the Politics of Antimicrobial Resistances" (2016).

Dr. Robin J. Paul
M.V.Sc. (VPH)
State Veterinary Dept., Kerala
Kerala's AMR action plan and initiatives to reduce antibiotic use in animals

Release of One Health AMR Action Plan (KARSAP) by Chief Minister of Kerala

In addressing issues such as AMR, it must recognized that the drivers for this complex issue lie across domains encompassing human health, animal health, environment, fisheries and water sanitation, hence can only be resolved through intersectoral Action Plans, which are cornerstone for action by the State. In India, only three states (viz. Kerala, MP and Delhi) have developed a Strategic Action Plan based on National Action Plan against this silent pandemic. Kerala was the first state in the country to have ramped up efforts to control AMR, and this plan was guided by WHO and was launched by the Chief Minister of Kerala in October 2018. The state plan is called Kerala AMR Strategic Action Plan (KARSAP) and has been operationalized through a One Health response which was formulated under the leadership of the Health Minister Ms K KShylaja.

The implementation of KARSAP the focussed Awareness and Understanding on AMR, regulations and surveillance systems. The Animal Husbandry Department, Livestock Management Training Centres (LMTCs) located across 14 districts of Kerala trained around 200 farmers every month. The Kerala State Veterinary Council conducts the Continuing Veterinary Education (CVE) program for Veterinarians on AMR. The Veterinary Univ. has included AMR in its curriculum with an aim to improve the understanding on AMR and promote prudent use of antibiotics and are conducting many AMR programs. The Veterinary Department trained their staff on WHO-NET, an Information System for Monitoring Antimicrobial Resistance. These labs are now doing AMR surveillance in Animals and Foods with an aim to develop baseline data on AMR in Kerala, based on this baseline information further AMR control strategies are to be developed.

FSSAI Bans Use of Antibiotic Colistin in Animal Feed

On 8 August 2019, The Food Safety and Standards Authority of India (FSSAI) issued a draft regulation to prevent the use of anti-biotic colistin in food, banned by the government of India in July.

Dr. G.K. Sivaraman
Principal Scientist,
ICAR-Central Institute of Fisheries Technology, Cochin

The Division of Microbiology, Fermentation and Biotechnology in ICAR-CIFT, Cochin, Kerala has two major Indo-UK projects on antimicrobial resistance with Dr. G.K. Sivaraman as the Principal Investigator. These projects are jointly funded by UK Research and Innovation / Economic Social Science Research Council, Newton Fund, and the Department of Biotechnology, Ministry of Science and Technology, Government of India. The project titled "Diagnostics for one health and user driven solutions for AMR" (DOSA)- was sanctioned on 3rd September, 2018 for duration of three years with an allocation of Rs. 98.304 lakhs to CIFT centre. The project is in collaboration with Indian partners from IIT-Delhi, ICAR-NDRI-Karnal, C-CAMP, Bengaluru, Assam University and Silchar Medical College, Silchar, Assam.

The project aims to determine the AMR drivers in diverse settings that includes, human, animals, aquaculture, food and environment of North Eastern Region specifically Guwahati by continuous surveillance for AMR pathogens. The major highlights of the project is to interpret the evolutionary and genetic lineage of these AMR pathogens and their transmission dynamics with the help of next generation sequencing.

Dr Ajit Singh Yadav*
Principal Scientist,
ICAR-Central Avian Research Institute, Izatnagar

*Director, NIAH, Bagpat

Antibiotics are not only used for disease treatment, but also as prophylactis. Surprisingly, antibiotics have also been also used as growth promoters in the livestock sector and this segment is much more considered resistance development point of view in bacterial population as antibiotics used for growth promotions are being used at low doses for longer time. Poultry sector is believed to use antibiotics for enhancing the growth rate of the birds which leads to antibiotic resistance amongst pathogens. Moreover, excess use of antibiotics may be another important segment of livestock sector especially used for growth promotion has led to the evolution of multiple Drug (antibiotic) resistance (MDR) phenomenon in food-borne pathogens. This needs to be addressed with use of effective alternatives to extant antibiotics.

