

**Second International Conference on Climate Change and  
Neglected Tropical Diseases 2010**  
Hotel Sheraton, Dhaka, Bangladesh

September 29-30, 2010

**Directorate General of Health Services  
Ministry of Health and Family Welfare  
Government of the People's Republic of Bangladesh**

# *Souvenir*

## **Second International Conference on Climate Change and Neglected Tropical Diseases 2010**

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## **2nd International Conference on Climate change and Neglected Tropical Diseases**

### **Theme: Climate change and health - impact on NTDs in Bangladesh**

Date: 29 - 30 September, 2010

Venue: Hotel Sheraton , Dhaka, Bangladesh

Bangladesh is highly vulnerable to natural disasters due to the frequency of extreme climate events and its high population density. Floods and cyclones are some of the major challenges that the country faces resulting in the greatest economic and human losses to the country. Higher temperatures including more extreme weather events, and sea level rise are already evident in Bangladesh. Among the many sectors going to be affected by climate change, the most important ones include water resources, agriculture and food security, ecosystems and biodiversity, and human health. Indeed, it has internationally been argued that Bangladesh, as a country may suffer the most severe impacts from climate change. The targets to achieve the millennium development goals of Bangladesh may be in jeopardy due to the adverse impacts of climate change.

Temperature trends for the daily maximum series and the daily minimum series of the annual and seasonal basis have shown that the overall temperature regime in Bangladesh is showing a rising trend. One estimate is that the average increase in temperature in Bangladesh would be 1.3°C and 2.6°C by the year 2030 and 2075 respectively with respect to the base year 1990. Global warming will increase the intensity of southwest monsoon, which will, in turn, bring about catastrophic ravages like floods and have far reaching consequences on health. During and after floods, the water borne diseases increase due to heavy contamination of the surface water. Thus climate change could cause floods, break-down of sanitation system, and more water and food-borne diseases like soil-transmitted helminthiasis (STH), cholera, and other diarrhoeal diseases.

Bangladesh may be one of the worst hit countries of the world due to a predicted rise in sea level as a result of global warming. The sea level rise (SLR) will inflict its impacts on health of the people living in the coastal area of Bangladesh. About 2,500, 8,000 and 14,000 km<sup>2</sup> of land (with a corresponding percentage of 2%, 5% and 10% with respect to the total land area of the country) will be lost due to SLR of 0.1m, 0.3m and 1.0m respectively. Coastal waters will become more saline and soil salinity will increase with the rise of sea level. Even the ground water aquifers will bear the brunt of salinity intrusion. The increase in salinity in underground water will affect the availability of fresh safe water. As a result, people will be more inclined to

use unsafe, contaminated surface water and will contact various water borne infectious diseases like cholera and other diarrhoeal diseases and STH and snake bite also increases during flood.

Incidence of vector-borne diseases like malaria, filaria, leishmania and dengue are likely to increase as a result climate change in this region. Increase in temperature may provide better environment for breeding of mosquito and sand fly in places where the temperature were previously below optimum. This may increase the human contact with the vectors responsible for spread of diseases like malaria, filaria, leishmania and dengue. Though the surveillance system is very weak with gross under reporting , 13 districts of Bangladesh are known to be endemic for malaria, 34 for filariasis and 45 for visceral leishmaniasis (VL). Dengue has been detected in all six divisional headquarters of Bangladesh whereas STH affects our population throughout the country. Filariasis is a parasitic disease which is believed to have infected about 20 million people, 10 million are with various forms of disability, leaving another 70 million at risk of infection. The incidence of visceral leishmaniasis on the other hand is estimated to be about 12,000 per year with about 65 million people at risk of contracting the disease. Some reports claimed a death rate of more than 10% in patients suffering from VL. About 70000 to 80000 malaria cases and 300 to 700 death cases are reported yearly. Following Global Fund round 6 case detection is increasing and death cases are reduced to around 50 cases in 2009. More than 98% of the total malaria cases in the country are reported from 13 high endemic districts. 10.9 million people are at risk of the disease, The three Hilly Districts (Bandarban, Khagrachari and Rangamati) and Cox's Bazar district report more than 80% of the malaria cases and deaths every year. Plasmodium Falcifarum is responsible for >80% cases. Rabies is also a neglected disease needs to be addressed in the conference.

The Government of Bangladesh in its health policy has targeted three neglected tropical diseases for elimination - lymphatic filariasis, visceral leishmaniasis and soil-transmitted helminthiasis. All of these diseases that affect the poorest of the poor living in remote rural areas of the country, are likely to be affected by climate change as mentioned above. The 2nd International Conference on Climate change and Neglected Tropical Diseases, to be held in Dhaka, Bangladesh on 29 - 30 September 2010 will invite experts from around the world and within the country to discuss the magnitude of the problems and give future directions to face the challenges posed by climate change. Key-note speeches and oral presentations followed by discussions will be shared by scientists, policy-makers, health service providers from government and non-government sectors, and other development partners who are expected to be present in the meeting. The meeting will hopefully become a landmark in the development efforts in the region by sharing knowledge and by fostering a dialogue among the stakeholders to bring a change and save millions facing death or disability due to the NTDs that are mostly curable or preventable.

## MESSAGES

1. Prime Minister  
Government of the People's Republic of Bangladesh
2. Minister  
Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh
3. Advisor to Prime Minister  
Ministry of Health and Family Welfare and Social Welfare Government of the People's Republic of Bangladesh
4. State Minister  
Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh
5. Secretary  
Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh
6. Director General  
Directorate General of Health Services, Government of the People's Republic of Bangladesh
7. Health and Family Welfare Secretary  
Bangladesh Awami League
8. Chairman  
BMRC, and President Bangladesh Medical Association
9. Secretary General  
Bangladesh Medical Association
10. Dean Faculty of Medicine & Chairman Basic Science, BSMMU
11. Chief Representative JICA Bangladesh Office
12. Director  
Disease Control DGHS & Chairman Organizing Committee



## **MESSAGE**

Prime Minister  
Government of the People's  
Republic of Bangladesh

I am happy to learn that the '2nd International Conference on Climate Change and Neglected Tropical Disease' is going to be held on 29-30 September 2010 in Dhaka.

Bangladesh is predominantly vulnerable to natural disasters. This vulnerability has become over-stretched due to frequency of extreme climatic events and high density of population.

Since, sectors like water resources, agriculture, food security, ecosystems and biodiversity are being affected by climate change, their impact will directly be evident on human health.

Bangladesh may suffer the most severe impacts of climate change jeopardizing the achievement of the MDGs.

Rising trend of temperature may increase the human contact with the vectors responsible for spread of Neglected Tropical Diseases like Malaria, Filariasis, Kala-azar and Dengue.

I hope that this international conference of scientists and experts will focus on the background, concerned phases and stages of health hazards as well as measures needed to mitigate them.

I wish every success of the conference.

Joi Bangla, Joi Bangabandhu  
May Bangladesh Live Forever

Sheikh Hasina



## **MESSAGE**

Minister  
Ministry of Health and Family Welfare  
Government of the People's Republic of  
Bangladesh

I am glad to know that Directorate General of Health Services is going to arrange 2nd international conference on Climate Change and Neglected tropical diseases.

Every natural disastrous event faces huge toll of vector- borne or water- borne bacterial, viral and parasitic diseases. Those diseases do not get due privilege, access, attention and mitigating measures at national and international level. The neglected diseases become more neglected with less addressed problems in developing countries.

Bangladesh, a developing tropical country of Southeast Asia directly facing the hardship of natural disasters for long. Flood, drought and cyclones have become the day to day events here. Gradual global warming and sea level rise are the two culprit factors behind natural ravages. The country is one of the worst victims of weather effects. Hon'ble Prime Minister Jononetri Sheikh Hasina raised Bangladesh issues in the Climate Conference known as 15th Conference of Parties (COP15) on climate change and environment. She is in relentless endeavour to face imminent problems of climate change.

So, I must say, the upcoming international conference is very much time demanding that will build up updated knowledge, share expertise, views and visions of international scientists to scale up government efforts to face challenges of climate change.

I wish grand success of the conference.  
Joy Bangla, Joy Bangabandhu  
Long live Bangladesh

Professor Dr. A. F. M. Ruhul Haque





## **MESSAGE**

Advisor to Prime Minister  
Ministry of Health and Family Welfare and  
Social Welfare Government of the  
People's Republic of Bangladesh

I feel proud and pleased knowing that the Directorate General of Health Services is going to arrange Second International Conference on Climate Change and Neglected Tropical Diseases. Impact of climate change on biological systems especially on human health have been documented since years. Altered survival and reproduction rate of the vector and pathogen (parasite, virus) and change in vector activities are the impacts of change in optimal climate condition.

Most of the vector borne diseases considered as neglected tropical disease are filariasis, leishmaniasis, soil transmitted helminthiasis, trypanosomiasis, schistosomiasis, rabies and arboviral diseases (e.g. dengue, yellow fever, japanese encephalitis). Effect of adverse climate on increment of snake bite is already evident. The potential impact of global warming on the transmission of neglected tropical diseases (NTD) did not get sufficient attention from researchers. But, it is alarming that epidemic potential may increase by 12-27% as a direct consequence of higher temperature. Vector borne parasitic diseases are almost full time accompaniment to the low income group people who are not highlighted or properly addressed at national and international level.

Now, the situation demands urgent need to investigate further on potential impact of climate changes for transmission of neglected tropical diseases and to guide the resource constrain countries for prevention and control of NTDs by sharing knowledge and fostering a dialogue among the stakeholders. I expect, the conference will focus pinpoint to find out ways of mitigation and facing effectively the incoming challenges of climate changes on neglected tropical diseases, those are highly predicted to strike Bangladesh.

I wish a brilliant success of the conference.

Prof. Dr. Syed Modasser Ali



## **MESSAGE**

State Minister  
Ministry of Health and Family Welfare  
Government of the People's Republic of Bangladesh

A small country with densely crowded population in Bangladesh has kept the health sector in a challenging situation. Moreover, instable climate and the increasing trends of tropical disease are alarming for the policy makers. Increased intensity and frequency of weather events results huge economic and health challenges for us.

The potential impact of global warming on the transmission of the neglected tropical diseases has not received sufficient attention from researchers. Most studies on the impact of global warming on the transmission of tropical diseases have focused on malaria. Very few studies have been carried out on the neglected tropical diseases, although some reviewers have discussed the situation as regards of vector-borne diseases.

There is an urgent need for researchers to investigate further, the potential impact of climate changes on the transmission of neglected tropical diseases. The findings of such researches are required so that populations can adopt or if necessary, migrate to overcome increased risks for transmission of neglected tropical diseases caused by climate changes. Though most of the neglected tropical diseases are preventable, Government and concerned stake holders will have to sit together for planning and implementation of appropriate control measure.

I do hope, experts from around the world and within the country will think over on development of guidelines on prevention and control of neglected tropical disease and action plan to fight against climate change. I wish grand success of this second international conference on climate change and neglected tropical diseases 2010.

Joy Bangla,  
Joy Bangabandhu.

