



Folkhälsomyndigheten

## **Sino-Swedish Bilateral Cooperation on Management of Antibiotic Resistance**

### **Final Narrative Report**

#### **1. Executive Summary**

The problem of increasing antibiotic resistance is not only a local problem to be handled on a national level. It is a global threat that requires both joint political commitments and research collaboration between nations in order to take adequate measures leading to long-term sustainable results.

The importance and benefits of cross national cooperation between China and Sweden on this issue was discussed at a ministerial meeting as early as 2008 and in 2009 a Sino –Swedish working group consisting of experts in the field of antibiotic resistance was formed. A cooperation framework was drafted in 2010 which later formed the basis for the Plan of Action for the period 2011-2014 that was signed by the Chinese minister of health and the Swedish minister for Elderly Care and Public Health.

The objectives of this project sprung from the thematic areas specified in the Plan of Action. The objectives were subsequently realized as subprojects. This process demonstrates the importance of collaboration between political commitment, joint action and research interest.

The focus and scope of the different subprojects have shifted somewhat during the three years of the project implementation period, 2011-2013. This report includes the five subprojects that have been successful, achieved results and have submitted final reports to the Public Health agency of Sweden (former Swedish Institute for Communicable Disease Control).

The greatest challenges of this project were met in the initial phase when developing completely novel relations and finding ways to cooperate as well as solving logistical challenges. But what started out as the biggest challenge proved to be the biggest gain in the end. Some of the relations built and experiences gained during this cooperation have led to the development of a new project that will start in 2014 with grants from the Swedish Research Council and the National Science Foundation of China (NSFC). This new research project has the aim to gain knowledge regarding the factors influencing transmission-dynamics and dissemination routes of antibiotic resistance between different sectors, in order to create possibilities to combat the problem of antibiotic resistance (humans, animals, food and the environment will be included).

Several of the subprojects now have plans for further collaboration and are actively seeking funding to ensure a sustainable continuation and development of the work initiated.

## **2. Purpose and Objectives of the project**

China's political commitment to health care system reform was declared at the highest level when President Hu Jintao stated in October 2006 that all Chinese people should have access to affordable essential health services. The main objective of this reform is to provide universal coverage of basic health care by the end of 2020. Many changes have taken place within this framework, helped by the positive economic development– changes with direct implications for health policies concerning the access, affordability and rational use of medicines.

A Memorandum of Understanding in the healthcare field has been part of the bilateral contacts between China and Sweden since 2006.

During the visit of the Swedish minister of public health, Ms. Maria Larsson to China in September 2008, the topic of antibiotic resistance was discussed as an important global health problem and as such an interesting area for Chinese-Swedish collaboration. The Chinese minister of health, Dr. Chen Zhu, proposed a meeting involving representatives from the two countries. The purpose of the meeting was to develop new strategies to manage antibiotic resistance. This was to be done by stimulating an exchange of knowledge and scientific collaboration between the two nations.

The meeting was followed by a second ministerial meeting held in Beijing in April 2009. At this meeting technical experts from both countries met and shared experiences and a Sino-Swedish working group was formed.

In March 2010 a Chinese expert group spent one week in Sweden and met with representatives from the Swedish Institute for Communicable Disease Control well as with scientists and clinicians from the Karolinska Institute, Karolinska Hospital, Uppsala University, local Strama-groups, the Swedish Medical Products Agency and the Uppsala Monitoring Centre. At this working group meeting in Sweden, a cooperation framework was drafted, specifying areas jointly identified as particularly interesting for bilateral cooperation. This cooperation framework then formed the basis for the Plan of Action for the period 2011-2014 that was signed by ministers Chen Zhu and Maria Larsson in Shanghai on 13 October 2010.

The aim of the project was to support the development and execution of joint activities i.e. subprojects, in line with the thematic areas of the Plan of Action for the period 2011-2014.

The thematic areas were:

- To promote public education and information promotion on the rational use of antibiotics.

- To promote investigation among medical facilities on the current situation of bacterial drug-resistance and the rational use of antibiotics.
- To promote research on direct and indirect socio-economic costs of antibiotic resistance.
- To jointly promote the development of national guidelines on the rational use of antibiotics and bacterial drug-resistance.
- To promote joint research on the epidemiology of drug-resistant bacteria (including drug-resistant surveillance), the mechanism of bacterial drug-resistance, and the control of drug-resistant bacteria.