Dr. Randhir Singh
Professor and Dr. Simran Thind, Associate Professor,
Centre for One Health, GADVASU, Ludhiana (Punjab)

They worked on a research proposal on antibiotic resistance funded by World Health Organization regional office for the South-East Asian Region (SEAR). They carried out the situation analysis of the antibiotic use in animal production and agriculture sector along with its impact on food safety and antimicrobial resistance (AMR) for SEAR countries which include countries like India, Bangladesh, Nepal, Sri Lanka, Thailand, Indonesia, Myanmar, Bhutan, Democratic People's Republic of Korea, Timor-Leste and Maldives. If the AMR problem is not tackled collectively, then we may be staring at somewhere around 10 million human deaths by 2050 and the impact would be more in low and middle-income countries. Therefore, it is important to continuously monitor this problem especially in the animal production and agricultural sector to work out ways and means to reduce the impact of AMR on human and animal health. The project report highlighted the need to upscale the existing surveillance network in the SEA region in the animal sector and bring them under one umbrella.

Dr. Purushottam Kaushik
Associate Professor, Dept. of Veterinary Public Health,
College of Veterinary Science, Patna (Bihar)

Initiated research in the area of antimicrobial resistance in reference to *Staphylococcus*, *E. coli*, *Aeromonas*, Salmonella and *Clostridium perfringens*. They are also working in the area of bacteriophage that can be used as an alternative to AMR. The department has isolated lytic phages for MRSA, *E. coli*, *Aeromonas* and characterized them. Recently the department has also been incorporated in the ICAR Network programme on Indian Network for Fisheries and Animal Antimicrobial Resistance to combat microbial resistance (INFAR).

INITITAIVES IN INDIA

Country's first 'One Health' consortium launched by D/o Biotechnology, Post COVID 19 [Posted on: 14 OCT 2021 9:19AM by PIB Delhi]

The Department of Biotechnology (DBT), Ministry of Science and Technology, GoI supported a mega consortium on 'One Health'.This programme envisages carrying out surveillance of important bacterial, viral and parasitic infections of zoonotic as well as transboundary pathogens in India, including the North-eastern part of the country. Use of existing diagnostic tests and the development of additional methodologies when required are mandated for the surveillance and for understanding the spread of emerging diseases. Dr. Renu Swarup during the launch of the programme remarked that this Consortium, consisting of 27 organisations led by DBT-National Institute of Animal Biotechnology, Hyderabad, is one of the biggest one health programs launched by Govt of India in post-COVID times. The One health consortium will consists of AIIMS, Delhi, AIIMS Jodhpur, IVRI, Bareily, GADVASU, Ludhiana, TANUVAS, Chennai, MAFSU, Nagpur, Assam agricultural and veterinary university and many more ICAR, ICMR centres and wild life agencies. International and national speakers shared their views on initiating and nurturing the concept of 'One Health' where man, animal, plants and environment are needed to be considered complimentary to each other for maintaining health of all.

FAO-ICAR Joint collaborative meeting for National Action Plan for Anti-microbial resistance (AMR)

The five basic objectives were discussed for one health approach.

- Awareness and understanding AMR.
- Strengthening knowledge for surveillance.
- Reduction in the incidence of infections.
- Optimize the use of antibiotics.
- Develop the economic use of antibiotics for sustainable investment.

Following suggestions were made by the experts and recommended by the Chairman:

- Mass awareness in all sectors.
- Strict monitoring for use of antimicrobials/ antibiotics.
- Regulatory mechanism at district and block level.
- Special marks on antibiotic packets.
- Long term studies in mission mode.
- Capacity building and national network programme.
- Development and implementation of common standard operating procedure (SOPs).
- Inter-sectoral co-ordination with identification of focal points.
- Database generation on production, distribution and usage of antimicrobials.
- Sharing of data from various sectors.

One Health: What it is & How it can be Implemented in India

Source: Down to Earth, By Debanjana Dey
https://www.downtoearth.org.in/blog/health/one-health-what-it-is-how-it-can-be-implemented-in-india-83673

The core of the One Health approach is rooted in acknowledging and understanding the interdependence of human and natural systems to obtain optimal health for people, animals and the environment. About 60% of the known infectious diseases in humans and 75% of all emerging infectious diseases are caused by pathogens that originate in animals, according to the Centers for Diseases Control and Prevention. One Health can have the following benefits:

