Attachment 1.

DHAKA - 12

ETHICAL REVIEW COMMITTEE, ICDDR,B.

Date 12.2.87

16.2.87

Principal Investigator Dr. NIGAR S. SHAHID Trainee Investigator (if any)

Application No. 87-004(P) Supporting Agency (if Non-ICDDR,B) GO

Title of Study Studies on the Combined effect of measles virus and Shigellae on Hela cells

Project status:
- (✓) New Study
- ( ) Continuation with change
- ( ) No change (do not fill out rest of form)

Circle the appropriate answer to each of the following (If Not Applicable write NA).

1. Source of Population:
   - (a) Ill subjects — Yes (No)
   - (b) Non-ill subjects — Yes (No)
   - (c) Minors or persons under guardianship — Yes (No)
2. Does the study involve:
   - (a) Physical risks to the subjects — Yes (No)
   - (b) Social Risks — Yes (No)
   - (c) Psychological risks to subjects — Yes (No)
   - (d) Discomfort to subjects — Yes (No)
   - (e) Invasion of privacy — Yes (No)
   - (f) Disclosure of information damaging to subject or others — Yes No
3. Does the study involve:
   - (a) Use of records, (hospital, medical, death, birth or other) — Yes (No)
   - (b) Use of fetal tissue or abortus. — Yes (No)
   - (c) Use of organs or body fluids — Yes No
4. Are subjects clearly informed about:
   - (a) Nature and purposes of study — Yes No NA
   - (b) Procedures to be followed including alternatives used — Yes No
   - (c) Physical risks — Yes No
   - (d) Sensitive questions — Yes No
   - (e) Benefits to be derived — Yes No
   - (f) Right to refuse to participate or to withdraw from study — Yes No
   - (g) Confidential handling of data — Yes No
   - (h) Compensation &/or treatment where there are risks or privacy is involved in any particular procedure — Yes No
5. Will signed consent form be required:
   - (a) From subjects — Yes No NA
   - (b) From parent or guardian (if subjects are minors) — Yes No
6. Will precautions be taken to protect anonymity of subjects — Yes No
7. Check documents being submitted herewith to Committee:
   - ___ Umbrella proposal - initially submit a overview (all other requirements will be submitted with individual studies).
   - ✓ Protocol (Required)
   - ✓ Abstract Summary (Required)
   - ✓ Statement given or read to subjects on nature of study, risks, types of questions to be asked, and right to refuse to participate or withdraw (Required)
   - NA Informed consent form for subjects
   - NA Informed consent form for parent or guardian
   - NA Procedure for maintaining confidentiality
   - ___ Questionnaire or interview schedule *

* If the final instrument is not completed prior to review, the following information should be included in the abstract summary:
1. A description of the areas to be covered in the questionnaire or interview which could be considered either sensitive or which would constitute an invasion of privacy.
2. Examples of the type of specific questions to be asked in the sensitive areas.
3. An indication as to when the questionnaire will be presented to the Cttee. for review.

The study involves the use of stock microbiological strains, and Hela cell line to be obtained from commercial

We agree to obtain approval of the Ethical Review Committee for any changes involving the rights and welfare of subjects before making such change.

Nigar S. Shahid
Principal Investigator

FEB 16 1987

Trainee

SECTION-I - RESEARCH PROTOCOL (Pilot)

1. Title : Studies on the combined effect of measles virus and Shigellae on HeLa cells.

2. Principal Investigator : Dr. Nigar S. Shahid

   Co-Investigator : Dr. Guo Cunsan
   Dr. Goutam Podder
   Dr. K.A. Chowdhury

   Consultant : Dr. Ivan Ciznar

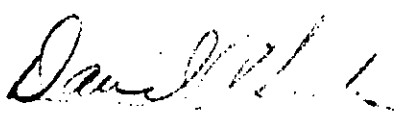
3. Starting Date : April 1, 1987

4. Completion Date : January 31, 1988

5. Total Direct Cost : US$4,367.00

6. Scientific Program Head : Dr. David A. Sack

This protocol has been approved by the Laboratory Sciences and Epidemiology Division

Signature of Scientific Programme Head : 

Date :

7. Abstract Summary:

Since a large number of children with measles experience a prolonged duration of diarrhoea we propose to look at the pathogenesis of this synergistic effect by studing the cytopathic changes on HeLa cell line by inoculating measles virus on a cell-line already infected by Shigellae spp., vice versa and simultaneously. Standard methods for establishment of the individual cultures of measles virus and Shigellae spp. will be

used and test strains will then be inoculated on the infected cell lines. Non-pathogenic E. coli strain will be used as a control. We expect to observe differences in the cytopathic effect on the cell lines by measuring the necrotic and degenerative cells, syncytial and giant cell formation by single and multiple infection..