(Dr. Capt.(Retd) Mozibur Rahman Fakir)



## **MESSAGE**

Secretary  
Ministry of Health and Family Welfare  
Government of the People's Republic of Bangladesh

Bangladesh is acutely affected by neglected tropical diseases. Climate instability might be one of the important reasons behind the higher prevalence of neglected diseases. Contamination of surface water during prolonged droughts, heavy rain and inundation of areas by sea water, river bank erosion and untimely flood have been causing various water borne infectious diseases in humans. Soil transmitted helminthiasis is another neglected event resulting in ill health especially in rural Bangladesh.

The Government of Bangladesh is taking steps to eliminate three neglected tropical diseases, namely, lymphatic filariasis, visceral leishmaniasis and soil-transmitted helminthiasis. Rabies - a 100% fatal and preventable disease has also drawn Government's attention. All of these diseases affect the poorest of the poor, living in remote rural areas of the country and need more care for prevention and control.

I do believe that the 2nd International Conference on Climate Change and Neglected Tropical Diseases, 2010 to be held at Dhaka will identify more on the magnitude of the problems and come up with recommendations in preventing disability and death due to the NTDs that are mostly curable and preventable.

On behalf of Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh, I welcome all the scientists, policy makers and Health Service providers from Government and non-government sectors from home and abroad and other development partners to this Conference.

I wish this Conference a Success.

Md. Humayun Kabir



## **MESSAGE**

Director General  
Directorate General of Health Services  
Government of the People's Republic of Bangladesh

Ecological changes influence disease patterns. A warming and unstable climate has been playing an ever-increasing role in driving the regional and global emergence, resurgence and redistribution of vector borne infectious diseases.

Bangladesh is in a threat with over burdened neglected tropical disease and disasters of climate change. Out of 64 districts, 13 districts of Bangladesh are known to be endemic for malaria, 33 for filariasis and 47 for visceral leishmaniasis (VL). Dengue has been detected in all six divisional headquarters of Bangladesh. Incidences of vector-borne diseases like malaria; filariasis, leishmaniasis and dengue are likely to increase as a result of climate change in this region. Increase in temperature and humidity may provide better environment for breeding of vectors like mosquito and sand fly in areas where temperature were previously below optimum. Thus increasing spread of vector borne diseases which are neglected, needs to be taken care of.

Climate constrains the range of communicable diseases, while weather affects the timing and intensity of outbreaks. The sea level rise (SLR) will inflict its impact on health of the people living in the coastal area. With increasing salinity of coastal waters, the ground water aquifers will also bear the brunt of salinity intrusion and contamination. Thus the availability of fresh safe drinking water is being affected. Contamination of surface water has been leading people to various water borne infectious diseases like hepatitis A, E, cholera and other diarrhoeal diseases.

Second International conference on Climate change and Neglected Tropical Diseases, 2010, will address all such issues for making a way-out and taking scientific step to counter those challenges. On behalf of Directorate of Health Services, I welcome all the participants from home and abroad who are attending this conference to share their experiences and knowledge with our home experts and scientists. I wish all the success of this two days conference.

Prof. Dr. Shah Monir Hossain



## MESSAGE

Health and Family Welfare Secretary  
Bangladesh Awami League

The overall impact of climate change on the socio-economic structure is being visible clearly every where in the world. Bangladesh as a tropical country is facing the effects of weather changes more severely. Though we are helpless to the natural disasters, but after any calamity the victims may get some attention from different section of people and forum. Unfortunately some of the neglected tropical diseases which might have been prevailing more due to the adverse weather effects are not getting due attention. But Present Hon'ble Prime Minister Sheikh Hasina gives special emphasis on Climate Change and Health.

I am happy to understand that the Second International Conference on Climate Changes and Neglected Tropical diseases, going to be organized under the guidance of Director General of Health Services will address those diseases to some extent. Filariasis, Visceral leishmaniasis, Soil-transmitted helminthiasis, Rabies, snake-bite and other vector borne diseases are among the most important diseases to be addressed in the Conference.

On behalf of Bangladesh Awami League, I express my sincere thanks to the organizers of this Conference and hope the two day long Conference will be a very fruitful one in terms of scientific outcome as well as appropriate recommendations for the future planning to combat these diseases.

I wish every success of the conference.

Joy Bangla,  
Joy Bangabandhu.

Dr. Md. Badiuzzaman Bhuiyan



## **MESSAGE**

Chairman BMRC and  
President  
Bangladesh Medical Association

Global warming and climate change has become the top agenda in all the national and international forums for years. Even though we are not sure about the impact of climate change but it has become evident that some of the tropical diseases are emerging as new threats due to the adverse effect of the climate changes. Unfortunately diseases which were already termed as neglected are going to cause more harm to us.

I am happy to know that Directorate General of Health Services is going to organize the Second International Conference on Climate Changes and Neglected Tropical diseases which will address Filariasis, Visceral Leishmaniasis, Soil-transmitted Helminthiasis, Rabies, snake-bite and other vector borne diseases. I do hope experts from home and abroad will exchange their knowledge to update us on the impacts of climate change events on NTDs.

I wish every success of the conference and hope the conference outcome will help all the doctors working in Bangladesh to pay more attention on these issues in future.

Prof. Mahmud Hasan

## **MESSAGE**

Secretary General  
Bangladesh Medical Association

Bangladesh as a tropical country facing the hardship of combating all sorts of natural challenges most of which are contributed by the damage caused by global warming. Beside those challenges it appears that we also have to face the consequences of the disease burden of many tropical diseases, some of which already appears to be aggravated due to the weather change effects. Filariasis, Visceral Leishmaniasis, Soil-transmitted Helminthiasis, Rabies, Snake-bite and other vector borne diseases are some of the diseases being affected by the weather change events.

It is appreciable that Directorate General of Health Services is going to organize the Second International Conference on Climate Change and Neglected Tropical diseases which will be helpful for the experts from home and abroad to understand the present situation of these diseases. I hope the conference will find ways for future to combat these diseases for effectively

I wish every success of the conference on behalf of Bangladesh Medical Association and hope the conference outcome will help all the doctors working in Bangladesh to pay more attention on these issues in future.

Prof. Dr. Md. Sharfuddin Ahmed



## **MESSAGE**

Dean Faculty of Medicine &  
Chairman Basic Science, BSMMU

Natural disasters being the regular companion of Bangladesh had been facing the burdens of weather change effects in many ways. Moreover newer issues evolved as a threat to health programs due to the same cause. Filariasis, Visceral Leishmaniasis, Soil-transmitted Helminthiasis, Rabies, Snake-bite and other vector borne diseases are among the threats need to be addressed immediately.

Directorate General of Health Services should be thanked for taking the timely initiative of holding the Second International Conference on Climate Change and Neglected Tropical Diseases. I wish and hope the conference will be a very successful one and experts from abroad and home will exchange their knowledge and ideas for the future improvement of the overall situation prevailing on the neglected tropical diseases due to weather change events.

I wish the grand success of the program and hope the conference outcome will guide the doctors working in Bangladesh in combating the diseases intensively.

Prof. M. Iqbal Arslan





## MESSAGE

Chief Representative  
JICA Bangladesh Office

It may not be wise to stick always to the dark side of the moon. But in fact it is evident that Bangladesh is one of the most vulnerable countries to Climate Change. Neglected Tropical Diseases (NTDs) might be one of the newer challenges which have emerged due to adverse effects of the climate change. NTDs affect the poorest of poor, living in remote areas of the country and need more care for prevention and control.

JICA has been committed to support Bangladesh to fight against NTDs. JICA has dispatched JOCVs (Japan Overseas Cooperation Volunteers) to endemic area of lymphatic filariasis (LF) to support National Filariasis Elimination Programme since 2004. They have been working with the civil surgeon office and health workers in the district to improve health for community people through their field activities such as health education, supporting MDA and provision of guidance of self care to LF patients. JICA is also planning to initiate a new project, which is Science and Technology Research Partnership for Sustainable Development (SATREPS). Technical Cooperation Project on "Centre of Excellence for Neglected Disease" in 2011 with ICDDR, B. The ultimate goal of the project is to strengthen the Government's Kala-azar Elimination programme in Bangladesh. The project is an international joint research focused on capacity development of researchers for elucidation of mechanism of Kala-azar and PKDL, development of its rapid diagnostic tools, and research on vector control method.

As one of major partners for NTDs control in this country, JICA hopes the upcoming conference will be a very successful one and scientists from home and abroad will find a platform to share their experiences to find better solution to solve the health problems related to the adverse effects of Climate Changes.

I wish every success of the conference.

Dr. Takao Toda



## **MESSAGE**

Ag. WHO Representative to Bangladesh

Bangladesh is a small country with a large population. The unstable climate and increasing trend of tropical diseases are alaming challenge for the country. Increased frequency and intensity of natural disasters further threaten health and economic growth of the country. The potential impact of global warming on the transmission of the neglected tropical diseases is an added burden.

The World Health Organization underscores the urgent need to investigate further the potential impact of climate changes on the transmission of neglected tropical diseases. The findings of such studies will help the country to adapt and mitigate risks due to transmission of neglected tropical diseases.

Bangladesh has already taken initiative for adaptation and mitigation of health risks due to climate change through an wide range of collaboration with other stakeholders. This is indeed appreciable. I do hope that experts from home and abroad participating in this conference will contribute to the development of appropriate strategies and guidelines for prevention, control and elimination of neglected tropical disease in Bangladesh.

I wish grand success of the second International Conference on Climate Change and Neglected Tropical Diseases 2010.

Dr. Serguei Diorditsa



## MESSAGE

Director, Disease Control  
DGHS & Chairman  
Organizing Committee

Honourable Chairperson Prof Shah Monir Hossain, Director General of Health Services, Respected Chief Guest Prof. A.F.M. Ruhul Haque, Hon'ble Minister, Ministry of Health and Family Welfare, Special Guest Prof. Mahmud Hasan, Chairman Bangladesh Medical Research Council, Key note Speaker Prof. Kazuhiko MOJI Team leader, Research Institute for Humanity and Nature, Japan, distinguished participants from home and abroad: Assalamualaikum and Good Morning.

It is my great pleasure and privilege to welcome you all to the Opening Ceremony of 2nd International Conference on Climate Change and Neglected Tropical Diseases hosted by the Ministry of Health & Family Welfare, Government of the People's Republic of Bangladesh. Many of you also have attended the 1st International Conference on Neglected Tropical Diseases hosted by our Ministry in July 2008.

Bangladesh is situated in the sub-tropic zone having all the risk factors of neglected tropical diseases such as Lymphatic Filariasis, Kala-azar, Soil-transmitted Helminthiasis etc along with Rabies, Snake bite and cholera which are related with climate change and cost many lives every year. Lymphatic Filariasis has been detected in 33 districts while Kala azar cases have been reported from 47 districts of Bangladesh. Soil-transmitted Helminthes is a major health problem, particularly affecting pre-school and school age children and pregnant women throughout the country. Rabies is another neglected and under reported disease in Bangladesh, which is almost 100% fatal but 100% preventable. Snake-bite is yet another neglected issue causing 40% death, especially during flood.

