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EDITORIAL

The 'One Health'imperative: Need of systemic approaches for implementation

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The modern global health landscape is defined by increasingly complex challenges arising from rapid environmental change, global connectivity, and exponential human population growth, demanding a fundamental paradigm shift toward integrated solutions. The concept of 'One Health' (OH) offers this necessary framework, serving as an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems, and recognizing their close interdependence [1].

While health, food, water, energy and environment are all wider topics with sector-specific concerns, the collaboration across sectors and disciplines contributes to protect health, address health challenges such as the emergence of infectious diseases, antimicrobial resistance, and food safety and promote the health and integrity of our ecosystems. By linking humans, animals and the environment, OH can help to address the full spectrum of disease control – from prevention to detection, preparedness, response and management – and contribute to global health security. However, successfully translating this philosophy which operates at community, national, regional, and global scales into concrete action remains a significant political, institutional, and economic challenge [2].

The urgent necessity for an integrated approach is clearly demonstrated by the origins of infectious diseases. The majority of novel, emergent zoonotic infectious diseases, or pathogens transmitted from animals to people, originate in wildlife or domestic animals. Indeed, 60% of emerging infectious diseases reported globally come from animals, and 75% of over 30 new human pathogens detected in recent decades have originated in animals. High-profile crises like Severe Acute Respiratory Syndrome and Highly Pathogenic Avian Influenza (H5N1) highlighted the vulnerability of societies and catalyzed the formal adoption of OH by international organizations, such as the World Health Organization, the Food and Agriculture Organization, and the World Organisation for Animal Health, now collaborating as the Quadripartite with the United Nations Environment Programme [1].

Furthermore, OH provides a critical framework for tackling Antimicrobial Resistance (AMR), a global health crisis where resistance can arise and spread reciprocally between humans, animals, and the environment. Addressing AMR requires a common policy framework bridging public health, agriculture, and farming sectors [3].

To realize its full potential, OH must evolve beyond a narrow focus on infectious diseases and adopt a truly systemic perspective. It must integrate environmental and ecological sciences, moving beyond viewing the environment simply as the scene of pathogen transmission. This systemic approach extends to Non-communicable Chronic Diseases– theleading cause of global human mortality which are influenced by urbanization, lifestyle changes, and exposure to chemical pollutants (ecotoxicology). The concept of **Health in Social-Ecological Systems** provides the theoretical apparatus to incorporate the complex, non-linear interactions among resources, governance, and users, making health outcomes

dependent on the sustainable management of environmental resources and social context[3].

Visible efforts to initiate multi-sectoral collaboration and cooperation leading to actual OH initiatives in India are less than a decade old. The Department of Biotechnology (DBT) organized an OH conference in 2019, drawing a roadmap to integrate knowledge and identify needs and opportunities in India, followed by a joint meeting with the Bill and Melinda Gates Foundation, recommending the initiation of the OH Platform to address livestock and human interdependencies.

In late 2019, the DBT constituted an expert group to identify priority areas relating to emerging or re-emerging infections, bio-safety and biosecurity challenges, and policies that require immediate or long-term interventions. The group recommended developing an OH framework through collaboration, cooperation, and human resource development. As a consequence, the DBT launched the country's first OH Consortium consisting of 27 centers (now 28) where veterinary, medical, and wildlife specialists were brought together on one platform to study the nationwide prevalence of 10 selected zoonotic diseases and five Transboundary Animal Diseases of importance to India. Simultaneous to the efforts of the DBT, the Indian Council of Medical Research and the Indian Council of Agricultural Research initiated discussions to establish the National Institute of OH in Nagpur in the State of Maharashtra to facilitate trans-disciplinary efforts [4]. The ambitious 2030 Agenda for Sustainable Development (SDGs) presents a unique political opportunity to embed this systemic thinking. Because the SDGs are integrated and indivisible, linking health (SDG 3) to issues such as climate change (SDG 13), poverty (SDG 1), and Sustainable Agriculture (SDG 2), they necessitate the kind of cross-sectoral collaboration championed by OH. Achieving the SDGs, while ignoring the linkages of health to ecosystem services and biodiversity, risks increasing antagonistic tensions and undermining overall progress [5].

Ultimately, the goal of OH demands a fundamental shift from sectoralized, reactive medicine to preventive actions across social, ecological, economic, and biological levels [5]. This necessitates cultivating political leadership, strengthening shared governance, fostering **transdisciplinarity**—integrating biological, social, and environmental knowledge, including traditional forms of knowledge [1]. It also requires integrating ecological and evolutionary science into training across medical, veterinary, and public health curricula [5]. With the projected annual benefit of the OH approach estimated at US$37 billion, the investment in building resilient, integrated health systems is not merely a scientific ideal, but an undeniable economic imperative for a healthier, more sustainable global society [2].

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