Reviews:

a. Ethical Review Committee : _____

b. Research Review Committee: _____

c. Director : _____

SECTION II - RESEARCH PLAN

A. INTRODUCTION

1. Objectives:

To study the pathogenesis of measles associated diarrhoea.

2. Background:

In developing countries measles is an important cause of morbidity and mortality (1). Diarrhoea and pneumonia are well recognized complications and may develop at or after the appearance of rash (2). Morley has reported from Nigeria that out of 179 attacks of diarrhoea in 256 children with different infections observed for a 3 year period, 109 attacks occurred in children with measles i.e. 60.86% were measles associated diarrhoea (3). Various reports from India suggest that between 21 and 40% of all diarrhoea cases reporting to hospitals were measles-associated. Community based studies have shown that of those children who are attacked with measles, 78% develop diarrhoea (4,5); in addition, data from Matlab (Bangladesh) suggest that 18% children having measles experience persistant diarrhoea which may extend up to 5 months after measles attack (6).

At the ICDDR,B Dhaka hospital 8% admissions gave a history of measles within the past 1 month of hospital visit. Of these patients a pathogen was detected in 62% of the samples. There were 17.4% Shigellae spp. 20.6% Campylobacter jejuni (C. jejuni), 15.4% enterotoxigenic escherescia coli (ETEC)

detected from this series. The following pattern was obtained from all diarrhoea patients coming under surveillance. With a pathogen identified for 52% of samples there was 12.6 Shigella, 7.2% C. jejuni, 11.6% ETEC.

A prospective field study conducted by ICDDR,B at Nandipara, a sub-urban village of Dhaka to identify pathogens associated with measles diarrhoea, found Shigella spp. as the most common pathogen followed by C. jejuni and ETEC in children with measles compared with their non-measles diarrhoea controls (7) and personal communication.

Measles virus has been isolated from stool of patients 25 days after clearance of rash (8). Since measles virus itself invades the intestinal mucosa producing desquamation of intestinal epithelum, it is associated with gaint cell formation. Substantial protein loss from the gut is more persistent in malnourished cases (9). Thus intestinal measles virus may be a diarrhoeal agent or it may account partially for prolonged susceptibility to secondary bacterial invasion due to the depression of immune response.

The synergistic effect of two internal infections is known to produce high mortality and morbidity rates, in part by promoting secondary infection in the host (10). Field studies have documented a synergistic effect between measles infection and accompaning prolonged diarrhoea in which the combined effect was greater than the sum of the impact of each infection (11).

Flaring up of old tuberculous lesions after measles have been reported from Africa (12). Enteroinvasive pathogens such as Shigella (13) and C. jejuni (14) have been reported to have very high carrier rates in the Bangladeshi population. The severity of shigellosis is also lessened in case of breastfed children (15). Since measles attack takes place in the breastfeeding age group it is possible that the entry of measle virus in the system exercerbates the latent infection of ehteroinvasive pathogens in the gut, producing prolonged and severe diarrhoea.

3. Rationale:

From the Study discussed above, knowledge of the pathogenisis of the synergistic effect of measles and enteropathogen will be obtained. We expect that experiments under this protocol will provide data which will help us to answer the basic question of our working hypothesis:- Does measles virus modify epithelial cells so that a subsequent attack by enteroinvasive pathogen occurs at a higher rate? Or, does the epithelial cells invaded by Shigellae become more susceptible to measles virus invasion? Such knowledge would represent a signigficant step ahead in understanding of the mechanism of pathogenesis of the combined infection and would also enable us to rationalize further studies related to immunity, defense mechanisms and prevention of the serious health problem in developing countries.