An estimated one billion people, one sixth of the world's population, suffer from one or more of the parasitic and vector borne diseases, most of which are highly endemic in Bangladesh. Global warming or the adverse effects of weather changes are claimed to be the cause of increased incidents of these diseases. I take this privilege to remind the commendable role of our Honourable Prime Minister Sheikh Hasina who raised this issue in the Global forum to get due attention from the developed nations to combat the situation in Bangladesh. We are indeed very hopeful that the Government will take all necessary measures to minimize the damages to health and environment due to climate change. We have great expectations from this conference where eminent scientists, policy makers and other experts from home and abroad are going to exchange knowledge, share ideas and conclude landmark propositions to face the challenges of climate change and neglected tropical diseases in our country.

On behalf of the Organizing Committee, I would like to express my heartfelt gratitude to all the participants, respected guests, observers, electronic and print media for joining us to make this event a success. I sincerely hope you will have an exciting experience in this conference and enjoy your stay in Dhaka. Khoda Hafez.

Prof. Dr. Moazzem Hossain

**Second International Conference on Climate Change and Neglected Tropical Diseases**  
**Hotel Sheraton, Dhaka, Bangladesh**  
**29-30 September, 2010**  
**Program Schedule**

<b>First day: 29<sup>th</sup> September 2010, Wednesday</b>		
8:00 – 9:00	<b>Registration</b>	
<b>Opening Session</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
9:00 – 9:10	Welcome address	Prof. Moazzem Hossain Director, Disease Control, DGHS
9:10 – 9:30	<b>Key-Note Speech:</b> Importance of Environmental Health Preparedness to Mitigate Adverse Impact of Global Warming and other Environmental Changes.	Prof. Kazuhiko Moji, Team Leader Echohealth, RIHN, Japan
9:30 – 9:45	Address by Chief Guest	H.T. Imam, Advisor to Hon’ble Prime Minister, Establishment and Administration Affairs, Government of the Peoples’s Republic of Bangladesh
9:45- 10:05	Inaugural Address by	Prof.Dr.Syed Modasser Ali Advisor to Hon’ble Prime Minister, Ministry of Health and Family Welfare and Social Welfare, Government of the Peoples’s Republic of Bangladesh
10:05 – 10:20	Address by Chairperson	Prof. Shah Monir Hossain, Director General, DGHS
10.20- 10.40	<b>Tea Break</b>	

<b>Scientific Sessions</b>		
<b>Scientific Session</b>		
<b>Session 1: Climate Change and Filariasis</b>		
<b>Chairperson: Prof. Kazuhiko Moji</b>		
<b>Co-chairperson: Prof. Quazi Tarikul Islam</b>		
<b>Time</b>	<b>Paper</b>	<b>Speaker</b>
10.40 – 11.00	Climate change and the biodiversity of lymphatic filariasis vectors in Bangladesh: need to know or a can of worms?	Ulrich Kuch
11:00 – 11:20	Global Programme for the Elimination of Lymphatic Filariasis-its impact so far and how climate change can influence transmission	Prof. Emeritus Dato Dr. C.P. Ramachandran
11:20 – 11:40	Diagnosis of a Mosquito-borne Disease: Use of Urine Samples for Detecting Filariasis Infection in a Monitoring Program after Successful Mass Drug Administration	Prof. Eisaku Kimura
11:40 – 12:00	Climate Change and Morbidity Management in LF	Dr. Nazma Kabir
12:00 – 12:20	Climate Change and Neglected Tropical Diseases with emphasis on vector borne disease: Need for preparedness	Dr. R .C. Dhiman
12:20 –13:00	<b>Lunch and Prayer Break</b>	

<b>Session 2: Climate Change and Kala-azar</b>		
<b>Chairperson: Prof. Emeritus Dato Dr. C.P. Ramachandran</b>		
<b>Co-chairperson: Prof. Taiichi Hayashi</b>		
<b>Time</b>	<b>Paper</b>	<b>Speaker</b>
13:00 –13:20	Impact of Climate Change on Kala-azar in Bangladesh.	Prof. Hamida Khanum
13:20 –13:40	Diagnostic Approaches Suitable to Ground Level in NTDs/VL	Dr. Eisei Noiri
13.40 – 14.00	Efficacy and acceptability of Indoor Residual Spraying (IRS), Long Lasting	Prof. Shireen Akhter

	Insecticidal Nets (LNs) and Environmental Management (EVM) for control of Visceral leishmaniasis /kala-azar vector in a kala-azar endemic area of Bangladesh	
14.00 – 14.20	Climatic factors and Kala-azar in Bangladesh	Prof. AKM. Shamsuzzaman
14.20 – 14.40	New treatments for Neglected Diseases	Bhawna Sharma
14:40-15:00	<b>Tea Break</b>	
<b>Session 3: Climate change and Emerging diseases</b>		
<b>Chairperson: Prof. Shinjiro Hamano</b>		
<b>Co-chairperson: Prof. AKM. Shamsuzzaman</b>		
<b>Time</b>	<b>Paper</b>	<b>Speaker</b>
15:00-15:20	The Impact of Climate Changes on the Burden of Rabies in Bangladesh	Dr. Kamruddin Ahmed
15:20-15:40	Climate Change and Impact on infectious diseases	Prof. Emeritus Dato Dr. C.P. Ramachandran
15:40-16:00	Impact of climate change on emerging and re-emerging diseases: A scientific review	Mohammad Nazrul Islam
16.00 – 16.20	Climate change and animal bite	Dr. Tania Bulbul
16:20 –16:40	Unwise effort to Control one Disease May be a Cause of Several Diseases	Prof. Dr. Md. Mahbubar Rahman
16.40 – 17.00	Climate change and Vector behaviour	Dr. Rosemary Peter
19.00 (7.00 PM)	Cultural Program	
20.30 (8.30PM)	Dinner	
<b>1<sup>st</sup> day closed</b>		

<b>Second day: 30<sup>th</sup> September 2010, Thursday</b>		
<b>Session 4: Snake bite, STH, other NTDs and Climate change</b>		
<b>Chairperson: Prof. Yukiko Wagatsuma</b>		
<b>Co chairperson: Prof. Md Ismail Khan</b>		
<b>Time</b>	<b>Paper</b>	<b>Speaker</b>
9:00 -9:20	Snake bite: the most neglected tropical 'disease' of the 21 <sup>st</sup> Century	Prof. M.A.Faiz
9:20 -9:40	"Snake bite envenoming and climate change – identifying knowledge gaps and priorities for action	Dr. Ulrich Kuch
9:40 -10:00	Climate change and infectious diseases: Probable influences on disease-transmitting vectors in Japan	Prof. Nobuo Ohta
10:00-10:20	Application of weather and climate information in developing Early warning systems for prediction of disease outbreaks in Bangladesh	Mr. Shamsuddin Ahmed
10:20-10:40	Effective surveillance system and underlying data: an unmet need for tracking neglected tropical diseases due to climate change in Bangladesh	Dr. Abul Hasnat Milton
10:40-11:00	<b>Tea Break</b>	
<b>Session 5: Diarrhoeal diseases, Vectors and climate change</b>		
<b>Chairperson: Prof. M.A. Faiz</b>		
<b>Co-chairperson: Prof. Nobuo Ohta</b>		
<b>Time</b>	<b>Paper</b>	<b>Speaker</b>
11.00 – 11.20	Seasonal and Intraseasonal Variations of Surface Meteorological Factors, and Their Effects on Diarrheal Diseases	Prof. Taiichi Hayashi
11.20 – 11.40	The influence of Climatic variability on Diarrhoeal Diseases	Prof. Yukiko Wagatsuma
11:40 – 12:00	Biochemical analysis of alternative oxidase (AOX) in <i>Cryptosporidium parvum</i> : localization of AOX to mitosome	Michiyo Harada
12:20 – 12:40	The Indian Ocean Dipole and cholera incidence in Bangladesh: a time series analysis	Prof. Masahiro Hashizume
12:40-13:00	Data on pathogenicity of Entamoeba spp.	Prof. Shinjiro Hamano
13:00-14:00	<b>Lunch &amp; prayer</b>	
14:00- 15:00	<b>Discussion and Presentation of Dhaka Declaration with vision 2021</b>	

<b>Closing Session</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
15:00-15:15	Presentation of the 'Dhaka Declaration with vision 2021'	Prof. Dr. Moazzem Hossain, Director, Disease Control
15:15-15:25	Address by Guest of Honour	WHO Representative to Bangladesh
15:25-15:35	Address by Special Guest	Md.Humayun Kabir Secretary, Ministry of Health and Family Welfare
15:35-15:50	Address by Special Guest	Dr. Capt. (Rtd.) Mozibur Rahman Fakir, MP Hon'ble State Minister, Ministry of Health and Family Welfare
15:50-16:05	Address by Chief Guest	Prof. Dr. A.F.M. Ruhul Haque Hon'ble Minister, Ministry of Health and Family Welfare
16:05-16:15	Address by Chairperson	Prof Shah Monir Hossain, Director General, DGHS
16.15 – 16.35	<b>Tea and end</b>	



## **An overview on Neglected Tropical Diseases (NTDs)**

Neglected Tropical Diseases (NTDs) are a group of chronic disabling infections affecting more than 1 billion people worldwide mostly those living in remote rural areas, urban slums or conflict zones. These diseases affect primarily poorest of the poor living in tropical and subtropical climates. Children are most vulnerable to infections of most NTDs. Almost all low-income countries are affected by at least five NTDs simultaneously, and more than 70% of countries and territories that report the presence of NTDs are low-income and lower middle-income economies. Beyond their negative impact on health, NTDs contribute to an ongoing cycle of poverty and stigma that leaves people unable to work, go to school or participate in family and community life. Whilst "the big three" infections - AIDS, TB and malaria - have caught the world's attention, these other disabling and sometimes fatal infectious diseases have, until very recently, been receiving relatively little attention from donors, policymakers, and public health officials. Yet NTDs control represents a largely untapped development opportunity to alleviate poverty in the world's poorest populations, and therefore has a direct impact on the achievement of the Millennium Development Goals.

**WHO is currently focusing on 14 NTDs:** NTDs are one of the key areas of concern for our society, as it was clearly formulated by WHO in 2006 as "Neglected Tropical Diseases - Hidden successes, Emerging opportunities". The list include: Buruli ulcer, Leishmaniasis, Chagas disease, Leprosy, Cholera/Epidemic diarrhoeal diseases, Lymphatic filariasis (LF), Dengue/dengue haemorrhagic fever, Onchocerciasis, Dracunculiasis (guinea-worm disease), Schistosomiasis, Endemic Trepanomatoses (yaws, pinta, endemic syphilis...), Soil-transmitted helminthiasis (STH) , Trachoma, Human African trypanosomiasis. Government of Bangladesh has taken national control programs for LF, Kala-azar, Dengue, Diarrhoeal diseases , Rabies and STH.