- Reduce potential threats at the human-animal-environment interface to control diseases that spread between animals and humans
- Tackle anti-microbial resistance (AMR)
- Ensure food safety
- Prevent environment-related health threats to humans and animals
- Protect biodiversity

Time for One Health Committees

Source: Dasgupta, et al., Indian J. Med. Res. 153(3):p 281-286, March 2021

The authors have presented a review stated following the several episodes of zoonotic disease outbreaks and the more recent COVID-19 pandemic, the Indian policy initiatives are committed to institutionalize One Health (OH) approaches and promote intersectoral, transdisciplinary collaboration and cooperation. They opined that the logical operational step will be the constitution of One Health Committees (OHC) at the State and district levels. The recent pandemics among humans (COVID-19 caused by SARS-CoV-2) and animals (African Swine Fever) have demanded extraordinary outbreak responses and driven calls for a One Health (OH) approach. Three recent policy initiatives have marked the main-streaming of One Health in India: a National Expert Group on OH as a multi-sectoral transdisciplinary collaborative group, a National Institute of One Health at Nagpur, Maharashtra and Integrated Public Health Laboratories. In 2017, India prepared its National Action Plan on antimicrobial resistance taking a OH approach involving human, animal and environmental sectors.

Implementation and Launch of One Health Pilot in Karnataka

One Health Brochure and One Health Capacity Building Plan at Orientation & Launch of One Health Pilot in Karnataka on 28 June, 2022 at ICAR- National Institute of Animal Nutrition and Physiology, Bengaluru, Karnataka.

Animal Antibiotics and Antimicrobials Market -Global Forecast to 2026

The global animal antimicrobials and antibiotics market is projected to reach USD 5.6 billion by 2026 from USD 4.7 billion in 2021, at a CAGR of 3.6% from 2021 to 2026. Market growth can largely be attributed to the rising demand for animal-derived food products, increasing incidence of zoonotic diseases, and the implementation of regulations to prevent the spread of animal diseases. Rising animal healthcare spending and the growing demand for pet insurance are further expected to drive the growth of this market. The untapped emerging markets such as China, India, and Brazil and growth in the overall companion animal population are also expected to offer significant growth opportunities to market players in the coming years. In 2020, the food-producing animals segment accounted for the largest share of around 73.4%. The Asia Pacific region is projected to grow at the highest CAGR of 5.4% during the forecast period. Factors such as the rapidly increasing animal population and rising demand for animal-derived food products are driving the growth of this market in the APAC.

Key facts about the antimicrobial use in India

There is no data on the antimicrobial use and sale from pharmaceutical industry in India. However, the amount of raw material imported is notified and it was reduced to 11,230.50 metric tonne in 2019, as the government has undertaken various steps to promote the production in the country. As per the information received from the port offices of the Central Drug Standard Control Organisation (CDSCO), it stood at 12,006.11 metric tonne (MT) for 2018 and 5,591.44 MT in 2017, Minister of Chemicals & Fertilizers D V Sadananda Gowda said. "The policies formulated by Government from time to time are designed to minimize country's dependence on imports and to give fillip to indigenous manufacturing," he added (https://economictimes.indiatimes.com/industry/healthcare/biotech/ pharmaceuticals/govt-taking-steps-to-reduce-countrys-dependence-on-imports-of-antibiotic-raw materials/articleshow/74080196.cms? from = mdr). As per Ministry of Environment Forest and Climate Change, draft notification on emission and discharge standards for Bulk Drug and Formulation (Pharmaceutical) Industries was notified on 23.01.2020. According to the ministry, thirty five suggestions were received from the associations, NGOs, individual experts and industry. Stakeholders consultation were made. Necessary information and research is not available for prescribing the appropriate norms for limiting the concentration of antibiotics, monitoring and compliance verification and testing protocols for effluents discharged from pharma industry. On the recommendations of ICMR, DCGI has banned 40 fixed dose combinations (FDCs) which were found inappropriate. Further, ICMR worked in collaboration with Indian Council of Agriculture Research, Department of Animal Husbandry, Dairy and Fisheries and the DCGI to ban use of Colistin as growth promoter in animal feed in poultry.

