



A path to cooperation between China and Mongolia towards the control of echinococcosis under the Belt and Road Initiative

Ying-Jun Qian^{a,b,c}, Wei Ding^{a,b,c,1}, Wei-Ping Wu^{a,b,c}, Amgalanbayar Bandikhuu^d, Tserennorov Damdindorj^d, Tsogbadrakh Nyamdorj^d, Bolor Bold^e, Temuulen Dorjsuren^f, Ganzorig Sumiya^g, Ya-Yi Guan^{a,b,c}, Xiao-Nong Zhou^{a,b,c}, Shi-Zhu Li^{a,b,c,*}, Lucero-Prisno Don Eliseo III^h

^a National Institute of Parasitic Diseases, Chinese Center for Disease Control and Prevention

^b Key Laboratory of Parasite and Vector Biology, National Health Commission, Shanghai, China

^c WHO Collaborating Centre for Tropical Diseases, Shanghai, People's Republic of China

^d National Center for Zoonotic Diseases, Ministry of Health, Mongolia

^e Swiss Tropical and Public Health Institute, Switzerland

^f Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia

^g Japan International Cooperation Agency

^h London School of Hygiene and Tropical Medicine, United Kingdom

ARTICLE INFO

Keywords:

Echinococcosis
Neglected zoonotic diseases
Zoonosis
Mongolia
China
Health cooperation
the Belt and Road Initiative

ABSTRACT

Health is the core of development. Health cooperation between countries plays a pivotal role under the Belt and Road Initiative (B&R). In 2013, China launched its B&R to improve the international cooperation of which health was an important component. As one of the neglected zoonotic diseases, echinococcosis has become a public health concern and is on top of the government agenda among neglected zoonosis in Mongolia. The transmission of the disease involves animal husbandry, and its characteristics determine the prevention and control of such diseases which requires cross-sector collaboration and comprehensive prevention and control strategies. Taking echinococcosis as an entry point and adopting a 'Mongolia-led, China-supported, and results-sharing' approach to public health cooperation will not only contribute to the advancement of Mongolia's national health coverage, but also promoting China's capacity to engage in global health. In this way, it contributes to meeting the sustainable development goals, especially goal 3, target 3.3: by 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases. This paper provides an overview on how the cooperation between China and Mongolia under the context of B&R was initiated, planned and moved forward to implementation. The experience may provide a good model and inform policy and practice for other bilateral cooperations.

1. Introduction

1.1. China's global health practices under the Belt and Road Initiative

In 2013, China launched its Belt and Road Initiative (B&R) linking Asia, Africa, and Europe to promote trade, infrastructure, and commercial associations (Tang et al., 2017). China has signed 170 official cooperation agreements with 122 countries and 29 international organizations under B&R by the end of 2018 (State Information Center,

2017). It was estimated that the B&R spanned over 68 countries and compassing up to 40% of the global gross domestic product in 2017 (Griffiths, 2017).

With the rapid globalization, health problems are no longer the responsibility of individual countries. Collective actions are necessary to combat global health crises, such as infectious diseases transmission, lifestyle risks, and health inequity, which are beyond one's territory (Hu et al., 2017; Tang et al., 2017; Ming et al., 2017; Chun-Li and Jia-Gang, 2018; Sheng-Qiang et al., 2017; Xiaodong and Xuyu, 2017). B&R

* Corresponding author at: National Institute of Parasitic Diseases, Chinese Center for Disease Control and Prevention, No 207, Ruijin Er Rd, Shanghai, 200025, China.

E-mail address: lisz@chinacdc.cn (S.-Z. Li).

¹ Co-first author.

<https://doi.org/10.1016/j.actatropica.2019.04.022>

Received 30 August 2018; Received in revised form 15 April 2019; Accepted 18 April 2019

Available online 19 April 2019

0001-706X/ © 2019 Elsevier B.V. All rights reserved.

provides a channel through which China facilitates its global health strategy, through commercial, cultural, and personnel exchanges that will improve bilateral and multilateral cooperation (Hu et al., 2017). In October 2015, China's National Health Commission (NHC, formerly known as National Health and Family Planning Commission) released its 'Three-Year Implementation Plan for Promotion and Cooperation of the B&R Health Exchange (2015–2017)' (National Health Commission, 2015) to promote health cooperation and collaboration between China and other countries along B&R. In 2016, the China-WHO Country Co-operation Strategy (2016–2020) was signed to define cooperation in health policies, planning, technology and human resources (The State Council Information Office, 2017). Following the call for building the healthy Silk Road under the framework of B&R by President Xi Jinping, China hosted the B&R High-Level Meeting to promote health cooperation in August 2017. In this way, China commits to enhance medical and health cooperation with countries along the route, and emphasize learning from and drawing on the experiences of others (The State Council Information Office, 2017).