### **Strategy to control NTDs in Bangladesh**

**Background:** Parasitic Diseases still pose major obstacles to health growth and socio-economic development in developing countries like Bangladesh. Malaria and Kala-azar are life threatening and the leading cause of mortality. Lymphatic Filariasis and soil-transmitted helminthiasis (STH) cause chronic debilitating symptoms those hinder health growth in children and also significantly reduce the productive life of adults. The effects of chronic parasitic infections are the major cause of the poverty, disruption in social stability and economic progress in developing tropical Countries. Bangladesh being in the tropical zone and having all the risk factors of all these parasitic diseases, harbors the biggest load of the parasitic disease burden , In Bangladesh 13 districts in the border areas with India and Myanmar are high malaria endemic area and about 98% of the total malaria morbidity and

mortality occurs each year in these areas. A total of 45 districts report cases of kala-azar and nearly 70 million populations in the 33 north and north-western districts are endemic for LF. STH are widespread in all areas particularly due to the low sanitation and hygiene and children <15 years are the victims of worm infestations and malnutrition. In addition Rabies a viral zoonotic disease and cholera , a bacterial disease is present all over the country.

### **Objectives based strategies of National control Programs:**

**a) Malaria control :** 1) Early case detection by RDT and prompt treatment by combination drugs containing artemisinin 2) Integrated vector management (IVM) by Insecticide Treated Nets (ITNs) and Long Lasting Insecticidal Nets (LLINs) for exophilic vectors and internal residual spray (IRS) for endophagic vectors 3) Containment of focal epidemics by Cross-border collaboration based on rapid response team, intelligence system, timely exchange of information, and management of the supplies 4) routine and sentinel surveillance for diseases and vectors to monitor drug and insecticide resistance.

**b) Kala-azar Elimination :** 1) Early diagnosis by RDT using rK39 based dipstick and complete case management by first line oral drug Miltefosine 2) Effective disease surveillance for more case finding and vector surveillance to monitor drug and insecticide resistance 3) Integrated vector management with a focus on indoor residual spraying of deltamethrin 4) Social mobilization by BCC activities and building partnerships with private, public, Non-government and international organizations 5) Operational researches.

**c) Elimination of Lymphatic Filariasis :** 1) Stopping the spread of infection by MDA with Tab Di-ethyl Carbamazine ( DEC) and Albendazole 2) Morbidity Control through community/home based care 3) Hydrocele operation and other sequel management 4) Social mobilization and community involvement including NGOs and CBOs 5) Routine surveillance of LF and vector.

**d) STH control :** School based campaign and de-worming is the mainstay. For this- (1) targeted school children are being given twice a year de-worming regimen, (2) Health and hygiene education is given to school children on STH control .

**e) Rabies control:** The main strategy for rabies control are (1) introduction of Intra-dermal Tissue Culture Vaccine (TCV) by replacing Nerve Tissue vaccine (NTV) by 2011, (2) Animal Birth Control (ABC) using EsterilSol from Ark Sciences , USA, (3) killing of suspected street rabid dog, (4) animal immunization for pet dog, (5) human resource development , (6) advocacy and social mobilization and (7) building partnerships with private, public, Non-government and international organizations

**e) Rabies control:** The main strategy for rabies control are (1) introduction of Intra-dermal Tissue Culture Vaccine (TCV) by replacing Nerve Tissue vaccine (NTV) by 2011, (2) Animal Birth Control (ABC) using EsterilSol from Ark Sciences , USA, (3) killing of suspected street rabid dog, (4) animal immunization for pet dog, (5) human resource development , (6) advocacy and social mobilization and (7) building partnerships with private, public, Non-government and international organizations

Common goal of the programs mentioned above are effective prevention, control and elimination of respective parasitic diseases by 2015 and Rabies by 2020 in Bangladesh .

**Achievements:** Kala-azar elimination and STH control program are in attacking phase. Kala-azar elimination activity was started with Miltefosine in June 2008 from Trishal. Gradual increase in participation from community is observed. First round of school de-worming was started in Nov 2008 & fourth round was complete in May 2010 with a coverage of about 20.0 million school children . Death rate from Dengue is zero for the last 4 years . Death in Malaria is touching to zero value. Mass drug administration (MDA) for LF elimination was started in Nov 2001 and in 2009 a total of about 40.0 million people were under MDA. Filaria Hospital ( A project of IACIB- NGO ) has been providing morbidity control including hydrocele surgery through MOU with MOH. LEPRU UK & RTI, USA are also working with MOH on LF elimination. Rabies control activity was started using TCV by ID vaccination and replacing NTV from 11 July 2010 for the first time in Bangladesh. In addition animal birth control by chemical sterilization of male dog for Rabies control was introduced from 19 September, 2010. A National Guideline for IDRV and Rabies control in Bangladesh was approved on 11 August 2010 at the National Steering Committee meeting chaired by Hon'ble Minister, MOH. BARA is also working with MOH for rabies control. One TAPP was approved with support from JICA on climate change and NTDs , in which IACIB & ICDDRB will work with MOH.

**Areas to strengthen:** Basic and operational researches on climate change impacts over vector borne and other parasitic diseases. Human resource development from both public and private sectors through training abroad and social mobilization are needed.

## ABSTRACTS

1. Climate Change And The Biodiversity Of Lymphatic Filariasis Vectors In Bangladesh: Need To Know Or A Can Of Worms?
2. Diagnosis Of A Mosquito-Borne Disease: Use Of Urine Samples For Detecting Filariasis Infection In A Monitoring Program After Successful Mass Drug Administration
3. Climate Change And Morbidity Management
4. Climate Change And Neglected Tropical Diseases With Emphasis On Vector Borne Disease: Need For Preparedness
5. Impact Of Climate Change On Kala-Azar In Bangladesh
6. Diagnostic Approaches Suitable To Ground Level In Ntds/VI
7. Efficacy And Acceptability Of Indoor Residual Spraying, Long Lasting Insecticide Treated Nets And Environmental Management For Control Of Visceral Leishmaniasis Vector In An Endemic Community Of Bangladesh
8. Small Scale Study On Climatic Factors And Kala-Azar
9. New Treatments For Neglected Diseases
10. The Impact Of Climate Changes On The Burden Of Rabies In Bangladesh
11. Climate Change And Impact On Infectious Diseases
12. Impact Of Climate Change On Emerging And Re-Emerging Diseases : A Scientific Review
13. Climate Change And Animal Bite
14. Unwise Effort To Control One Disease May Be A Cause Of Several Diseases
15. Climate Change and Vector Behaviour
16. Snake bite: the most neglected tropical 'disease' of the 21st Century
17. Snake bite envenoming and climate change - identifying knowledge gaps and priorities for action
18. Climate change and infectious diseases : Probable influences on disease-transmitting vectors in Japan
19. Application of weather and climate information in developing Early warning systems for prediction of disease outbreaks in Bangladesh.
20. Effective surveillance system and underlying data: an unmet need for tracking neglected tropical diseases due to climate change in Bangladesh
21. Seasonal and Intraseasonal Variations of Surface Meteorological Factors, and Their Effects on Diarrheal Diseases
22. The Influence Of Climatic Variability On Diarrhoeal Diseases
23. Biochemical analysis of alternative oxidase (AOX) in *Cryptosporidium parvum*: localization of AOX to mitosome
24. The Indian Ocean Dipole and cholera incidence in Bangladesh: a time series analysis
25. *Entamoeba moshkovskii* can establish the infection in the cecum of CBA mice and induce pro-inflammatory cytokine production
26. Modelling the future niche distribution of venomous snakes under climate change: a case study of the greater Black Krait (*Bungarus niger*), a recently identified cause of neuro-mycotic envenoming in Bangladesh
27. Species diversity of phlebotomine sand flies from a single house in a VL (Kala-azar) endemic area of Mymensingh District, Bangladesh.

## Climate change and the biodiversity of lymphatic filariasis vectors in Bangladesh: need to know or a can of worms?

Mandy Kronefeld,<sup>1</sup> F.M.H. Nurunnabi Chaudhury,<sup>2</sup> Jens Amendt, Richard Zehner,<sup>1</sup> Moazzem Hossain<sup>2</sup> and Ulrich Kuch<sup>1</sup>

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**Background and objectives :** Lymphatic filariasis (LF), a mosquito-borne disease with a 2020 elimination target, currently affects 120 million people in 81 countries. Being temperature-dependent, the development of LF vectors and their parasites may be influenced by changing climatic conditions. In Bangladesh, *Culex* mosquitoes, especially members of the *Culex pipiens* complex like *Culex quinquefasciatus* are important LF vectors. As members of this complex are hard or impossible to distinguish from each other by morphological characters, we assessed their diversity and geographical variation by DNA barcoding, at the same time screening them for filaria diversity.

**Contents :** We collected mosquitoes from 12 locations in different eco-regions of Bangladesh and PCR-amplified and sequenced the barcode region of the mitochondrial cytochrome oxidase subunit I (CO I) gene for at least ten morphologically identified adult *C. quinquefasciatus* from each locality. DNA evidence revealed much greater genetic and species diversity of *C. pipiens* complex mosquitoes than expected. There were three geographically largely co-distributed clusters of haplotypes, several of them with greater sequence divergences than between other recognized *Culex* species. Mosquitoes from Chittagong and Maulavibazar were individually analyzed for filarial DNA by PCR and sequencing using conserved primers for the mitochondrial 12S rRNA gene. Filarial DNA sequences were identified in 31 of 503 female mosquitoes belonging to five genera, among them members of two *C. pipiens* complex haplogroups. The commonest filaria, *Wuchereria bancrofti* and *Dirofilaria immitis*, were also detected in the city of Chittagong. The DNA sequences of four *Onchocerca* spp. could not be assigned to any known taxon and might represent new filaria species.

**Conclusions :** Our study revealed an astonishing cryptic diversity of vectors of LF and other diseases in Bangladesh. As the different species likely differ in their ecological niches and other features (e.g., biting habits, vectorial abilities and insecticide resistance), they may also respond in different ways to climate change. Thus, we suggest that more knowledge of the diversity, distribution and ecology of mosquitoes is needed not only for disease control and elimination targets but also for any projections of future changes.

## **Diagnosis of a Mosquito-borne Disease: Use of Urine Samples for Detecting Filariasis Infection in a Monitoring Program after Successful Mass Drug Administration**

Eisaku Kimura,<sup>1</sup> Makoto Itoh,<sup>1</sup> Mirani V. Weerasooriya,<sup>2</sup> Thishan C. Yahathugoda,<sup>2</sup> Mohammad S. Samad,<sup>1</sup> Hidekazu Takagi,<sup>1</sup> and Fumiaki Nagaoka<sup>1</sup> Kazuhiko Moji,<sup>3</sup> Moazzem Hossain<sup>4</sup>

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**Background and objectives :** The Global Programme to Eliminate Lymphatic Filariasis has been underway using annual mass drug administration (MDA). Many countries have completed the planned 5 rounds of MDA, successfully reduced microfilaria (mf) rates to a very low level, and are considering concluding MDA.