Specific Aims:

1. To observe susceptibility of HeLa cells infected with measles virus to subsequent infection with Shigellae and vice versa.

2. To observe morphological changes in HeLa cells with the combined infection.

3. To set up a virus cell culture line at ICDDR,B.

MATERIALS AND METHODS

Methods for multiplication and maintainance of HeLa cell is described in Appendix 1.

Effect on Mammalian Cell Line:

1. **Measles Virus:**

The cytopathic change induced by measles virus will be characterized by formation of cytoplasmic and intranuclear inclusions formation of syncytia and multinucleated giant cells and strand formation, consisting of spindle shaped cells with long and irregular cytoplasmic process and of round cells with granular cytoplasm (16).

2. Shigellae spp.

a. Plaque formation by virulent Shigella flexneri (17)

Shigella plaques are formed in HeLa cell monolayers in the presence of an agarose overlay containing tissue culture medium and gentamycin, which will eliminate extracellular bacterial growth. Microscopically the plagues are

characterized by a central area of dead host cells surrounded by cells infected with Shigellae. Cells further away from the plaque center should remain uninfected. One strain of each species of Shigellae, will be tested in the present study. A non-pathogenic E. coli strain will be used as a control.

To observe the synergestic effect of measles virus on Shigellae in fected HeLa cells plague formation will be observed until 14 days.

HeLa cell line infected by a Shigellae strain is expected to form plagues in 7 days time. After 90 min of incubation with Shigellae strain all necessary washing procedure to remove the non-internalized bacteria will be performed and measles virus will be applied and adsorbed for 4 hours. Agarose overlay will then be applied and plague formation will be observed everyday for 14 days.

HeLa cell line will be infected with measles virus. Cytopathic effect is expected to be observed by 2-3 day and completed in 7-14 days. At 72 hours we will inoculate the cell-line will a Shigellae strain and observe changes every day and compare with control.

b. Quantitation of HeLa cell monolayer invasion by Shigellae spp.(18).

This is a major determinant in the virulence of Shigellae spp. It will be developed on an agarose-L agar overlay technique which will allow for the convenient quantitation of the number

of infected HeLa culture cells on a monolayer. Infected monolayers will be washed. The number of infected HeLa cell present will be determined by overlaying the monolayer with distilled water-agarose followed by an equal volume of 2 x L agar. Bacterial colonies formed over infected cells in 24 h will be counted. Since bacterial colonies are not observed with noninvasive variants of Shigellae spp., invasiveness of a strain will be checked by performing the standard Sereny test (19). HeLa cells persistantly infected with measles virus will also be infected by each species of Shigellae and observed it regular intervals compared with control as mentioned above. Visualization will be done by light and phase contrast microscopy both unstained and stained and immuno flourescence.

This study will examine the changes in the cell line by

i. Inoculating measles virus on a cell line (HeLa) already infected by Shigellae spp.

i. Inoculating Shigellae on a measles virus-infected HeLa cell line.

i. Inoculating both Shigellae and measles virus simultaneously.

We expect to observe qualitative and quantitative differences in the cytopathic effect in the cell lines by measuring the number of necrotic cells, degenerated cells, syncytial or giant cell formation.

Facilities Required:

No new infrastructural arrangements are needed. Dr. Guo Cunson a visit Scientist from the Peoples Republic of China who is one of the co-investigator has got experience in tissue cultures and especially on measles virus.

NO.	Chemicals and reagents	Brand or place of prodn.	Unit of pack	Price unit Cost (US$)	Order	Project requirement (US $)
1.	Eagle's Minimum Essential Medium	Gibco	10 L	35	3	105
2.	Zero Mr. Agarose		10 gm	53.00	3	159
3.	Dulbecco's MEM		100	6	10	60
4.	Calf Serum		100 ml	35	4	140
5.	Fetal bovine serum		100 ml	24	2	48
6.	Trypsin	Difco	100 ml	12	2	24
7.	Streptomycin and penicillin g(Reagent)		20 ml	8	3	24
8.	Gentamycin		10 ml	193	2	386
9.	Dichloroisocyanuric acid		500 gm	8.40	10	84
0.	Hanks solution		500	15	6	90
1.	Measles antiserum		1	25	1	25
2.	Measles haemaglutination antigen		1	25	2	50
3.	Flouresecence labled rabbit anti-human immune globulin		1	100	1	100
4.	HeLa cell line		1	15	2	30
5.	Misc reagent					100
		Sub-total				1428