At the same time, with growing recognition of China's role as a major player in global health, there is an increasing call home and abroad to improve its health engagement particularly in Africa, which is an important partner in the B&R (Han et al., 2008; Grépin et al., 2014; Yang et al., 2018; Juan, 2014). As early as in 2000, China and Africa committed themselves to a new partnership in public health cooperation at the first China-Africa Cooperation Ministerial Conference (Siringi, 2003). In this regard, China has been attempting to innovate traditional projects which focus on sending medical teams, infrastructure construction and then invest in infectious diseases control in the long run (Zou et al., 2014). In practice, China has been implementing several public health programs in the last 5 years (Table 1). In 2015, cooperation plans on public health were announced at the Johannesburg Summit of the Forum on China-Africa Cooperation (FOCAC). During the 2018 Beijing Summit of the FOCAC, the Beijing Action Plan (2019–2021) was adopted which showed a unprecedented height in China-Africa cooperation. In this action plan, China committed to launch cooperation programs on the prevention and control of emerging and re-emerging communicable diseases, schistosomiasis, and HIV/AIDS (<https://www.fmprc.gov.cn/zfltfh2018/eng/>).

1.2. China-Mongolia health cooperation under the B&R

Mongolia is one of the sparsely populated countries with a population density of 1.9 population per square kilometer. There are approximately half of the country's population in the capital (Ito et al., 2014).

As the country seeks to develop economy and deliver modern health care to its people, some infrastructure, such as transportation and communication, constructed in the Soviet period, may not be able to meet the demand of development. It was reported that inequity in health care utilization had increased over time (Dorjdagva et al., 2017, 2015; Ebright et al., 2003; Chinese Academy of International Trade and Economic Cooperation, 2017). China and Mongolia have a long-term cooperation on health. Starting from 2004, a bilateral health cooperative plan has been set up and been renewed every four years, which focuses on communicable diseases control, traditional medicine and quarantine (The Central People's Government, 2009; National Health Commission, 2017a). For years, China has been actively supporting Mongolia's development and provided a great number of medical and health services, such as infrastructure construction and medical treatment. In August 2011, a total of 92 Mongolian patients with eye diseases were treated by the Chinese medical doctors and 49 cataract patients regained their sight. In October 2015, the China-Mongolia Chingeltei Children's hospital was built up under the support of China Foundation for Peace and Development. It was considered as the flagship project of bilateral cooperation. Afterwards, a number of medical facilities were donated by China and a total of 20 Mongolian

Table 1
China's engagement in global public health in the past 5 years.

Start Year	Task/Activities	Main implementer	Sponsor	Country
2014	Rescue mission to fight with Ebola virus diseases (Hongzhou, 2015; Tambo et al., 2016; Lu et al., 2016)	Chinese military medical teams	China	Sierra Leone
2015	Building of Africa CDC	China CDC	China, US	Ethiopia
2015	Pilot project on malaria control (Wang et al., 2019)	National Institute of Parasitic Diseases, China CDC	China, UK	Tanzania
2016	Cooperation project for schistosomiasis control (Kun et al., 2019)	Jiangsu Institute of Parasitic Diseases	China	Zanzibar
2007	China-Myanmar malaria project (Juan, 2014)	Health Poverty Action	China, Global Fund	Myanmar
2015	Pilot interventions to improve the health of women and children (Zhao et al., 2019)	Fudan University	China, UK	Ethiopia, Myanmar
2016	Australia China Papua New Guinea pilot cooperation on malaria control (Department of Foreign Affairs and Trade, 2016)	National Institute of Parasitic Diseases, China CDC	China, Australia	Papua New Guinea
2007	Mass drug administration of artemisinin-piperaquine in high malaria endemic area (Deng et al., 2014)	Guangzhou University of Chinese Medicine	China, Comoro	the Comoros Archipelago

medics were trained in China. In 2016, a considerable number of computers, telephone systems and healthcare software were donated by China to 112 hospitals in Mongolia. In 2017, initiated by the Chinese Red Cross Foundation and Mongolian Red Cross Society, the B&R humanitarian aid program for congenital heart disease treatment in children with serious illness was launched. A total of 100 children were provided with free surgical treatment in China, of whom 12 cases were successfully operated on (State Information Center, 2017; China foundation for peace and development, 2018). It is seen that the health cooperation between the two countries mainly focuses on medical and health assistance and few activities have been undertaken in the area of public health.

2. Echinococcosis control in Mongolia and China

Neglected zoonotic diseases (NZDs) associated with people living in close proximity to animals, can drive serious human suffering and considerable losses to livestock they depend on (WHO, 2017; Institute of Medicine, 2011; British Veterinary Association, 2016; WHO and OIE, 2002; Grace et al., 2012; Hattendorf et al., 2017). However, lack of reliable data on incidence and impact due to absence of accurate and prompt diagnosis are major problems across the NZDs (Halliday et al., 2015). In 2010, a tripartite concept agreement between WHO, The Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE, the International Office of Epizootics becomes the World Organisation for Animal health in 2003, but keeps its historical acronym OIE) was established under the ‘One Health’ approach, which represented a concept that human and animal health were closely linked and inter-disciplinary collaboration was required for the successful control of zoonoses (Jarvis, 2015; WHO et al., 2010; British Veterinary Association, 2016; Hattendorf et al., 2017; Zinsstag et al., 2015). It is believed the right time for concerted effort to tackle the NZDs with the Sustainable Development Goal (SDG) in place (Johansen et al., 2017).

