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Educational Forum

Teaching reform and practice of medical parasitology under the perspective of "one health"

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ABSTRACT

The report of the 20th National Congress of the Communist Party of China underscored the significance of prioritizing people's health as a development strategy. Due to global warming, the rapid expansion of tourism, escalating population migration, and the excessive exploitation of natural resources, the frequency of zoonotic and foodborne parasitic diseases is increasing, posing a grave threat to the well-being of humans, animals, and the environment, which is collectively known as "One Health". Parasitology is an indispensable discipline in the domains of animal medicine, environmental health, and food safety, particularly in the context of the "One Health" initiative. By integrating the concept of "one health" into parasitism teaching practices, we aim to transform traditional teaching methods, refresh educational resources, and enhance the quality of education. This comprehensive approach is designed to emphasize the interconnectedness of medical parasitism with animal medicine, environmental conservation, and societal development. By doing so, we aim to meet the evolving needs of the new era and emerging medical sciences, fulfilling the aspirations of being a "trusted doctor of the people and the party". Ultimately, this approach will contribute to building a stronger and healthier human community, enhancing students' understanding, capabilities, and appreciation of the "One Health" paradigm.

Keywords: Health, Medical parasitology, Teaching reform, Mixed teaching

INTRODUCTION

In recent years, the prevalence of zoonoses has significantly increased globally, posing a grave threat to the health of humans, animals, and the environment, thus becoming a prevalent public health challenge worldwide. To achieve harmonious coexistence among humans, animals, and the environment, the notion of "one health" has gradually gained widespread acceptance and recognition among nations and academic institutions. For instance, to establish a thorough surveillance system for Campylobacteriosis, New Zealand implemented a risk management policy to effectively curb the spread of the disease.[1] In India, the All Health Council intervention was instrumental in significantly decreasing the mortality rate of human rabies.[2] In China, Li and other scholars have developed a novel, comprehensive monitoring and early warning system for infectious diseases, whereas Wang et al outlined prevention and control strategies and objectives for schistosomiasis in China from a holistic health perspective.[3,4] Concurrently, due to the escalation of international exchanges, changes in climate and environment, and alterations in lifestyle, the emergence and recurrence of parasitic diseases, imported parasitic diseases, and foodborne parasitic diseases are on the rise. In the outline of the "Healthy China 2030" plan, the CPC Central Committee and the State Council clearly noted that under the current national conditions, we should actively respond to the diversity of the disease spectrum, ecological environment and lifestyle to achieve the goal of healthy

China.[5] Subsequently, in July 2019, the "Healthy China Action" (2019-2030) report noted that current infectious diseases and endemic diseases pose serious health threats to the public, and the prevention and control of some parasitic diseases still face challenges.[6] To better implement the healthy Chinese strategy and protect people's health, we need to better understand the concept of total health and clarify the relationship between "total health" and parasitic diseases. Guided by this concept, academic cooperation should be strengthened to explore the correlations among parasitology, animal medicine, environmental protection and food safety. At the same time, we will constantly improve the relevant curriculum system of parasitology and actively explore interdisciplinary research to promote the development of this field to a greater extent.

AN OVERVIEW OF THE "ONE HEALTH" CONCEPT

One health strives to tackle global public health challenges by creating a comprehensive, integrated, effective, and collaborative solution that fosters the healthy growth of humans, animals, and the environment. As human and animal comorbidities continue to increase, medical organizations worldwide have embraced the "one health" paradigm to promptly detect and effectively treat these diseases. Several countries and regions, including China, have already embarked on implementing the "one health" approach to halt the spread of zoonosis. Nevertheless, uncertainties persist in the global management of zoonosis, and integrating the "one health" concept into China's "Healthy China Strategy" remains an urgent concern. It is imperative for us to seize this development opportunity and vigorously advance research on "one health".

"ONE HEALTH" AND PARASITOLOGY TEACHING

The concept of "One health" emerged from an extensive examination of the intricate relationship between human and animal diseases. This concept not only serves as a crucial reference for the prevention and management of such diseases but also inspires educational renovations in parasitology, fostering innovative ideas for the protection of both human and animal health. In July 2021, the Education Group belonging to the Medical Parasite Branch of the Chinese Preventive Medical Association convened a seminar in Chengde city, China. The objective was to deliberate on effective strategies for talent cultivation and adapting to evolving challenges under the aegis of the "One Health" paradigm. Subsequently, on July 16, 2022, at the 15th National Symposium on Human Parasitology Teaching Reform and Curriculum Construction, Xiaonong Zhou delved into the essence of "One health" and presented a fresh perspective on global tropical disease prevention and control. Professor Shen advocated for China to formulate a "One health" action plan that aligns with the "Big health" strategy, aiming for more streamlined health management. Professor Wang analyzed the status and challenges of parasitology, proposing a suite of reform measures. Notably, the "One Health" concept has significantly propelled the advancement of medical paramatology courses.[7,8] Li and his team attempted to integrate this concept into teaching practices.[9] Similarly, Liu and colleagues proposed embedding the "One Health" concept in the "new medical" talent training model, reshaping the parasitology curriculum system and teaching content accordingly.[10] Consequently, reforming medical parasitology and enhancing the quality of medical education are imperative.

