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Adjustment Analysis of the Teaching Content of Parasitology Examination in Higher Vocational Colleges

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Abstract: At present, the infection rate of human parasitic diseases has changed greatly in our country, and foodborne parasitic diseases have become the mainstream of human parasitic diseases, among which the more frequent foodborne parasites are a liver fluke, taeniasis, *cysticercus*, *trichinella*, *toxoplasma gondii* and so on. The test methods for parasitic diseases are pathogenetic examination, immunological examination, molecular biological examination and combined diagnosis. Based on the current epidemic characteristics of human parasitic diseases in China and their examination and analysis, the teaching content of the course Parasitology Examination in higher vocational colleges is adjusted, and the main popular human parasitic diseases and their examination methods are listed as the teaching focus, and other parasitic diseases that have been eliminated or reached the control standard are transferred to the familiar or understood teaching content. To make the teaching of medical laboratory technology in higher vocational colleges closer to the needs of vocational posts and improve the adaptability of students to their posts.

Keywords: Human parasitic diseases; Epidemic; Higher vocational Parasitology Examination; Teaching content

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1. Current epidemic and analysis of human parasitic diseases in China

1.1. Prevalence of human parasitic diseases

Research on the changing trend of the burden of human parasitic diseases in China shows that as of 2019, the burden of major human parasitic diseases in China has decreased significantly, the burden of foodborne parasitic diseases is relatively high, and the burden of cysticercosis is on the rise [1]. The third National Parasitic Survey suggests that the prevalence of parasites in China has undergone great changes, the traditional infection rate of key parasites has been greatly reduced, and the decline of soilborne nematodes is the most obvious, in the vast majority of areas of the country, soilborne nematodes only show a low prevalence or sporadic state, the five major parasitic diseases in our history have gradually eliminated or reached the control standard, and the problem of food-borne parasites has become increasingly prominent. Foodborne parasitic

diseases have become the main popular human parasitic diseases in the country, the main popular foodborne parasitic diseases are clonorchidosis, taeniasis and cysticercosis, trichinosis, toxoplasmosis and so on [2,3].

Among them, it is the most serious foodborne parasitic disease in China [4]. Etiology of taenia taeniformis is infected by eating meat containing *taeniformis cysticercus*. *Taeniformis suis*, *taeniformis Asiatica* and *taeniformis bovis* are prevalent in China [5]. *Taeniformis cysticercus* can be caused by eating taeniformis ova. *Paragonimus wilsoni* is the main species of paragonimus in human infection. It is often infected by eating raw or semi-raw potamon crab or la Quilla [6]. According to the third national parasite survey, the estimated number of infections of *clonorchis sinensis* in China was about 5.98 million, mostly distributed in South China and Northeast China [2]. The number of infections in Guangxi, Guangdong, Heilongjiang and Jilin provinces reached 2.92 million, 1.84 million, 560,000 and 260,000, respectively [7]. The estimated number of taenia tapeworm infections in China is about 370,000, mainly distributed in Tibet Autonomous Region, where taenia tapeworm infections account for 95% of the total cases in China, while cysticercosis is most reported in Yunnan and Sichuan provinces in Southwest China [8]. The infection rate of paragonimus in China is 1.70/100,000. Based on scattered investigation reports, *Paragonimus cysticercus* has been detected in crabs in many parts of the country, and most human cases have been reported in South China and Southwest China [9]. In addition, trichinosis has a worldwide distribution, and serological test results show that about 11 million people are infected worldwide [10]. China is an area of severe trichinosis, which has been reported in other provinces except Hainan Province and Taiwan Province, and local outbreaks often occur [11]. Toxoplasmosis also has a global distribution, and human infection, especially the positive serum anti-toxoplasmosis antibody, is extremely common. The positive rate of serum anti-toxoplasmosis antibody in the Chinese population is 20–50% [12]. In recent years, the infection and prevalence of *Angiostrongylus guangzhouensis* have been on the rise [13], and the host Fushou snail has gradually spread from the southern region to the central region [14]. The natural focus of *Angiostrongylus Guangzhouensis* exists in 7 provinces (autonomous regions), including Fujian, Jiangxi, Zhejiang, Hunan, Guangdong, Guangxi and Hainan [3].