As one of the NZDs, echinococcosis accounts to an estimate of more than 19 300 deaths per annum and around 871 000 disability-adjusted life-years (DALYs) globally (Torgerson et al., 2015). Together with rabies, taeniasis and cysticercosis and foodborne trematodiasis, it is identified as a priority NZD for which veterinary public health interventions are needed (WHO, 2017). Human echinococcosis is mainly due to *Echinococcus granulosus sensu lato* and *E. multilocularis* infection responsible for cystic echinococcosis (CE) and alveolar echinococcosis (AE), respectively. CE is particularly prevalent in pastoral communities and typically with an observed transmission between dogs and livestock, while AE is seen to be less common and normally transmitted between wild canids and small mammals (Ito and Budke, 2015, 2014; Deplazes et al., 2017). At least 270 million people, accounting for 58% of the total population are at risk of (CE) in Central Asia including Mongolia (Zhang et al., 2015). Aside from severe health losses, CE results in annual economic loss estimated at 1.92 billion among the affected population and 2.19 billion USD for livestock, respectively, with consideration of underreporting (Budke et al., 2006). It has been shown that low public awareness to echinococcosis, poor management of stray dogs, irregular slaughtering practices, and low access to health services particularly among the population at risk contribute to the spread of the disease (Otero-Abad and Torgerson, 2013; Barnes et al., 2017; Zhang et al., 2015).

2.1. Underreported echinococcosis cases and weak public health system in Mongolia

In Mongolia, AE is less common than CE with so far five cases documented (Ito and Budke, 2015). With the collapse of the Soviet Union in 1990s, surveillance for echinococcosis and dog deworming interventions ceased in Mongolia, increasing the risk of disease transmission (Ito and Budke, 2015; Ito et al., 2013; Zhang et al., 2015;

Ebright et al., 2003; WHO, 2010).

In response, the Mongolian government has increased its emphasis on echinococcosis (especially CE) these years (WHO, 2015). By applying a multi-criteria ranking model, echinococcosis was identified as one of five zoonotic diseases determined to be of high priority, in addition to brucellosis, rabies and anthrax (McFadden et al., 2016). In 2017, the Ministry of Health issued the ‘Technical Guidelines for Zoonotic Diseases Prevention and Control’, in which ‘Technical Guidelines for Echinococcosis Control’ was integrated as one of the annexes as a general guidance of the diagnosis, treatment, and reporting of echinococcosis. A bunch of stakeholders in echinococcosis control, including the Ministry of Health, hospital, zoonotic health center, veterinary departments makes it difficult in the implementation of existing policies and coordination (Ider et al., 2012; Gurbadam et al., 2010). Nevertheless, the Mongolian government now is working on developing of an overall plan for the control of echinococcosis. Numerous researches on genetics and immunological diagnosis have been carried out while nationwide control programs are few (Ito et al., 2010; Ito et al., 2014; Chinchuluun et al., 2014; Jabbar et al., 2011; Ito et al., 2013; Watson-Jones, D. L. et al., 1997; Wang, Y. et al., 2005). In Mongolia, management of echinococcosis is mainly focused on treatment, particularly surgery, with few interventions such as disease surveillance and dog management (Zhang et al., 2015).

In Mongolia, there are few surveys and reports on CE due to inadequate testing method (Ito and Budke, 2015; Zhang et al., 2015; Bold et al., 2018). A survey of livestock CE based on serological testing in 18 provinces showed the highest overall seropositivity in Bayan-Ölgii and 9.2% of goats, 3.6% of sheep and 5.9% of cattle were seropositive out of 1707 serum samples. As indicated by the author, the result potentially implied CE prevalence in domestic animals in Mongolia (Chinchuluun et al., 2014). A field survey in Khovd province in 2016 showed a 23.8% prevalence of taeniid eggs in domestic dogs by PCR and 3.5% in human by ultrasound examination, respectively (B. Chinchuluun, unpublished). Another study in Umnugovi Province illustrated 35.6% of high prevalence among domestic dogs by using feces floatation test (Temuulen D, unpublished). Supported by the World Bank, a retrospective study on hospital-based records between 2008 and 2015 showed 30% CE cases were under 16 years of age. It was not until 2017 did Mongolia began to report echinococcosis cases as a notifiable disease. Only 17 confirmed CE cases were reported in the whole year in eight provinces and Ulaanbaatar based on a hospital registration system. The prevalence of these conditions is believed to be underestimated because of under-reporting and under-diagnosis (WHO, 2014; Ito and Budke, 2015; Halliday et al., 2015).