Mosquitoes spread filariasis, and their abundance will be influenced significantly by the climate change, facilitating persistence and/or resurgence of filarial infection. Thus, anti-filariasis programs have to be more vigilant than ever to detect new infections, so that proper measures can be taken without delay. In the post-MDA stage, ICT card test to detect filaria antigen is considered a tool for the monitoring. However, it is expensive and requires blood collection. We must recognize that the monitoring will have to be repeated with subjects who are now predominantly healthy, and in an environment where filariasis has become a less important public health problem than before. We have developed an immunodiagnosis using urine samples (urine ELISA). The efficacy and usefulness in the post-MDA stage will be discussed. A new urine-based diagnostic method, suitable for field use, will be introduced.

**Findings :** Urine ELISA detecting filaria-specific IgG4 showed high sensitivity (95.6%) and specificity (99.0%). Due to the ease of collecting samples, the method has been well accepted by local people and employed successfully in several studies. It also showed higher sensitivity than filaria antigen tests, suggesting its usefulness in monitoring resurgence in a post-MDA low endemic situation. In Sri Lanka, the effect of 5 rounds of MDA had been monitored with urine ELISA. It effectively detected minute change in prevalence that would not be detectable by antigen and mf tests. Recently, the ELISA was also evaluated in Bangladesh with satisfactory results. The efficacy of our new urine-based diagnosis that can be made visually will also be presented.

**Conclusions :** The climate change may intensify mosquito breeding, and interfere with filariasis elimination program. An effective tool for monitoring resurgence is necessary, and urine-based diagnosis will be advantageous for its ease in sample collection, and acceptability by people.

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## **Climate change and Morbidity Management**

Dr.Nazma Kabir ,LEPRA healthinaction,UK

Climate change is a health and disability .It will affect the world's poor and of those disabled people will be the most severely affected. People with LF and other disabilities in developing countries will bear the impact of climate change.

Many factors will affect people with disabilities. These include: heat waves, drought and the resulting food insecurity, water scarcity and flooding and climate related disasters. All of these factors will have severe effects on the health of disabled people.

It is well documented that people with disabilities. These include : heat waves, drought and the resulting food insecurity, water scarcity and flooding and climate related disasters. All of these factors will have severe effects on the health of disabled people.

It is well documented that people with disabilities are more vulnerable during emergencies. This is because they have more complex issues during relief and rehabilitation. Access and transport barriers are some of these issues. Often they are also unprepared and ill-equipped during emergencies.

For organizations and agencies working with people suffering from LF disabilities climate change will pose many challenges. During emergencies locating patients will be a problem. Floods and other disasters will prevent or complicate the ability to monitor adherence to self care. Furthermore, if water becomes limited it is likely to be prioritized for drinking rather than the washing of limbs. Access to medicines and doctors for disabled people will also be minimal.

26 Million People have already been displaced by climate change related events. This number increases by a million every year. By 2030 this number is projected to triple due to increased vulnerability of low lying islands and countries like Bangladesh to flooding. In Bangladesh there are 4 million people affected by LF related disabilities : they are more likely to be affected by climate change.

Given these facts, it is imperative that we work together to help prepare people with NTD disabilities to cope during emergencies and to address the long term issue of climate change. There are however immediate steps that we can take to help people adapt to risk. Such strategies might strategies the training of people with disabilities in disaster management with emphasis placed practicing self in resource constrain setting, the inclusion of people with disabilities within all national disaster management plans, and the training of people with disabilities in monitoring and support of patients on self care.

## **Climate Change and Neglected Tropical Diseases with emphasis on vector borne disease: Need for preparedness**

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**Background and objectives:** Climate change is a new threat to human health due to projected rise in temperature, altered rainfall and rise in sea level. Of various Neglected Tropical Disease (NTD) in Southeast Asia, Vector Borne Diseases (VBD) are likely to be affected the most as their transmitting agents are poikilothermic creatures. In recent years studies have been undertaken on malaria *Vis a Vis* Climate change, but certain disease like dengue, leishmaniasis and filariasis are still neglected. The present communication reviews the assessments made on adverse health impacts of climate change on malaria and other neglected diseases with emphasis on Southeast Asia.

**Contents:** The scientific basis of climate change impacts on malaria and other VBD are defined in the presentation. Assessments undertaken at global and Southeast Asian region for malaria, dengue and leishmaniasis etc have been reviewed. In India, vulnerability assessment and future scenario of malaria and dengue based on occurrence of disease incidence, temperature, and combination of temperature and Relative Humidity using various methodologies. Recent studies using A1B scenario of PRECIS model with 0.440 x 0.440 grid (using HadRM2/HadRM3H), projected scenario of malaria and dengue by the year 2030 have been made. In addition to projected scenario, the results of evidence based data on biophysical determinants of malaria being generated at high altitudes in India will also be presented.

**Conclusions:** Studies undertaken in India on malaria reveal that transmission windows of malaria in northern and western parts are likely to widen by 2-3 months while shorten in southern states. Studies using A1 B scenario of PRECIS model reveal that there is temporal increase in transmission of malaria in northern and eastern states while reduction in southern states towards eastern coast. New areas are projected to experience opening of transmission in hilly areas.

Projection of Dengue by 2030 reveals opening up of Transmission windows (1-3 months) in 18 pixels in India. The states of Jammu & Kashmir, Northeastern, Uttarakhand, Sikkim, some part of Madhya Pradesh and West Bengal are vulnerable to increase in Transmission Windows of dengue. Reappearance of chikungunya in India and emergence of Kala-azar in some foci need to be elucidated. Scope of collaborative work in this direction with Southeast Asian countries will also be projected.

District level risk maps of climate sensitive disease with prevailing climatic parameters and in view of projected climatic scenarios using regional climate models, attribution of risk due to climate change alone, situation analysis for current status of disease and lessons learnt, societal adaptive capacity and formulation of adaptation framework are warranted for addressing the adverse impacts of climate change.



## Impact of Climate Change on Kala-azar in Bangladesh

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**Background and Objectives:** Leishmania is one of the major neglected diseases in the world which been heavily impacted by the global climate change. The climate of Bangladesh is also changing which making people more prone to infectious diseases. Visceral leishmaniasis or kala-azar is not out of that list. A baseline study to observe the impact of climatic factors on the incidence of kala-azar in Mymensingh district which is the endemic most district in Bangladesh.

**Content:** Kala-azar incidence rate, climatic factors, vectors breeding sites and adult vectors were collected from 70 different locations of Mymensingh district. Relationships between kala-azar endemicity with soil types were evaluated. It was found that the high or medium high land areas were more endemic for kala-azar. In contrast kala-azar was found almost absent from medium low or low land areas. Pearson's lag-correlation was calculated for the number of Kala-azar patients of each season with monthly average temperature (Tavg.) and rainfall. It was found that in winter, Kala-azar cases were negatively correlated with the average temperature of summer. If the average temperature in the summer decreased slightly the kala-azar patient number increased in winter. In summer no impact of average temperature on kala-azar incidence reported. But, there were three significant positive impact of precipitation in winter and the increased numbers of Kala-azar cases. Increased precipitation of previous 5th, 3rd and 2nd months influenced the kala-azar patient's numbers in summer.

It was also found that in monsoon, kala-azar case number increased if the precipitation of previous 5th month increased and decreased in the previous 2nd months. It was also found that rainfall of previous 2nd month had a positive relationship with the kala-azar case number of a month. But rain fall of previous 5th month had a strong positive significant relationship with the kala-azar cases of Mymensingh district. On the other hand average temperature of previous 4th month has a negative impact.

**Conclusion:** The present data showed significant co-relationship between climatic factors and kala-azar incidence in Mymensingh district. Further study is required to evaluate the in depth impact of climatic factors in kala-azar in our country.

## Diagnostic Approaches Suitable to Ground Level in NTDs/VL

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Visceral leishmaniasis (VL) is a vector-borne fatal systemic infection caused by various species of *Leishmania* intracellular protozoan, and further developments for sensitive and specific diagnostic approaches are still required for the appropriate disease control. Recently, our group developed highly sensitive and specific method an ELISA with a recombinant protein rKRP42, which is a part of an *L. donovani* kinesin-related protein and a homolog of rK39. The rKRP42 was validated with ELISA using urine samples and found high sensitivity and specificity, which is particularly suitable mass survey of VL. In addition, loop mediated isothermal amplification (LAMP), a method that amplifies DNA rapidly under isothermal condition, was developed and showed high sensitivity for protozoan.

L-type fatty acid-binding protein (L-FABP) is a 14 kDa protein and plays a role of chaperone in cytoplasmic lipid metabolism. We have recently reported that L-FABP is predominantly expressed in proximal tubular epithelial cells and voided to urine in ischemic condition and under oxidative stress immediately after injury (JASN 18:2894, 2007). L-FABP is also useful to monitor the severity of sepsis (CCM 2010 epub ahead of print). VL shows a wide variety of clinical manifestation from simple fever to multiple organ failure. Kidney is an organ potentially reflecting the whole body condition by urine and our group recently clarified the potential efficacy of urinary L-FABP for the disease control of VL in Bangladesh.

In this session, we will introduce above addressed our recent achievements and would like to discuss SATREPS/JICA scheme for the disease control projects through ICDDR,B.

## **Efficacy and acceptability of Indoor Residual Spraying, Long Lasting Insecticide Treated Nets and Environmental Management for control of visceral leishmaniasis vector in an endemic community of Bangladesh**

Shireen Akhter, Rajib Chowdhury, NP Maheswary and Axel Kroeger

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**Background:** Visceral leishmaniasis (VL), known as kala-azar in Indian sub-continent, is a public health problem in Bangladesh. The current VL control strategy in the country relies on diagnosis and treatment of kala-azar and post kala-azar dermal leishmaniasis. Although this therapeutic intervention decreases the active cases and reservoir, even then the cases are increasing in affected districts involving new areas also. It indicates that only therapeutic intervention is not sufficient to control kala-azar in the country. Another strategy, VL vector control which is not present in Bangladesh is to be considered. It decreases vector sandfly and reduces kala-azar transmission. Both strategies together may eliminate the disease from the country. However, an effective vector control programme components are Indoor Residual Spraying (IRS), Long Lasting Insecticide Treated Nets (LNs) and Environmental Management (EVM). Before initiating the programme, the most effective approach for sandfly control is to be explored. Thus a cluster randomized control trial study has been conducted during the period of July 2006 to June 2007 in four villages of a highly kala-azar endemic upazilla Fulbaria, Mymensingh district, Bangladesh

**Objective:** To determine the effectiveness of IRS/LNs/EVM in reducing sandfly density and evaluate their acceptability by the community people.

**Methodology:** From each selected village (based on high endemicity for last 5 years), six clusters consisting of 50 households were randomly selected and sandfly densities were determined by CDC light trap. Four arms were formed having similar types of vector densities. Three arms were randomly allocated to three interventions and 4th one as a control. Interventions were given and sandfly densities were determined after 6, 12 and 20 weeks of intervention. Acceptability of intervention methods were determined by face to face interview with structured questionnaire after 4 weeks of intervention.

**Result:** IRS and LNs were significantly more effective in reducing sandfly density than EVM and control ( $p < 0.0001$ ). IRS appeared better than LNs with no significant difference. EVM had slight effect on sandfly but no significant difference was found between EVM and control. The acceptability of LNs, IRS and EVM were 97.50%, 85.00% and 76.25% respectively.