Equipment

		Unit of pack	Price unit (US $)	Order	Disburse (US $)
1.	0.22 u millipore membrane filter	100	55	1	55
2.	Culture flask 25 cm^2	100	100	3	300
3.	Plastic tissue culture dishes	100	133	1	133
4.	Microtitre assay plate (Flat bottom) 96 wells	50	38	6	228
5.	Auto pipette	1	250	2	500
6.	Glass ware (Misc)				100
		Sub-total		=	1316

SECTION III

1. PERSONNEL SERVICES

Name	Position	% time use
Dr. Nigar Shahid	NO B	50%
Dr. Guo Cunsun	Int. Fellow	25%
Dr. G. Podder		15%
Technician		15%
Dr. Ivar Ciznar	Consultant	

REFERENCES

1. Chen LC, Rahman M, Sardar AM. Epidemiology and causes of death in a rural area of Bangladesh. Int. J. Epidemiology 1980, 9:25-33.

2. Smith EA and Foster SO. Measles in areas of malnutrition. J of Nigerian Medical Journal 1970;7(3):16-18.

3. Morlay D. Measles in Nigeria. Amer. J. Dis. Children 1962, 103:250-53.

4. Jaspal D, Krishna MS et al. Increasing severity of measles; a critical analysis of 200 hospitalized cases. Indian Paediatrics 1978;15(12):719-23.

5. Ramakrishnan K. Measles a clinical study of 600 cases. Indian Paediatrics 1978;12:1035-37.

6. Shahid NS, Claquin P, Sheikh K, Zimicki S. Long term complications of measles in rural Bangladesh. Journal of Tropical Medicine and Hygiene 1983;86:77-80.

7. ICDDR,B Annual Report 1985. P. 31.

8. Dossetor SF, Whittle HC, Greenwood BM. Persistnat measles infection in malnourished children. British medical J. 1977, 1:1633-5.

9. Wialliam AO and Os timehin B: Autopsy study of measles in Ibadan Nigeria. Ghana Med J 1970;March 13-27.

10. MacKowiak PA. Microbial Synergism in human infection. New. Eng J Med 1978;278:21-26.

11. Koster FT, Curlin GC, Aziz KMA, Haque A. Synergistic impact of measles and diarrhoea on nutrition and mortality in Bangladesh. Bull WHO 1981;59(6):901-8.

12. Morley DC. Severe measles in the tropics. British Med Journal 1969;1:297-300.

13. Shahid NS, Grenough WB, Samadi AR, Huq MI, Rahman N. Handwashing with soap reduces diarrhoea and spread of pathogens in Bangladesh village. Manuscript submitted for publication.

14. Glass RI, Stoll BJ, Huq MI, Struelens MJ, Blaser M, Kibriya AKMG. Epidemiologic and clinical features of endemic campylobacter jejuni infection in Bangladesh. J Inf Dis 1983;148(2):292-296.

15. Clemens JC, Stanton B, Stoll B, Shahid NS, Banu H and Chowdhury AKMA. Breast feeding as a determinant of severity in shigellosis. Am J Epid 1986;123(4):710-20.

16. Norrby E, Chiarini A and Marusy KH. Measles Virus variant: Intracellular appearance and biologic charecteristics of Virus products. In: "The Biology of darge RNA virus" (RD Barry and BWJ Mahy, eds) P 141-153. Academic Press, NY London.

17. Oaks EV, Wingfield ME, Formal SB. Plaque formation by virulent Shig flexneri Inf. & Immunity 1985;48(1):124-9.

18. Niesal DW, Chambers CE, Stockman SL. Quantitation of HeLa cell monolayer invasion by Shigella and Salmonella species. J Clin Micro 1985;22(6):897-902.

