ガーナ大学医学部医療協力
計画・打合せ調査チーム報告書

JICA

昭和52年11月

国際協力事業団
医療協力部

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

目　　次

I　調査チーム派遣の目的

我が国のガーナに対する医療協力は昭和43年以来「ウイルス学と電子顕微鏡学」をテーマとする第1次プロジェクト，「低栄養と感染症」をテーマとする第2次プロジェクトと順調な歩みを続け，昭和51年5月に派遣された第2次プロジェクトのエバリュエーションチーム（団長：福島県立医科大学外科学教授　本多憲児）とガーナ大学医学部との間で取り交された合意議事録に基づいて，昭和51年6月8日から4年間の予定で「病態生理学と免疫学」をテーマとする第3次プロジェクトが開始された。

今回の調査チームは第3次プロジェクト前半の成果を評価すると共に，後半の協力内容を検討，調整するために派遣された。

Ⅱ　調査チーム構成

団　　長　　福島県立医科大学衛生学教室
　　教　授　　星　島　啓一郎

団　　員　　福島県立医科大学整形外科学教室
　　講　師　　渡　辺　　真

団　　員　　国際協力事業団医療協力部医療第２課
　　職　員　　朝　日　紀　樹

Ⅰ 調 査 日 程

6月16日（木曜日）

11：00　東京発（JL443）

18：05　ロンドン着（Post House 泊）

6月17日（金曜日）

09：10　ロンドン発（KL120）

11：10　アムステルダム着

12：10　アムステルダム発（KL587）

18：30　アクラ着（Ambassador Hotel 泊）

6月18日（土曜日）

10：00～12：00

派遣専門家（藤原，工藤，大立目，吉田，門井，加藤，黒羽根，中村各専門家）との打合せ。第3次プロジェクト前半の研究活動を聴取すると共に，後半の研究について討議。

16：55　星島団長　アクラ着（BR367）

6月19日（日曜日）

休　　日

6月20日（月曜日）

11：30～12：30

在ガーナ日本国大使館　表敬訪問。

（楊大使，松本一等書記官。藤原，工藤，大立目各専門家同行。）

13：00～14：00

ガーナ大学医学部　部長Prof. H.H.Phillips 表敬訪問・打合せ。

18：30～20：30

Flairにて派遣専門家招待　カクテル　パーティー。

6月21日（火曜日）

09：00～12：00

ガーナ大学医学部　Department of Chemical Pathology 訪問，現況並びに今後の研究方針について打合せる。

（門井専門家，加藤専門家同席。）

6月22日（水曜日）

09:00～10:00

ガーナ大学医学部 Department of Microbiology 訪問，Head Prof. S. N. Afoakwa と協議。

（藤原，大立目各専門家同席。）

10:30～11:00

ガーナ大学医学部Department of Surgery（Ophthalmology）見学，第2次プロジェクトで供与した眼科関係の供与機材の稼働状況をみる。

11:10～12:00

ガーナ大学医学部Department of Obstetrics & Gynaecology 訪問．吉田専門家，Dr. C. A. Klufio, Dr. J. B. Wilsonと打合せ。

12:30～14:00

ガーナ大学医学部 Canteenにて医学部長 Prof. H.H. Phillips 招待昼食会。

6月23日（木曜日）

09:00～10:00

ガーナ大学医学部Department of Pathology 訪問，Head Prof. E. C. Christianと協議。

（中村専門家，黒羽根専門家同席。）

昭和51年度供与機材レントゲン撮影装置（7月初旬到着予定）の据付け場所について打合せる。

10:30～12:00

ガーナ大学医学部Department of Physiology 訪問，工藤専門家，Acting Head Prof. S. K. Addae と協議。

第3次プロジェクト前半の研究報告並びに今後の計画について打合せ。

15:00～17:30

ガーナ大学医学部Administration Office にて，第3次プロジェクト後半のプロトコールについてガーナ側スタッフと協議。

出席者

日本側　星島団長，渡辺団員，朝日団員，藤原専門家，工藤専門家

ガーナ側　Prof. Phillips, Prof. Quarcoopome, Prof. Ofosu-

Amaah, Dr. Klufio, Dr. Bruce-Tagoe, Mr. Klutse

19:00～21:30

Palm Court にて藤原専門家招待夕食会。

6月24日（金曜日）

09:00～11:00

ガーナ大学医学部Administration Office にてResearch Coordinating Committee の開催。

第3次プロジェクト後半のプロトコール、ガーナ側の合意を得る。

出席者

日本側　星島団長、渡辺団員、朝日団員、藤原専門家、工藤専門家、大立目専門家、中村専門家

ガーナ側　Prof. Quarcoopome (Prof. Phillips の代理でChairman)、Prof. Asirifi, Prof. Christian, Prof. Korsah, Prof. Afoakwa, Prof. Addae, Dr. Br-uce-Tagoe, Mr. Klutse

14:00～16:00

アクラ市内見学

19:00～20:30

大使公邸にて橘大使招宴。

6月25日（土曜日）

10:00～12:00

ガーナ大学本部（レゴン地区）、野口英世記念医学研究所敷地、米国協力プロジェクトダンファ地区視察。

19:30～21:30

ガーナ大学医学部長 Prof. Phillips 宅にて晩餐会。

6月26日（日曜日）

休　　日

6月27日（月曜日）

10:00～12:00

在ガーナ日本国大使館に報告並びに帰国挨拶。

（藤原専門家、工藤専門家同行）

13:00~16:00

派遣専門家及びその家族と懇談。

主として第3次プロジェクト後半の派遣専門家チームに対する業務上並びに日常生活上の引継ぎ事項について。

19:00~20:30

Stop - over にて計画・打合せチーム招宴。

6月28日（火曜日）

07:00　アクラ発（KL580）

17:10　アムステルダム着

18:40　アムステルダム発（AF915）

19:45　パリ着（Hotel Nikko de Paris 泊）

6月29日（水曜日）

14:00　パリ発（JL440）

6月30日（木曜日）

11:20　東　京　着

Ⅳ. 第3次プロジェクトのIst Phaseについて

第3次プロジェクト後半に触れるについては当然の事ながら現在進行中のIst Phaseを評価しながら2nd Phaseを考えるのが誰しも納得のゆく順序であろう。

1975年6月にガーナ側とかわされたR/Dには資料1のように述べられている。主題はPatho-Physiology of Tropical Diseases and Immunological Studies on Tropica-l Diseasesで，第1次，第2次のプロジェクトの結果をふまえ，それを内包的にも外延的にも発展をはかる企図をもち，ガーナ側も非常な期待と，心からなる歓迎の意をもって始まったものである。

しかし，どんなにその意図が高かろうとも派遣専門家に人を得なければ計画は画餅にすぎず，ガーナ側もまたこれに充分なる協力体制はとらぬであろう。幸いに学識，人格，さらにその国際経験の豊富な福島県立医科大学藤原名誉教授，さらに同教授をサポートするガーナ長期滞在2回目の大立目専門家，チーム・リーダー工藤専門家もまた長期滞在3回目，これに配するに吉田，門井，加藤，黒羽根，中村各専門家の5新鋭と数えあげれば，今日のIst Phaseがいかにすぐれた構成をなしているかは明白なことである。おそらくJICA派遣チームの中，人数その質共に第1級のものと誇り得るものであろう。

これら専門家をガーナ側が充分高く評価している事は，いつもそのプログラムの初期では研究室やoffice roomの獲得が問題となりなかなか ― 場合によっては8ケ月を要した事さえあった ― 確保できないのが常であったが，工藤リーダーの積極的な活動もありまたcounter-part(doctorレベルの)更にそれをサポートするtechnological staffも一部を除き不足なく与えられていた。彼等の研究計画については資料2の通りである。

ただ比較的早期に着任した工藤，大立目，吉田各専門家の場合を除いては，主要機械がやっと到着したばかりで調査団の滞在中はその荷ほどきにかかったところであったが専門家達はやる気充分と見受けられた。

今迄の研究成果は資料3のごとくであった。これはenterovirus，HBの血清疫学の上で単にガーナ国内的意義を持つのみならず，国際的視野からも現在特に求められている仕事で，その仕事の結果が待ち遠しいものである。

個々の研究活動を通じての技術指導については以上の如くであるがそれにも増して強調したい事がある。元来ガーナ大学医学部ではDepartmentの独立性が極めて強くそれはそれなりに良いところもあるが，おたがいの間の壁は想像以上に硬くいろんなDepartmentより各々のexpertを出し，力を合わせてひとつのプロジェクトに対し協同する風潮は殆んど無きに等しかった。第2次

プロジェクト後半より日本人専門家のmultiple な指導活動，さらに供与機材の有効利用のためにもこうしたプロジェクト・チームを組織して活動する事の重要性を強調して来たが，第３次プロジェクト前半ではそれが見事に実を結びResearch Protocol に見られる如く日本人専門家を中心としたinter-departmental な組織が定着した事である。この事は将来の野口英世記念医学研究所の運営についても必ずや大きく寄与する事と思われ，我々の接触した多くのガーナ側スタッフもこの方式の良さを改めて高く評価していた。

なお，第３次プロジェクト前半チームが使用中の laboratory 及び office の一覧表を掲げる。このうち殆んどは後半チームも使用を予定されるもので，後半チームがこの他にガーナ側より提供される予定のものは表中予定とする。ただ後述する如く野口英世記念医学研究所建設の前半の完成が予定される来月８月以降は相当大幅な変更が推測される。

A) Immunology, Virology Group

1) 7 laboratories（内４ケ所はガーナ側と共用）

2) 2 offices

B) Electrolytes and Amino-Acid Metabolism Group

1) 4 laboratories

2) 1 office

C) Aneamia Group

1) 3 laboratories

2) 1 office

D) Sickle Cell Aneamia Group

1) 5 la oratories

2) 1 office

E) 第3次Project 後半の追加予定

1) 4 la oratories

2) 1 office

V　第３次プロジェクト後半の打合せについて

我々がアクラに到着した時，アチャンポン現国家評議員議長（大統領）とガーナ大学 ―― 更に医学部の場合はそれに医師会も同調して ―― のポリシーが正面衝突して医学部全体が騒然として居て，主だったスタッフは毎日のように開かれる緊急会議に呼び出され，納得がゆくまでの話合いを持つ事は非常に困難であったが，第３次プロジェクト後半の専門家達の活躍に不自由しない条件の確保という意味ではガーナ側との打合せの目的は達し得た。

