

# **Achievement of Korea-China Collaborative Project and the Collaboration with KAHP**

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### **Abstract**

Congratulations on the 40<sup>th</sup> Anniversary of KAHP, which has made great contributions to the control of parasitic diseases in Korea, and to the development of collaboration with China and other Asia countries aiming at the common interest. The 40 years of KAH/KAHP and its predecessor, Korea Association of Parasite Eradication has composed a brilliant road map to bring the prevalence of intestinal parasite infection from 84.3% in 1971 to the current prevalence of 2.4%, and to endeavor in the promotion of the health of children, man and woman, and low income families in Korea, as well as to generously share the successful experience in parasite control with China during the last half century. Indeed, the 40<sup>th</sup> birth day of KAHP is marked with great achievements and bright future.

### **Korea-China collaborative project supported by KOICA**

In the beginning of this century, China-Korea collaboration in parasitic diseases control turned to a new page, when a record of "The Korea-China Collaborative Project of Control Strategies for Helminthiases in Pilot Areas" was officially signed in Beijing in June 21, 2000 by the Korea International Cooperation Agency (KOICA), Republic of Korea and the Department of International Cooperation, Ministry of Health (MOH), People's Republic of China.

The Objectives of this collaborative project are:

1. to support the nation-wide development of the Chinese government's control strategies for human parasite infections by suggesting effective control strategies of human parasite infections in pilot areas through the project.
2. to develop Chinese institutional capacity to control human parasite infections by supporting human resource development and necessary equipments to the institutions concerned and pilot areas.

To the project, the Korea government provided an amount of 1 million US\$ assistance through KOICA, and Chinese government provided 152,000US\$ budget to support the implementation in pilot areas.

The project has been successfully implemented during the past 5 years (2000–2004) by the implementing agencies of both sides, KOICA and Chinese Academy of Preventive Medicine (Chinese Center for Disease Control and Prevention). The KAH and the Institute of Parasitic Disease (IPD)/China CDC are the responsible organizations for preparation and implementation of the project during the project period. The pilot areas were designated in Heilongjiang Province for food-borne helminth infection (*Clonorchis sinensis*) infection, Jiangxi Province for soil-transmitted helminth (*Ascaris lumbricoides*) and Guangxi Zhuang Autonomic Region for *Clonorchis* and other food borne parasite infections.

The KOICA project of helminth control was developed after 5-year NGO collaboration of KAH and IPD supported by KOICA and KAH and commenced from 1995. It should be particularly indicated that the collaboration in parasite control between KAH and IPD was encouraged by an agreement on health and medicine signed by Korea Ministry of Health and Social Affairs and China Ministry of Health in June 3, 1994. During the NGO collaboration, Korean parasitologists jointly with Chinese partners initiated the field investigation and control for soil-transmitted and food-borne parasite infection in Jiangxi, Guangxi, Anhui and Liaoning provinces, carried out scientific exchange and technical training, and built up mutual understanding and good friendship for the preparedness of

further collaboration at a national level leading to the application and implementation of the KOICA project. It should be stressed that KAHP contributed and witnessed the development of Korea–China collaboration in parasite control for people's health during the last ten years.

It was commonly recognized by both side that the parasitic diseases was a big threat to the people's health of both countries in the mid–20<sup>th</sup> century, and the experience gained thereafter in Korea in effective control of the parasite is constructively helpful to China, when the overall prevalence of human parasite infection was as high as 62% in 2000. On the other hand, the "eradication"of an infectious disease can only be granted when the disease is eliminated in the world, especially the world is becoming smaller today due to the convenient and frequent exchange in cultural and commercial activities. Therefore, the collaboration in parasite control will be mutually beneficial to the people of both parties.

## Implementation of the KOICA project

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2004 is the conclusion year of the KOICA project, and is the year to review the achievements. It is believed by the experts of both sides that the project has been highly successful, and the proposed objectives well reached.

Led by China MOH, the project implementation in the pilot areas has been strongly supported and coordinated by China CDC, IPD/China CDC, and the province health authorities. Organized by Heilongjiang and Guangxi CDCs, Jiangxi province IPD, more than 200 health professionals involved at all levels accomplished tremendous amount of control work according to the project program.

Technical training and scientific exchange met the aim of human resource development set in the project. Over 110 person times of Chinese experts, technical professionals and administrative persons attended the annual workshopsto review the progress and discuss the work plan, and participated the training sessions for laboratory examination in Seoul.