2.2. Experiences of China in lowering heavy echinococcosis burden

As one of the NZDs, echinococcosis has been on the top of the agenda for decades in China, according to the national control programme on major parasitic diseases (2006–2015) issued by the National Health Committee (formerly the Ministry of Health). In 2005, the central government established a special foundation in eight endemic provinces nationwide to carry out echinococcosis control. Since 2007, echinococcosis has become one of the major communicable diseases with free treatment surgery subsidies. In November 2015, the State Council approved the establishment of multi-sector communication mechanism for major diseases control, which consists of 30 agencies such as the National Health Commission, the United Front Work Department of the Communist Party of China (CPC) Central Committee, the Central Comprehensive Management Office, the National Development and Reform Commission and the Ministry of Education, to further strengthen the control efforts for major diseases including echinococcosis, and to develop overall work plans in major parasitic diseases. In March 2017, a total of 10 departments, including the National Health Commission, the United Front Work Department of CPC Central Committee, the National Development and Reform

Commission established the Steering Working Group for the integrated control of echinococcosis in the Tibet Autonomous Region, Sichuan Tibetan Area, as well as Yushu and Guoluo Prefecture in Qinghai Province. Followed by the Action Plan for echinococcosis control (2010–2015), together with the National Development and Reform Commission, the Ministry of Finance, and nine other ministries, the National Health Commission jointly issued the national plan for controlling major parasitic diseases including echinococcosis (2016–2020). These integrated control strategies included dog and livestock management, health education, patient treatment and management (Zhang et al., 2015). This plan aimed at lowering the prevalence in human and owned dogs to less than 1% and 5%, respectively in 70% endemic counties by 2020.

By the end of 2017, a total of 1.244 billion CNY was allocated for the screening and treatment of patients, the control of infection source, as well as capacity building. For example, in Qinghai Province, around 161 million was allocated in 2149 administrative villages in 243 townships of 32 endemic counties. A total of 2.3 million population benefited from the programme with over 10,000 drug treatments and 600 surgeries conducted. In 2017, 20.6 million CNY was additionally funded to Qinghai for surgical treatment, ultrasound screening and construction of comprehensive demonstration for echinococcosis control. In addition, the central government continued to provide technical support in setting up reference laboratories for echinococcosis in target provinces, such as Sichuan and Qinghai (National Health Commission, 2017b).

Based on the recent national survey conducted during 2012–2016, the prevalence rate of echinococcosis in humans declined to 0.28% in 2012 compared with 1.08% in 2004 (Zhang et al., 2015; National Health Commission, 2010). The distribution showed a high prevalence in the Qinghai-Tibet Plateau, with an observed gradual decreased trend with the increase in distance. With the development of the echinococcosis programme, the areas covered have been scaled up from 10 counties in 2005 to 140 counties in 2012. As a result, the increase intensity of case screening contributed to the increasing number of reported cases of human echinococcosis. It was believed that the registration of dogs, deworming and community health information and communication contributed to the reduction of disease prevalence (Wei-ping et al., 2018). Altogether, there are 368 endemic counties in 9 provinces (autonomous regions), which are Inner Mongolia, Sichuan, Tibet, Gansu, Qinghai, Shaanxi, Ningxia, Yunnan and Xinjiang of which 115 counties have a prevalence of both CE and AE. However, according to the recent survey, the prevalence in the endemic areas was 0.28%, with estimated 166,098 patients and 60 million population at risk, which is still the highest in the world. The disease burden of echinococcosis ranks ninth among the neglected tropical diseases in China, adding up to 322.4 thousand disability adjusted life year (DALYs), suggesting the need for continued and enhanced efforts if echinococcosis is going to be eliminated in the future (Meng-yuan et al., 2018; Yang et al., 2013). Additionally, innovative researches on echinococcosis control have been conducted and translated into practice in China (Yu et al., 2017).

3. China-Mongolia collaboration opportunities on echinococcosis control

3.1. Situation Analysis through on-site investigation

To collect more information on echinococcosis control in Mongolia and to acquire local staff's point of views on China-Mongolia cooperation, a field investigation through a survey and focus group discussions combined with in-depth interviews of key informants were conducted in March 2018 by Chinese public health practitioners. In the group discussions, participants were separated into three groups for identifying the challenges and needs in echinococcosis control in Mongolia and expressing their opinions on China-Mongolia collaboration (see

Table 2).

A total of 29 individuals participated in the survey and 15 of which were interviewed. The participants were from the WHO Mongolia Office, Mongolian government sectors, local hospitals, veterinary institutes, laboratories, and two echinococcosis patients.

The results showed that 79.3% of the respondents were not aware of the national plan for infectious diseases control; 44.8% regarded limited funding as a big challenge in echinococcosis control, while two respondents indicated that it may not be a constraint since the government and international agencies could support research programmes. 58.6% responded that there was no field control efforts for echinococcosis and 75.9% did not receive any training associated with echinococcosis in the recent 5 years. Additionally, two clinical doctors added that it was common that doctors diagnose based on his/her own experiences without following the cyst staging and WHO-IWGE recommendations during interviews, reflecting insufficient implementation on clinical CE management in Mongolia (Bold et al., 2018). In light of the gaps and needs for potential China-Mongolia cooperation, 8 respondents proposed to promote government engagement, while 10 pointed out the low public awareness and 17 mentioned insufficient capacities in disease control. A total of 22 participants proposed to establish a national strategy, conduct nationwide investigation and launch routine surveillance activities, as well as receive technical support from China.