19. Sereny B. Experimental keratoconjunctivitis shigellosa. Acta Microbiol Acad Sci Hung 1956;4(4)367-76.

Appendix - 1

MULTIPLICATION OF HeLa CELL CULTURE

I. Medium:

1. To prepare medium follow manufacturer's instructions for dissolving powder Eagle.
2. Add 100 ug/ml streptomycin and 100 units/ml penicillin G per litre, mix well.
3. Filter through a 0.22 u millipore membrane filter.
4. Aseptically into some screw cap flasks 90 ml per flasks.
5. Add 10 ml of sterile calf serum to 1 flask.
6. Store at 4 °C refrigerator for no more than 4 weeks.

II. Maintenance of HeLa cell culture:

1. Obtain HeLa cell line culture from a laboratory that is routinely onducting this assay cell must be frozen.
2. Using a pasture pipette add a drop of cell suspensions to 4.5 ml of the Eagle's medium solution with 10% calf serum and antibiotic in a 25 cm^2 culture flask. Two or more flasks are routinely carried.
3. Maintenance of the tissue culture requires weekly passage to fresh medium.
4. Observe cells for confluency in the monolayer using a substage phase microscope.

III. Passage of HeLa cell-line:

Cells are passage a least once a week and 2 flasks are minutely maintained. Fresh Eagle Medium with 10% calf serum and antibiotic should be added the day before passage. Simply decant the old medium and add 4.5 ml of the fresh medium.

1. Decant Eagle with 10% calf serum and antibiotic from confluent cells.

2. Add 2 ml of 0.25% trypsin wash over cells for about 5 minutes and decant.

3. Incubate at 37 C in or 20 minutes with monolayer side of the flask up.

4. Add 2 ml Eagle with 10% Calf serum and antibiotic to stop trypsin digestion and agitate t suspend all cells and break up any clumping. Take the cell suspension into a sterile centrifuge tube and spindown at 600 r.p.m./min for 5 minutes at room temperature.

5. Add desired quantity of cell suspension to a new tissue culture flask with fresh Eagle with 10% calf serum and antibiotic. The amount added may be adjucted to actieve new monolayer cell confluency at a specified time point. Usually one drop of the cell suspension from a pasture pipette into 4.5 ml of medium should reach confluency in 3 days.

6. Incubate at 37 C (best in 6% CO_2)

....

Or use Medium 1640 5% fetal bovine serum
2 mps glutamine
50 u/ml penicillin G
50 ug/ml streptomycin

Abstract Summary for ERC

1. The protocol is completely laboratory based and will involve a mammilian cell-line and laboratory strains. No human population is involved.

2. There is no potential risk involved.

3. Standard laboratory safety procedures will be used.

4. Since all laboratory strains are coded no confidentiality will be maintained.

5. No potential risk involved.

6. No interviews involved.

7. No individual subject are involved. However, the study will provide some light on the pathogenesis of diarrhoea associated with measles.

8. The protocol will require the use of stock Shigellae and E. coli strains. HeLa cell line will be obtained from a commercial laboratory.

PS:NSPATHMI.PRO

CURRICULA VITAE

PRINCIPAL [redacted] -INVESTIGATOR

1. Surname/Family Name: **SHAHID**

   First name/other names **NIGAR SAYEM**

2. Date of birth: **24.11.50**

   Place of birth: **Dhaka**

   Nationality: **Bangladesh**

3. Degrees

Degree	Year	Institution	Disciplines
MBBS	**1976**	**Dhaka Medical College**	**Medicine, Surgery**
M Sc	**1980**	**Ross Inst. London School of Hyg. & T.M.**	**Community Health**
M P H	**1986**	**Johns Hopkins University School of Hyg.**	**Epidemiology**

4. Academic Distinctions:

Degree	Year

5. Present post (Title, Institution, Dates)

   Title : **Epidemiologist/Asstt. Scientist**

   Institution: **ICDDR,B**

   Date: **From 27.03.81 To Present**

CURRICULA VITAE

6. Previous posts:

a) Title : **Resident**

b) Institution : **Dhaka Medical College**

c) Date : **16 Sept. 1980 to 26th March 1981**

a) Title : **Medical Officer**

b) Institution : **Red Lion and Son Society, Iran**

c) Date : From **3rd Dec. 1976** to **20 July, 1979**

a) Title : **In-Service Training**

b) Institution : **Dhaka Medical College**

c) Date : From **1st April,1976** to **2nd Dec., 1976**

7. Academic & Research Awards, Consultant & other posts

United Nation University Fellow.

