Occupational Health and Environment: Historical Review, Practical Considerations, and the Idea of "One Health"

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Abstract. The real-life situations and anti-epidemic actions of people in places, cities, and spaces highlight the importance of the idea of "One Health" and the environment for occupational health. This paper presents an interdisciplinary analysis of the public health history and practical considerations of occupational health and the environment from a global health perspective, with "One Health" as the core concept. The realistic considerations include global health inequalities, complex sites, and ecological environments, new discoveries and uncertainties of occupational health diseases, occupational health and infectious diseases, chronic diseases, etc. The new "Hippocratic thinking" of occupational health and the "one health" idea based on sustainable development is proposed. The idea of "One Health" and the idea of "Human Health Community" provide feasible paths for occupational health development in line with environmental justice and social justice, and "One Health" can be used as a way to realize the "Human Health Community". The idea of "One Health" can be used as a new strategy to achieve the "Human Health Community".

Keywords: Occupational Health, Environment, One Health

1 Introduction and Problem Formulation

In modern Europe, mercantilism, agrarianism, and industrialism have successively emerged. Along with industrial revolutions and the interplay between politics and economics, industrial society has continued to evolve, with health and welfare concerns of workers becoming increasingly significant throughout history. In the present day, the world remains in the era of industrial civilization, with rapid technological advances, and humanity faces a prolonged ecological predicament. Among the issues of environmental justice and social justice, occupational health issues are more prominent than ever, which have now become global issues transcending national boundaries. As a major economic and social development concern, occupational Safety and health have been included in the basic principles and rights framework of the International Labor Organization's (ILO) work at the International Labor Conference (ILC). However, how has the chronic ecological change affected occupational health? How has the COVID-

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19 pandemic changed work organization, environments, jobs, and skills, and how have changes in places, spaces, and work content impacted occupational health? Social science research on such issues remains insufficient, and this paper aims to provide a preliminary discussion of these topics through a review of occupational health history, practical considerations, development concepts, and response strategies.

2 A Review of Occupational Health History

2.1 Early Research on the Health of Occupational Groups

Modern occupational medicine began with Bernardino Ramazzini, an Italian medical scientist whose "Diseases of Workers ” was the first comprehensive treatise on occupational medicine. Ramazzini's work is considered a classic in the field and is as important as Vesalius' contribution to anatomy and Morgani's studies of pathology (Rosen, 1958).

One of the first medical historians to focus on occupational health was Henry Ernest Sigerist, who in the 1930s published " An Outline of the Development of the Hospital" [1] and "Historical Background of Industrial and Occupational Diseases"[2]. He published papers on public health institutions and occupational health in the 1930s. When Sigerist suggested that George Rosen write a history of miners' diseases, Rosen conducted a basic study of the history of occupational medicine. In his classic work, "A History of Public Health”, Rosen provided a comprehensive overview of Western public health, including workers' diseases, their health, and welfare. Another pioneer in occupational health history was Ludwig Teleky, whose "History of Factory and Mining Hygiene" (1948) provided insights into the history of workers' health.

2.2 The Influence of the "New Historiography" in the 1980s

In the 1980s, under the influence of the "new historiography," a new generation of public health historians, David Rosner and Gerald Markowitz, took a "social context" approach to occupational disease. The study of occupational health history was multiply integrated with the new social and political histories. David Rosner, former professor of public health and history at Columbia University, is the author of "Hives of Sickness: Public Health and Epidemics in New York City", among others, and co-author with Gerald Markowitz of "Dying for Work: Workers' Safety and Health in Twentieth-Century America" (1987), "Deadly Dust: Silicosis and the Politics of Occupational Disease in Twentieth-Century America" (1991), and "Deceit and Denial: The Deadly Politics of Industrial Pollution" (2002), etc. Studies of the health history of the topic of silicosis in the United States carry multiple meanings of the socio-cultural environment of its time, the industrial hygiene movement of the labor movement’s social reform, and the political, economic, and legal aspects. The history and society of the United States co-constructed silicosis, and in turn, silicosis influenced and shaped the history of the era in which it occurred.