折衝の経過を日を追って述べてみる事とする。

６月18日，19日の両日は土曜，日曜であったが特に現地派遣専門家の方々にお集りを願って，進行中の第３次プロジェクト前半についての問題点，後半についての展望，希望を話し合った。

20日（月曜日），橋在ガーナ日本大使を表敬訪問する。大使はにこやかにかつ暖かく我々を迎えてくださり，「助力を惜しまない」と非常に協力的な言葉をいただいた。なお，その席で，野口英世記念医学研究所がその前半でも出来た暁は当然その一部を日本人専門家が使用しても良いのではないかとの示唆をいただいた。これは今回の任務からはみ出した事であるが，同研究所の前半の完成は来年８月と予定され第３次プロジェクト後半が機材も到着し本格的活動を開始する時期で ―― 理屈なり筋論はともかく ―― 具体的には考えざるを得ない問題で，大使のこの見解はその大筋を示してくださったものとして有難く受け取った。なおこの点は個人的ベースで話合ったガーナ側幹部も同意したところであった。

ついで，やっとつかまえた医学部長Dr. Phillipsを表敬訪問する。当方の意図のあらまし（資料４）を彼にpersonalな立場で告げ，彼も当方の意図を良く了解，その線でガーナ大学医学部側をまとめる事を約束してくれた。

21日（火曜日），Department of Chemical Pathologyを訪問。そこにベースを置く門井，加藤両専門家と懇談，使用中の研究室を見廻った。不幸にもDepartmentの長のDr. Swa-niker も他のドクター達も不在であったので相手側との話合いはできなかったが，第２次プロジェクト以来の供与機材 ―― それは第３次プロジェクト後半に於いても充分活用されねばならぬものであるので ―― も良く動いている事を認めた。ただし，主要機器のひとつであるBlood－Gas Analyzerが不調で（昨年度の修理班も何とか手直しした様であるが）早急の手当がなかなか困難のようで，とりあえず今回到着したアイエルメーター社製（精度等は劣るもの）を活用し何とか切り抜ける外なしと示唆した。

22日（水曜日），まず藤原専門家と大立目専門家がベースをおくDepartment of Microb-iologyを訪問。Head of Department のDr. Afoakwaと会談，第３次プロジェクト後半の

研究について話し合う。Dr. Afoakwaの案内で両専門家のoffice，laboratoryを始めDepartment 全部について詳しく視察，日本から相当前に供与した機材が尚よく動いていることを確認した。

また，同じDepartment に属する電子顕微鏡室にDr. Mingle を訪問 ── 彼はOTCA 受入れの研修員として10カ月間阪大微研で研修を受けた経験がある ── 殊にScanning Electron － Microscopeがガーナ大学医学部のみならず他の学部，更にはCape Coast University，Kumashi University よりの研究者も訪れて共同研究していることを知った。ただし，第1次プロジェクトの前半で供与した透過型電顕は，よくここまで持ったものと思われる程使われておりその維持，管理も行き届いていたが，容る年波には勝てずとでも言おうか，ピントが甘くなりtraining 用には何とか使えるとしても部品の補充もままならぬ程古くなり更新の必要が痛感された。第3次プロジェクト後半のAnaemia Research Group，Gall-Stone Research Group も必要とする機材なので敢えて詳しくふれた。

電顕室に隣接したAnipackを調査する。第3次プロジェクト前半は勿論，後半では特に大切な設備であるので注意深く見て廻ったが，Anipackについているair-washer，air-conditioner は稼働せず，早急に修理の必要ありと考えた。所謂修理班の派遣が必要であるが，現地にもガーナ・サンヨーに技術者も居り（現地で工場の大拡張中で非常に多忙らしいが）又野口英世記念医学研究所設立のためのその方面の技術者も訪問されるのであろうから，この方々の力を借りるのもひとつの方法かとも考えられる。

ついで Ophthalmology Unit を訪問したところ緊急会議のためUnit の長 Dr. Quarcoopome は不在であったが，案内されて第2次プロジェクトの時供与された機械の大半が良く稼働しているのを見た。又これらの機械と当時の保坂専門家達の活動の結果 このUnitの仕事が急速にW. H. O. 等にも認められ omputalized Electro-Retinogramを送られ活動していた。日本の専門家とその供与機材がいかにガーナに寄与したかを目のあたりに見て感激した。ただ期待していた第3次プロジェクト後半のcounter-partと目される人々には，いづれも緊急会議のため不在で会うことができなかった。後に会ったDr. Quarcoopomeの話ではSurgery Blockに日本側の使用し得る部屋を確保し得る事は非常に困難とのことであるのでCholelithiasis Team の部屋は別に確保することにした。

ついで吉田専門家が活躍のベースをおくMaternity Block を訪問。同専門家のcounter-part であると共に，第3次プロジェクト後半のcounter-part に想定されるDr. Klufio，Dr. Wilson（近く日本に研修に赴く筈）と吉田専門家の活動振りについて説明を受けた。昭和51年度供与機材であるBlood-Gas Analyzer 等々の機械は到着したばかりであったが患者

の診察室とドアひとつで連がっている正にうってつけの所にセットされ，office-type laboratoryとしては良く機能する場所と思われた。Haematology Unit からも staff や technologist がここにやって来るとか，また測定器械類が（必ずしも日本より供与したもののみではないが）Haematology Unit にあるものについては，そちらにサンプルを持って行き分析がすすめられており team work も良いと判断され第3次プロジェクト後半のための態勢も整っていると考えられた。その後別室のEcograph とその活用振りを視察，殆んど完璧な動きを示していた。視察中，更に医学部カンティーンでDr.Klufio，Dr Wilson と第3次プロジェクト後半のプログラムについてのあらましについて話し合いを行ったが，大筋については当方とガーナ側との意向は一致した。

更に吉田専門家と共にHaematology Unit を訪問。ここでも長のDr. Bruce-Tagoe は緊急会議で不在で，Chief Technologist の案内で視察，狭いながらも吉田専門家の研究，更に第3次プロジェクト後半の活動には充分の広さと見受けられた。

20日のDr. Phillips 医学部長との会談で，第3次プロジェクト前半から後半にかけてPatho-Physiology of Bone の主要機器のひとつであるX線撮影装置の設置場所に示唆されたMedical Block のX線室を下見後，医学部 staff 用の lounge に直行，そこでDr. Asirifi（Head of the Department of Child Health ）と会い，第3次プロジェクト後半の研究プログラムにつき大筋の了解を取り付けた。

なお，この日は医学部長主催の luncheon が医学部カンティーンで開かれ，先のMaternity Block 訪問でこれも緊急会議で会えなかったDepartment of Obstetrics & Gynecology の Head であるDr. Bentsi-Enchill，Ophthalmology Unit の Head の Dr. Quarcoopome と第3次後半について大方の意見の一致を取り付けた。

23日（木曜日），Patho-Physiology of Bone のグループがベースをおくDepartment of Pathology に Head の Dr. Christian を黒羽根，中村両専門家と共に訪問。年間4000体を超える病理解剖を何とかこなしている大多忙の彼は快く1時間にわたってDepartment of Pathology，さらには解剖用Unit を先に立って案内してくれた。第3次プロジェクト前半もようやく機材が到着，専門家も着任したばかりで正にスタートしようとする所であったが，彼は自分のところにベースを置かれたことを多とし更に後半についても我が方の提案を充分に了解，そのプッシュを約束してくれた。

ついで工藤専門家がベースを置きかつ医学部長Dr. Phillips が第3次プロジェクト後半のCholelithiasis Group のベースにと示唆した Department of Physiology に工藤専門家のmain counter-part のProf. Addae を訪問。

Dr. Dakubu	(Nuclear Medicine Unit)
Dr. Larmie	(Department of Pharmacology)
Dr. Boatin	(Department of Biochemistry)
Dr. Belcher	(Department of Pediatrics)
Dr. Mingle	(Electron Microscopic Unit, Department of Microbiology)
Dr. Bruce-Tagoe	(Haematology Unit)

等々（勿論，工藤専門家もProf. Addae と共にその主導的地位にある）と見事に構成されたNa - Body - Water - Sickle Cell Anaemia チームの研究活動の説明を受けた。これらの成果は7月中旬に行われるInternational Congress in Physiological Science で発表すると共にJ. Clinical Investigation にも発表の予定との事。

続いて工藤専門家，Prof. Addae と Department of Physiologyを主にBasic Medical Science Building の研究施設を見て歩く。日本からの供与機材を含め良く整備されており，第3次プロジェクト後半のCholelithiasis の専門家のためのベースを置く事についても内諾を得た。当方としては先ずGall Stone の分析にかかるには — 主なる機器は赤外線分光光度計という非常に精密なものであるので，質の良い建物と言う点でこのBasic Medical Science Building を最も望ましいと考えたし，且又同じ建物のうちに仕事の関連深いBio-chemistry, Pharmacology のDepartment もあり Surgical Block よりやや遠い点を除けば考え得る最上の所を獲得し得たと思う。

午後はガーナ側の主な人々と非公式な第3次プロジェクト後半に対する打合せ会を開き，先方，当方とも率直な意見を交換し相互理解を深めた。

24 日（金曜日），Ghana/Japan Research Coordinating Committee を開く。Dr. Phillipsは緊急会議でレゴンの本部に行ったため，Department of Ophthalmology の Head である Dr. Quarcoopome が議長を代行，その概略はガーナ側でとった速記をもとにまとめてみると資料5の如くであった。