In the group discussions, each group highlighted the importance of an overall understanding and related control strategies. Challenges in intersectional collaboration were also highlighted by the groups covering the topics on diagnosis and treatment in human and animals, and capacity building. Lack of diagnostic tools for both humans and dogs, and drugs such as praziquantel and albendazole were put forward as an obstruction to echinococcosis control. As per bilateral cooperation, it was highly recommended that joint research could be a good start to share China's experiences and train people. Gaps and needs in echinococcosis control were identified as follows according to the results of group discussions and in-depth interviews.

3.2. Implications and routes for China-Mongolia's public health cooperation under B&R: an example of echinococcosis control

Based on the consultations and the situation analysis, there are opportunities to expand the bilateral cooperation in the field of public health between the two countries, taking echinococcosis as an example. Therefore, the following areas are proposed for action:

3.3. Setting up a cooperation mechanism

China works with Mongolia to formulate its mid- and/or long-term plans for the control of echinococcosis, and prepare supporting documents such as technical guidelines, implementation programs, and technical standards as well. Effective medical and veterinary interaction is needed for echinococcosis control under the guidance of 'One Health' model and 'Universal Health Coverage', which is integral to the advancement of health for all. China assists Mongolia in establishing a joint working mechanism to control the disease and resource allocation, which not only includes communication among various units within the Ministry of Health, but also involves cooperation with other government bodies and professional organizations such as Ministry of Agriculture, Ministry of environment and others relative to echinococcosis control.

3.4. Integrating and optimizing resources

Currently, there are many sources of information related to echinococcosis control with multi-sectoral management coming from the Ministry of Health, veterinary departments, academic institutions, and cooperative partners. It is urgent to integrate relevant resources and

Table 2
Gaps and needs/actions for Mongolia in the echinococcosis control cooperation with China.

Gaps	Needs/Actions
Lack of action plan and national strategy	Improve and approve national action plan, improve the strategy
Limited and scattered information on nation-wide disease mapping	Cross-sectional survey to be conducted to set up the baseline
Not well-established surveillance system	Strengthen/improve the present surveillance system
Lack of dog management, a lot of stray dogs	Dog deworming, registration
Lack of technology, including patient treatment, diagnostic tools in dogs	Capacity building (such as training)
High-cost of drugs	Drug supply and development
Low public awareness	Health education
Limited funding	Financial support

information, including different departments such as the medical system, public health, animal health, inspection and quarantine, research centers and other stakeholders, as well as experts in different fields such as medicine, epidemiology, biology, parasitology and veterinary science to jointly carry out the multi-lateral cooperation. As advocated by WHO, it is appealing if echinococcosis control could be integrated with other dog-transmitted NZDs such as rabies by combining drug administration and vaccination, and control program of CE with brucellosis as well (WHO, 2017, 2015; WHO, 2013, 2014). Aside from achieving efficiency through cooperation, such programmes also become cost-effective.

3.5. Strengthening technical exchange

China provides experience and technology to assist Mongolia in setting up country-owned action plans with appropriate strategy and standard, conducting investigations and active monitoring to map the disease. Comprehensive capacity building should be carried out through training Mongolian faculty. Such training should cover not only technical skills, but also project management capabilities. Taking the language barrier into consideration, capacity-building projects based on training and technology exchange could serve as an economical and effective way to rapidly train a group of technicians for a short term.

In the light of the current situation, it is suggested that the project should be used as a basis between the two parties for joint project applications under the principle of ‘Mongolia-led, China-supported, and results-sharing’ which is believed to be an effective way of initiating cooperation. The pilot site can be selected to carry out on-site control through which echinococcosis control plans and strategies could be formulated. It is also a good opportunity to test, evaluate and adjust Chinese products and diagnostic reagents showing promising in field application (Ruini et al., 2013; Yan et al., 2008; Dong et al., 2011; Zhumabai et al., 2005). Taking echinococcosis as an entry point will not only contribute to the advancement of Mongolia’s national health coverage, but also help improve China’s ability to participate in global health. In this way, it contributes to the achievement of Sustainable Development Goals.

What needs to be emphasized before going to the ground is that, regardless of how China-Mongolia cooperation is carried out, adapting to local conditions within Mongolia is crucial particularly when considering integrated control. Only through this manner that cooperation can be sustained and ensured and the best results be achieved.

4. Conclusion

There are many researches on echinococcosis in Mongolia, however, the holistic picture of epidemiological situation is not clear thus there is a need to provide a strong evidence from the ground. Top-level framework in designing an overall plan and implementation is urgent and imperative. The gap analysis we conducted provides a unique insight to direct collective efforts likely to result in effective echinococcosis control in Mongolia under the framework of B&R, and further inform

China’s contribution in public health cooperation to the global society. The Chinese government attaches great importance to the prevention and treatment of echinococcosis. Over the years, it has made positive progress and accumulated considerable technical and programmatic experiences. Mongolia has been doing initiatives in preventing and treating echinococcosis. If China and Mongolia use echinococcosis as an entry point within the ‘One Health’ framework, bilateral cooperation will be conducive to opening up cooperation space in the public health field, conforming to the common interests of China and Mongolia under the framework of the B&R to promote Mongolia’s national health goals, increase China’s involvement in global health, which will finally contribute to the universal health coverage and may set a good example to other countries. In addition, to align with the B&R, it could pursue increasing cooperation with present multilateral initiatives, such as Shanghai Cooperation Organisation, and the China-Mongolia-Russia Economic Corridor.