2.3 Environmental Perspective: Exploring Occupational Health from an Environmental Standpoint

In the mid to late 20th century, environmental history gained prominence in European and American historiography, leading to the emergence of the study of occupational health from an environmental perspective. This new trend prompted the use of innovative methods to incorporate environmental and ecological dynamics into history from a fresh standpoint. Related works include "Factory as Environment: Industrial Hygiene, Professional Collaboration, and the Modern Science of Pollution" (Christopher Sellers, 1994), "Occupation and Disease: How Social Factors Affect the Conception of Work-Related Disorders" (Allende Derby, 1996), and "The Hazards of Work: From Industrial Disease to Environmental Health Science" (Sellers, 1997). Samuel P. Hays' "Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985", and James C. Whorton's "The Arsenic Century: How Victorian Britain was Poisoned at Home, Work, and Play", by leading contemporary American historians of new politics and environmental politics, also fall into this category.

Furthermore, research on occupational health in developing nations has revealed that significant occupational hazards arise not only from exposure to industrial pollutants such as dust, heavy metals, and toxic substances commonly observed in developed countries but also from infectious diseases. For instance, workers dispatched to sub-Saharan Africa, Southeast Asia, and Latin America face significant risks associated with malaria and neglected tropical diseases. As workers move across different physical sites, some scholars in labor history have underscored the importance of studying the worker's "body"[3].

Meanwhile, another approach known as historical ecology has been proposed to understand the workplace[4]. This approach focuses on studying human and environmental interactions over long periods of time, often centuries (CL Crumley,1987). Historical ecology aims to study and understand such interactions across time and space in order to fully understand their cumulative effects Through such interactions, humans adapt and shape their environment, continuously contributing to the transformation of the landscape. Historical ecologists recognize that humans have had impacts around the world that have affected the landscape in different ways, thereby increasing or decreasing species diversity and that a holistic view is essential to be able to understand the system (Balée, 1998).

Occupational health history has witnessed a broadening of research space, moving from traditional historiography to the influence of the "new historiography" and then to the "environmental history" turn, This expansion has opened up new avenues of inquiry, enabling exploration of new locations, themes, and methodologies. The convergence of social, cultural, geographic, ecological, and occupational health research has generated exciting opportunities for interdisciplinary development. Additionally, the correlations and interactions between global history, environmental history, disease history, and occupational health history are increasingly complex and fertile, stimulating creative breakthroughs.

3 Practical Considerations of Occupational health and the Environment

3.1 Persistent Global Health Disparities

Despite significant progress in occupational health, the issue remains significant and severe. World Health Organization (WHO) and International Labor Organization (ILO) jointly estimate that work-related illnesses and injuries caused 1.9 million deaths in 2016. Globally, the number of work-related deaths decreased by 14% between 2000 and 2016, possibly indicating improvements in workplace safety and hygiene. However, deaths resulting from heart disease and stroke associated with long working hours increased by 41% and 19%, respectively, revealing an emerging trend of psychosocial occupational risk factors. The topic of occupational safety and health highlights global health disparities that stem from social and economic inequalities. The social and cultural history of medicine and the ecological history of medicine has contributed to the understanding of global health disparities, and the evolving concept of "health" has profoundly influenced the change of medical models. In 1948, the World Health Organization defined "health" in its charter as "a state of physical, mental, and social well-being and not merely the absence of disease and infirmity."

Since the 1970s, the understanding of medicine has shifted from a "biological model" to a "Bio-Psycho-Social Model." "The Bio-Psycho-Social Model explores the dynamic, multidirectional interactions between biological phenomena, psychological factors, and social contexts, and can be a tool for gaining a deeper understanding of the social determinants of health and promoting health equity. A "physical-psychosocial" paradigm for approaching and developing occupational safety and health can help reduce health inequities[5]. According to WHO, many diseases and deaths can be prevented and the social inequalities that underlie inequalities in people's health can be changed, requiring a range of government policies and measures to improve environmental, political, economic, social, and cultural equity. Scholars such as Paul Farmer (2013) and Arthur Kleinman (2013) have used the perspective of " resocializing disciplines" (Combining anthropology, sociology, history, and political economy) to explore global public health and health issues in the context of epidemiology, demography, and clinical practice. Other scholars (Angus Deaton, 2013; Anne Case, 2020) [6] [7] have explored the issue of income inequality and health inequity in a deeper way by reflecting on the contemporary capitalist system.