**Conclusion:** IRS proved to be the most effective intervention in reducing VL vector. It may be recommended as the method of choice for VL vector control conducted by the Government for 2-3 years. As acceptability of LNs was high among rural people and it also proved effective, so after IRS, LNs should be distributed to maintain VL vector free status. EVM may be encouraged as a complementary measure of VL vector control through health education.

## **Small scale study on climatic factors and Kala-azar**

Prof. AKM. Shamsuzzaman<sup>1</sup>, Abdullah Yusuf<sup>2</sup>, Shamsar Ahmed<sup>3</sup>, Ahmad Raihan Sharif<sup>4</sup>, Kazi M Jamil<sup>5</sup>, Prof. Moazzem Hossain<sup>6</sup>

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Basic data on climatic factors, population pattern and socio-demography in relation to agent, host and vectors of Kala-azar are really very much inadequate or disorganized. The present study has attempted to methodically collect, collate and interpret relevant data with special emphasis on environmental factors (raised basal temperature, humidity) to establish a link with present emergent and gradual up rise of leishmaniasis prevalence. A structured questionnaire was used as data collection tools. A group of manpower (University Students) were trained and oriented for this work. Both endemic and non-endemic districts of Kala-azar (total 64) were the study sites. On analyzing the data, ranges of relative humidity either in endemic or in non-endemic districts was found to be between 62 - 88% and mean temperature between 28 - 36°C. Soil type and average rainfall also did not show significant variation. Water logging and extreme weather events did not show any reflection to the prevalence of Kala-azar among endemic districts as per present record of the public sector. Since, not much variation of climatic factors are observed among endemic and non-endemic districts of kala-azar, so various research questions have been generated. Reasonable epidemiological case finding and recording system to be adopted arranging sentinel and active surveillance. The vector bionomics in non-endemic area need to be further explored by ecological niche or automated weather recording system. Operational researches to be strengthened on climate change events to find out explanation this unusual epidemiological and ecological pattern.

## **New treatments for Neglected Diseases**

**BHAWNA SHARMA**

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Neglected tropical diseases (NTDs) are a major burden on health worldwide causing serious morbidity and mortality. For NTDs such as Chagas disease, Leishmaniasis and Human African Trypanosomiasis (HAT) current tools available for patient management are either toxic, require long courses, are difficult to administer or are costly.

The Drugs for Neglected Diseases initiative (DNDi) is a product development partnership that focuses on delivering new treatments for NTDs that are effective, cheap and field orientated. DNDi aims to develop 6-8 new treatments and create a robust pipeline for NTDs. The organization is also strongly committed to raise awareness and advocate for increased public responsibility on NTDs and as well as build capacity in endemic countries. DNDi has developed a unique network of partnerships that has allowed it to successfully deliver several products since its inception in 2003. This includes two fixed dose combination for malaria (ASAQ and ASMQ) and as well the NECT treatment (Nifurtimox-Eflornithine combination treatment) for HAT.

In 2010 DNDi, has successfully completed two pivotal phase III trials on Visceral Leishmaniasis (VL). The LEAP 0104 trial in East Africa conducted with the LEAP (Leishmania East Africa Platform) is working on recommending a 17 day combination treatment of sodium stibogluconate (SSG) and paromomycin. This treatment is shorter and cheaper than the standard treatment of SSG alone for 30 days.

DNDi and its partners, including the Indian Council of Medical Research has also recently completed the VL-Combo 07 trial in Bihar India. This trial demonstrated that 3 short course combinations of AmBisome & miltefosine, AmBisome & paromomycin and miltefosine & paromomycin were as effective as and safer than the standard treatment of amphotercin B. All combinations had an ITT efficacy of at least 97.5%. DNDi intends to work with local partners to firstly conduct a pilot implementation of these combinations in India, and secondly extend these treatments to other countries in the South Asia region. A study in collaboration with Shaheed Suhrawardy Medical College (ShSMC) and the International Centre for Diarrhoeal Disease Research Bangladesh (ICDDR,B), Bangladesh has therefore commenced to evaluate the short course combination has started in the VL endemic Mymensingh District.

DNDi is also conducting upstream research, including with partners in India, to develop a new drug candidate for VL through medicinal chemistry and lead optimization.

## **THE IMPACT OF CLIMATE CHANGES ON THE BURDEN OF RABIES IN BANGLADESH**

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**Background and objectives :** A significant number of studies have focused on the effects of climate changes on vector or food borne infections. Despite the severity of rabies little is known about the impact of climate changes on this dreaded disease. The recent reemergence of rabies in several countries is possibly indicating the effects of climate changes. Furthermore studies suggest that vampire bat population, the main rabies transmitter in Mexico and Costa Rica, is expanding and moving into higher elevations in those countries as a result of warming. Based on several factors, the situation of rabies after climate changes is projected here. This might be helpful for the implementation of proactive measures to control rabies in Bangladesh.

**Contents :** Globally every year 55,000 people die of rabies, of which 95% occur in the developing countries of Asia and Africa. Bangladesh is not an exception but is severely affected by rabies. According to the WHO every year 1,550 people die of rabies in this country and cause a significant amount of economic loss. Rabies is not a notifiable disease in Bangladesh; therefore the actual number might be several folds higher than this figure. Dogs are the main transmitter of rabies in Bangladesh and to some extent cats, mongoose and foxes/jackals are also responsible. With sea level rise many areas of Bangladesh will be submerged. Since Bangladesh is one of the densely populated countries on earth. Habitat loss will force people and animals to share smaller area than previously they occupied. It will increase animal-human interaction and rabies might spread drastically. Climatic conditions that favor an increase in the fox/jackal population such as an increase in the rabbit and rodent populations may in turn lead to an increase in the incidence of human rabies. This is an unrecognized complex situation of host and rabies virus interaction on the verge of climate changes.

**Conclusions :** Considering climate changes associated adverse effects on Bangladesh it is anticipated that human and economic loss due to rabies might be increased. Therefore Bangladesh should establish urgently rabies control program, improving surveillance and reporting.

## CLIMATE CHANGE AND IMPACT ON INFECTIOUS DISEASES

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In recent years we have all been affected by the spread of infectious diseases. Be it sars, swine fever, bird flu, hini, nipah virus, dengue or monkey malaria. As humans dominate more of the world we become an even larger target for these and other diseases. A rise in the incidence of new and previously suppressed infectious diseases is being linked by scientists with dramatic climatic and environmental changes now sweeping our planet earth. Deforestation, natural destruction of habitats for agriculture road and irrigation, pollution of rivers and coastal waters, and promoting conditions for new and old pathogens to thrive along with urban sprawl, lack of sanitation and slum conditions.

A case to point is the highly pathogenic highly virus in Malaysia which until recently was found in Asian fruit bats. In late 1990s it emerged as a fatal disease in humans, This has been linked with a combination of forest fires in Sumatra and the clearance of natural forest fires in Sumatra and the clearance of natural forests in Malaysia for palm oil plantations. Bats, searching for fruits were forced into closer contact to domestic pigs giving the virus its chance to spread to humans via people handling pigs. Almost a similar but ecologically different situation was reported later from Bangladesh with nipah virus infections.

The issue of climatic change and environmental degradation and a rise in many new and old infectious diseases is a complex sometimes subtle, one that is causing concern among scientists and public health specialists.

These are perhaps some of the overlooked factors in the persistence, emergence and re-emergence of infectious diseases. They also interact with trends of economic development, population growth, urbanization, migration and environmental pollution. Some of these factors will be discussed.

## **Impact of climate change on emerging and re-emerging diseases : A scientific review**

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**Background and Objective :** Long term changing effects of natural environment especially in temperature, precipitation, wind and other weather patterns are significantly associated with emerging and re-emerging diseases in tropical and subtropical countries. Prevalence rate of malaria, dengue, rift-vally fever, cholera, west-nile and lyme diseases are increasing as a manner which becomes the major public health problem for modern civilization. Rapid increase in population size, energy consumption, intensity of land use, burning of fossil fuels, International trade and travel and other human activities, deforestation which are the major causes to rising the level of carbon dioxide in atmosphere. The prime objective of the study is to reduce mortality and morbidity from the emerging and re-emerging diseases through proper utilization of limited resources.

**Content :** Climate changes may alter local ecology of water, food and vector borne infective agents. It create pave environment for emerging the waterborne like amoebiasis , cryptosporidiosis, giardiasis, Schistosomiasis , ascariasis, enterobiasis and food borne diseases, salmonellosis, Salmonella serotype enteritidis, Campylobacteriosis , cholera, Escherichia coli, Listeria monocytogenes infections and vector-borne" diseases include malaria, dengue fever, yellow fever, and encephalitis. By developing the infrastructure of health care delivery system and improving information, education and communication, we will minimize morbidity and mortality from the emerging and re-emerging diseases.

**Conclusion :** Prevention, mitigation, remediation and appropriate public health measurements are the prime tools for reduction of prevalence and incidence rate of emerging and re-emerging diseases.

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## CLIMATE CHANGE AND ANIMAL BITE

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Bangladesh has a tropical monsoon-type climate, with a hot and rainy summer and a dry winter. Rabies is endemic in Bangladesh and it is distributed almost uniformly in all the areas of the country. On an average 30, 000 animal bite cases and 160 rabies cases reported at IDH annually. According to World Health Organization, every year 1,550 people die of rabies in Bangladesh and around 80,000 people undergo treatment.

**Objectives :** To find out the relationship of climate change with the seasonal variation of reported animal bite cases at IDH.

**Materials and Methods :** A cross sectional study included all the patients having animal bite and clinically diagnosed cases of rabies, referred to IDH from January 2004 to December 2008 were included in the study from the clinical records and registrar book of the hospital. Clinical case sheet had data on age, sex, date of register and admission, date of bite, area of residence, nature of injury, history of anti rabies vaccine and antiserum administered, type of vaccine administered, animal species involved, nature of that animal. Recorded average temperature and humidity chart of Bangladesh was collected from Bangladesh Meteorological Department.

**Results :** The study revealed significant ( $p < 0.05$ ) correlation of animal bite cases with humidity but no significant correlation found with temperature change round the year. According to the hospital record it was observed that the reported cases of animal bite is lowest in the month of June and then increasing and reached to pick by September but again decrease in the month of October and November. There is sudden increase of animal bite cases reported in the hospitals in the month of December and January. Highest humidity (79%) showed in the month of June and July and December and January showed the lowest humidity (54%).

**Conclusion:** The study showed more animal bite cases reported at IDH when the humidity and temperature is lower. While the reason for this is unknown, we suggest it may be because of children spending time outdoors playing with dogs in the winter when the temperature is more preferable for playing outside.