Declarations of interest

None.

Acknowledgements

This study was supported by the China-UK Global Health Support Programme funded by UK DFID (GHSP-CS-OP3-V07).

References

- Barnes, A.N., Davaasuren, A., Baasandagva, U., et al., 2017. A systematic review of zoonotic enteric parasitic diseases among nomadic and pastoral people. *PLoS One* 12, e0188809.
- Bold, B., Hattendorf, J., Shagj, A., et al., 2018. Patients with cystic echinococcosis in the three national referral centers of Mongolia: a model for CE management assessment. *PLoS Negl. Trop. Dis.* 12 (8), e0006686.
- British Veterinary Association, 2016. Achieving a common good. *Vet. Rec.* 179, 1.
- Budke, C.M., Deplazes, P., Torgerson, P.R., 2006. Global socioeconomic impact of cystic echinococcosis. *Emerg Infect Dis.* 12, 296–303.
- China foundation for peace and development, 2018. Chinese Medical Equipment Donated to Children’s Clinic in the Ulaiba District. Available from: <http://www.cfpd.org.cn/Detail.aspx?newsId=1833&Tid=216>.
- Chinchuluun, B., Sako, Y., Khatanbaatar, I., et al., 2014. A survey of seropositivity to antigen B, an immunodiagnostic antigen for human cystic echinococcosis, in domestic animals in Mongolia. *Parasitol. Int.* 63, 324–326.
- Chinese Academy of International Trade and Economic Cooperation, 2017. Guidance for Foreign Investment in Mongolia. 2017). Available from: <http://fec.mofcom.gov.cn/article/gbdqzn/>.
- Chun-li, C., Jia-gang, G., 2018. Challenge and strategy of prevention and control of important parasitic diseases under the Belt and Road Initiative [Article in Chinese]. *Chin J Schisto Control.* 30, 111–116.
- Deng, C., Wang, Q., Zheng, S., et al., 2014. Mass Drug Administration of Artemisinin-piperazine on High Malaria Epidemic Area. *Trop. Med. Health* 42 (2 Suppl), 33–41.
- Department of Foreign Affairs and Trade, 2016. Australia, Aid program performance report 2015–16. Australian government, Papua New Guinea. Available from: <https://dfat.gov.au/aid/Pages/australias-aid-program.aspx>.
- Deplazes, P., Rinaldi, L., Alvarez Rojas, C.A., et al., 2017. Global distribution of alveolar and cystic echinococcosis. *Adv. Parasitol.* 95, 315–493.
- Dong, M.H., Shao, J., Shi, C., et al., 2011. Discussion of laboratory diagnosis for echinococcosis [Article in Chinese]. *Chin J Schisto Control.* 23, 722–726.
- Dorjdagva, J., Batbaatar, E., Dorjsuren, B., et al., 2015. Income-related inequalities in health care utilization in Mongolia. 2007/2008–2012. *Int. J. Equity Health* 14, 57.
- Dorjdagva, J., Batbaatar, E., Svensson, M., et al., 2017. Free and universal, but unequal