3.2 Intricate Places and Ecological Environment

In recent times, there has been a great enrichment in public scientific knowledge regarding environmental factors such as chemicals and physical issues, as well as their impact on health, leading to an increased awareness about these concerns. Disease and ecology have a close link, and concerns for occupational health extend to various places such as workplaces, residences, and communities. Naturally occurring organisms, as well as air, water, and soil in urban and rural areas alike, are likely to harbor a wide

range of pathogens, parasites, and toxic substances. The idea that climate and environment have a direct effect on health has been around for centuries. Hippocrates, the "father of medicine," who lived thousands of years ago, believed that air, water, and place are vital determinants of human health and wellness. He attributed the causes of disease to three factors: innate characteristics (such as gender and age), lifestyle, place of residence, and climate, as well as various triggers associated with things like overeating and self-indulgence. The disease is not a static entity but rather a dynamic process that involves a natural interaction between the body and its surroundings. As we face a more intricate ecosystem and environment, occupational safety and health calls for a new way of thinking referred to as the "**Hippocratic turn**" by historians of environmental health[8].

3.3 New Findings and Uncertainties in Occupational Health Diseases

Changes in environment, place, and space brought about by economic development and industrial change. Over the decades, rapid industrial development, new materials, technologies, and processes have brought about "new" environmental exposures to pollutants and occupational diseases, such as pneumoconiosis from the dust of metals and their compounds (tin, iron, antimony, barium, and their compounds), indium poisoning, and chronic obstructive pulmonary disease (COPD) from irritating chemicals, leukoplakia, blast deafness, etc. Since the late 20th century, new interdisciplinary fields like environmental toxicology, food toxicology, pharmaceutical toxicology, industrial toxicology, and new materials toxicology have led to new discoveries and uncertainties about occupational health diseases. Recent toxicology research has focused on nanomaterials (NMs), persistent organic pollutants (POPs), endocrine disruptors (EDCs), and their effects on genetic and neurological functions. In the workplace, psychosocial factors can lead to occupational tension, mental and behavioral disorders, and musculoskeletal injuries like cervical spondylosis, frozen shoulder, low back pain, osteophytes, and sciatica. The use of modern technology can cause new work-related diseases like pear-shaped muscle syndrome, eye fatigue, and vision loss from prolonged computer use. These are all new occupational diseases that cannot be ignored but are contrary to physiology or psychosomatic medicine. Psychosomatic medicine studies the effects of social, psychological, and behavioral factors on the metabolism and quality of life of humans or animals. In the digital age, it is essential to consider the "illness-health" of the "digital laborer" subject's body and embodiment. It is important to note that young people are more vulnerable to occupational safety and health risks due to their physical and mental developmental stage, lack of work experience and training, limited work-related hazard awareness, and lack of bargaining power.

3.4 Occupational Health and Chronic Diseases

Chronic diseases were not a concern for public health experts and were not included in "modern Chinese healthcare" until the 1990s. However, with the rapid growth of industrialization, urbanization, population aging, and changes in economic, ecological, cul-

tural, and lifestyle factors, chronic non-communicable diseases have become a significant public health issue and burden in both urban and rural China. Chronic diseases in the workplace are closely linked to the "three highs" (hypertension, hyperlipidemia, and hyperglycemia) and the "three highs" (high stress, high social interaction, and high workload) in the workplace. In 2010, China officially launched a chronic disease prevention and control campaign, targeting four major chronic diseases: cardiovascular diseases, malignant tumors, chronic respiratory diseases, and diabetes, and integrating disease monitoring, prevention, and treatment into a comprehensive system. WHO's policy report "Preventing Chronic Disease: A Critical Investment" states that factors affecting the prevalence of chronic disease range from macro socioeconomic, cultural, political, and environmental factors to indirect and direct risk factors. William G. Rothstein's book " *Public Health and the Risk Factor: A History of an Uneven Medical Revolution* " examines the application of the concept of "risk factors" and healthy lifestyles to major chronic diseases in the 20th century, using coronary heart disease as a public health issue. He argues that the concept of "risk factors" and healthy lifestyles for disease prevention was the greatest revolution in public health and preventive medicine in the 20th century.

3.5 Occupational Health and Infectious Diseases

The COVID-19 pandemic that emerged in 2019 has posed new challenges to occupational health, highlighting the need for national standards regarding infectious diseases in the workplace. Such standards can help prevent microbial exposure and create a safe and healthy work environment that ensures the continuity of various industries. Several countries have taken rapid steps to recognize COVID-19 as an occupational disease.

The COVID-19 pandemic has hit labor markets hard around the world, causing rising unemployment, economic shutdowns, and a severe contraction in the world economy. For cities, the COVID-19 health crisis has expanded into a crisis involving urban access, urban equity, unemployment, and public services, with the most vulnerable groups in society suffering in varying degrees. Informal workers and those in low-wage jobs often face greater occupational safety and health hazards than formally employed workers and often lack job security, benefits, social protection, or the means to collectively bargain. Vulnerable workers, facing the catastrophic effects of economic disruption caused by COVID-19, may be impoverished by the pandemic in the face of reduced household income or consumption [9]. Related studies have shown a general decline in people's mental health during the epidemic, with women, immigrants, informal employment, and the younger workforce, in particular, more likely to be hard hit by the epidemic at both the employment and psychological levels. The workplace is critical to preventing and controlling outbreaks. Adequate safety and health measures at the workplace can play a key role in containing the spread of disease and protecting workers, and even society as a whole[10].