Similar person times of Korea experts and administrative staff conducted more than 40 times of site visit to supervise the implementation and delivery on spot training to the local professionals.

The project board consisting of competent expertise and administrative leaders from both countries played a crucial role in evaluation, supervision, coordination and reporting of the project implementation. The KOICA Representative Office in Beijing and KAHP have made great efforts together with Chinese partners to organize and coordinate the shipment of equipments and anthelmintic drugs, fund delivery, annual workshops, training activities and site visit in pilot areas. All these strong input has made the project smoothly completed with significant achievements.

## Achievement of the KOICA project

The chemotherapy with praziquantel is the principle measure for the control of helminthiasis, and applied in different strategies in the project provinces. A total of 136,386 fecal examinations have been carried out, 50,439 residents treated, 28,005 human serum samples tested by ELISA assay for understanding transmission status and capacity development, 6,130 individuals examined by ultrasound scanning for morbidity estimation, and 4,491 questionnaires performed to investigate the intestinal trematode transmission factors.

Health education has been carried out when the fecal examination and treatment were being delivered in the pilot areas by means of propaganda slogans, TV, VCD, broadcasting, billboards to enhance the public awareness and self-protection. The villagers were encouraged to change unhealthy habits.

Technical training is of great importance for human resources development through the project. The training was conducted in the annual training workshop, the site visits of Korean Experts, the review meetings with the implementation teams in the provinces

and the practice in the field. The technical training has been fruitful indeed to the professionals at all levels. It is believed the training in knowledge and techniques is one of the major achievements of the project.

### **1. Food-borne helminth infection(*Clonorchis sinensis*) control in Heilongjiang Province pilot areas**

Heilongjiang province is located in the far northeast of China with an area of 454,000 km<sup>2</sup> and a population of 37.92 million.

The province possesses rich water resources with 5 main rivers and two big lakes, where the first and the second intermediate hosts of clonorchis are prevalent. Most of the environment around the water is favorable to clonorchis transmission. The toilets are simple and the feces are used as fertilizer without any sanitation process. The residents often feed cats or dogs with small fish or fish heads and internal organs, which makes the reservoir animals heavily infected. When it rains, the water body is contaminated by the human and animals feces, and the *Clonorchis* transmission persisted.

The human infection of *Clonorchis* is caused by traditionally eating raw fish infected with *clonorchis metacercaria*. Therefore, clonorchiasis has been highly endemic in some parts of the province with prevalence high up to 80% recorded in the baseline survey of the project in some places, especially where Korean ethnic group is densely populated.

The field survey in Heilongjiang project areas provided evidence of local transmission that the 1<sup>st</sup> intermediate host snails were found and high infection rate in the 2<sup>nd</sup> intermediate host fish was confirmed. Moreover, over 50% pigs and dogs were found to be *clonorchis* positive in a sampling survey.

To develop an optimal control strategy, the different control strategies were applied in 9 pilot site groups in 3 counties. The sites were selected in high and moderate endemic areas according to a baseline survey, the pilot site are listed below.

In the high endemic area (prevalence 45–70%)

Group 1, no intervention (Ctrl 1)

Group 2, once in two years drug treatment for all people (1/2y)

Group 3, once a year treatment for all people (1/y)

Group 4, once a year treatment for positive cases (1s/y)

Group 5, twice a year treatment for positive cases (2s/y)

Group 6, once a year treatment for positive cases and reservoir host (1s/y)

In the moderate endemic areas (prevalence 23–28%)

Group 7, no intervention (Ctrl 2)

Group 8, once in two years treatment for positive cases (1s/2y)

Group 9, once a year treatment for positive cases (1s/y)

During the project period, a total of 134,343 villagers were examined for fecal clonorchis eggs, 49,966 villagers treated with praziquantel (Shin Poong Pharm.Co.), 23,765 serum samples tested by ELISA assay for understanding transmission status, and 6,130 individuals were examined by ultrasound scanning as an approach to estimate the morbidity.

It was demonstrated through the control activities that chemotherapy with praziquantel (oral total dose 75 mg/kg given by 25 mg/kg, 3 times/person/day) either to the whole population or the positive cases is effective to significantly reduce the prevalence in 4 years in comparison with the control group receiving no intervention (Fig 1–2). It is noticed that twice a year selective chemotherapy in high endemic area showed a reduction rate of 92%, and once a year selective chemotherapy in moderate endemic area resulted in a reduction of 83%. However, chemotherapy even once in two years in high endemic area also gained 73% reduction rate.