- utilization of primary health care in the rural and urban areas of Mongolia. *Int. J. Equity Health* 16, 73.
- Ebright, J.R., Altantsetseg, T., Oyungerel, R., 2003. Emerging infectious diseases in Mongolia. *Emerg. Infect. Dis.* 9, 1509–1515.
- FAO, OIE, WHO, 2010. Sharing Responsibilities and Coordinating Global Activities to Address Health Risks at the Animal-human-ecosystems Interfaces.
- Grépin, K.A., Fan, V.Y., Gordon, C., et al., 2014. ShenChina's role as a global health donor in Africa: what can we learn from studying under reported resource flows? *Global. Health* 10, 1–11.
- Griffiths, J., 2017. Just What Is This One Belt, One Road Thing Anyway? [Online]. Available from: <https://edition.cnn.com/2017/05/11/asia/china-one-belt-one-road-explainer/index.html>.
- Gurbadam, A., Nyamkhuu, D., Nyamkhuu, G., et al., 2010. Mongolian and Japanese Joint Conference on 'Echinococcosis: diagnosis, treatment and prevention in Mongolia' June 4, 2009. *Parasit. Vectors* 3, 8.
- Halliday, J.E., Allan, K.J., Ekwem, D., et al., 2015. Endemic zoonoses in the tropics: a public health problem hiding in plain sight. *Vet. Rec.* 176, 220–225.
- Han, Q., Chen, L., Evans, T., et al., 2008. China and global health. *Lancet* 372, 1439–1441.
- Hattendorf, J., Bardosh, K.L., Zinsstag, J., 2017. One Health and its practical implications for surveillance of endemic zoonotic diseases in resource limited settings. *Acta Trop.* 165, 268–273.
- Hongzhou, Lu, 2015. China takes an active role in combating an Ebola outbreak: on-site observations and reflections from a Chinese healthcare provider. *Intractable Rare Dis. Res.* 4 (4), 217–219.
- Hu, R., Liu, R., Hu, N., 2017. China's Belt and Road Initiative from a global health perspective. *Lancet Glob. Health* 5, e752–e753.
- Ider, B.E., Adams, J., Morton, A., et al., 2012. Perceptions of healthcare professionals regarding the main challenges and barriers to effective hospital infection control in Mongolia: a qualitative study. *BMC Infect. Dis.* 12, 170.
- Institute of Medicine, 2011. The Causes and Impacts of Neglected Tropical and Zoonotic Diseases: Opportunities for Integrated Intervention Strategies. The National Academies Press, Washington, DC. <https://doi.org/10.17226/13087>. Available from:.
- Ito, A., Budke, C.M., 2014. Culinary delights and travel? A review of zoonotic cestodiasis and metacercarial dermatitis. *Travel Medicine and Infectious Diseases* 10.
- Ito, A., Budke, C.M., 2015. The present situation of echinococcoses in Mongolia. *J. Helminthol.* 89, 680–688.
- Ito, A., Agvaandaram, G., Bat-ochir, O.E., et al., 2010. Short report: histopathological, serological, and molecular confirmation of indigenous alveolar echinococcosis cases in Mongolia. *Am. J. Trop. Med. Hyg.* 82, 266–269.
- Ito, A., Chuluunbaatar, G., Yanagida, T., et al., 2013. Echinococcus species from red foxes, corsac foxes, and wolves in Mongolia. *Parasitology* 140, 1648–1654.
- Ito, A., Dorjsuren, T., Davaasuren, A., et al., 2014. Cystic echinococcoses in Mongolia: molecular identification, serology and risk factors. *PLoS Negl. Trop. Dis.* 8, e2937.
- Jabbar, A., Narankhajid, M., Nolan, M.J., et al., 2011. A first insight into the genotypes of *Echinococcus granulosus* from humans in Mongolia. *Mol. Cell. Probes* 25, 49–54.
- Jarvis, S., 2015. Progress and challenges in controlling neglected zoonotic diseases. *Vet. Rec.* 176, 85–86.
- Johansen, M.V., Welburn, S.C., Dorny, P., et al., 2017. Control of neglected zoonotic diseases. *Acta Trop.* 165, 1–2.
- Juan, Luo, 2014. Model of China-Myanmar Malaria Project and enlightenment for Chinese Health Aid Program [in Chinese]. *Chin. J. PHM* 30 (4), 480–483.
- Kun, Yang, Haitao, Yang, Yousheng, Liang, et al., 2019. A path analysis on China's participation in global health governance: a case study of China Aid of Schistosomiasis Control in Zanzibar [in Chinese]. *Chin J. Schisto Control*. Available at <http://kns.cnki.net/kcms/detail/32.1374.R.20190312.1146.001.html>.
- Lu, Y., Rong, G., Yu, S.P., et al., 2016. Chinese military medical teams in the Ebola outbreak of Sierra Leone. *J R Army Med. Corps* 162, 198–202.
- Mcfadden, A.M., Muellner, P., Baljinnam, Z., et al., 2016. Use of Multicriteria Risk Rankings of Zoonotic Diseases in a Developing Country: Case Study of Mongolia. *Zoonoses Public Health* 63 (2), 138–151.
- Meng-yuan, Z., Wei-ping, W., Ya-yi, G., et al., 2018. Analysis on disease burden of hydatid disease in China [Article in Chinese]. *Chin J Parasitol Parasitic Dis* 36 (1), 15–19.
- Ming, g., Lixia, T., Lerong, Y., 2017. Implicits on the changes and challenges in global health governance. *Global perspective* 21.
- National Health Commission, 2015. Three-year Operational Plan to Advance Health Cooperation Under the Belt and Road Initiative (2015–2017). Available from: <http://www.nhfc.gov.cn/gjhzs/s7951/201510/76c079e5164c4e14b06a48340bd0588a.shtml>.
- National Health Commission, 2010. Action Plan for Echinococcosis Control (2010–2015). Available from: <http://www.nhfc.gov.cn/kj/s5873/201012/d6ecfb409a4947c29c9ec990aba897ce.shtml>.