The original objectives in the application were the following:

- Support the development of an educational model on antibiotic use and antibiotic resistance targeting schools in China and Sweden;
- Support the development of a new model to assess the socioeconomic costs of antibiotic resistance;
- Support bilateral exchange and training activities on the surveillance of antibiotic resistance and consumption;
- Support bilateral exchange and training activities on laboratory methodologies and microbiology;
- Continue to share knowledge and deepen relations in the Sino-Swedish working group.

In 2011 a request to redistribute funds was submitted to Sida, since the objective to support the development of a new model to assess the socioeconomic cost of antibiotic resistance and consumption was deemed not feasible.

A Results framework matrix for the project as a whole and the subprojects was developed during 2012 with support from a consultant at the request of Sida. This resulted in some additional expected outcomes, the most important can be found listed under 3.6. Realization of the expected outcomes. The results framework matrix can be found in Appendix 3.

### **3. Project wide results (by objective)**

The objectives presented above resulted in five different subprojects, all of which have been successful and produced results valuable in the continued strive towards effective measures combat antimicrobial resistance. These results are described below on a subproject level, by the project managers.

Results for the project cooperation as a whole relate to the last objective that states the importance to continue to share knowledge and deepen relations between the Sino-Swedish cooperation partners. This objective was successfully met by the fact that the relations created by this cooperation have led to a new collaborative project involving some of the partners of

this project. The title of the new project is Sino-Swedish Integrated Multisectorial Partnership for Containment of Antibiotic resistance (IMPACT), it starts in 2014 with grants from the Swedish Research Council and the National Science Foundation of China (NSFC).

A number of activities have been implemented to meet the objective to establish and deepen sustainable relations between the Chinese and Swedish collaboration partners, most important are perhaps the project meetings and workshops.

- The first project meeting was held in Hangzhou, Zhejiang province, in April 2011. Both the original projects and new ideas were discussed between representatives from the subprojects and invited stakeholders from the healthcare and pharmaceutical sectors.
- In September 2011, the Sino-Swedish working group met again in Beijing, to finalize and initiate the revised subprojects. This meeting brought together the full working group. The subproject groups developed work plans and the practical implementation of the respective collaborative projects.
- A workshop was organized by the Chinese coordinator in Hangzhou in June 2012 and the 2012 annual meeting was arranged in Stockholm in November.
- A meeting was held in Stockholm in June 2013. This meeting was also an opportunity for those involved to discuss the continuation of the project after Sida financing.
- The 2013 annual meeting was held in August in Qingdao. Many of the subprojects had at the time reached results that were presented.
- The final stakeholder conference was held in Beijing in December 2013. The conference aim was dissemination of experiences and results from the cooperation. In this meeting not only the Chinese and Swedish ministries of health were represented but also Sida and the future Chinese funding agent NSFC. Further were several other actors working with the containment of antibiotic resistance represented, e.g. China CDC, the China Agricultural University, Fudan University and Peking University in addition to partners involved at all stages of the project progress.

Further results which are presented more in detail below may be summarized as increased awareness among researchers, prescribers and the public of the threat of antibiotic resistance and importance of prompt initiatives to contain it; increased knowledge on the resistance situation in healthy rural individuals as well as in urinary tract infection patients and in tertiary hospitals. Increased knowledge has also been obtained on antibiotic use as analysis of prescription data as well as with regards to knowledge, attitudes and behavior in relation to antibiotic use.

Another important achievement has been a first step towards more cross-sectorial communication and cooperation in relation to the antibiotic issues. E.g. has the Antibiotics in Education for sustainable development- AB-ESD project promoted and enabled such increased communication between the Chinese ministry of Health and the Ministry of Environmental Protection.

Further has the resulting demonstrated high resistance levels in healthy individuals provoked the demand for more information on the factors important for transmission of antibiotic resistance

between the environment, food, animals, community and healthcare. Contacts have been taken across sectors and an important knowledge exchange and collaboration have consequently been initiated.

### **Results on a subproject level (reported by the subproject leaders themselves):**

#### **3.1. Antibiotics in Education for sustainable development- AB-ESD**

Before the development of AB-ESD there were very few examples of organized education on the rational use of antibiotics. There was for instance information material from Strama in Sweden and the “e-Bug” provided by EU, but no examples of long term integration of education in schools and preschools on the rational use of antibiotics. Also, WHO never mentioned sustainable development in its strategies for the containment of antibiotic resistance, and UNESCO did not include antibiotics in the health theme of education for sustainable development.