The data analysis showed that higher prevalence was seen in groups of age ranging from 30 to 50, and in male residents.

According to the experience obtained through the project, an optimal control strategy for clonorchiasis may be selected based on the endemicity of the disease, the resources



available and the cost-effect balance in the area concerned. A small baseline survey may be helpful for the decision making. It is believed that the control program supported by the KOICA project generated good models for sustainable control in the future.

ection rate of parasites was 80.2% while the infection rate of *Ascaris lumbricoides*, hook worms, *Trichuris trichiura*, *Enterobius*

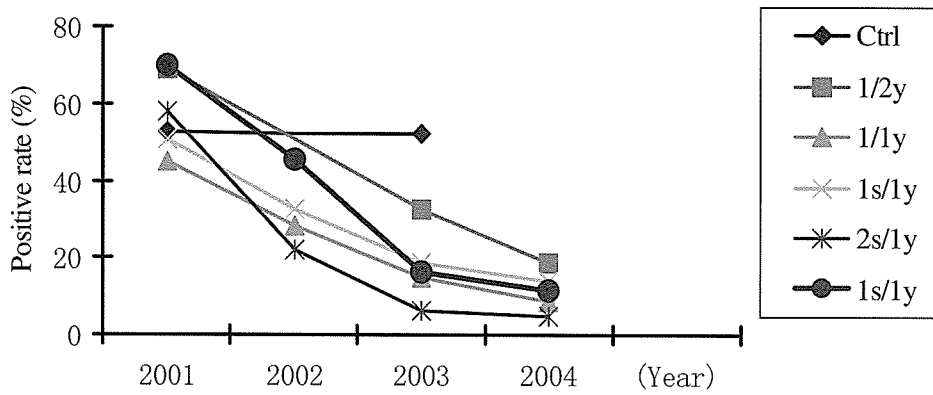


Fig 1. Egg positive rate of C.s in intervention and control groups in high endemic groups

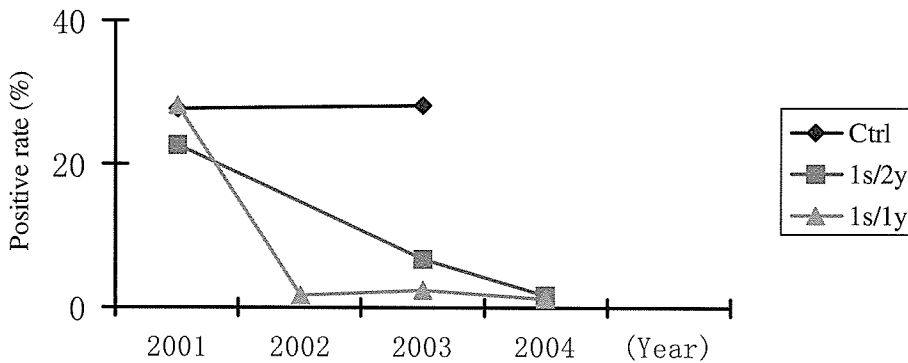


Fig 2. Egg positive rate of C.s in intervention and control groups in moderate endemic groups

## 2. Soil-transmitted helminth (*Ascaris lumbricoides*) control in Jiangxi Province

Jiangxi Province is located in the east of China and to the south of middle and lower reaches of Yangtze River. It covers an area of 160,000 km<sup>2</sup> with total population of 42.12 million. As a subtropical area, the annual average temperature is 16–20°C with 240–330 days frost-free and 1,200–1,900 mm rainfall. Rice production is the major component of agricultural activities in the province. The climate, natural environment and production are suitable for the transmission of helminthiasis and thus make the province one of the major endemic areas of helminthiasis in China.

According to the first national survey of human parasitic infection in 1989, overall infection rate of parasites was 80.2% while the infection rate of *Ascaris lumbricoides*, hook worms, *Trichuris trichiura*, *Enterobius vermicularis* was 71.1%, 17.6%, 17.0, and 19.6% respectively in Jiangxi province. The highest infection rate was found in children under age of 14. In 1999, a site survey showed that the overall infection rate of intestinal parasites in the villagers was still as high as 72.5%, and the infection rate of *A. lumbricoides*, hookworms, *T. trichiura* was 50.9%, 33.4% and 11.4% respectively. The high prevalence of helminthiasis was attributed mainly to the poor environment condition in the village and inappropriate habits of the villagers.