8. Other University & Institutional Posts

9. Current Research Interests including details of Projects of which Applicant is Principal Investigator.

Measles, Measles associated diarrhoea and measles vaccine.

The impact of measles immunization on diarrhoeal morbidity and growth (Protocol #84-006).

10. Publications & Communications : (If space is inadequate, please attach list)

Attached list.

Curriculum Vitae of Nigar Sayem Shahid

ORIGINAL SCIENTIFIC PUBLICATIONS:

1. Shahid NS. Long term complications of measles in rural Bangladesh. ICDDR,B International Publication 1981. Dissertation series No. 3.

2. Shahid NS, Alam AN, Haider K, Henning C, Gothefors L, and Greenough WB. Rapid technique for detection of pneumococcal pneumonia. Bulletin of the Bangladesh Medical Research Council. Vol. VIII, No. 2, 1982. p. 47-51.

3. Shahid NS, Rahman ASMM, Aziz KMA, Faruque ASG, and Bari MA. Beliefs and treatment related to diarrhoeal episodes reported in association with measles. Tropical and Geographical Medicine, Vol. 35, No. 2. p. 151-6, 1983.

4. Shahid NS, Claquin P, Sheikh K, Zimicki S. Long term complications of measles in rural Bangladesh. Journal of Tropical Medicine and Hygiene 86, p. 77-80, 1983.

5. Shahid NS, Samadi AR, Khan MU, Huq MI. Classical versus El tor cholera. A prospective family study of a concurrent outbreak. Journal of Diarrhoeal Disease Research 2 (2), p. 73-78, 1984.

6. Samadi AR, Huq MI, Shahid NS, Khan MU, Eusof A, Rahman ASMM, Yunus M, Faruque ASG. Classical Vibrio cholerae biotype displaces El tor in Bangladesh. Lancet, Vol. 1, 805-807, 1983.

7. Tacket C, Shahid NS, Huq MI, Alim ARM, Cohen ML. Usefulness of plasmid profiles for differentiation of Shigella isolation in Bangladesh. Journal of Clinical Microbiology, 20, (20), 300-301, 1984.

8. Shahid NS, Rahman ASMH, Anderson BC, Mata LJ, Sanyal SC. Cryptosporidiosis in Bangladesh. British Medical Journal. Vol. 290:114-115, 1985.

9. Samadi AR, Chowdhury AI, Huq MI, Shahid NS. Risk factors for mortality of complications for diarrhoea in Bangladesh. British Medical Journal. Vol. 290: 1615-1617, 1985

10. Neogi PKB, Shahid NS, Sanyal SC. First isolation of Y. enterocolitica from stool of a diarrhoeal patient in Bangladesh. Bangladesh Pediatrics, Vol. 9(1):10-14, 1985.

11. Shahid NS, Rahman MM, Haider K, Banu H, Rahman N. Changing pattern of antibiotic resistance to S. dysenteriae type 1 and S. flexneri in Bangladesh. Journal of Infectious Diseases, Vol. 152, No. 6, p. 114-1110, 1985.

12. Neogi PKB, Shahid NS, Sanyal SC. Yersinia enterocolitica infection in Bangladesh -- a case report. Journal of Tropical and Geographical Medicine, Vol. 37(2):362-64, 1985.

13. Clemens JD, Stanton B, Shahid NS, Stoll B. Breast feeding as a determination of severity in shigellosis: evidence for protection throughout the first three years of life in Bangladesh children. American Journal of Epidemiology, Vol. 123(4):710-720, 1985.

14. Haider K, Huq MI, Hossain A, Shahid NS. Electrophenotypes of DNA rotavirus in infants and young children with acute diarrhoea in Bangladesh. Journal of Diarrhoeal Diseases Research. Vol. 3(4): 219-222, 1985.

15. Islam SS, Shahid NS. Morbidity and mortality in a diarrhoeal diseases hospital in Bangladesh. Transactions of the Royal Society of Tropical Medicine and Hygiene Vol. 80(5):748-52,1986.