このRecord には所々小さな問題点が見受けられるが，大体において我が方の意向を充分反映させたものと思われる — これが出来上ったのが出発前日の夕方7時頃だったので小さな誤解については口頭で訂正を申し入れておいた。

資料6　　第3次プロジェクト後半のResearch Protocol

尚会議の中でガーナ側より供与機器の配線図等が欲しいとの要望があった。これは本ガーナ医療

協力のはじめの頃より既に星島により要望された事で，ＯＴＣＡ ― ＪＩＣＡ の購入担当者に必ず欧文のuser's manual のみならず service manualを必ずつける事を要望していた。1975年頃星島が直接タッチした機器については実行された所であるし，且又その２カ月半にわたって星島がガーナ滞在中には，ガーナ側に対しこれらのものを機器の重要部品と同様に取り扱う事を指導，一連番号をうって保管すべき事を行わしめた。

修理班は年１回の派遣であるし，又その１回も機器の多様化につれ，技術的にも，滞在日数も必ずしも充分でないので，これらservice manual は必需品で供与機材の有効利用の上で欠くべからざるものである。ガーナ大学医学部内にも一定の修理をなし得るElectronics Unit もあり，かつその内のひとりは技術研修のため来日し，日本電子その他で研修ずみのものであるし上記の事は今後必ず実行されたい。

夕刻，大使公邸でdinner の招待をうけた。非公式に当日までの折衝結果を報告。

25日（土曜日），長期専門家とその家族の方々と野口英世記念医学研究所の建設予定地を視察，意外にガーナ側の作業も早く，予定地に到る道路と給水管の設定を終っているのを知る。

夕方，医学部長Dr. Phillips に dinner に招かれた。ガーナ大学医学部の殆んどの senior staff が出席。仕事の話に終始した。こうした事は，こんな場でやるべきではない事を重々承知していたが，調査日程がやや短かった事と先述した緊急会議の連続で仲々 senior staff をつかまえることができなかったからである。

26日（日曜日）は休日。

27日（月曜日），要求しておいた昭和52年度機材要請リストに対するDr. Phillips の日本大使館あての letter を受けとり（資料７）大使館に赴き，大使に正式に折衝結果を報告。今後とも変らぬ御後援をお願いして辞去。ついで，Photo-Illustration Unit を訪問した。ひとつには長期専門家の方々がこの内容をよく知らないようであったのでその方々にそこの利用法を知らせると共に，23日の訪問でDr. Christian（Department of Pathology）がcolor transparent filmのprocessingが出来ると言っていたので（彼はその時 koda-chrome と言っていたが）それを確かめるためである。その結果，koda-chrome とは Dr. Christian の思いちがいでagfa-chrome である事を知ると共に，現像用の試薬類が不足しているとみうけた。今後は試薬等と共にagfa-chrome を持って行けば color slide が現地で作れる事になり，研究には大いに助かる事になる。

午後は長期専門家との懇談に４時間以上をすごした。その結果提起された問題については後に記する。

28日（火曜日），早朝の出発にもかかわらず，藤原専門家をはじめ全専門家の見送りを受けてアクラをたった。

Ⅵ　長期専門家の生活について

アクラは現在とどまる所を知らないインフレと，それに輪をかけるような生活必需品及び住宅不足にみまわれている。現在の第3次プロジェクト前半の専門家達は工藤リーダーの大車輪の活躍で何とか住居は確保している。（たゞこの為にリーダーは6カ月分以上の前払い家賃を立替えたと言う）後半の人々については，今の家を何とか確保して受けつげそうではあるが，契約の更新の場合，相当な家賃の値上げを要求される可能性が非常に強い。現在の前半の人々でもすでに¢1,000をこえる家賃を払っている人もある。又後半の人々が，完成を予想される野口英世記念医学研究所に研究，指導のベースを置こうとすれば，現在確保されている所より相当遠くはなれており，（普通で車で30 ～ 40分，ラッシュアワーではその倍位），又通勤に便利な地帯はアクラで一番の高級住宅地で（日本大使公邸もこゝにある），たとえ住居がみつかっても今すでに¢2,000～¢3,000の家賃である。後半専門家の生活を考えた場合，これに対するＪＩＣＡの家賃手当の大幅な増額とその早急な対応がのぞまれる。

冷蔵庫：生活必需品である，現在8専門家にガーナ大学医学部から貸与されている2台を含めて13台の冷蔵庫がある。後半チームの7名においてもなお少ない。

フリーザー：これも食物保存上必要欠くべからざるものである。現在12 台あるが，各家庭2台を必要とするならこれもまた不足している。

クーラー：現在18台あるが1台は使用に供せず，従って冷蔵庫，フリーザー，クーラーに関しては後半派遣専門家が前半派遣専門家のものをゆずり受けたとしても，不足しており，後半派遣専門家は購入あるいは支給を受けて持参せねばなるまい。

自動車：交通機関の発達していないガーナ国においては自動車もまた生活必需品である。本年派遣専門家の藤原，中村，黒羽根各専門家の自動車は現在なお船積みされたかどうか不明である。これは日本国内の問題であり，輸送期間を4カ月位とみても手続上，赴任証明，及びパスポートの発行は6カ月以上前にする必要がある。日本国内の問題についてはなお改善の余地があろう。この3専門家はガーナ大学医学部から自動車の貸与を受け借用しているのが実情である。現在借用している自動車は第1次プロジェクト以来のものもあり，現在もなお何とか使用に耐え得るものは2台である。

第3次プロジェクトのR/Dにおいては住宅及び車はガーナ側が負担することが明記されたが，現在においては，それは困難であり，第3次プロジェクト進行中の現在は以上述べた如くである。従って第3次プロジェクト後半においては在ガーナ専門家と密な連絡をとって前半のものを利用出来得るものは利用して，このプロジェクトを続けて行かねばなるまい。

第１次プロジェクトより現在にいたるまで，流石，医療協力の専門家だけあって，自己及び家族の健康管理に意を用いてきたゝめ，その職務を全うできなかったような大きな疾病にかからずにここ９年間あまりを過ごしてきたが，医療薬品，殊に保存期間の短かい予防接種用ワクチン，更に血清等々はガーナの現地に於いては調達が困難な事が多い。ガーナにおいては破傷風，百日咳，脊髄性小児麻痺などがしばしばみられるものであり，特に専門家の子供に対するvaccinationが必要とするであろう。破傷風，ＢＣＧ，麻疹，三種混合，ポリオ等はたえず補給する必要がある。

彼等が不安なく充分職責を全うする為にも，何等かの形でＪＩＣＡよりこれら薬品類等の供与なのぞみたい。

渡航前の準備に要する資金の円建の融資については，再三長期専門家から要望があった。渡航準備のための資金準備の実態を述べてみると，次の如くになる。

ガーナに於いては自動車は必需品で，且現地での調達は極めて困難であり，ガーナ大学自身も極度に不足しており，仲々に提供を受ける事はむづかしい。それのみか，ガーナ大学医学部は専門家が携行してくる車を，その離任にあたって何とか獲得しようと期待しているのが実情である。又ガーナは現在食糧難に見舞われており，決して特にぜい沢な暮し，或いは日本食にこだわるわけでなくとも，相当量の食糧品等も携行し，それにともなってそれらを保存するためのフリーザー，更に生活の為のクーラー等々つゝましいと思われる準備をしても，輸送費を含めて，３５０万円はくだらない費用が必要となる。それに加えてまた日本国に於ける家の問題もある。借家契約のまゝガーナに赴くと年間約６０万円の支出となる。荷物を入れておく倉庫などもまた今後の問題となるであろう。

そのためにＪＩＣＡから支給される準備金では，はるかに不足し，専門家達はいづれもその資金調達に非常に苦労しているのが現状である。支度料の大幅増とＪＩＣＡの保証か何かで，低利資金の円建の融資を特にお願いしたい。

資料1

RECORD OF DISCUSSIONS BETWEEN THE JAPANESE MEDICAL SURVEY TEAM AND THE AUTHORITIES OF THE GOVERNMENT OF GHANA ON THE TECHNICAL COOPERATION IN THE FIELD OF PATHO-PHYSIOLOGY AND IMMUNOLOGY

The Japan International Co-operation Agency dispatched the Medical Survey Team (hereinafter referred to as the Team) which was headed by Professor K. Honda, Director of Fukushima Medical School Hospital to the Republic of Ghana from 25th May to 10th June 1976 for the purpose of evaluating the result of the technical cooperation project which was undertaken from 16th May 1973 until now and working out the details of the technical cooperation project in the field of patho-physiology and immunology in the Republic of Ghana (hereinafter referred to as the Project).

The Team exchanged views and had a series of discussions with the authorities concerned of the Government of Ghana concerning the desirable measures to be taken by both Governments to implement the aforementioned Project.

As a result of the survey and discussions, both parties agreed to recommend to their respective Governments to carry out the matters referred to in the attached document hereto concerning the technical project in the field of patho-physiology and immunology.

8th June, 1976

E.A Badoe

pp Professor H.H. Phillips
Acting Dean of the University
of Ghana Medical School

Professor K. Honda
Head of the Japanese
Medical Survey Team

ATTACHMENT DOCUMENT

1. BACKGROUND

Recognizing that the Government of Japan has co-operated in the field of Electron-Microscopy, Virology, Ophthalmology and Biochemistry based on the dispatch of the Japanese Medical Survey Team to the Government of Ghana in 1968, the Government of Japan will continue to undertake medical co-operation with the Government of Ghana in the field of basic medical science. It is mutually expected that this project may enlarge its geographical scope of work so as to include medical personnel of other African countries in the near future.

2. THE OUTLINE OF THE PROJECT IS AS FOLLOWS:

i. The improvement of basic education and research works on patho-physiology and immunology.

ii. The technical co-operation to be implemented by receiving participants, sending experts and providing equipment.