## **Unwise effort to Control one Disease May be a Cause of Several Diseases**

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Malaria is still a threat in Bangladesh as in many countries although a concerted effort was initiated for the eradication of its mosquito vector by applying DDT during the 60's. At one point, eradication of malaria was acclaimed but later on it reappeared along with other virulent fevers like Kaalazar and Dengue. Use of DDT is no more legally allowed in Bangladesh, which has been officially replaced by a number organophosphates and/or synthetic pyrethroids and their combinations in addition to the Integrated Vector Management (IVM) package. IVM being a labour-intensive community approach is still to go a long way to be mass popular. Adulticides, larvicides, residual sprays, mosquito coil, insecticide-impregnated curtain, aerosol etc. still serve as the major weapons of mosquito control. Thus mosquito control still mostly depends on chemical insecticides. Although use of DDT is banned in Bangladesh, there are reports on their illegal use in different forms. Moreover, there is tons of left-over DDT in Bangladesh, which is likely to cause several diseases. As per one report, about 500 MTs of DDT stockpiles are lying in the Medical Sub-Depot at Chittagong for over a period of 26 years. DDT is a persistent organic pollutant (POP) pesticide, which can cause diseases like cancer, endocrine disorder, disruption of immune system, embryonic abnormality, reproductive disorder, etc. Other chemical insecticides, which are replacing DDT, are also not free from hazardous impacts. IVM thus appears to be a wise approach requiring concerted efforts for the management of mosquito to control malaria. Such an IVM comprises use of *Bacillus thuringiensis* Berliner var. *israelensis* (B.t.i.), methoprene, bio-control agents, cleaning of breeding sites, pyrethroid-impregnated curtain etc. Therefore, a wise effort should be to completely stop the use of DDT, elimination of its stockpiles wherever they are in Bangladesh and to popularize the IVM throughout the country.

## **Climate Change and Vector Behaviour**

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It is a well known fact that climatic factors play a role in the emergence and re-emergence of infectious disease.

Climate change is occurring as a result of imbalances between the incoming and outgoing radiation in the atmosphere (Patchauri et al 2007). Solar radiation, on entering the atmosphere is absorbed by the earth's surface and reemitted as infrared radiation, this is then absorbed by the greenhouse gasses namely carbon dioxide, methane and nitrous oxide. Because of among other things, deforestation these gasses cannot be effectively removed from the atmosphere. Heat produced as a result of these processes is causing global temperatures to rise at a faster rate than at any time since record keeping began in the 1850's. This rise in temperature will result among other things in changes to the hydrological cycle (warmer air retains more moisture than cooler air). Some areas will have more rainfall, others more droughts and severe weather events are expected to become commonplace.

Rising temperatures and changing rainfall patterns are expected to have a substantial effect on the burden of infectious diseases transmitted by insect vectors and through contaminated water (Shurman, E. K., 2010).

Insect Vectors are generally more active at higher temperatures, in addition to this there is an increased likelihood of them establishing themselves in new areas. The greatest effects of climate change on transmission are likely to be observed at the extremes of the range of temperatures at which transmission occurs (Ranges between 14 - 18°C and 35 - 40°C). Thus with changing temperatures the vectors geographic range can be shifted and reproductive and biting rates can be substantially increased whilst the pathogen incubation period is shortened.

It is essential to try and understand the linkages between climatological and ecological change in order to determine how these will affect diseases emergence and redistribution in an attempt to optimise prevention strategies (Patz et al, 2007).

## **Snake bite: the most neglected tropical 'disease' of the 21st Century**

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**Background and objectives :** Snake bite is a common emergency situation that a doctor working in rural area has to face with little knowledge and logistic support. Current medical curriculum addresses the topic in a 'shortcut' approach without much reflection of reality. Thus doctors find them in a difficult situation while handling the snake bite. The objective of the presentation is identification of these lacunae in the area of snake bite.

**Contents :** Available data from endemic countries show unacceptable number of bite and death. In Bangladesh a nationwide survey reported ~6000 deaths per annum. Increased incidence during monsoon with even higher bite and death during flooding (second to drowning) was found. Rural farming community including children are the main victims of snake bite causing a huge economic burden on family pushing them further down to the 'poverty line'. Bites are mostly non venomous, major venomous bites are neurotoxic. New species with unique neuromyotoxicity has been discovered. Diagnostic facility is not available. Little scientific approach for diagnosis and management was made. Optimum treatment (antivenom, assisted ventilation) although known no attempt was made to manufacture or provide them by the local pharmaceuticals. The antisnake venom currently being used is far from optimum, lacking activity against some deadly locally prevalent venomous snakes like *B. niger*, green pit viper or sea snake. Antisnake venom and mechanical ventilation is available only in limited facilities. Many patients die at home, en route to hospital or at facility although snake bite is an eminently treatable condition. Training of health care professionals and community awareness need expansion.

**Conclusion :** Inadequate attention for prevention, diagnosis and management of an important problem of the rural poor indicate the disparity in provision of scientific care for poor man's health condition even in 21st century justifying labeling snake bite as the most neglected tropical 'disease'. Establishment of snake park and facility for developing 'venom pool' from locally prevalent venomous snakes for production of specific antisnake venom should be a priority. No snake bite victim should die without diagnosis, antivenom and assisted ventilation in time of need. Community mobilization for seeking scientific care should be a model public health movement.

## **Snake bite envenoming and climate change - identifying knowledge gaps and priorities for action**

Ulrich Kuch

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**Background and objectives:** Snake bite envenoming is a neglected but eminently curable disease causing massive morbidity, mortality and disability among the rural poor of subtropical and tropical countries, thereby promoting poverty. This review aims at identifying knowledge gaps and priorities for action in the face of climate change.

**Contents:** Global estimates of snake bite envenoming identify South Asia as the most affected region. A nation-wide community-based survey revealed around 700,000 bites per year in Bangladesh alone of which approximately 6,000 are fatal (M.R. Rahman et al., pers. comm.). As the survival and activity of snakes is strongly influenced by climatic factors, climate change is expected to have significant impacts on their diversity, distribution and abundance. Depending on the species this may lead to extinctions, range shifts or range expansions and corresponding changes in health risks. In addition, extreme weather events like floods can create periods of peak frequency encounters between snakes and humans, resulting in exceptionally high mortality due to the simultaneous inaccessibility of healthcare. The knowledge of venomous snake diversity in South Asia

## **Climate Change And Infectious Diseases : Probable Influences On Disease-Transmitting Vectors In Japan.**

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It is a big concern that global warming might have influences on the endemic situation of infectious diseases. There are various possibilities causing alternations in disease endemicity, however, ecological changes for vector animals could have serious effects. Domestic malaria has been eradicated in Japan, and all patients with Dengue fever are imported cases in Japan. Those current situations might be changing because of range of mosquitoes, snails and others are moving from south to north in Japan. *Aedes albopictus*, the important vector mosquito for Dengue fever and West-Nile fever are expanding from south to north in Japan, and it is observed even in the north-end of the mainland of Japan in these years. *Anopheles minimus* is capable of transmitting *Plasmodium falciparum*. This mosquito species are distributed in the south end islands of Japan, however, there is concern that *A. minimus* is becoming to adapt to northern islands. *Angyostrongylus cantonensis* is a parasite species mainly located in sub-tropical areas in the world. However, their vector snails are spreading in Japan and whole areas in Japan could be endemic areas of *A. cantonensis* infection.

It is important to monitor the ranges of vector animals to prevent expansion of disease endemicities of infectious diseases. In this symposium, we would like to report the current situations and probable future concern in Japan will be discusses.

## **Application of weather and climate information in developing Early warning systems for prediction of disease outbreaks in Bangladesh.**

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Weather and climate is an important determinant for human health. Both weather and climate variables can be as human exposures that directly or indirectly impact on human health. Moreover, these are not expected to remain constant, and are all likely to increase their impacts on human health. Impacts of the climate are visible in Bangladesh in the form of temperature extremes, erratic rainfall, droughts, intense rainfall in short spell of time. In addition to immediate impacts on health, increased frequency of extreme weather events could have indirect impacts on health, including greater incidence of infectious disease, due to factors such as breakdown in sanitation, lack of clean fresh water. Three hourly weather data of Bangladesh were analyzed to visualize extreme weather events, rainfall, temperature etc. that may be useful for the development of early warning system for the prediction of disease outbreaks due to heat waves and other extreme weather events in Bangladesh.

## **Effective Surveillance System And Underlying Data: An Unmet Need For Tracking Neglected Tropical Diseases Due To Climate Change In Bangladesh**

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**Objective :** Establishment of efficient surveillance system to monitor and record diseases related to climate changes.

**Background and rationale :** Bangladesh is susceptible to floods, tropical cyclones, storm surges, and droughts, however; in relative terms, the impact felt in Bangladesh due to climate change will be more acute as a result of health effects and the imposition of damage on development in direct and indirect ways. The geographical location and geo-morphological conditions of Bangladesh have made the country exceptionally vulnerable to climate change. Its effects on health, both direct and indirect, will affect most populations in the next decades and put the lives and wellbeing of millions of people at increased risk. These health threats are due to changing patterns of disease, water and food insecurity, vulnerable shelter and human settlements, extreme climatic events, and population growth and relocations. Vector-borne diseases will expand their reach especially among elderly people and; will increase because of heat waves, and the indirect effects of climate change on water, food security, and extreme climatic events are likely to have the biggest effect on human health globally as well as in Bangladesh. Parasitic and infectious diseases (PIDs) are imposing a significant threat to human, livestock, and wildlife health and are changing dramatically in the face of human-induced environmental contaminations. Malaria and dengue fever are emerging while; schistosomiasis, leishmaniasis, filariasis, and helminthiasis are projected to increase as a result of climate change putting additional pressure on health services delivery systems. Considering the geographical and geo-morphological conditions, epidemiological information on patterns, nature and characteristics of such diseases are important to take appropriate measures. For developing an efficient health adaptation strategy to tackle the changed climatic condition it is necessary to have appropriate information and hence it is important to have systematic and efficient ongoing surveillance system for climate change. Data generation, documentation and a management system in Bangladesh for relevant health data is not yet a priority for policy makers and management.

**Conclusion :**Continuous monitoring and effective surveillance system are the basis to get the necessary data on various disease profile especially for vector borne and tropical disease. Underlying data along with policy and information are critical to prevent and deal with any changed conditions related to climate change. This study ventures such an assessment, data generation, involvement of stakeholders, and understanding of health care delivery system which in turn guides to policy makers for developing health adaptation strategies and other climate change scientists as the basis for designing future studies.



## **Seasonal and Intraseasonal Variations of Surface Meteorological Factors, and Their Effects on Diarrheal Diseases**

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**Background :** Bangladesh has multi-scale variations of weather conditions in a year: annual, seasonal, intraseasonal and daily variations. Dry and rainy seasons are two main seasons. However, the active and break phases can be seen in the summer monsoon seasons in Bangladesh. Sometimes the serious disasters of floods and cyclones make the extraordinary conditions of environment. Variations of meteorological factors in those multi-scale variations impact the occurrence and prevalence of diarrheal disease.

**Objectives :** We estimate the effect of surface weather condition on diarrheal diseases.

**Methods :** Meteorological data in Bangladesh Meteorological Department and Diarrheal surveillance data in ICDDR,B Dhaka Hospital were used for over 22 years (1980-2001).

**Results and Conclusions :** The seasonality of air temperature and rainfall can be detected is primarily effect for the understanding the variations of diarrheal disease patients.