16. Islam MS, Shahid NS, Haque E, Aziz KMA, Mustafa G. Characteristics and practices of traditional birth attendants in Matlab, Bangladesh. Journal of Preventive and Social Medicine Vol.3(2):23-31, 1984.

17. Huq MI, Shahid NS, Ahmed WV. Bacteremia due to gram negative organisms during diarrhoea. Indian J. Med. Microbiology Vol.4, :59-63, 1986.

18. Samadi AR, Shahid NS, Huq MI, Banu H. Clinical and epidemiological features of ETEC diarrhoea by toxin type. Tropical and Geographical Medicine (in press).

19. Stanton B, Clemens JD, Khair T, Shahid NS. Follow up of children discharged from hospital after treatment for diarrhoea in urban Bangladesh. Tropical and Geographical Medicine (in press).

20. Shahid NS, Greenough WB III, Samadi AR, Huq MI, Rahman N. Handwashing with soap reduces diarrhoea and spread of pathogens in a Bangladeshi village. Journal of Infectious Diseases (in press).

21. Neogi PKB, Shahid NS. Serotypes of Campylobacter jejuni isolated from patients attending a Diarrhoeal Diseases Hospital in Urban Bangladesh. Journal of Medical Microbiology (UK) (In Press).

CURRICULA VITAE

[redacted]/CO-INVESTIGATOR

1. Surname/Family Name: Guo

   First name/other names Cunsan

2. Date of birth: 7 oct. 1933

   Place of birth: Beijing, the people's Republic of China

   Nationality: Chinese

3. Degrees

Degree	Year	Institution	Discipli:

4. Academic Distinctions:

	Degree	Year

5. Present post (Title, Institution, Dates)

   Title : Director, Chief doctor

   Institution: Jilin Provicial Hygiene and Disease preventive Centre Changchun China

   Date: From 1985 up To now

CUPRICULA VITAE

6. Previous posts:

a) Title : Director, Department of Virology
b) Institution : Jilin provincial Anti-epidemic Centre, China
c) Date : From 1961 to 1979 (Except 1966–1971)

a) Title : Director, Section of Epidemiology
b) Institution : Jilin provincial Anti-epidemic Centre, China
c) Date : From 1979 to 1980

a) Title : Deputy director – Director (Chief doctor)
b) Institution : Jilin provincial Anti-epidemic Centre, China
c) Date : From 1980 to 1985

7. Academic & Research Awards, Consultant & other posts

1. China National Scientific & Technical Article Award, 1978
2. Science & Technic Award of Ministry of Public Health China, 1979
3. China National Technical Award, 1985

8. Other University & Institutional posts

1. Deputy director of Society of epidemiology, Chinese Medical Association
2. Member of standing Committee of Medical Virology, Chinese Medical Association
3. Hold a post concurrently of Epidemiology at Jilin Medical College.
4. Committee Member of National Special Topic on CDD

9. Current Research Interests including details of Projects of which Applicant is Principal Investigator.

Epidemiology, Virology (measles virus)

10. Publications & Communications : (If space is inadequate, please attach list)

Recent contents of Original articles

1. C.S. Guo, et al: Mathematical analysis & Microcomputer system of Epidemiology
   Chinese Acta of Medicine Information processing, 1994:1
2. C.S. Guo, et al: Etiologic studies on the outbreaks of

epidemic diarrhea in Jilin Province.
National Congress of Diarrhea, 1985, Feb.
3 Z.Y. XU, C.S. Guo, et al: Epidemiological Studies of Hemorrhagic Fever with Renal Syndrome
J. Inf. Dis. 1985; 152:1.137
4 Y.N. Huang, C.S. Guo et al: Coronavirus-like particles in fecal samples from patients with Epidemic Diarrhea.
Virus Information Exchange Newletter (Australia)
1985; 2:59
5 H.X. Shiao, C.S. Guo et al. The handbook of Rapid diagnosis of virus infections disease (Peking). 1985
6 C.S. Guo, Y.N Huang et al: Study on virology etiology of diarrhea in Jilin.
National Congress of Epidemiology. 1986. Aug.