Research on the curriculum innovation of parasitology guided by the concept of "one health"

Guided by the concept of "one health," we have undergone profound reforms in the teaching practice of medical parasitology. This concept underscores the intimate linkage between medical parasitology and animal medicine, environmental conservation, and social advancement, emphasizing the significance of its comprehensive, coordinated, and sustainable growth. Through meticulously crafted and innovative course content, we seamlessly integrated this philosophy into online teaching, offline teaching, experimental teaching, and other facets of educational delivery. Our objective is to nurture medical professionals who align with the demands of the holistic health concept, thus supporting the execution of the Healthy China Strategy.

CHANGE IN TEACHING PHILOSOPHY

In recent years, the development trend of parasitic diseases in China has changed significantly. The number of human-specific parasite-related diseases, such as traditional soil-derived nematode diseases, significantly decreased. However, zoonotic diseases and foodborne parasitic diseases, such as some intestinal parasitic diseases, have significantly increased. It is particularly noteworthy that with the advancement of urbanization, the high incidence of parasitic diseases in some rural or urban areas is spreading faster and faster in rural and urban areas, which makes the prevention and control of parasitic diseases more challenging. The traditional curriculum design of medical parasitology mainly focuses on traditional diagnostic and treatment methods, but it ignores how to more effectively prevent emerging parasitic diseases and sudden infectious diseases. To better cope with this situation, our teaching and research team decided to make a comprehensive reform of the curriculum. In the reform, we always adhere to the achievement-oriented approach, taking "student as the center, integration of modern information technology means, cultivate students' post competency" as the core idea of course construction. We introduce the concept of "all health" into the classroom teaching and practical teaching content of medical parasitology. In terms of the curriculum, we focus on the close integration of parasitology with animal medicine, environmental health and food safety, aiming to break through traditional disciplinary boundaries and promote

the interdisciplinary integration of multiple disciplines. For example, in the theory class, we added the topic of foodborne parasites and zoonotic parasites, emphasizing diseases and food health, water protection and animal waste management to promote environmental health. In the practical class, we added the detection of animal feces and intestinal parasites, the detection of metacercariae in fish and shrimp, and the detection of vector-related parasites so that students can better understand and master the relevant knowledge. Through this series of reform measures, we aim to cultivate students' ability to combine theory with practice, apply what they have learned, and have job competence so that they can better adapt to the needs of future medical health and public health.

UPDATE THE TEACHING MODEL

To cultivate students' precision medical literacy, basic education and the integration of accurate prediction, diagnosis, treatment and other technologies are needed. In the nontraditional teaching method, mixed online and offline teaching modes are adopted to provide students with comprehensive knowledge. Students can master the basic concept and the latest development trend of medical parasitology; train students to pay attention to practice, theory and practice; and cultivate students' innovative thinking, scientific research ability, teamwork ability, analysis and solution to clinical problems and the comprehensive quality of social development.

In online teaching, we introduce multiple interactive methods, such as posting and in-class tests, to stimulate students' interest in learning. At the same time, mobile learning enables us to push knowledge, cases and other content on MOOCs, SPOCs, WeChat groups and other platforms to further stimulate students' enthusiasm for independent learning. In 2020, our courses will be awarded national online courses. We make full use of high-level online courses and a national virtual simulation experiment platform. We are committed to transforming students from a passive acceptance learning mode to a self-led learning mode, stimulating their active thinking and innovation ability, and cultivating them to become lifelong learners. In our online content, to help students better understand the complex relationships between parasites and humans, animals, and the environment, we added three special sections: zoonotic parasites, foodborne parasites, and imported parasites. These sections will help students establish full health concepts and make them aware of the threat to human health from parasite transmission. Furthermore, we have focused specifically on the latest parasitic disease epidemic trends and case reports. By introducing relevant news reports at home and abroad, we constructed a rich and colorful extracurricular learning resource database for students. These reports can not only help students understand the current situation of parasitic diseases but also stimulate their interest and curiosity in the field of parasitology. Through these improvements, we hope to help students better understand the route of transmission and preventive measures for parasitic diseases while improving their health awareness and self-protection ability.

Offline teaching emphasizes answering students' doubts and effectively improving students' thinking ability and problem-solving ability by guiding in-depth analysis and discussion. In the discussion class, we used a clinical case-oriented teaching approach, aiming to guide students to think deeply about the symptoms, mechanisms and therapeutic targets associated with parasitic diseases. In addition, we have introduced resources such as exploratory cases and expert teaching to provide students with more comprehensive cutting-edge knowledge and technology. At present, we have built a rich offline resource base. According to the different professional needs, we carefully selected the corresponding cases for teaching. These cases cover a variety of key parasites, including emerging parasites, emerging parasites, foodborne parasites, and zoonotic parasites. The case focuses on the infection, diagnosis and prevention and control of parasites. In some specific cases, one African engineer was suffering from malaria, another patient contracted cysticercosis after eating spicy hot pots, another patient developed pneumoncinosis after tasting drunk crab, and some even developed filariasis after fishing by the river. These vivid cases allow students to understand the infection and transmission mode of various parasites, as well as subsequent clinical treatment and preventive measures in daily life. In addition, we have added an exploratory case discussion session to follow international frontiers, such as the biological control method of "making mosquito with mosquitoes", unique strategies for Plasmodium to treat cancer, and human experiments for the development of schistosomiasis vaccines. These cases enable students to gain insight into the latest developments in the parasite field and stimulate their innovative thinking and curiosity.