3. THE MEASURES TO BE TAKEN BY THE GOVERNMENT OF JAPAN

i. In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures through the JICA to dispatch, at its own expense, Japanese experts in the field of Patho-physiology and Immunology including those for installation of equipment upon the request of the Government of Ghana through the normal procedures under the Technical Co-operation Scheme. (Application Form A1).

ii. In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures through the JICA to provide, at its own expense upon the request of the Government of Ghana such equipment, machinery, vehicles and materials required for the implementation of the Project through the normal procedure under the Technical Co-operation Scheme. (Application Form A4)..

The equipment, machinery, vehicles and materials referred to above will become the property of the Government of Ghana upon delivery c.i.f. at the port of disembarkation to the authorities concerned of the Republic of Ghana.

iii. The equipment referred to above will be utilized exclusively for the implementation of the Project in close consultation with the Japanese experts.

iv. In accordance with laws and regulations in force in Japan the Government of Japan will take necessary measures through the JICA to receive, at its own expense, Ghanaian staff associated with the Project for such technical training in Japan through the normal procedure under the Technical Co-operation Scheme. (Application Forms A2, A3).

4. THE MEASURES TO BE TAKEN BY THE GOVERNMENT OF GHANA

i. In accordance with laws and regulations in force in Ghana, the Government of Ghana will take necessary measures to ensure the recruitment of Ghanaian counterpart personnel and provide, at its own expense, the services of such counterpart personnel.

ii. In accordance with laws and regulations in force in Ghana, the Government of Ghana will take necessary measures to provide at its own expense:

(a) Space for laboratories, building and other incidental facilities;

(b) Supply or replacement of equipment and other materials for appropriate running of the project, other than those provided by the Government of Japan.

iii. In accordance with laws and regulations in force in Ghana, the Government of Ghana will take necessary measures to meet:

(a) All running expenses necessary for the effective implementation of the Project;

(b) Customs duties, internal taxes and other similar charges, if any, imposed on the Government of Ghana in respect of the goods provided by the Government of Japan;

(c) Expenses necessary for the domestic transportation of the goods as well as for their installation, operation, and maintenance and repair;

(d) Expenses for vehicles with driver for the Japanese experts during working hours;

(e) Expenses for the internal travel in Ghana of the Japanese experts on duty;

(f) Expenses necessary for fully furnished housing accommodation for the Japanese experts.

iv. The Government of Ghana will grant to the Japanese experts privileges equivalent to the privileges accorded to senior members of the University of Ghana Medical School.

v. The Government of Ghana will provide temporary registration for the Japanese doctors participation in the co-operative Research Programme during their stay in Ghana, provided that such doctors are registered to practice medicine in Japan.

vi. The Government of Ghana will grant the Japanese experts and their families privileges, exemptions and benefits in Ghana no less favourable than those granted to experts of other countries or of international organizations such as the United Nations under similar circumstances.

5. CLAIMS AGAINST THE JAPANESE EXPERTS

The Government of Ghana undertakes to bear claims, if any arises, against the Japanese experts resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Ghana, except for those claims arising from the wilful misconduct or gross negligence of the Japanese experts.

6. The Japanese experts will give primarily technical guidance and advice to Ghanaian staff associated with the Project pertaining to the implementation of the Project, and Ghanaian Authorities concerned for the successful implementation of the Project.

7. Both Government will consult with each other when necessary, in respect of any matter that may arise from or in connection with this Record of Discussions.

8. The foregoing recommendations, if accepted, will promote co-operation between Japanese Medical Scientists and their Ghanaian counterparts in several departments of the University of Ghana Medical School. It is therefore proposed to set up a Committee under the Chairmanship of the Dean, consisting of representatives of both the Japanese resident scientists and the University of Ghana Medical School for the purpose of organizing, co-ordinating and facilitating the implementation of the Research Projects agreed to by the parties concerned and keeping the programmes under constant review.

9. The duration of the Japanese co-operation for the Project will be four (4) years commencing on 6th June, 1976.

資料2

Project-III: Pathophysiology and Immunology of Tropical Diseases

Phase-1

General Supervisor: Prof. T. Hujiwara

1: Immunological and epidemiological studies on malaria and hepatitis.

Supervisor: Prof. T. Hujiwara (Japanese Expert)
Principal Investigator: S. Ootatsume (Japanese Expert)
Coprincipal Investigator: S. N. Afoakwa (Microbiology)
A. L. Foli
W. A. Chinery (Microbiology)
P. A. K. Addy (Microbiology)
F. K. Wurapa (Community Health)
Y. Asirifi (Child Health)

2: Effects of treatment on the immunoglobline levels in tropical diseases.

Supervisor: Prof. T. Hujiwara (Japanese Expert)
Principal Investigator: N. Kadoi (Japanese Expert)
Coprincipal Investigator: T. D. Osafo (Chemical Pathology)
S. N. Afoakwa (Microbiology)
C. A. Reindorf (Child Health)
E. C. Christian (Pathology)
S. Ofosu-Amaah (Community Health)

3: Separation and Characterisation of the immunoglobulins in tropical diseases and malnourished children.

Supervisor: Prof. T. Hujiwara
Principal Investigator: M. Kato (Japanese Expert)
Coprincipal Investigator: S. Ofosu-Amaah (Community Health)
R. K. Anteson (Microbiology)
Y. Asirifi (Child Health)
G. R. E. Swaniker
(Chemical Pathology)
K. K. Korsah (Obstetrics and Gynecology)

4: Vitamine deficiency in tropical diseases and malnourished children.

Principal Investigator: T. D. Osafo (Chemical Pathology)
Coprincipal Investigator: N. Kadoi (Japanese Expert)
M. Kato (Japanese Expert)
A. K. Foli (Medicine)
F. K. Wurapa (Community Health)
C. A. Reindorf (Child Health)
J. M. Blankson (Child Health)
E. C. Christian (Pathology)
G. R. E. Swaniker (Chemical Pathology)

5: Studies of bone abnormalities by radiological and histological methods in relation to the metabolic disturbance.

Principal Investigator: Y. Kurobane (Japanese Expert)
Coprincipal Investigator: T. D. Osafo (Chemical Pathology)
K. G. Korsah (Orthopedics)
K. Owusu (Orthopecdics)
E. C. Christian (Pathology)
K. Brakohiapa (Radiology)
C. A. Reindorf (Child Health)
N. Kadoi (Japanese Expert)
M. Kato (Japanese Expert)

6: Radiological and histological studies of bone in Ghana, in special reference to age.

Principal Investigator: T. Nakamura (Japanese Expert)
Coprincipal Investigator: Y. Kurobane (Japanese Expert)
M. Kato. (Japanese Expert)
E. C. Christian (Pathology)
K. G. Korsah (Orthopedics)
K. Brakohiapa (Radiology)
K. K. O. Bentsi-Enchill (Gynecology)
J. K. E. Amorin (Community Health)

7: Haemodynamic studies of pregnant women and newborns in tropical zone.

Principal Investigator: T. Yoshida (Japanese Expert)
Coprincipal Investigator: K. K. Korsah (Gynecology)
J. B. Wilson (Gynecology)
C. A. Klufio (Gynecology)
A. A. Bruce-Tagoe (Haematology)

S. K. Addae (Physiology)
J. A. A. Mingle (Electron Microscopic Unit)
Y. Asirifi (Child Health)
N. Kadoi (Japanese Expert)

8: Malnutrition and the development of fetus: its dynamic study.

Principal Investigator: K. K. Korsah (Obstetrics & Gynecology)
Coprincipal Investigator: T. Yoshida (Japanese Expert)
C. A. Klufio (Gynecology and Obstetrics)
J. B. Wilson (Gynecology & Obstetrics)
S. Ofosu-Amaah (Community Health)
G. R. E. Swaniker (Chemical Pathology)
C. A. Reindorf (Child Health)

9 Sickle cell anaemia in Ghana : its physiology, morphology and pathology.

Principal Investigator: M. Kudo
Coprincipal Investigator: S. K. Addae (Physiology)
H. J. Pigon (Physiology)
B. Y. A. Andoh (Biochemistry)
B. P. Gyang (Biochemistry)
T. D. Osafo (Chemical Pathology)
J. A. A. Mingle (Electron Microscopic Unit)
A. A. Bruce-Tagoe (Haematology)
P. K. Nyame (Radiation Biology: Medicine)
S. O. Larbi (Pharmacology)
S. Ofosu-Amaah (Community Health)

資料 3

ECOLOGY OF ENTEROVIRUSES IN GHANA

Isolation of Poliomyelitis and Other Enteroviruses from Water and Sewage

By

P. A. K. Addy, PH.D., DTM & H*

and

S. Otatume, PH.D.**

Virus Laboratory, Department of Microbiology, University of Ghana Medical School, Accra, Ghana

Introduction

Mass and prolonged excretion of enteroviruses in faeces of sick and normal, healthy carriers can cause heavy contamination of surface waters and sewage. Hence, these must be regarded as one of the main reservoirs of enteroviruses in the outer environment and potential sources of pollution of drinking water, soil and irrigated farm cultures (Bagdasaryan and Kazantseva, 1967). The detection of viruses in sewage and other natural waters is of signal importance to health authorities (Mosley, 1965). The public health importance of detecting enteroviruses in water and sewage has been recognized by various investigators and the numerous literature on the subject is a clear testimony to this fact (Paul *et al.*, 1939; Melnick, 1947; Kelly, 1957; McLean *et al.*, 1961: Wallis *et al.*, 1969: Duff, 1970).

The present study describes enterovirus isolations made from water and sewage in the Greater Accra Region. We did not set ourselves the task of determining the quantity of enteroviruses detected. An attempt was, however, made to relate our isolates with known clinical syndromes associated with enteroviruses.

Materials and Methods

Sample Collection Points:

Collection of samples was undertaken from October, 1971, through April 1972. No samples were collected in March, 1972. A total of 67 water and sewage samples were collected from 23 rivers, 7 streams, 21 ponds, 2 lagoons, 8 wells and from 6 gutters in the Greater Accra Region. Of the 67 samples collected 42 (62.7%) were from rural waters. 33 of the sample sources served as sources of water for drinking, washing and bathing; animal pollution was contended by inhabitants to be very minimal. Sixteen (16) sample sources formed part of the sewage system of the Greater Accra Region. 51 samples, therefore, were for human and for animal consumption.