1.2. Detection of human parasitic diseases

Take the examination of liver fluoriasis and toxoplasmosis, which are more popular in China, as an example:

1.2.1. Liver fluoriasis

1.2.1.1. Etiological examination

At present, the most direct method for laboratory testing of hepatic fluoriasis is still to collect fecal samples to check the pathogen of parasite eggs, specifically using the direct smear method, modified Kato thick smear method, saturated brine floating polymer method, water washing precipitation method and formaldehyde ether centrifuge precipitation method, etc. However, the positive rate of fecal detection of parasite eggs is not high, and the etiological test is not suitable for large-scale on-site screening of hepatic fluoriasis.

1.2.1.2. Immunological examination

Enzyme-linked immunosorbent assay (ELISA) and immunocolloidal gold technology are commonly used. ELISA is suitable for the field detection and early diagnosis of liver fluke infection, but it is still difficult to select the antigen with high sensitivity and specificity. The immunocolloidal gold technology based on the hydrophobic colloidal solution has the advantages of sensitivity, simplicity and rapidity, and has been popularized use.

1.2.1.3. Molecular biology check

The application of PCR technology can specifically and accurately detect liver fluke egg genes in fecal samples, but the required instruments are inconvenient to carry and easy to produce cross-contamination in the test, and it is rarely used for large-scale field investigation to detect liver fluke disease [3]. Ring-mediated isothermal amplification technique is more suitable for a rapid detection of liver fluoriasis because of its good specificity and sensitivity. It does not require complex testing instruments.

1.2.2. Toxoplasmosis

1.2.2.1. Etiological examination

Including smear staining, animal inoculation and cell culture. Smear staining is often followed by a microscopic examination of Toxoplasmo trophoblast by Giemsa staining. Animal inoculation or cell culture is better than smear staining to detect the pathogen. The rate is higher, but its consumption is longer, which has the risk of promoting the spread of pathogenic biological hazards [15].

1.2.2.2. Immunological examination

The routine method for laboratory tests of toxoplasmosis is serum immunological examination, including staining, agglutination test, immunofluorescence test, enzyme-linked immunosorbent test, etc. The widely used detection methods of toxoplasmosis antibodies are ELISA and agglutination test, and serum agglutination test is also suitable for field epidemiological investigation. Serum immunoassay has the advantages of good accuracy and simple operation, but it also has limitations and can not locate toxoplasmosis.

1.2.2.3. Molecular biological examination

At present, different molecular diagnostic methods for *Toxoplasma gondii* have been developed, such as conventional PCR, LAMP method, gene chip technology and gene sequencing technology. Among them, the LAMP method has a good application prospect because of its high sensitivity, convenient operation and low equipment requirements. Gene chip technology and gene sequencing technology are also developing rapidly.

1.2.2.4. Combined diagnosis

Combined diagnosis is usually a combination of serum immunology and molecular biology techniques. For example, PCR detection combined with ELISA has better analytical performance and accuracy than ELISA alone.

At present, the methods commonly used for the detection of human parasitic diseases include etiological diagnosis, immunological diagnosis, molecular biology diagnosis and combined diagnosis. The advantages and disadvantages of each laboratory diagnostic method are shown in **Table 1**. Etiological diagnosis methods can be used as the basis for diagnosis, but the operation is usually cumbersome and the detection rate is low. Immunological diagnostic methods are easy to operate and have good sensitivity and specificity, but only as auxiliary diagnosis. Molecular biological diagnostic methods are accurate and reliable, but require high cost. Combined diagnostic methods have high detection efficiency, but a more effective combined diagnostic model has not been explored.

Table 1. Test methods for human parasitic diseases

Method	Advantages	Cons
Etiological diagnosis	As the basis for diagnosis, direct and effective	Operation is usually time-consuming and laborious, the detection rate is not high, easy to miss. The technical factors of inspection personnel have a great influence
Immunological diagnosis	Good sensitivity and specificity. Simple, cheap and fast	Generally, only as an auxiliary diagnosis, there is cross-reaction, easy to cause misdiagnosis
Molecular biology diagnosis	Accurate testing with reliable results	High requirements for experimental environment and personnel, and expensive costs
Joint diagnosis	It can improve the sensitivity, specificity and efficiency of detection	The most effective combined diagnosis model has not yet been explored