The different control strategies, i.e., mass chemotherapy or selective chemotherapy at different interval of time, were applied to the pilot villages to observe the effects of intervention (Table 2). The chemotherapy was applied using albendazole

In the high endemic area (prevalence 41–49%)

Group 1, no intervention (Ctrl 1)

Group 2, once in two years drug treatment for all people (1/2y)

Group 3, once a year treatment for all people (1/y)

Group 4, once a year treatment for positive cases (1s/y)

Group 5, twice a year treatment for positive cases (2s/y)

In the moderate endemic areas (prevalence 21–29%)

Group 6, no intervention (Ctrl 2)

Group 7, once in two years treatment for positive cases (1s/2y)

Group 8, once a year treatment for positive cases (1s/y)

Group 9, twice a year treatment for positive cases (2s/y)

During the project period, 10 species of intestinal helminthiasis were identified, i.e., *Ascaris lumbricoides*, hook worms, *Trichuris trichiura*, *Fasciolopsis buski*, *Clonorchis sinensis*, *Enterobius vermicularis*, *Opisthorchis felinus*, *Metagonimus yokogawai*, *Heterophyes heterophyes* and *Schistosoma japonica*.

A single dose of 400 mg of albendazole ( Shin Poong Pharm.Co., Korea ) was given to the residents of 2 to 65 year old. A single dose of 40 mg/kg of praziquantel ( Shin Poong Pharm.Co. ) was given for the treatment of schistosome infection. At the same time, other trematode infection was also treated with praziquantel when found.

In the pilot sites, a total of 71,069 residents were examined for fecal helminth eggs, 23,286 people treated with anthelmintics, and 10,026 human serum samples were tested by ELISA assay.

It was observed that the strategy of mass chemotherapy once a year showed the highest reduction rate (86.1%) of ascaris infection (from 45.2% in 2001 to 6.3% in 2004) in high endemic area and the selective chemotherapy twice a year leading to a reduction rate of 69.3% (from 27.4% in 2001 to 8.4% in 2004) in moderate endemic area. Meantime, it was noticed that the chemotherapy once every other year could obtain a reduction rate of 76% and one selective treatment every other year a reduction rate 59%, The *T. trichiura* infection rate in this area was found to be considerably high ranging from 11 to 39%. After initiation of the project, the prevalence of *T. trichiura* infection was brought down significantly in all villages 4 years. In the sites with selective chemotherapy twice a year, the reduction rate of *T. trichiura* infection was 88.2% and 82.1% respectively. In other two villages, where the selective chemotherapy was delivered once a year, the reduction rate was 57.1% and 58.8% respectively. In one site, where mass chemotherapy was applied once a year, the reduction rate was 54.9%. The results suggest that the strategy of selective chemotherapy twice a year showed better effect for control of trichuris transmission. On the other hand, mass chemotherapy

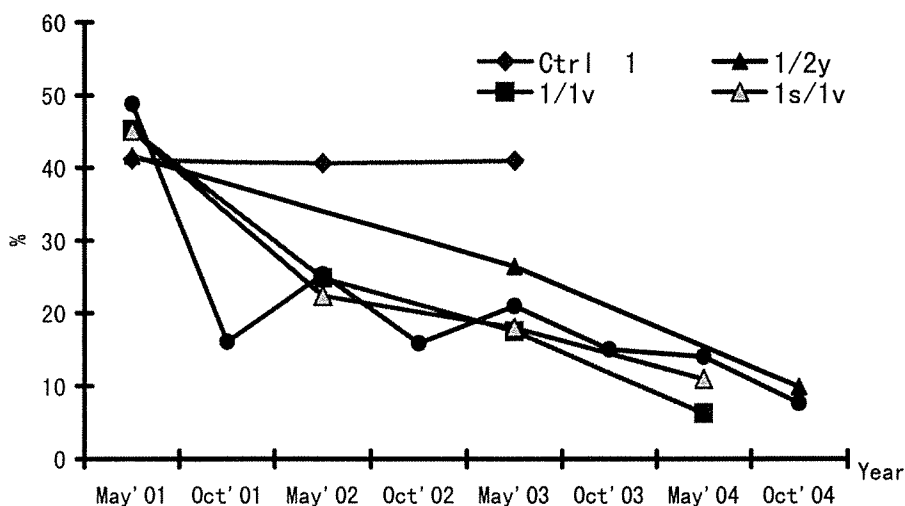


Figure 3. The change of Ascaris infection after intervention in high endemic villages