Sampling and Treatment:

Specimens were collected in sterilized 1½ litre Winchester bottles, chilled in wet ice and salt prior to their transportation to the laboratory.

Particles in the raw samples were allowed to settle at the bottom of the bottle and the supernatant was passed through serum-treated filter membrane to remove bacterial contaminants. 100 ml. aliquots of the filtered materials were centrifuged in the cold at 3×10^3 rev./min. for 15 mins. After discarding the sediment, the supernatant of the various aliqouts were centrifuged at 14×10^3 rev./min. for 2 hours. The supernatants were discarded, the sediments suspended in 1 ml. aliquots of PBS (Phosphate Buffered Saline) and stored at-20°C or-70°C until used.

Tissue Cultures:

HEp-2 cell line was grown in Eagles MEM with 10% calf serum and maintained in Eagles MEM with 5% calf serum. Concentrations of antibiotics in both media were as follows:— Penicillin 200 Units/ml.; streptomycin 200 μg/ml.

Isolation of Viruses:

Each of the reconstituted sediments obtained by the centrifugation method described above was inoculated into HEp-2 cultures containing 1ml. of maintenance medium, using 0.2ml. per culture tube. Six culture tubes were used per sample. The cultures were incubated at 37°. C and examined at 3rd, 6thand 10th days for cytopathic effect. Viral, cytopathogenic effects (CPE) were scored on 3rd, 6th and 10th days post inoculation. Cultures showing CPE were harvested and stored at-20°.C or titrated on 3rd passage to determine virus end-titres. Virus titres were calculated by the Reed and Muench method (Reed and Muench, 1938). Those showing no CPE were passaged 3 times before discarding as negative.

Identification of Isolates:

This was performed on 3rd passage isolates by the tube neutralization method using WHO Intersecting Serum Pools Scheme (Schmidt et al., 1971), and by determination of the neutralization indices as described elsewhere (Addy et al., 1970; Addy, 1973).

Results

From 67 water and sewage samples collected from rivers, streams, ponds, Lagoons, wells and gutters in the Greater Accra Region, 22 virus isolates from

*Dr. Patrick A. K. Addy, Principal Medical Research Officer and Head, Dept. of Arbovirology, East Africa Virus Research Institute, P.O. Box 49, Entebbe, Uganda.

**Dr. S. Otatume, Dept. of Bacteriology Fukushima Medical College, Fukushima, Japan.

TABLE 1: *Description of Habitats, with positive Enterovirus Isolation Sampled*

Sample	Locality	Habitat	Source	Isolate(s)
S- 1	Mendskrom (Urban) ..	Open running water carrying liquid discharge of public utility; polluted with human and/or animal faecal matter	River	B-3
S- 3	Bortianor (Urban) ..	Stagnant water used for washing and bathing	Pond	B-1
S- 4	Bortianor (Urban) ..	Open running water containing fish; used for drinking, bathing and washing; carries also waste water from the villages lying along it	Stream	B-3
S- 8	Denkyira (Rural) ..	Uncemented shallow well dug out for drinking purposes; shaded by trees	Well	B-3
S- 9	Denkyira (Rural) ..	Drinking water from an uncemented well; surface covered by algae	Well	B-3
S-11	Abakrowa (Rural) ..	Open stagnant pool of water, clear but with mosquito larvae. Served as drinking water source.	Pond	E-3
S-19	Akramaman (Rural) ..	Dug-out uncemented shallow well; for drinking, cooking, washing, etc.	Well	P-1
S-20	Obom (Rural)	River, shaded by bamboo trees; carries waste discharges from nearby villages. Used for house-hold purposes	River	B-3
S-21	Tenbibian (Rural) ..	Pool of stagnant water, inhabited by tadpoles. Shaded by trees.	Pond	B-3
S-36	Liberation Circle Accra (Urban)	Open street gutter in a densely populated area, carrying household liquid wastes into the Odor River	Gutter	E-7
S-37	Alardzo, Odor River (Urban)	Concrete lined deep sewer, carrying mainly house-hold discharge from densely populated urban areas. Bathing and washing are done by some inhabitants in this river. Faecal pollution is heavy.	River	B-3
S-38	Achimota, OdorRiver (Urban)	As described for S-37	River	E-19
S-39	Kokomlemle, Ring Road North (Urban)	Open gutter carrying waste from over 20 to 40 residential buildings.	Gutter	B-3
S-46	Nungua (Urban).. ..	Stagnant pool of water. Serves as drinking water for cattle. Cattle herdsmen drink from and wash into the pool.	Pond	P-2
S-48	Ridge/Ambassador Hotel Area (Urban) (Near Ambassador Hotel)	Concrete lined gutter, carrying waste from residential buildings and from the Ambassador Hotel. Likely to be polluted with human as well as animal excrements.	Gutter	P-2 E-3
S-49	Ridge/Ambassador Hotel (Urban) Between Ridge Circle and Police Station	As decribed for S-48	Gutter	A-16, B-5 E-27
S-50	Roman Ridge (Urban) ..	Muddy unlined pool, carrying waste water from nearby houses.	Pond	P-2
S-66	Odumase (Rural) ..	River, serves as drinking water for man and animal; also used for washing and bathing	River	E-3
S-67	Odumase (Rural) ..	As described for S-66	River	P-2

TABLE 2: *Distribution of Enterovirus Isolates in Relation to Sample Sources.*

Sample Sources	No. of Samples Collected	No. of Positive Samples	Percentage of Positive Samples	Enterovirus Strains Identified
Rivers ..	23	6	26.1	P-2, 2E-19 3B-3
Streams ..	6	1	16.7	B-3
Ponds ..	23	5	21.7	P-1, 2P-2, B-3, E-3
Lagoons ..	2	0	0	—
Wells	8	3	37.5	P-1, 2B-3
Gutters ..	5	4	80.0	P-2, A-16, B-3, B-5, E-3, E-7, E-27
Total	67	19	28.4	—

TABLE 3: *Enterovirus Isolates Distributed According to Month and Year of Sampling*

Year	Month	Sample Size	No. of Positive Samples	Percentage of Positive Samples	Enterovirus Strains Identified
1971	October ..	5	3	60.0	P-1, 2B-3
	November ..	30	6	20.0	P-1, 4B-3, E-3
	December ..	4	4	100.0	2B-3, E-7, E-19
Sub-total (1971)	.. .. ..	39	13	33.3	—
1972	January ..	8	1	12.5	P-2
	February ..	11	3	27.3	2P-2, A-16 B-5, E-3, E-27
	March ..	Sample collection	was suspended		
	April	9	2	22.2	P-2, E-19
Sub-total (1972)	.. .. ..	*28*	*6*	*21.4*	—
Grand Total	.. .. ..	67	19	28.4	—

19 samples were made, thus giving an isolation rate of 24.8%. Coxsackie B-3 viruses were isolated from 8 samples, giving an isolation rate of 11.9%. Poliovirus isolation rate was 9%. Two samples were found to be mixtures of Poliovirus type 2, Echo-3 and Echo-27 and Coxsackie A-16 and Coxsackie B-5, respectively. Table 1. gives the description of the samples yeilding positive enterovirus isolation. On the whole, 8 Coxsackie B-3, 2 Poliovirus type 1, 4 Poliovirus type 2, 2 each of Echovirus types 3 and 19 and one each of Echovirus types 7 and 27, Coxsackie B-5 and Coxsackie A-16 were identified. The distribution of the isolates according to sample sources is indicated in Table 2.

11 out of 16 sample sources forming part of the sewage system (lagoons, streams, rivers and gutters) of the Greater Accra Region, yielded 13 isolates. Seven isolates identified as Poliovirus type 2, Echo-3, Echo-7 Coxsackie A-16, Coxsackie B-3 and Coxsackie B-5, were from samples collected from gutters (80% virus isolation rate) in the City of Accra; one isolate, Coxsackie B-3, was made from a stream near Bortianor, a suburb of Accra, and two isolates, Poliovirus type 2 and Echo-19 were made from samples collected from the Odor River in the City of Accra. The remaining 3 isolates, Coxsackie B-3, Poliovirus type 2 and Echo-3, were recovered from samples collected from two rivers, flowing through Odumase and the other through Obom, both rural areas. Of the 67 sample sources, 51 served as sources of water for drinking by man and/or animals, for bathing and/or for washing. From the 51 utility waters, that is, rivers, streams, ponds and wells, a total of 15 isolates comprising two Poliovirus type 1, four Poliovirus type 2, two Echo-19, six Coxsackie B-3 and one Echo-3 were obtained; the rate of virus isolation was 29.4%.

From Table 2, it can be seen that the percentage of virus isolated from wells dug out specifically for human consumption was as high as 37.5%. For rivers, ponds and streams which serve outlying villages, in most cases as the sole source of water, the respective rates of isolation were 26.1%, 21.7% and 16.7%. Amongst the isolates from these sources were 4 Poliovirus type 2 and one Poliovirus type 1, both casual agents of Poliomyelitis.

The distribution of isolates per month of the study period, October, 1971, through April, 1972, is shown in Table 3. In 1971, 39 samples were collected out of which 13 isolates were obtained. These included two Poliovirus type 1, eight Coxsackie B-3 and one each of Echo-3 and Echo-19. The percentage of virus isolation for that year was 33.3%.