4 One Health: The New Idea of Occupational Health

COVID-19, along with previous outbreaks such as avian influenza, Ebola, and the current global monkeypox outbreak, are acute human health crises that stem from viruses that may have originated from animals. More than 75% of new infectious diseases in humans are of zoonotic origin, and the health of ecosystems is closely linked to the emergence of these diseases. Over two-thirds of zoonotic diseases are transmitted by wild animals. In 2012, the New York Times published an article titled "The Ecology of Disease," which advocated for “One Health”—a global initiative involving over 600 experts—stressing that human, animal, and environmental health are interconnected and must be studied and managed holistically. The COVID-19 pandemic underscores the significance of the One Health approach in addressing major global public health and human health issues.

The term "zoonosis" was first introduced by Rudolf L.K. Virchow (1821-1902), a German pathologist, who pointed out that there should be no clear boundary between human and animal medicine. Calvin W. Schwabe, known as the "father of veterinary epidemiology," proposed "One Medicine" to reflect the intertwined nature of epidemiology, animal diseases transmissible to humans, veterinary medicine, and human medicine. Zoonotic diseases have been increasingly common since the late 20th century. In 2004, the World Wildlife Conservation Society (WCS) recommended "One World One Health," emphasizing the vital link between human, domestic animal, and wildlife health, as well as the disastrous effects of disease on biodiversity and ecosystems. The WCS also suggested the Manhattan Principles as a means of preventing widespread outbreaks. Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (OIE), and the World Health Organization (WHO) have all embraced the "One World One Health" idea.

Human health, animal health, and environmental health are inherently interconnected, interdependent, and interactive. The UN High-Level Panel of Experts on "One Health" has defined "One Health" as an integrated and collaborative approach that seeks to achieve sustainable equilibrium and optimal health for people, animals, and ecosystems. This approach recognizes the interdependence and close linkage between the health of humans, domestic and wild animals, plants, and the broader environment, including ecosystems. It engages various sectors, disciplines, and communities across different levels of society to jointly promote well-being, address health and environmental threats, and satisfy shared needs such as clean water, energy, and air, safe and nutritious food, climate action, and sustainable development.

The "One Health" approach, which encompasses human health, animal health, and environmental health, involves animal ethics, ecological ethics, and environmental ethics. "One Health" is based on the eco-ethical principle of "sustainable development" and aims to promote this concept. Occupational Safety health is a crucial element in measuring "sustainable development." The Sustainable Development Goals (SDGs), which were adopted by all UN member states in 2015, strive to eradicate poverty, reduce inequality, and create a peaceful and prosperous society that prioritizes sustaina-

bility by 2030. 17 Sustainable Development Goals (SDGs) including poverty, inequality, climate change, environmental degradation, and peace and justice, are closely related to occupational health.

How can we promote environmental justice and social justice for occupational safety and health? In the words of UN Secretary-General António Guterres, in this highly globalized world, it is no longer possible for individual countries to solve problems individually; we need a global response. In the sense of human community, the idea of "human health and health community" provides a feasible path for sustainable development of global occupational health, and "one health" can be a new strategy to achieve human health and health community.

5 Conclusion

According to British sociologist Anthony Giddens, "Rather than entering a period of post-modernity, we are moving into one in which the consequences of modernity are becoming more radicalized and pervasive than ever before," and ecological, environmental and geographical issues have become closely bound up with occupational health issues. David Harvey in "Justice, Nature, and the Geography of Difference" notes that the immense concentrations of the population now occurring throughout the world create their own milieus in which distinctive and often new hazards can all too easily flourish. New diseases are emerging and old ones are returning (Levins, 1994)[11]. In the new epidemic, the real situation and actions of people in places, cities, and spaces make it easier to understand the same earth, the same world, and the same health, this is not an environmentalist "eco-utopia", but to face the "consequences of modernity", rethink the way of occupational survival, and think about the relationship between occupational health and the environment. Under the topic of occupational health, we will think more broadly about poverty, inequality, climate, environmental degradation, prosperity, and global challenges related to peace and justice.

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