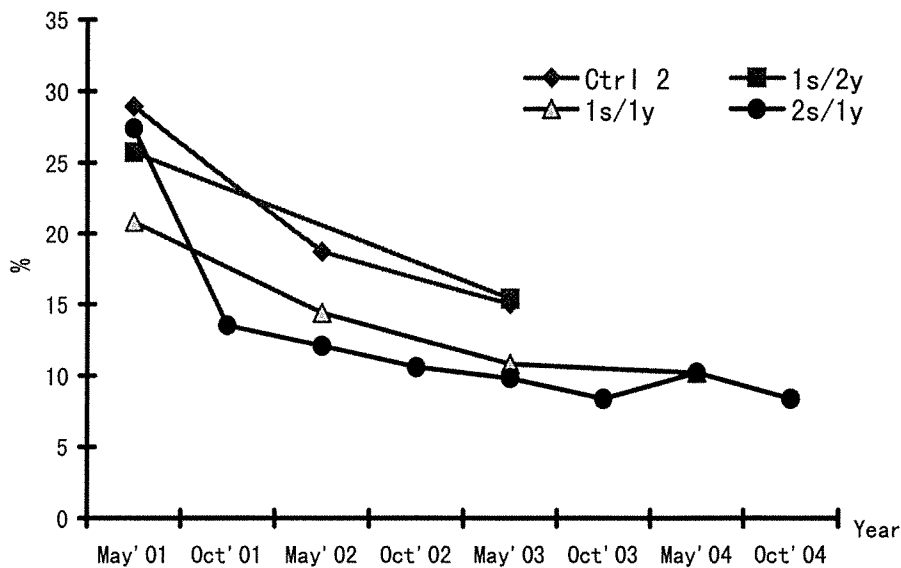


Figure 4. The change of Ascaris infection after intervention in moderate endemic villages

once a year and selective treatment once in every other year also showed significant reduction in prevalence.

The hook worm infection differs from place to place. The prevalence in 7 sites were lower than 3%. In One site, the infection rate was reduced from 18.5% to 1.3 (93% reduction) by chemotherapy twice a year. However, another site where no intervention was taken, the infection rate was maintained at 10% after 4 years.

Therefore, it was shown that chemotherapy is an effective approach to reduce the prevalence soil-transmitted helminth infection markedly in 4 years (Fig 3-4). Mass chemotherapy may be applied in high endemic areas, while selective chemotherapy in moderate endemic areas. Obviously, the decision for the control strategy may be made based on the level of prevalence, recourses available, community cooperation and the cost-effect consideration.

Guangxi Zhuang Autonomic Region for Clonorchis and other food borne parasite infections.

### **3. Control of Clonorchis and intestinal trematode infections in Guangxi Zhuang Autonomic Region**

Guangxi is located in the south of China, with an area of 236,000 km<sup>2</sup>.

It is in subtropical zone with the humid climate, abundant sunlight, and high temperature. The annual average temperature is between 16.C<sup>o</sup>-23.C<sup>o</sup> all over the province, the highest up to 37C-39.C in most of places, and over 40.C in some places. The average rainfall is about 1100-2800mm with 70-80% in the late half year. The humid and warm climate is very suitable for the transmission of human parasite and breeding of intermediate host, therefore, some human parasite infection are spread in the province.

In Guangxi there are 12 minorities including Zhuang, Han, Yao, Miao, Dong, Molao, Maonan, Jiu, Hui, Shui, Yi, Gelao, and 12 minority autonomous counties, 62 minority townships. The total population reported in 2002 is over 4.8 million of which Zhuang

minority is over 1.6 million that is the largest one of the 55 minorities in China.

The collaborative project in Guangxi focuses on the food borne helminthiasis control, including clonorchiasis, taeniasis and intestinal trematode infections. This is based on the fact that in Guangxi many minorities' peoples have a tradition to eat raw fish, pork, pig liver, pig blood, beef, and snake blood. Furthermore, some minority residents share the same house with domestic animals.