2. Adjustment of the teaching content of Parasitology Examination in higher vocational colleges

2.1. Analysis of the textbook Parasitological Examination for higher vocational education

The content of human parasitic disease examination written in the textbook of Parasitological examination used by most of the medical examination technical majors in higher vocational colleges is mainly divided into two forms. One is according to the biological characteristics of human parasites in different classifications for medical worms, medical protozoa, and medical arthropods three parts of the chapter. Medical worms include nematodes, flukes and tapeworms. Medical protozoa have rhizopodia, flagellates, sporozoa, and ciliates. Medical arthropods are insectidae and arachnids. The other is written according to the different classifications of parasitic parts of human parasites, divided into digestive tract parasites (such as roundworm, hookworm, whipworm, pinworm, F*asciola fascialis*, *Strongylostrongylus faecalis*, taenia tapeworm, *Entamoeba histolytica*, *Giardia lamella*, etc.), liver and bile duct parasites (such as liver fluke, liver lamiformis, *Granulococcus granulosus*, *Echinococcus multilocularis*, etc.), vascular system parasites (such as filaria, *Schistosoma japonicum*, Plasmodium, *Leishmania dunalii*, conium worms, etc.), nervous system parasites (e.g. *Angiostrongylus cantonensis*), skin and tissue parasites (e.g. Trichotrichodes, anisakis, tapeworm Mansoni, *Toxoplasma gondii*, Sarcocystis, *Sarcoptes mange*, etc.), respiratory system parasites (e.g. Pneumotrema), urogenital system parasites (e.g. *Trichomonas vaginalis*).

2.2. Adjustment of the teaching content of "Parasitology Examination" in higher vocational colleges

In the past, the teaching of the "Parasitology Examination" in many higher vocational colleges was carried out following the content of the textbook, and the teaching of human parasitic diseases and their examination was completed according to the order of the content of the textbook. However, at present, the prevalence of human parasitosis in our country has undergone new and great changes. In order to combine classes with posts, make higher vocational teaching more adaptable to the needs of vocational posts, and actively train students' adaptability to vocational posts, the teaching content of courses should be adjusted over time. According to the characteristics of the epidemic trend of human parasitosis in the country, the important and difficult points and sub-points of the teaching content of the "Parasitology Examination" in higher vocational college can be reclassified. The teaching focuses on the introduction of food-borne human parasitic diseases

and their examination, such as liver fluviasis, taeniasis and cysticercosis, pneumostomiasis, trichinosis, toxoplasmosis and angiostrongylosis. Soilborne human parasitic diseases and their examination, such as ascariasis, hookworm disease, whipworm disease, pinworm disease, entamoebiasis, gardiasis and other human parasitic diseases that have reached the standards of elimination or transmission control, such as filariasis, plasmosis, *Schistosomiasis japonicum*, *Leishmaniasis dungieri*, are divided into the teaching content to be familiar with. Then, opportunistic human parasitic diseases and their testing, such as toxoplasmosis, babesiosis, cryptosporidiosis, microsporidiosis, and steroidiasis, as well as imported parasitic diseases, such as imported malaria, trypanosomiasis, schistosomiasis mansoniasis, are taken as the difficult content of teaching. Insect-borne parasitic diseases such as conjunctival sucking worm disease, Hymenococcus minuta disease and Acanthocephalus megalostris disease are taken as the teaching contents to be understood. At the same time, it is important to pay attention to cultivating students' innovative thinking in the teaching, and actively explore and create new testing methods based on existing testing methods for human parasitic diseases.

3. Summary

With the rapid development of the modern economy and the improvement of living standards, people's diet and eating habits are more diverse, such as dry, raw food, smoking, raw salting and other diets are favored by people, and such diet is easy to lead to food-borne parasitic disease infection, such as raw drunk shrimp may be infected with lung fluke, diet fish may be infected with liver fluke and so on. To this end, there is a new epidemic characteristic of human parasitic diseases in the country, food-borne parasitic diseases have become the main popular human parasitic diseases. The laboratory testing methods usually used for parasitic diseases are etiological examination, immunological examination, molecular biological examination, and combined diagnosis, to effectively improve the diagnosis and treatment rate in the future, it is necessary to continue to develop advanced, standardized and high-sensitivity and specific laboratory testing methods. To this end, the teaching of medical laboratory technology in higher vocational colleges, to better adapt to the requirements of the post, combined with the curriculum, in the teaching "Parasitological Examination" course in higher vocational colleges, the teaching content should be adjusted, focusing on the current epidemic of human parasitic diseases, and other human parasitic diseases that have been eliminated or reached the control standards as familiar and understood content. For the inspection methods pay attention to cultivating students' pioneering and innovative thinking, and guide students to actively explore new inspection methods, to improve the quality of higher vocational teaching.

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