Measures to combat AMR in India

India has previously instituted surveillance of the emergence of drug resistance in disease causing microbes in the context of vertical programmes, like the Revised National Tuberculosis Control Programme (RNTCP), the National Vector Borne Disease Control Programme (NVBDCP), and the National AIDS Control Programme (NACP), to name a few. However, a cross-cutting programme dealing with antimicrobial resistance across multiple microbes has been lacking. The Ministry of Health & Family Welfare (MoHFW) identified AMR as one of the top 10 priorities for the ministry's collaborative work with WHO. The National Health Policy 2017 identifies antimicrobial resistance as a problem and calls for effective action to address it. An international conference on AMR – "Combating Antimicrobial Resistance: A Public Health Challenge and Priority", was jointly organized by the Government of India and World Health Organization (WHO) in February 2016, which was attended by more than 350 participants. The Hon'ble Prime Minister, Shri Narendra Modi, and the Hon'ble Union Minister for Health, Shri J.P. Nadda have reiterated government's commitment to tackle AMR.

List of Approved Drugs for Veterinary in India

https://cdsco.gov.in/opencms/export/sites/CDSCO_WEB/Pdf-documents/listofveDrugs.pdf

NOTIFICATION LIST OF ESSENTIAL MEDICINES FOR ANIMAL USE in India

No.X.11035/385/2019-DRS Government of India Ministry of Health & Family Welfare (Drugs Regulation Section) NIrman Bhavan, New Delhi Dated the Nov., 2020

COVID-19 Epidemic Brings Black Fungus into the Limelight in India

Rishendra Verma

Emeritus Professor, ICAR-Indian Veterinary Research Institute, Izatnagar, India

Source: One Health Publications
KANSAS STATE UNIVERSITY (COLLEGE OF VETERINARY MEDICINE) ONE HEALTH NEWSLETTER
October 18, 2021–OHNL 2021 VOLUME 13, ISSUE 2

Introduction

Lurking in the background of the Indian COVID-19 epidemic, black fungus infections (mucormycosis, phycomycosis or zygomycosis) have been on an unexpected rise, leading the Government of India to use One Health joint efforts to address such a fungal scourge. Since 2019, at the inception of COVID-19 in India, more than 8,800 cases of black fungus have been reported in India. Five states of India, Tamil Nadu, Odisha, Gujarat, Rajasthan, and Telangana, have declared black fungus as a notifiable disease under the Epidemic Diseases Act, 1897.1 In addition, cases of black fungus have been reported in other Indian states, including Maharshtra (1,500), Gujarat (1,163), Madhya Pradesh (575), Haryana (268), Dehli (203), Uttar Prdeash (169), Bihar (103), Chattisgarh (101), and Karnataka (97) (Fig. 1)[2].

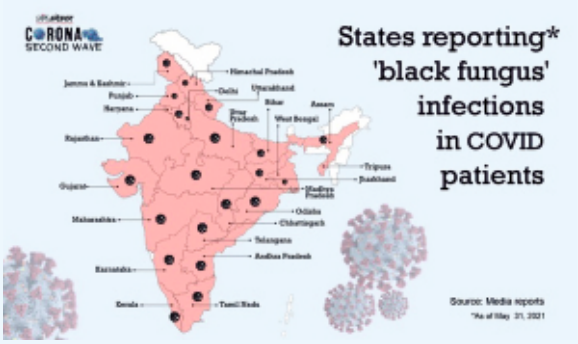

Fig. 1: The map shows cases of black fungus in various States of India; Source: Gaon Connection, 6 July 2021

According to the Indian Council of Medical Research (ICMR)[4], the following conditions in COVID-19 infected patients increases the risk of developing a mucormycosis infection: uncontrolled diabetes, weakened immune system (steroid use, organ transplant or cancer) prolonged intensive care unit or hospital stays, and voriconazole therapy (i.e., treatment of invasive fungal infection). These observations were disseminated after previous epidemiological reports of mucormycosis infection were documented, where 83 out of 100 COVID-19 positive cases suffered from diabetes, 45 out of 45 COVID-19 positive cases had diabetes, and two paediatric COVID-19 positive cases were diabetic, noting that diabetes weakens immunity and increases susceptibility of COVID-19 infection.5

In a recent study (2019-2020), the prevalence of mucromycosis was reported to be nearly 80 times higher in India than in developed countries.3 The article aimed to provide glance in light of the status of black fungus and its link with COVID-19 patients as well as the magnitude of problem in India. The efforts made by Indian veterinary and medical experts, doctors, and government are presented in this article.