## THE INFLUENCE OF CLIMATIC VARIABILITY ON DIARRHEAL DISEASES

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**Background :** Diarrheal disease remains a remarkable factor that causes significant mortality annually, especially in developing countries. It is also anticipated that the global warming may further accelerate the increasing trend of epidemics in near future. Thus, it becomes more and more important to clarify the dynamics that control the epidemic of diarrheal diseases.

**Objectives :** We aim to assess the impact of local and global climatic variability on diarrheal diseases.

**Methods :** Diarrheal surveillance data used were daily diarrheal patient numbers from ICDDR,B Dhaka Hospital for over 22 years (1980-2001). Time scales of meteorological elements used were diurnal, intra-seasonal, seasonal and inter-annual variations. Lag-correlation and time-series regression models were used to assess an effect of meteorological phenomenon on the epidemiology of diarrheal diseases.

**Results :** We identified several local, regional and global environmental factors that affect the epidemic peak of diarrheal patients. Regional climatologic and hydrological environmental factors associated with the late rainy epidemic correlate with regional anomalous atmospheric circulation patterns, i.e., stronger than normal local Hadley circulation, and stranger than normal Tibetan High. It indicates that El Niño/Southern Oscillation (ENSO) mode maturing in the preceding winter significantly correlates with the epidemics.

**Conclusions :** The winter El Niño affects the epidemic in Dhaka in late rainy season, through the suppression of western North Pacific rainfall and the resultant anomalous southasian monsoon circulation.

## **Biochemical analysis of alternative oxidase (AOX) in *Cryptosporidium parvum*: localization of AOX to mitosome**

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**Abstract** :Diarrhea is caused by bacteria, virus or parasite. *Cryptosporidium* spp. is a one of the parasites caused watery diarrhea that is called cryptosporidiosis. Currently there is no effective drug to cryptosporidiosis but we found that the parasite has a cyanide-insensitive alternative oxidase (AOX), which is the drug target molecule of African Sleeping Sickness. AOX is a terminal oxidase of the mitochondrial respiratory chain in plant, fungi, protozoa and some nematodes, but not in mammal. Although this enzyme is known to be localized to mitochondria, *Cryptosporidium parvum* does not have typical mitochondria. However, *C. parvum* is reported to have a relict mitochondrion, mitosome. To see the localization of AOX in *C. parvum*, we examined a protocol of preparation of mitosome enriched fraction from *C. parvum* sporozoites and demonstrated its enzymatic activity, expression and subcellular localization.

*C. parvum* oocysts (HNJ-1 strain) were obtained from immunodeficiency mouse. Following cell disruption and fractionation, western blotting was performed using antibody against *C. parvum* heat shock protein 70 (Hsp70, kind gift from Dr. Keithly) to confirm its localization to mitosome. As the results, Hsp70 protein was localized to 5,000 × g pellet fraction when the cells were gently homogenized by a pestle and glass beads. Then we examined enzymatic activity of AOX using fractions obtained from the disrupted cells. Ubiquinol oxidase activity was detected in 5,000 × g fraction reproducibly and was inhibited completely by 10 nM ascofuranone, which is a specific inhibitor of Trypanosome AOX. Furthermore, specific antibody against purified recombinant *C. parvum* AOX was prepared to determine its expression and subcellular localization. Western blotting showed the protein cross-reacted with this antibody was also localized to 5,000 × g fraction. These results clearly show functional AOX is localized to mitosome.

## **The Indian Ocean Dipole and cholera incidence in Bangladesh: a time series analysis**

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**Background and objectives :** It has been reported that El Niño-Southern Oscillation (ENSO) plays a role in the interannual variation of endemic cholera in Bangladesh. There is increased interest in the influences of the Indian Ocean Dipole (IOD), a climate mode of coupled ocean-atmosphere variability, on regional ocean climate in the Bay of Bengal and Indian monsoon rainfall. We explored the relationship between the IOD and the number of cholera patients in urban and rural Bangladesh, controlling for the effects of ENSO.

**Contents :** We performed time-series regression using negative binomial models on the number of monthly hospital visits for cholera in Dhaka and Matlab (1993-2007) and the Dipole Mode Index (DMI) controlling for ENSO index (NINO3), seasonal and interannual variations. The association between cholera cases and sea surface temperature (SST) and sea surface height (SSH) of the northern Bay of Bengal was also examined. An increase of 0.1 in DMI was associated with an increase in cholera incidence of 2.6% (95% CI: 0.0-5.2) and 6.9% (95% CI: 3.2-10.8) in Dhaka and Matlab, respectively, with a lag of 0-3 months. Cholera incidence in Dhaka increased by 2.4% (95% CI: 0.0-5.0) following a decrease in DMI of 0.1, with a lag of 4-7 months. The increased risk of hospital visits for cholera was associated with high SSH and SST in both areas.

**Conclusions :** Our findings suggest that negative and positive dipole events increase the incidence of cholera in Bangladesh with time lags of different durations.

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## **Entamoeba moshkovskii can establish the infection in the cecum of CBA mice and induce pro-inflammatory cytokine production**

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*Entamoeba histolytica* (Eh) causes extensive mortality and morbidity worldwide, whereas *E. dispar* (Ed) is a commensal of human gut and never causes the amoebic diseases. *E. moshkovskii* (Em) is considered a free-living amoeba which is morphologically similar to Eh and Ed, although it is genetically and biochemically different from them. Recent studies have suggested that Em may parasitize and be a pathogen, with infections giving rise to diarrhea and other intestinal disorders. However, it still remains unclear whether this species is pathogenic and what is responsible for the pathogenicity exerted by *Entamoeba* spp. In this study, virulence of Em was evaluated using an animal model of intestinal amebiasis, in which intracecal inoculation of Eh trophozoites led to establishment of infection in 50-80% of CBA mice. The study showed that Em but not Ed could infect CBA mice similarly to pathogenic Eh, and that substantial number of mice infected with Em exhibited symptoms such as diarrhea. These results indicate that Em can be pathogenic. To further explore the differences in infectivity or pathogenicity among *Entamoeba* spp, their ability to induce inflammatory responses was examined. In response to pathogenic Eh and Em, but not to non-pathogenic Ed, peritoneal macrophages produced substantial amounts of pro-inflammatory cytokines, indicating the relationship between the property to induce pro-inflammatory cytokine and to establish the infection. In addition, as the patterns of pro-inflammatory cytokine induced by each *Entamoeba* spp were distinct, we are examining the composition of pathogen-associated molecular patterns of them.

## **Modelling the future niche distribution of venomous snakes under climate change : a case study of the Greater Black Krait (*Bungarus niger*), a recently identified cause of neuro-myotoxic envenoming in Bangladesh**

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**Background and objectives :** The Greater Black Krait (*Bungarus niger*), previously known from north-eastern India, Nepal and Myanmar, was recently reported to cause envenoming in Bangladesh. There is no specific antivenom against its venom which destroys nerves and muscles. To obtain more information on this highly dangerous snake we modelled its present distribution, performed projections of its possible future distribution under climate change scenarios, and estimated the robustness of these projections.

**Contents :** We analyzed the ecological niche of *B. niger* using occurrence and climatological observation data. To reconstruct its present distribution we estimated the species' ecological niche by applying seven niche models of different complexity, including a new model based on Gaussian probability density functions, using relevant bioclimatic variables from the WorldClim dataset. For future conditions we performed experiments using bioclimatic Variables from climate model output of the IPCC emission scenarios SRES B1, A1b and A2 with the fully-coupled atmosphere-ocean general circulation model ECHAM5/MPIOM and the regional climate model CLM. For both, we interpolated data to match the resolution of the WorldClim dataset and to generate the set of bioclimatic variables. To exclude model-inherent biases, we did not use absolute data of the AR4 model experiments but considered climatic anomalies relative to the present-day control run. Then, we added the anomalies to observation data for the periods 2011-2030, 2046-2065 and 2080-2099. Robustness of projections was compared based on the total probability density density of occurrence in a grid cell and control experiments.

**Conclusions :** The present potential distribution of *B. niger* covers much of Bangladesh, and the species may occur throughout the country (with lower probabilities in the west). Based on climate alone, *B. niger* will survive in its core area with a north-eastward range shift that is limited by topographic barriers. Projections for Bangladesh differ according to the climate model used, CLM showing less suitable conditions in the future and ECHAM5 showing acceptable and even better conditions in some areas. These discrepancies are rooted in different projections of precipitation in the warmest and the driest quarters.

Variables from climate model output of the IPCC emission scenarios SRES B1, A1b and A2 with the fully-coupled atmosphere-ocean general circulation model ECHAM5/MPIOM and the regional climate model CLM. For both, we interpolated data to match the resolution of the WorldClim dataset and to generate the set of bioclimatic variables. To exclude model-inherent biases, we did not use absolute data of the AR4 model experiments but considered climatic anomalies relative to the present-day control run. Then, we added the anomalies to observation data for the periods 2011-2030, 2046-2065 and 2080-2099. Robustness of projections was compared based on the total probability density density of occurrence in a grid cell and control experiments.

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[Poster presentation]

## **Species diversity of phlebotomine sand flies from a single house in a visceral leishmaniasis (kala-azar) endemic area of Mymensingh District, Bangladesh**

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**Background and objectives :** Future projections of vector-borne diseases are fraught with uncertainties because they need to incorporate independent and inter-dependent systems like climate, pathogen, vector, and human activity or exposure. Knowing the disease vectors, their pathogen transmission abilities and ecology is therefore essential. However, basic knowledge about many vectors is still scarce, and advances in their study reveal greater species diversity than anticipated. Here we illustrate this additional challenge with an example from work in progress on sand flies, the vectors of kala-azar or visceral leishmaniasis (VL).

**Contents:** We collected sand flies on a single evening from the mud walls of a house and cattle shelter in a VL endemic area of Mymensingh District and PCR-amplified and sequenced the barcode region of the CO I gene for 59 specimens. Morphologically, a sub-

sample of these could be identified as *Sergentomyia babu babu* and *Phlebotomus argentipes*. The molecular data, however, revealed the presence of at least five different species, i.e., *S. babu babu* and several genetically distinct potential members of the *P. argentipes* complex. Using PCR primers amplifying minicircle kDNA, *Leishmania* spp. were detected and sequenced from more than 10% of the sand flies belonging to three different species including *S. babu. babu*, indicating a high infection rate.

**Conclusions:** The presence of several morphologically similar sand fly species in a single building was surprising. In previous studies of *P. argentipes* (sensu lato), geographically isolated, morphologically different populations were often regarded as members of a single species. Recently three species in the *P. argentipes* complex were resurrected. As genetically divergent populations / species may differ in their resistance to insecticides, their identification and characterization is a prerequisite for VL control methods targeting vectors. Molecular identification is also required for studies of differing vectorial abilities among populations and their respective roles in VL epidemiology, both under present and future climate scenarios. In this context, *S. babu babu* deserves particular attention. As conventional PCR cannot distinguish infected from infective sand flies, further studies on the putative vector status of *S. babu babu* in Bangladesh are indicated.

**Key words:** Biodiversity; DNA barcoding; *Leishmania*; *Phlebotomus*; sand fly; *Sergentomyia*; visceral leishmaniasis.

[Poster presentation]