The investigation was carried out in 13 pilot sites with high prevalence of clonorchiasis and taeniasis

Total 13 pilot sites with a population about 40000 have been covered. During the last 5 years, Korean experts have visited the most of study sites

During the 5 years, 2043 stool specimens were examined with Kato-Katz in Mashan, Yongning, Rongshui, Fushui and Hengxian County (Table 1)

**Table 1. Results of stool examination of intestinal helminthes in Guangxi (2001-2004)**

County	No. examined	Clonorchis No.(%)	Ascaris No.(%)	Trichuris No.(%)	Hookworm No.(%)	Tapeworm No.(%)	Total No. (%)
MashanA	215	58(26.98)	102(47.44)	43(20.00)	7(3.25)	0	146(67.91)
MashanB	415	58(14.00)	272(65.54)	209(50.36)	20(4.82)	0	346(83.37)
Yongning	215	72(20.11)	35(9.78)	11(3.07)	18(5.03)	0	115(32.12)
RongshuiA	394	0(0.00)	242(61.42)	188(47.72)	52(13.20)	46(11.67)	308(78.17)
RongshuiB	224	0(0.00)	126(56.25)	149(66.52)	14(6.25)	8(3.57)	184(82.14)
RongshuiC	71	0(0.00)	31(43.66)	25(35.21)	0(0.00)		47(66.20)
FushuiA	142	71(50.00)	3(2.11)	1(0.70)	10(7.04)		78(54.93)
FushuiB	224	20(8.93)	56(25.00)	21(9.38)	26(11.61)	0	126(56.25)
Total	2043	279(13.66)	867(42.44)	647(31.67)	147(7.20)	54(2.64)	1350(66.08)

All 279 egg positives of *Clonorchis sinensis* and/or intestinal helminthes were firstly treated with 10mg/kg of praziquantel, and some feces samples were collected for obtaining the adult worms for species identification. After collection of the fecal samples a total dose 75 mg/kg of praziquantel was given to all the case of clonorchiasis.

To control the parasitic diseases, identification of parasite and its transmission should be identified.

Investigation on intestinal trematodiasis has been carried out in two counties where

prevalence of clonorchis infection was found to be 30.94%. During the project investigation, *Haplorchis taichui* was first time identified in the two counties, Mashan and Fushui. After study on the morphology, Korean and Chinese experts identified the worm as *Haplorchis taichui*. The average size of the worm is  $0.499-0.662 \pm 0.249-0.307$  mm. The worm is pear like in shape with an oral sucker and a procreate sucker, and other morphological characters.

To confirming the local transmission of the parasite, more than 40 species of fish suspected as the second intermediate hosts of *Haplorchis taichui* were caught from the river and ponds in Mashan, Fushui, Yangsuo and Nanning county, most species of them were infected with *Haplorchis taichui*.

The studies on *Taenia asiatica* has been carrying on since 1998 in KAHP-IPD/China CDC NGO program in, Luzhai County, Guangxi where people have a the habit of eating raw pig liver.

Based on the results of morphological observation, animal infection experiments and investigation at molecular level, Korean and Chinese experts confirmed that the taenia found in Luzhai, Guangxi is *Taenia asiatica*, which is for the first time the species was identified in mainland of China.

During the past 5 yeas, several surveys were performed in other minority areas, however, it is unclear yet whether *Taenia asiatica* exists in other areas. It is recognized that further investigation would be important to understand the epidemic of the parasite.

Furthermore, 8922 human serum samples were analyzed by ELISA, 4491 people were visited with questionnaire.

The implementation of the project in Guangxi provided another strategy model for the area where intestinal parasitic infections are prevalent.

#### **4. The consummation of the project**

The KOICA project is reaching to the end point this year with great success and strengthened friendship between the two sides:

The Chinese implementation team would like to express our gratefulness to the crucial funding assistance for the large scale control project contributing to the improvement of

people's health in the endemic areas, and enhancing the institutional ability to control the parasitic diseases. The equipments supported to the local areas played an irreplaceable role in the implementation.

The KOICA Representative Office in Beijing and the KAHP has devoted a great deal of efforts technically and administratively in initiation and successful operation of the project.

It is impressed that the Korea expertise has made prominent contribution to the development and consummation of the collaborative projects in recent 10 years. We would like to extend our sincere appreciation to all the Korea experts involving in the collaboration, and wish we will continue the close linkage working together forward to a common goal in the years to come.