From the 1972 isolates, for which the percentage

TABLE 4: *Enterovirus Isolates Related to Known Enterovirus Clinical Syndromes.*

Clinical Syndromes	Enterovirus Types	Outbreaks
Paralytic Diseases	P-1, P-2, B-3, E-7	P-1, P-2
Encephalitis and Meningoencephalitis	P-1, P-2, B-3, B-5, E-19	—
Cerebellar Ataxias	P-1, P-2	—
Aseptic meningitis	P-1, P-2, A-16, B-3, B-5	P-1, P-2, B-3, P-5
Epidemic myalgia	B-3, B-5	B-3, B-5
Conjunctivitis	A-16, B-5	—
Respiratory Syndromes:		
Upper Respiratory Illnesses Group	B-3, B-5, E-3, E-7, E-19	—
Lower Respiratory Illness	B-5 A-16, B-5, E-19	—
Gastrointestinal Syndromes	B-3, B-5, A-16, E-7, E-19	—
Cardiovascular Syndromes:		
Myocarditis	B-3, B-5	—
Pericarditis	B-3, B-5, E-19	—
Lymphadenopathy	A-16, B-5	—
Splenomegaly	B-5	—
Orchitis	B-5	—
Cutaneous Syndromes:		
Skin Rashes	B-1, A-16, B-3, B-5, E-3 E-7, E-9, E-19	A-16, B-5, E-9
Vesicular Dermatitis	A-16, B-3, B-5, E-9	—
Petechiae	B-3	—
Neonatal Infection:		
Encephalomyocarditis	A-16, B-3	—
Gastroenteric cum Respiratory Syndromes ..	E-19	—

of isolation was calculated to be 21.4%, four Poliovirus type 2 and one each of Coxsackie A-16, Coxsackie B-5, Echo-3, Echo-19 and Echo-27 were the enterovirus strains identified.

From the 42 samples collected from rural waters, 8 samples yielded 8 viral isolates as against 14 isolates obtained from 11 samples out of 25 samples collected from urban and sub-urban waters. The rates of virus isolation from rural and urban-sub-urban waters were 19.0% and 44.0% respectively.

Apart from the isolates common to both rural and urban-sub-urban waters, namely, Poliovirus types 1 and 2, Coxsackie B-3, Echo-3 and 19, Coxsackie A-16, Coxsackie B5, Echo-7 and 27 were isolated from urban-suburban waters only.

Discussion

The examination of sewage for the presence of viruses has been undertaken for several years (Paul *et al.*, 1939; Gard, 1950; Melnick, 1947; and many others), and the fact that human and animal viruses pollute surface waters is well recognized (Kelly, 1957; Clarke and Chang, 1959; Lamb *et al.*, 1964; Grinstein *et al.*, 1970; Wilterdink *et al.*, 1970). The knowledge of the occurence and distribution of enteroviruses and other enteric viruses pathogenic for man in natural waters as well as in sewage is of immense public health importance (Brison, 1968, Wilterdink, *et al.*, 1970), for these represent a useful group of animal viruses for studying in detail the transmission of enteric virus infections of man and animals.

Systematic virological investigations of water and sewage, therefore, are an indis-

pensable method ofsurveillance of enterovirus circulation amongst the population as well as a control of their circulation in sewage.

To detect viruses in surface water and sewage, concentration of the sample is necessary (Metcalf and Stiles, 1968; Duff, 1970; Grinstein *et al.*, 1970;) Ultracentrifugation as applied in our survey facilitates efficient concentration with a minimum of handling of viruses in water and sewage. The number of concentrates yielding positive results was most acceptable. Yet this alone, to our minds, is not enough: the method of virus assay is equally important as the concentration of the sample.

The tube method when compared with the plaque assay method is found to be the cheaper and the much more commonly employed method, yet, from our experience, it is, for quantitative studies, somewhat limited by its failure to:

1. reveal virus concentrations in a given quantity of sample;
2. provide means of selection of individual virions present in the sample, and therefore, imposes a limitation on the chances of picking out virulent, vaccine and/or intermediate poliovirus types, let alone picking other enteric viruses present in the sample.

It is, therefore suggested that in addition to the concentration of samples for virus surveys of water and sewage, both the tube and the plaque assay methods should be employed. The plaque assay method alone may fail to reveal enteroviruses which do not plaque at all or plaque only very slowly.

The isolation rate achieved with our method of concentration and virus assay was 28.4%. In view of the fact that the rate of virus isolation and concentration of virus from surface water and sewage are subject to seasonal variations, and that the source of sample collection, quantity of circulating viruses and the grade of pollution of samples differ from country to country and even within the same country, a comparison of our findings with findings of other workers from different countries cannot and should not be made.

Data obtained from our survey indicated that the pattern of enterovirus isolation from water and sewage seemed to vary from the one year to the other; so also varied the rate of enterovirus isolation. Thus, it was found that whereas in the 1971 study period, poliovirus isolates were all of the serotype 1, the serotype identified in specimens examined in 1972 were all poliovirus type 2. It was also observed that in 1971, when 8 Coxsackie B-3 strains were isolated from water and sewage, none was isolated in 1972. The isolations made in 1972 were Coxsackie A-16, Coxsackie B-5 and Echovirus type 27. Echovirus types 3 and 19 were isolated in both study years.

A similar finding was made, when virus isolations were made from stool samples collected from infants in the Greater Accra Region during the same period, 1971 – 1972 (Otatume and Addy, 1973). There is, therefore, a correlation between enterovirus isolation from faeces and from water and sewage in the given space of time. Human infections could, therefore, be reflected in virus contents in water and sewage.

Whether or not virus will be demonstrated in water and sewage is determined by the number of virus excretors. It has been postulated that poliovirus is demonstrable in water and sewage when between 0.27% and 0.4% of the local population excretes the virus (Chin *et al.*, 1967; Weiland, 1968). This means, therefore, that for a population of 370 people only one person needs secrete virus and the surrounding surface waters become polluted with enteroviruses potentially capable of causing disease in man. This, however, will depend upon the defaecation habits, the number of passive vectors, (the housefly) present at the time and the recreational practices of that individual.

It was found that the incidence of enteroviruses in water and sewage samples was at its peak in December. This finding is in agreement with those of Addy *et al.*, 1973, who indicated that the incidence of enteroviruses reached peak level during the hottest months of the year, namely, between December and February. Since there is no large scale poliomyelitis vaccination in the country and for that matter within the last three months prior to the present survey, our finding should be considered a true reflection of enterovirus circulation in the area surveyed.

Furthermore, the high incidence of enteroviruses during this period can be attributed to three major factors (Addy *et al.*, 1973; Otatume and Addy, 1973), namely to:–

1. the over-abundance of houseflies in the country during the hottest months of

the year. Food contamination at this time is high and so will be human infection;

2. the unhygienic practices of quite a sizeable proportion of the population in the study area. Infection rate during this period must be high, so also will the rate of virus dissemination; and
3. the big numbers of bathers who find their way to pools, ponds, lakes, rivers and lagoons during the hot periods of the year. There could be no doubt that a good number of them would be enterovirus carriers (excretors). The percentage of virus excretors will definitely be more than 0.27%. Hence, pollution of water by these bathers should be high.

Our survey further revealed that the rate of virus isolation from urban/suburban waters was higher than that found for rural waters. Population densities of urban/suburban areas are bigger than population densities of rural areas. This factor may be contributory to the higher incidence of enteroviruses recorded for urban/suburban waters. Population densities, therefore, play a role in the concentration and rate of dissemination of enteroviruses in a given area.

Within the same period 1971–1972, 48 poliovirus strains were isolated from faecal samples obtained from infants and children aged 0–15 years in the Greater Accra Region, and out of the 38 strains, all of which were poliovirus type 1, subjected to the rc/40 marker test, 76% were found to be virulent (Addy *et al.*, 1973). Because no large scale vaccination against poliomyelitis has ever been carried out in the country, and to the best of our knowledge not before or during the survey period, it can safely be speculated that the polioviruses isolated in this survey could be mostly the wild type. The public health significance of our present findings and those of Addy *et al.*, 1973, and of Otatume and Addy, 1973, cannot, therefore, be overemphasized.

All poliovirus types, some Coxsackie A and B viruses and some Echovirus serotypes are capable of causing sporadic as well as epidemic diseases in man. The enteroviruses are known to cause a large array of diseases from mild respiratory illness to encephalitis and paralysis which may occur either in sporadic or epidemic form.

It can be seen that Coxsackie B-3, which was isolated 8 times in three months of the study period in 1971, has been found to cause, apart from aseptic meningitis, epidemic myalgia (Bornholm Disease), acute benign pericarditis and myocarditis, also paralytic illness, encephalitis, meningoencephalitis as well as encephalomyocarditis, the last mostly in infants. It is also associated with enteroviral exanthemata (Grodum and Dempster, 1959;, Kibrick *et al.*, Lerner *et al.*, 1942; McLean 1966).

Coxsackie B-5 is mostly associated with respiratory tract infections. It is, however, capable of causing all the disease syndromes associated with Coxsackie B-3 virus infections (McLeod *et al.*, 1956; McLean *et al.*, 1961; Clemmer *et al.*, 1966).

Coxsackie A-16 is known as the aetiologic agent of Hand-Foot-and-Mouth disease, a disease characterized by fever, shallow ulcerative lesions or vesicles in the oropharynx or fauces and by a macolopapular rash which later becomes vesicular on the hands and feet including the palms and soles. The chief victims of this illness are children aged 1–7 years (Robinson *et al.*, 1958).

Amongst the Echoviruses isolated in this survey, Echovirus types 7 and 19, have frequently been associated with gastroenteritis. Echovirus 19 may also cause encephalitis, upper respiratory and cutaneous diseases (La Forest *et al.*, 1957). Echovirus types 3 and 7 are responsible for certain cases of aseptic meningitis. To the best of our knowledge, no disease syndrome has so far been ascribed to Echovirus type 27.

The public health importance of poliomyelitis, particularly, that associated with the serotypes 1 and 2 which are the most frequently isolated strains in Ghana, has previously been discussed elsewhere (Addy *et al.*, 1973; Addy *et al.*, in press).

We would like to stress, at this juncture, that this survey which does not purport to be anything more than a pilot one, suggests that human to human spread of polioviruses as well as other entero-viruses in Ghana is reflected in the yield of enteric viruses in surface water and sewage, and therefore, any future poliovirus survaillence in the country should include water and sewage. Furthermore, the 29.4 rate of virus isolation from utility waters (wells, rivers, ponds and streams), is high; but what is more alarming is the 37.5% virus yield from

wells which are specifically dug out to provide water for human consumption. As already pointed out, frequent surveillance of enteric viruses in water and sewage is called for. It is one of the most appropriate sources of information on the circulation not only of polioviruses but also other entero- and enteric-viruses.