- National Health Commission, 2017a. Director Li Bin Met With Relevant National Health Ministers During the High-level Seminar on 'Belt and Road' and 'Healthy Silk Road'. Available from: <http://www.nhc.gov.cn/zhuz/gjil/201708/15aa7c9f207e4ceca320f159d7537684.shtml>.
- National Health Commission, 2017b. A Reply to Recommendation No 3270 of the Fifth Session of the 12th National People's Congress. Available from: <http://www.nhfc.gov.cn/zwgk/jianyi/201712/3046c5a3b39242819bbc680147cd056a.shtml>.
- Otero-abad, B., Torgerson, P.R., 2013. A systematic review of the epidemiology of echinococcosis in domestic and wild animals. *PLoS Negl. Trop. Dis.* 7, e2249.
- Ruini, Z., Lamu, W., Muti, M., 2013. Recent advances on development of coproantigen for dogs infected with *Echinococcus* spp [Article in Chinese]. *Chinese J. Zoonoses* 29 (4), 398–402.
- Sheng-qiang, W., MENG-MENG, Y., GUO-DING, Z., et al., 2017. Control of imported mosquito-borne diseases under the Belt and Road Initiative [Article in Chinese]. *China J. Schisto Control* 30 (1), 9–13.
- Siringi, S., 2003. Africa and China join forces to combat malaria. *Lancet* 362, 456.
- State information center, 2017. China's Official Belt and Road Portal [Online]. Available from: www.yidaiyilu.gov.cn.
- Tambo, E., Ugwu, C.E., Guan, Y., et al., 2016. China-Africa Health Development Initiatives: Benefits and Implications for Shaping Innovative and Evidence-informed National Health Policies and Programs in Sub-saharan African Countries. *Int. J. MCH AIDS* 5 (2), 119–133.
- Tang, K., Li, Z., Li, W., et al., 2017. China's Silk Road and global health. *Lancet* 390, 2595–2601.
- The Central People's Government, 2009. Minister of Health Chen hao Meets With Mongolian Minister of Health Sang Longba. Available from: http://www.gov.cn/gzdt/2009-04/29/content_1299474.htm.
- The state council information office, 2017. Development of China's Public Health As an Essential Element of Human Rights. Beijing. Available from: <http://www.scio.gov.cn/zfbps/32832/Document/1612687/1612687.htm>.
- Torgerson, P.R., Devleeschauwer, B., Praet, N., et al., 2015. World health organization estimates of the global and regional disease burden of 11 foodborne parasitic diseases, 2010: a data synthesis. *PLoS Med.* 12, e1001920.
- Wang, D., Chaki, P., Mlacha, Y., et al., 2019. Application of community-based and integrated strategy to reduce malaria disease burden in southern Tanzania: the study protocol of China-UK-Tanzania pilot project on malaria control. *Infect. Dis. Poverty* 8 (1), 1–6.
- WHO, 2010. The Control of Neglected Zoonotic Diseases: Community-based Interventions for Prevention and Control.
- WHO, 2013. Sustaining the Drive to Overcome the Global Impact of Neglected Tropical Diseases-second WHO Report on Neglected Tropical Diseases.
- WHO, 2014. The Control of Neglected Zoonotic Diseases-From Advocacy to Action Report of the Fourth International Meeting.
- WHO, 2015. Investing to Overcome the Global Impact of Neglected Tropical Diseases-third WHO Report on Neglected Tropical Diseases.
- WHO, 2017. Integrating Neglected Tropical Diseases Into Global Health and Development-fourth WHO Report on Neglected Tropical Diseases.
- WHO, OIE, et al., 2002. WHO/OIE manual on echinococcosis in humans and animals: a public health problem of global concern. In: Grace, D., Mutua, F., Ochungu, P. (Eds.), 2012. Mapping of Poverty and Likely Zoonoses Hotspots.
- Xiaodong, T., Xuyu, C., 2017. Challenges and preparation for public health under the Belt and Road Initiative [Article in Chinese]. *J. Pub. Health Prev Med.* 28 (4), 1–5.
- Yan, H., David, H.D., Wen, Y., et al., 2008. Epidemiology and risk factor analysis for canine echinococcosis in a tibetan Pastor al area of Sichuan [Article in Chinese]. *China J. Parasitol Parasitic Dis* 26 (4), 245–252.
- Yang, G., Wang, Y., Zeng, Y., et al., 2013. Rapid health transition in China, 1990–2010: findings from the Global Burden of Disease Study 2010. *Lancet* 381, 1987–2015.
- Yang, H.M., Liu, P.L., Guo, Y., 2018. Determinants of China's development assistance for health at the sub-national level of African countries (2006–2015). *Infect. Dis. Poverty* 7 (1), 1–9.
- Zhao, Y., Hu, Y., Liang, J., 2019. A pilot study on the simulation-based training for Ethiopia skilled birth attendants. *Nurse Educ. Pract.* 34, 130–138.
- Yu, Q., Xiao, N., Yang, S.J., et al., 2017. Deworming of stray dogs and wild canines with praziquantel-laced baits delivered by an unmanned aerial vehicle in areas highly endemic for echinococcosis in China. *Infect. Dis. Poverty* 6, 117.
- Zhang, W., Zhang, Z., Wu, W., et al., 2015. Epidemiology and control of echinococcosis in central Asia, with particular reference to the People's Republic of China. *Acta Trop.* 141, 235–243.
- Zhumabai, Aerxun, Yeerjiang, et al., 2005. A newly developed rapid diagnosis of echinococcosis in comparison to imaging diagnosis [Article in Chinese]. *Fu Bu Wai Ke* 18 (5), 304–305.
- Zinsstag, J., Schelling, E., Whittaker, M., et al., 2015. One Health: The Theory and Practice of Integrated Health Approaches. CPI Group Ltd., UK.
- Zou, G., McPake, B., Wei, X., 2014. Chinese health foreign aid and policy: beyond medical aid. *Lancet* 383, 1461–1462.