AB-ESD is a stepping stone towards integrating antibiotics into global concepts for sustainable development, and is also a cost efficient tool for time saving promotion through the global networks for ESD, for instance through the Foundation for Environmental Education (FEE), which is an umbrella organization of 65 member countries. This process would most likely not have been initiated without AB-ESD.

The major expected results of the project have been reached, with some minor exceptions, like the number of post-implementation surveys collected.

The surveys collected show that there is a self-reported increased knowledge and behavior change among the participants of the project, including the knowledge that antibiotics is useless for curing common colds, and a reduction of buying antibiotics over the counter and an increase in obtaining antibiotics at hospitals.

The development of AB-ESD has also catalyzed the cooperation between the MEP and the MoH in China,

#### **3.2. Antibiotic prescription, utilization and prevalence of ESBL in healthy subjects in Shandong province**

The project consists of two parts, one investigating the attitudes and behaviours among prescribers in the rural areas of Shandong and one studying the prevalence and risk factors of faecal carriage of ESBL-producing *Enterobacteriaceae* in rural communities in Shandong province.

All the proposed studies were carried out within the scope of the project.

It was assumed to exist a discrepancy between doctor’s attitudes and practices regarding antibiotic prescribing. To evaluate this assumption doctors from county hospitals, township health center’s and village clinics were investigated by a self-completed questionnaire in three purposely-selected counties to present their attitude on antibiotic use. In addition prescriptions with the diagnosis of common cold out of randomly sampled prescriptions from the above rural

health institutions were analysed to assess the relationship between doctors' self-reported prescribing behaviour and antibiotic use.

A substantial gap was found between doctors' attitudes and practice regarding antibiotic prescribing, where attitudes were in line with recommendations whereas practice showed a high inappropriate prescribing of antibiotics for the common cold.

The prevalence of carriage of ESBL-producing *Enterobacteriaceae* in the counties was estimated beforehand to be 10% in the calculations of sample size. The study was conducted in 2012 in the rural Shandong Province, located in the eastern part of China. Eighteen villages were selected as study sites using a multistage sampling based on the vertical administrative structure in rural China. The GDP per capita 2011 was in Jiaonan County located in the eastern part USD 12,131, Ningyang County in the central part USD 4,591, and Yanggu County, in the western part, USD 3,854. In total 1000 faecal samples from rural residents were included. All participants were interviewed using a standardized questionnaire. The key variables for each participant were age, gender, education, number of persons in the household; annual household income; consumption of raw vegetables; household water supply, antibiotic usage in the previous year, admission to hospital in the past five years and invasive procedures during the previous year.

The faecal carriage in Jiaonan, Ningyang Yanggu was 52%, 31%, 45%, respectively. This is an extremely high carriage of ESBL-producing *Enterobacteriaceae*. The corresponding carriage in Sweden is approximately 4%. Preliminary analysis of risk factors indicates that previous antibiotic consumption and hospital stay is risk factors for carriage of ESBL-producing *Enterobacteriaceae*. The carriage was highest in the county with the highest income. This could possibly be due to higher antibiotic consumption.

The alarmingly high faecal carriage of multi-resistant ESBL-producing bacteria indicates that the most commonly prescribed antibiotics are not optimal for treatment and will most likely affect the treatment options of infections for the people in the rural area of Shandong.

The end result of the project is to provide basic information and methods for establishment of a monitoring and evaluation system for antibiotic utilization and resistance patterns in rural China and to thus provide recommendations to improve rational antibiotic use.

### **3.3. Prevalence of ESBL producing *Escherichia coli* and pneumonia in primary health care patients with UTI.**

The purpose of the project was to provide basic information on the difference in prevalence and resistance mechanisms in patients with urinary tract infections (UTI) in primary care centres in different areas in China and Sweden.

All the proposed studies were carried out within the scope of the project.

The prevalence of ESBL producing *E. coli* and *K. pneumoniae* in primary care patients with UTI were studied at 4 centres in different provinces of China and in the County of Östergötland, Sweden. ESBL producing *E. coli* were detected in 39% of the patients in China and among 29%

of the patients with *K. pneumoniae*. Corresponding figures in the County of Östergötland was 2.4 and 2.5%.

In China the high prevalence of multiresistant ESBL producing *E. coli* in primary care were found to be at a level similar to the high levels found in hospital treated patients. This indicates that the most commonly prescribed antibiotics are not optimal for treatment of patients with urinary tract infections in the primary care.