In the experimental course, we used a task-driven teaching method by combining teachers' explanations and clinical case analysis and flexibly used the lecture teaching method and the case teaching method to enhance the interaction between teachers and students. Such a teaching method helps to create an environment conducive to learning. In addition, to cultivate students' ability to find, analyze and solve problems, we added virtual simulation teaching content. Taking medical flukes as an example, the course design covers the field teaching of egg identification, including observation under a microscope for the construction of an experimental animal infection model. Finally, we will provide some interactive discussion content, such as in which parts of our country may flood disasters cause schistosomiasis epidemics? How can it be prevented and cured? With such a discussion, students can gain a deeper understanding of the epidemiology and control strategies of schistosomiasis.

ENRICHING TEACHING RESOURCES

With the proposal of the concept of "new medical science", the teaching reform trend of medical parasitology must

adapt to the development of science and technology and information technology, and cutting-edge technologies such as virtual simulation, artificial intelligence and big data should be actively used. To meet the learning needs of students, the teaching and research team has taken the following measures not to enrich the teaching resources: (i) To build a multimedia teaching resource library. The repository integrates multidisciplinary teaching resources of human parasitology, animal parasitology, clinical parasitology and medical laboratory science. Using advanced microscopy techniques, we captured multiple morphologies of parasite bodies, from various microscopes to Flash animations of experimental videos and simulation experiments, which provided strong support for clinical examination; (ii) Enrich the online teaching platform of human parasitology. With the help of national high-quality online learning resources, we provide various forms of learning materials, including PPTs, teaching plans, speeches, teaching videos, PBL learning videos, microlessons and MOOCs. Students can access these materials at any time through the internet platform to gain better knowledge of parasitology. In addition, we established a WeChat group to interact with students by releasing classic cases, insect egg drawing videos, excellent film and television works, and timely answers to questions to help them understand their knowledge. (iii) Construction of a microscopic interaction laboratory. With the support of the school, we established a new morphological laboratory with a digital microscope multimedia interactive system. This combination of traditional and modern technology in the laboratory allows students to observe morphological phenomena more intuitively. The use of digital microscopes enables complex course content to be displayed more clearly and accurately, which helps students master knowledge quickly and comprehensively. Through digital microscopy interaction experiments, teachers and students can use a variety of functions, such as static capture, dynamic capture and automatic video recording, to stimulate learning interest and improve learning efficiency. Screen monitoring enables teachers to accurately understand students' learning status, quickly solve difficulties, and correct negative learning attitudes, thus significantly improving teaching quality.

STRENGTHEN QUALITY ORIENTED EDUCATION

To ensure the success of the strategic goal of "healthy China", we should carefully design the course content, focusing on the concept of full health among people, animals and the environment. From the perspective of zoonotic parasitic diseases, we need to emphasize the importance of harmonious coexistence between humans and animals and between humans and nature to avoid the spread of diseases caused by unreasonable environmental development or natural destruction. In addition, focusing on foodborne parasitic diseases means paying attention to dietary habits and food safety to prevent the disease. At the same time, excessive contact, killing and consumption of wild animals should be avoided to reduce the risk of transmission of natural parasitic disease. In terms of environmental protection, we can explore new biological control technologies, such as mosquito control methods, to control mosquito-borne diseases. Finally, we should have a deep understanding of the concept of harmony between man and nature, regard clear waters and green mountains as precious wealth, and put them into practice. From an overall health perspective, the prevention and control of parasitic diseases are crucial to the protection of human, animal and environmental health. Through the course study, students will gain a deeper understanding of the importance of the prevention and control of parasitic diseases and infectious diseases and establish the concept of full health.

CONCLUSION

Integrating the concept of "one health" into the reform and practice of medical parasitology can more effectively shape students' health and health literacy. This not only enables them to more deeply understand and address all kinds of parasitic diseases but also enables them to better adapt to the needs of the new medical context. Against the background of new medicine, the introduction of the "full health" concept into the reform and practice of medical parasitology provides a solid theoretical basis for adapting to the transformation of new medicine from "disease treatment centered" to "health promotion centered". This transformation has not only changed the model of medical education but also changed its core concept. It emphasizes overall health and well-being and focuses on people's overall health. Through the introduction of the concept of "all health", we can better realize the educational goal of "cultivating people by virtue", cultivate excellent medical talent with both professional knowledge and moral quality, and make greater contributions to people's health.

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