Summary

During the period 1971 through 1972, the distribution of enteroviruses in Ghana (the Greater Accra Region being the selected study area) was studied by virological examination of water and sewage collected from 67 sources. The rate of virus isolation was 28.4%. The type of enteroviruses isolated and the rate of virus isolation was found to vary from the one year to the other.

The percentage of virus isolation from utility waters was as high as 29.4% and that from wells was even higher, standing at 37.5%. Urban waters were found to be more contaminated with enteroviruses than rural waters. A correlation was found between enterovirus isolation from water and sewage and from stools. Maximum enterovirus isolation was found during the hottest months of the year. An attempt was made to relate isolated enteroviruses with known clinical syndromes and to stress the public health importance of our findings.

Acknowledgements

The authors are most grateful to Messrs. Fred Halm-Lutterodt, Michael Addo Pappoe and L.C. Donkor for their excellent field and Laboratory assistance.

We would also like to thank the Overseas Technical Co-operation Agency (OTCA) of Japan for financial assistance.

References

Addy, P. A. K. (1970). Ph.D. Thesis, University of Bern, Switzerland.

Addy, P. A. K., Beckley, C., Tagoe, D. Q. and Otatume, S. (1973). *Ghana Med. J.*, 12/3: 295.

Bagdasaryan, G. A. and Kazantseva, V. A. (1967). *J. Hyg. Epid. Microbiol. Immunology*, 11: 286.

Brison, J. (1968). *Bull. World Hlth. Org.*, 38: 79.

Chin, T. D. Y., Mosley, W. H., Robinson, S. and Gravelle, C. R. (1967). In: G. Berg: Transmission of Viruses by Water Route, N.Y., Interscience, p. 389.

Clark, N. A. and Chang, S. L. (1959). *J. Am. Water Works Assoc.*, 51: 1299.

Clemmer, D. I., Li, F., Le Blanc, D. R. and Fox, J. P. (1969). *Am. J. Epid.*, 83: 123.

Duff, M. F. (1970). Applied Microbiology, 19 120.

Gard, S. (1940). *J. Exp. Med.*, 71: 779.

Grinstein, S. Melnick, J. L. and Wallis, C. (1970). *Bull. Wrld. Hlth. Org.*, 42: 291.

Grodum, E. I. and Dempster, G. (1959). *Cand. J. Microbiol.*, 5: 605.

Kelly, S. (1953). *Am. J. Public Hlth.*, 43: 1532.

Kelly, S. (1957). *Acta Med. Scandinavca*, 159: 63.

Kibrick, S. Melendez, L. and Enders, J. F. (1957). *Ann. N.Y. Acad. Scl.*, 67: 311.

La Forest, R. A., McNaughton, G. A., Beale, A. J., Clarke, M., Davis, N., Sultanjan, J. and Rhodes, A. J. (1957). *Canad. Med. Ass. J.*, 77: 1.

Lamb, G. A., Chin, J. D. Y. and Scarce, L. E. (1964). *Am. J. Hyg.*, 80: 320.

Lerner, A. M., Cherry, J. D. and Klein, J. Q. (1962). *Arch. Intern. Med.*, Chicago;, 110: 687.

Lund, E., Hendstroem, C. E. and Strannengard, O. (1966). *Am. J. Hyg.*, 84: 282.

McLean, D. M., Donohue, W. L., Snelling, C. E. and Wyllie, J. C. (1961). *Canad. Med. Assoc. J.*, 85: 1046.

McLean, D. M. (1966). *Am. J. Med. Scle.*, 251: 351.

McLeod, D. G., Beale, A. J., McNaughton, G. A. and Rodes, A. J. (1956). *Lancet*, 2: 701.

Melnick, J. L. (1947). *Am. J. Hyg.*, 45: 240.

Melnick, J. L. Emmons, J., Opten, E. M. and Goffey, J. H. (1954). *Am. J. Hyg.*, 59: 185.

Metcalf, T. G. and Stiles, W. C. (1968). *Am. J. Epid.*, 88/3: 379.

Mosley, J. W. (1965). In: Berg, G. Transmission of viruses by the Water Route. J. Wiley and Son N.Y., pp. 5–23.

Otatume, S. and Addy, P. A. K. (1973). *Ghana Med. J.*, 12: 282.

Paul, J. R., Trask, J. D. and Culetta, C. S. (1939). *Science*, 90: 258.

Reed, L. J. and Muench, H. (1938). *Am. J. Hyg.*, 27: 493.

Robinson, C. R., Doana, F. W. and Rhodes, A. J. (1958). *Canad. Med. Assoc. J.*, 79: 615.

Schmidt, N. J., Melnick, J. L., Werner, H. A., Ho, H. H. and Burkhardt, M. A. (1971). *Bull. Wrld. Hlth. Org.*, 45: 317.

Wallis, C., Grinstein, S., Melnick, J. L. and Fields, J. E. (1969). *Applied Microbiology*, 18: 1007.

Wallis, C. and Melnick, J. L. (1967a). *Am. J. Epidem.*, 85: 459.

Wallis, C. and Melnick, J. L. (1967b). *Bull. Wrld. Hlth. Org.*, 36: 219.

Weiland, H. T. (1968). Thesis, University of Leiden.

Wilterdink, J. B., Weiland, H. T. and Verlinde, J. D. (1970). *Archiv. fuer die gesamte Virusforschung*, 32: 82.

SEROEPIDEMIOLOGICAL SURVEY OF HEPATITIS B VIRUS INFECTION IN SCHOOL CHILDREN AROUND SENCHI AREA (PRELIMINARY REPORT)

By

S. Otatume*, S. N. Afoakwa, J. A. A. Mingle L. K. A. Derban and E. O. Laryea.

Department of Microbiology, University of Ghana Medical School, and Health and Safety Department of Volta River Authority.

Introduction

Massive development projects usually result in changes in the ecology of both plant and animal species. Such changes are of public health importance since these affect the disease patterns of the human population, in and around the affected areas. A dam has been proposed to be built at Kpong, in the Eastern Region of Ghana. As part of the evaluation of the impact of this major man-made project on the population, it was planned to conduct a sero-epidemiological study of infectious diseases in the Senchi area, before the construction of the proposed dam, and to follow it up after the completion of the dam. This programme was planned with the collaboration of the Health and Safety Department of the Volta River Authority (V.R.A.) and the Department of Microbiology, University of Ghana medical School, Korle Bu.

This brief note describes the results of the serological examination for Hepatitis B (HB) virus infection of the school children around Senchi area, which was carried out as part of the sero-epidemiological survey stated above.

Materials and Methods

The study area, Senchi, is a village about 100 KM from Accra and 10 KM. from Akosombo Dam of the Volta Lake. The village is located along the Volta River, down stream of the Volta Lake and expected to be outside of the flooded area by the proposed Kpong Dam (Lower Volta Lake). The altitude ranges from 60 to 80 meters above sea level. Estimated population is approximately 1,700-1,800, and most of them depend upon farming for their livelihood. Pipe-borne water supply and sewerage systems have not yet been established in the area.

507 Blood specimens were collected from the school children aged between 5 and 16 years, 5-10 ml. sample of blood was collected from each child into a sterile container. The serum was separated and stored at-20°C until tested.

HB antibody (HBs-Ab) and antigen (HBs-Ag) in the sera were examined by the passive haemagglutination (PHA) and reverse passive hemagglutination (R-PHA) tests respectively as described by Imai *et al.* (1974). The HBs.-Ab and HBs-Ag coated red blood cells were kindly provided by Professor Mayumi of Jichi Medical School, Tochigi, Japan.

Sera which were reactive at 1 : 8 were taken as positive in both the PHA and R-PHA tests.

TABLE 1: *Incidence Rate of HBs-Antibody in the Serum of Children around Senchi Area According to the Age Group and Sex using PHA test.*

Group	Age	Sex	
		Male	Female
1	5-6	1/32 (3.1)	7/32 (21.9)
2	7-8	4/50 (8.0)	13/54 (24.1)
3	9-10	12/54 (26.7)	6/45 (13.3)
4	11-12	10/53 (18.9)	16/57 (28.1)
5	13-14	8/42 (19.0)	5/31 (16.1)
6	15-	5/31 (16.1)	5/19 (26.3)
	Not Recorded	0/4 (-)	0/3 (-)
Total		40/266(15.0)	52/241(21.6)
Mean		S=8.4843** 92/507 (18.2)	S=5.8279

*: *Numerators indicate positive numbers, and denominators numbers of serum specimens examined. Numbers in the parentheses indicate percent of positive cases.*

**: *standard deviation in percent.*

*A Virologist sent by Japan International Co-operation Agency (ICA) under the Medical Co-operation Programme between the Governments of Ghana and Japan. Present address: Department of Bacteriology, Fukushima Medical College, Fukushima (960). Japan.

TABLE 2: *Incidence Rate of HBs-Antigen in the serum of Children around Senchi Area According to the Age group and Sex using R-PHA Test.*

Group	Age	Sex	
		Male	Female
1	5–6	5/32 (15.6)*	7/32 (21 9)
2	7–8	15/50 (30.0)	5/54 (9.3)
3	9–10	11/54 (20.4)	5/45 (11.1)
4	11–12	6/53 (11.3)	7/57 (12.3)
5	13–14	5/42 (11.9)	2/31 (6.5)
6	15–	6/31 (19.4)	1/19 (5.3)
	No Recorded	2/4 (50.0)	2/3 (66.7)
Total		50/266 (18.8)	29/241 (~~012~~ 12.0)
Mean		S=6.9636** 79/507 (15.6)	S=5.9908

*: *Numerator indicate positive numbers, and demominators numbers of serum specimens examined. Numbers in the parentheses indicate percent of positive cases.*

**: *standard deviation in percent.*

Results

HBs-Ab: As shown in Table 1, the HBs-antibody levels in the girls had an incidence rate of 21.6% and the boys 15.0%, indicating a higher incidence rate for the girls with 5% significance levels. In the boys, the incidence rate of HBs-Ab in the under 8 years old was definitely lower than the over 9 years old with 2.5% significance levels, while in the girls, HBs-Ab positive rate in the under 8 years old was higher than 9 years old.