This study also showed that there is a rising proportion of a certain resistance mechanism gene called bla<sub>CTX-M-55</sub> both in both humans and animals. This implies two possibilities. One is the possible transmission of the pathogen, which carried the gene or the gene itself between human and animals or transmission of ESBL genes through the food chain.

### **3.4. Comparative study on antibiotic prescribing in Sweden and China.**

Many studies indicated that China had a high prescribing rate of antibiotics, and the most commonly used antibiotics for inpatient care in China were broad-spectrum antibiotics. In Sweden, a more reasonable use of broad-spectrum antibiotics has been the government's objective.

Antibiotics have been less frequently prescribed in the Chinese public general tertiary hospitals since 2008 due to continued government efforts in strengthening the regulation during 2002-2011, especially the 2011 nationwide initiative to promote the quality of antibiotic use. Continuity and consistency of these interventions are still needed. Although overuse of antibiotics has been contained or improved there are still huge gaps when compared to the countries where antibiotic use is well controlled and antimicrobial resistance is well contained. Further in-depth efforts are needed to address the potential perverse incentives in the Chinese health systems in order to better promote the quality of antibiotic use in its public hospitals.

Even though the use of antibiotics have decreased in Chinese tertiary hospitals since 2008, 50% of all hospitalized patients received antibiotics in 2012, compared to 34% in Sweden. The level of total consumption was 473 DDD/1000 patient days in Chinese hospitals compared to 588 in Sweden. These reverse results can possibly be explained by differences between the two countries, such as different health service delivery systems (primary care as a gatekeeper of hospitals specialist care does not exist in the Chinese settings), different prescribed doses, and different mean length of stay for hospitalized patients.

The proportion of different classes of antibiotics showed that in China the consumption of broad spectrum antibiotics still dominates, compared to Sweden where the most used antibiotics were penicillin's. For example, in 2012 the proportion of penicillin's (J01C) of the total antibiotic use (DDD) in China was 11% and in Sweden 45%.

Administration route is another way of measuring prescribing patterns. Proportion of inpatient medical records with parenteral antibiotics was 46% in China, compared to 15% in Sweden. Proportion of outpatient prescriptions with parenteral antibiotics was 2% in Chinese hospitals (although emergency and pediatric wards were excluded in the Chinese data) compared to almost zero in Swedish hospitals.

The research objective to analyze and compare the patterns of hospital antibiotic use between China and Sweden will hopefully provide policy recommendations on antibiotic regulatory mechanism to the Chinese policy makers.

### **3.5. Investigation among medical facilities in China and Sweden on the current situation on bacterial drug-resistance and the rational use of antibiotics.**

Before the project started, the Chinese MoH had taken four major administrative interventions for the improvement of the rational use of antibiotics and antibacterial resistance, including principles for clinical use of antibiotics (2004), regulations for the management of nosocomial infections (2006), recommendations for enhancing the prevention and control of multidrug resistant bacterial infections (2008), and guides for hospital drug therapeutic committee (2002). However, due to strained resources, insufficient enforcement, absence of supervision and inspection, and inefficient implementation plans, these policies and strategies were not successful. We believe that our project to investigate the current situation on bacterial drug-resistance and the rational use of antibiotics in tertiary hospitals in China and Sweden has contributed to the establishment and implementation of the new mandatory administrative strategies for the rational use of antimicrobials in hospital settings which was introduced by the Chinese MoH in March 2011.

### **3.6. Realization of expected outcomes.**

The results of the project and of the subprojects have realized practically all of the expected outcomes outlined in the application. The expected outcomes of the project were the following:

- Increased common knowledge regarding antibiotic use and antibiotic resistance among Chinese and Swedish citizens, in particular children.-**Achieved by the Antibiotics in Education for sustainable development- AB-ESD project.**
- Increased knowledge about the socio-economic burden of antibiotic resistance i.e. increased mortality, increased morbidity, changes in the use of healthcare resources and increased overall healthcare costs.- **Deemed not feasible and funds were redistributed**
- An improved scientific basis for several approaches to improve the use of antibiotics and to contain antibiotic resistance.- **Different aspects of this expected outcome were achieved by all projects apart from the Antibiotics in Education for sustainable development- AB-ESD project that did not have this as an expected outcome.**
- Establishment of a structure for local collaboration regarding antibiotic policy in a provincial setting in China.-**Achieved by the Antibiotic prescription, utilization and prevalence of ESBL in healthy subjects in Shandong province project.**
- Increased and deepened contacts between Chinese and Swedish researchers and agencies that can benefit further collaboration between the countries.-**Achieved by the project as a whole.**