Black Fungus Characteristics and Treatment

Black fungus infection or mucormycosis is an opportunistic fungal infection that interrupts the blood supply to normal tissue that becomes black due to necrosis, hence the name "black fungus". Mucormycosis occurs in humans as well in domestic and wild animals (cattle, sheep, cats, dogs, cows, horses, dolphin, bison, and seals). The types of opportunistic fungi that cause mucormycosis include several species that are found worldwide: Mucor irregularis, Rhizopus homothallicus, Syncephal astrum, Cunninghamella bertholletiae, Apophysomyces variabilis, and Litchthemia spp. (formerly called Absidia). Rhizopus oryzae, R. micosporous and Apophysomyces variabilis have been reported in India. R. oryzae (Fig. 2), the most common type of black fungus, is responsible for nearly 60% of mucormycosis cases in humans and accounts for 90% of the rhino-orbital-cerebral (ROCM) form in India.[6]

Fig. 2: Mucormycetes (Source: CDC, 2021: https://www.cdc.gov/fungal/diseases/mucormycosis/causes.html).

Mucormycosis may be gastrointestinal (swallowed fungal spores), cutaneous (when fungus enters through a break in skin), or disseminated in form (when the infection spreads through the bloodstream, affecting other organs in the body). This fungus can cause pain, redness around eyes and/or nose, fever, headache, shortness of breath, coughing, and vomiting blood. Lung or sinus infections sometime requires major surgery to remove the eye or part of diseased skull and jaw.

Black Fungus and COVID-19

The possibility of heavy contamination in medical oxygen cylinder pipes and hospital humidifiers cannot be ruled out during prolonged hospitalization of COVID-19 patients. Airborne fungal spores are the major source of

hospital indoor contamination, which increases the risk to COVID-19 patients acquiring an airborne nosocomial infection. Due to the shortage of beds, oxygen supply, and ventilators, COVID-19 patients can become frantic to seek hospitalization. In certain situations during the sudden demand of ventilators and medical oxygen supply, the air ways of ventilators may become exposed to humidity in the rush to aid patients, facilitating fungal infection. Monitoring of Indian hospitals for the presence of fungi is not generally undertaken; rather, the emphasis is on sanitization of the premises. This is a realistic concern, since a previous study revealed that airborne fungal monitoring of 160 samples collected from different wards and operating rooms in India yielded 7 genera of fungi.7

The ICMR4 has issued an advisory on the diagnosis and treatment of black fungus. Amphotericin B is considered the drug of choice for the treatment of black fungus. This drug selectively inhibits the synthesis of ergosterol, a sterol unique to fungal cell membranes, causing the formation of pores that cause rapid leakage of contents, followed by fungal cell death. The Indian government granted approval to produce more injections by more pharmaceutical firms to meet increased demand.

Moving Forward

Fig. 3: Model diagram showing how the Indian government is involved in bringing One Health aspects together to combat black fungus infections.

For the first time in India, veterinary research laboratories are actively working with medical doctors in collective response efforts, recognized as the most significant One Health activity in the country with the support of the government (Figure 3). They are jointly diagnosing COVID-19 by RT-PCR and promoting regular surveillance and stringent measures for disease control. These approaches include air disinfection systems, ventilation systems, the use of high-efficiency particulate air (HEPA) filters for high-risk wards, closing the windows, control of entry and exit doors, and the control or complete elimination of flowers brought into hospitals by patient visitors that are necessary to reduce fungal spores in the environment.8 Patients infected with COVID-19 and black fungus calls for joint efforts of veterinarians and medical experts under the umbrella of One Health for rendering prompt diagnosis, treatment, and prevention. The need of utilizing the skills of veterinarians arose due to their competence in the RT-PCR laboratory in the wake of the emergent situation needing prompt diagnosis of COVID-19 in human samples. In the interest of time, veterinarians and medical experts were required to share responsibilities and actions under the One Health umbrella in order to better manage the black fungus and COVID-19 outbreaks.

Hopefully, the lessons learned in this pandemic will prepare India to meet future health challenges, including collaborative support between veterinary and human medicine professionals. The policy makers and administrators responsible for decision making in government of India have realized that teamwork utilizing a One Health approach is one of the most valuable lessons learned from the COVID-19 pandemic.

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