### 3.6.1 Additional expected outcomes in Results Framework from 2012:

- The AB-ESD establishes the first structure for multidisciplinary cooperation between authorities in charge of ESD and health authorities for large scale outreach of knowledge on rational use of antibiotics to the public.  
Increased knowledge from pilot is used in concept for broader implementation of AB-ESD-**Achieved and continuing by the Antibiotics in Education for sustainable development**
- Pilot project implemented and evaluated in 3 pre-schools, 12 schools, and 5 green communities in each of 3 cities in China, in total 60 entities in China involved, and 30-50 schools and preschools in Sweden-**Achieved by the Antibiotics in Education for sustainable development- AB-ESD project.**
- Primary Health Care study on Urinary Tract Infection patients finalized and analyzed-**Achieved and continuing by Prevalence of ESBL producing *Escherichia coli* and *Klebsiella pneumonia* in primary health care patients with UTI**  
Dissemination and publication of results- **Achieved and continuing by Prevalence of ESBL producing *Escherichia coli* and *Klebsiella pneumonia* in primary health care patients with UTI and Antibiotic prescription, utilization and prevalence of ESBL in healthy subjects in Shandong province**
- Analyze and compare antibiotic prescribing patterns between China and Sweden-**Achieved by Comparative study on antibiotic prescribing in Sweden and China.**
- Identification of areas for improvement and formulation of policy recommendations to China on antibiotic regulatory mechanism based on description of antibiotic consumption patterns in China and Sweden- **Achieved by Comparative study on antibiotic prescribing in Sweden and China.**
- To utilize increased knowledge about AB use and AB resistance to guide development of guidelines for the rational use and prescription of antibiotics- **In process by Investigation among medical facilities in China and Sweden on the current situation on bacterial drug-resistance and the rational use of antibiotics.**

## 4. One concrete example

“It was a really great experience to take part in the workshop arranged by CEEC in Jinan and to learn about the rational use of antibiotics from the Chinese and Swedish experts, presenting the whole concept for us and showing us the teaching material for AB-ESD, which we could use when teaching our students. We all felt very committed to the task and were inspired to work in groups and come up with creative suggestions regarding how to teach our students. It's obvious that we as teachers could play a major role in helping the next generation to understand how to live rationally with antibiotics. Later in the day we received strong support for our work from

the pharmacologists at the hospital. We felt encouraged to go on and teach the knowledge about rational use of antibiotics to our students.”

**Han Wei, Vice-president at Jinan Yanshan School, China.**

## **5. Poverty reduction**

The right to equal care independently on income and/or social status is crucial to poverty reduction. This project might not in itself contribute to poverty reduction neither does it claim to have that as a specific aim. But antibiotic resistance costs lives, money and threatens to undermine modern basic healthcare and advanced medicine. Thus is the work with containment of antibiotic resistance and rational use of the currently available effective antibiotics necessary for a sustainable and equal care in the future.

## **6. Challenges**

The project encountered difficulties initially with regards to financial transaction procedures, several of the projects had a delay in their budget absorption during both 2011 and 2012. This was partly due to the circumstance that the partner institutions did not allow for retrospective reimbursement, available funds were required before activities could start. SMI and subsequently Sida later facilitated advance transfers to these institutions via the Chinese coordinator institution.

Another challenge encountered was that completely new relations had to be built. The involved partners had to lay the groundwork for cooperation, both nationally and internationally. There was also the challenge of communication, which was facilitated by the Annual workshops and Meetings that allowed for face to face interactions.

The different subprojects encountered challenges of various kinds relating to the nature of the project. Examples of that described by the project leaders:

### **6.1. Antibiotics in Education for sustainable development- AB-ESD**

A big challenge in the project has been changes in the budget on the Swedish side. As a solution to this, some activities had to be co-funded by external financial resources and a larger part than planned was co-funded by SMI.

### **6.2. Antibiotic prescription, utilization and prevalence of ESBL in healthy subjects in Shandong province**

One challenge when implementing the project was to obtain material for faecal sampling, this was finally managed by procurement of the material in Sweden and subsequent delivery to China.

Another big challenge was to get permission to send samples from China to Sweden. This was finally solved thanks to great efforts of the Chinese subproject leader but regrettably led to further delays in the project implementation.

### **6.3. Prevalence of ESBL producing Escherichia coli and pneumonia in primary health care patients with UTI.**

A great challenge was to exchange bacterial strains between China and Sweden.

### **6.4. Comparative study on antibiotic prescribing in Sweden and China.**

In China, the biggest challenge of this project was to secure that data collected from different project hospitals across China are reliable. Although all of them have joined the national antibiotic clinical use monitoring network, and report data periodically, the existing data was never validated externally and compared in details with other hospitals. The existing data has until now mostly been used for government inspections and some is even suspected to be modified artificially in order to look good.

In Sweden the biggest challenge of this project was to perform interviews with policy makers and prescribers. This was solved by engaging a medical student during Oct 2013 to March 2014 who has translated and modified the questions plus performed nearly 40 interviews. The answers from these interviews will be analyzed during February-March 2014.

### **6.5. Investigation among medical facilities in China and Sweden on the current situation on bacterial drug-resistance and the rational use of antibiotics.**

To obtain data on antibiotic consumption from the tertiary hospitals was initially difficult but after direct contact with officials at the Chinese MoH and the implementation of the special campaign in 2012 this problem was resolved. However no military hospital is included in the study as they are outside the control of MoH.

## **7. Lessons learned**

This project has led to a better understanding of the situation and the problems related to antibiotics in the respective countries as well as the different ways to handle them. Much has been learned so far and the exchange of information and experience will continue beyond this project.

The importance of understanding culture for a good cooperation has been very clear personal relations are important for a successful cooperation. Also laying a solid groundwork at the project initiation has proved to be crucial for a successful partnership.

## **8. Partner driven cooperation- lead to sustainable relations and**

### **Side effects/ spin off effects**

As mentioned previously the relations formed during this project have led to the development of a new project with some of the present partners, aiming at increased knowledge regarding the transmission-dynamics and dissemination routes of antibiotic resistance between different sectors (humans, animals and the environment). This new project will start in 2014 with grants from the Swedish Research Council and the National Science Foundation of China (NSFC).

## **9. Benefit to the partner organizations**

The benefit to the partner organizations have been substantial. The cooperation has strengthened the relations between both organizations and individuals.

## **10. The thematic priorities and**

### **The perspective of the poor and the rights perspective**

This project started out with the challenge of having to establish new project organizations and activities, but also of having to form basic grounds for cooperation and partnerships. This made it unrealistic to incorporate an active agenda to work for the thematic priorities.

## **11. Collaborating Partners**

Dr Xiao Yonghong, Professor, Chinese State Key Laboratory for Diagnosis and Treatment of Infectious Disease (SKLID), Zhejiang University, P.R. China

Dr Sun Qiang, Associate Professor, School of Public Health, Center For Health Management and Policy, Shandong University, P.R. China

Dr Jing Sun, Senior Researcher, Wuhan University and National Institute of Hospital Administration, Ministry of Health, P.R.China

Ms. Jin Yuting, Centre for Environmental Education and Communications (CEEC), Ministry of Environmental Protection, P.R China

Dr Yu Yong, Associate Professor, the First Hospital Affiliated to the Chinese PLA General Hospital, Beijing, P.R. China

Dr Lennart E. Nilsson, Professor, Department of Clinical and Experimental Medicine, Linköping University, Sweden

Ms. Elisabeth Mühlhäuser, The former Swedish Institute for Communicable Disease Control and Lund University, Sweden

Dr Staffan Sylvan, MD PhD, Uppsala County Council and Uppsala University, Sweden

Dr Malin Grape, PhD, The Public Health Agency of Sweden, Sweden

Dr Karin Tegmark-Wisell, The Public Health Agency of Sweden, Sweden

Ms. Gunilla Skoog, The Public Health Agency of Sweden, Sweden

Ms. Ulrica Dhonhammar, The Public Health Agency of Sweden, Sweden

Ms. Emily Sellström, The Public Health Agency of Sweden, Sweden

Dr Andreas Heddini, The former Swedish Institute for Communicable Disease Control, Sweden

Senior Advisors:

Dr Göran Tomson, Professor, Div Global Health, Karolinska Institute, Sweden. Honorary Guest Professor Shandong University, China

Dr Otto Cars, Professor, The Public Health Agency of Sweden, Uppsala University and Action on Antibiotic Resistance, ReAct, Sweden

## **12. Attachments**

1. Written Financial Report
2. Financial Report, numbers
3. Results Framework Matrix
4. Education Material from the Antibiotics in Education for sustainable development- AB-ESD project.
5. A brief presentation (one-page flyer) presenting the cooperation