Consequently, in the age groups, both 5–6 and 7–8 years old HBs-Ab positive rates of the boys were statistically lower than those of the girls with 2.5% and 5% significance levels. The incidence rates of HBs-Ab in the boys increased gradually with advancing age, namely 0% for 5 years, 3–7% for 6 years, 7.1% for 7 years, 9.1% for 8 years and 35.0% for 9 years old (not shown in the table). However, this particular tendency was not observed in the girls so far tested.

HBs-Ag. Table 2 shows the results of HBs-Ag test according to the age group and sex. Overall rate of HBs-Ag. positive cases of the boys was higher than that of the girls, namely 18.8% and 12% respectively. The highest incidence rate of HBs-Ag was observed in the age group of 7–8 years old boys and 5–6 years old girls. It would appear from these results that the school girls in Senchi area were infected with HB virus one or two years earlier than boys. Clinically, however, the children who carried the HBs-Ag looked healthy.

Discussion

In this report the overall incidence rate of HBs-Ag was found to be 15.6% as determined by the R-PHA test. This is much higher than the rates so far reported by other workers. Foli and Swaniker (1971) detected among blood donors at Korle Bu Teaching Hospital in Accra, HBs-Ag in the blood of 6.1–6.7%. They used the immunodiffusion test and the immune-precipitation techniques respectively. Yokota and Minami (1972), and Minami (1973) surveyed the incidence rate of HBs-Ag in patients of non-jaundice causes and healthy people from various parts of Ghana using immunoelectrophoresis technique. According to their results, the overall rates of incidence were 6.7% in the males and 4.9% in females; the incidence rates in the age groups of 5–9 and 10–14 years old boys were as high as 10% and 11.9% respectively. The R-PHA test used in this report is known to be significantly more sensitive than the agar gel diffusion, and counter-electrophoresis systems used by the previous authors (Vyas and Schulmann 1970, Germain *et al* 1972). This may partly explain the higher incidence rate in this report.

Another explanation may be the different age groups studied in each case. Byrom *et al.* (1973) reported that although HBs-Ag is detected in individuals of all ages in tropical countries, it is most frequent in children aged between five and fifteen years. Our group comprised the 5 to 15 years whilst Foli and Swaniker examined those in the 21–40 year old age group. Minami and co-workers used sera from a wider age group namely 0–45 years or over.

HBs-Ag has become very important in view of its relationship with chronic hepatitis, and liver cirrhosis and more recently with hepatocellular carcinoma (Prince *et al.* 1970, Vogel *et al.* 1970; Nishioka *et al.* 1973).

In Ghana, the present situation of infective hepatitis is becoming quite serious. Since 1969, reported cases of infective hepatitis have been rising every year with 10 to 30% of annual increasing rate (Otatume, 1974). The implications of the high incidence of

antigen carriers, as has also been reported here, with respect to acute viral hepatitis in Ghana and the role of HBs–Ag in the genesis of chronic liver disease and primary liver cell carcinoma have been discussed by Foli and Swaniker (1971).

The role of mosquitoes and other blood sucking arthropods in the transmission of HBs–Ag has been studied (Smith *et al.* 1971, Prince *et al.* 1972, and Byrom *et al.* 1973) and it has been suggested that "the high prevalence of chronic hepatitis infections in the tropics may depend on blood sucking arthropod vectors to assure a high frequency of exposure in the early years of life when the risk of developing hepatitis B virus infection is greatest".

Senchi village where this study was done as well as other villages along the Volta Lake Basin are known to have a high density of the "black fly" (Simulium sp.) and no doubt of mosquitoes as well. In this country, it may be perhaps possible, therefore, with further studies to throw more light on the role of blood sucking arthropods in the spread of HBs–Ag. Also it is important to examine the HBs–Ag and HBs–Ab levels in a variety of infective hepatitis patients with a view to elucidating further the relationship of HBs–Ag and liver diseases.

Summary

HBs–Ab and Ag were tested for the sera of the school children around Senchi area using PHA and R–PHA method. Overall rate of HBs–Ab positive cases was 18.2% and HBs–Ag was 15.6%. The incidence rate of HBs–Ab was higher in the girls, and that of HBs–Ag was higher in boys. The results presented here also suggested that girls in Senchi area seemed to be infected with HB virus earlier than boys. The reason for this is not yet clear.

References

Byrom, N. A, Davidson, G, Draper, C. C, and Zuckerman, A. J, (1973:, Role of Mosquitos in Transmission of Hepatitis B Antigen, *J. Inf. Dis.* 2: 259–260.

Foli, A. K. and Swaniker, G., (1971). High Prevalence of Australia (Au) Antigen Carriers Among Blood Donors in Accra; *Ghana Med. J.*, 10, 214–217.

Germain, K. H., Sturdivant, S. K. and Rightsel, W. A. (1973). Evaluation of a Red Cell Agglutination Test for Detection of Australia Antigen (HB Ag). Appl. *Microbiol*, 4, 524–527.

Imai, M, Yamanushi, K, Ozawa, N, Takahashi, K, Sato, M. and Mayumi, T. (1974). Detection of HBs-Atigen or –Antibody using R–PHA or PHA, *Medical Technol.*, 3: 239–244, (in Japanese)

Minami, K. (1973). An epidemiological investigation of viral diseases in Ghana. In Viral Diseases in S. E. Pacific Area and Africa. pp. 79–109. Intern. Med. Found. Japan, Tokyo.

Nishioka, K., Hirayama, T(, Sekine, T(, Okochi, K(, Mayumi, M, Juei-Low, S, Chen-Hui, L. and Tong-Min, L, (1973). Australia antigen and Hepatocellular carcinoma. *GANN monograph of Cancer Research*, 14: 167–175.

Otatume, S. (1974:,) Recent trend of infectious diseases in Ghana. *Nettai*, 8: 149–158. (in Japanese).

Prince, A. M, Leblanc, L–, Krohn, K, Masseyeff, R. and Alpert. M. E. (1970). S. H. Antigen and Chronic liver disease. *Lancet*. 2: 717–718.

Prince, A. M, Metselaar, D. Kafuko, G. W, Mukawaya, L. G, Ling, C. M, and Overby, L. R, (1972). Hepatitis B antigen in wild-caught mosquitoes in Africa. *Lanect* 2: 247–250.

Smith, J. A, Ogunba, E. O, and Francis, T. I. (1972). Transmission of Australia Au (1) antigen by Culex mosquitos. *Nature* (*Lond.*:, 237: 231–232.

Vogel, C. L, Anthony, P. P, Mody, N, and Barker, L. F. (1970). Hepatitis — Associated Antigen in Uganda Patients with Hepatocellular Carcinoma. *Lancet*, 2: 621–624.

Vyas, G. N. and Shulman, N. R, 1970. Haemagglutination Assay for Antigen and Antibody Associated with Viral Hepatitis; *Science*, 10: 332–333.

Yokota, T. and Minami, K. (1972). An epidemiological investigation of Australia antigen in Ghana, *Jap. J. As. Inf. Disease*, 46: 233–239.

原　著

ガーナの感染症の現状（続報）

福島県立医科大学細菌学教室

大立目　信　六　　藤　原　留　造

前報[4]において1972年までのガーナにおける感染症の趨勢について述べたが，本編においては主な感染症のその後の実情について報告する。特に発生数や死亡者数の多いもの，あるいは特徴のある変化を示しつつある疾患などを中心に話題を進めていきたい。また，前報においては一部のウイルス性疾患の増加が著しかったことを指摘し，それらがどのように推移するかを見守る必要があることを記載したが，今回はその点についての1974年現在における回答も用意した。前報ではガーナを中心として，アフリカの他の地域との比較なども若干試みたが，本編では各疾患のガーナ国内における地域的分布の解析などに焦点をしぼった。

筆者らは1975年4月（藤原）と同年11月（大立目）にそれぞれ1～2ヶ月ずつJICAの短期派遣専門家としてガーナ大学を訪れ，免疫学，ウイルス学の指導あるいは研究協力を行ったが，その際に同国の疫学的統計資料を蒐集して来た。本編において用いた資料は前報と同じく政府より公表された統計資料，即ち厚生省発行のGhana Monthly Epidemiological Bulletin　などである。

ガーナの全般的人口動態：　周知のごとく，開発途上国における現下の最大の悩みの一つに人口増加の問題があげられるが，ガーナもその例外ではない[3]。1973年には900万人を越えた人口はいぜん年率3％以上の勢いで増え続けている。表1に1970年の人口動態の資料を示し，また図1にガーナの9つの行政区の概略図並びに人口分布を示した。これらの各地方の人口はAshanti地方とEastern地方が他より多い程度で，概ね10％前後になっている。以下，主な感染症について最近の趨勢を述べていく。

表1．ガーナの人口動態（1970）

推定総人口（1970）	…8,559,300.
5才以下	……1,563,100.(18.3%)
15才以下	……4,015,900.(46.9%)
女性再生産年令人口(15－44才)	…1,785,400.(20.9%)
母子人口	……5,801,400.(67.8%)
出生率	……50 per 1,000
一般出生率	……230 per 1,000 Women of 15－44 years old
総出生率	……6.7 per Woman
1～4才児死亡率	……Male：45.6, Female：48.3
（推定・出生時死亡を除く）	
幼児死亡率	……133 per 1,000 live birth
推定粗死亡率	……18－20 per 1,000.
人口自然増加率	……3.0－3.5%per year

Measles　麻疹：　1970，71年と著明な増加を示したが，以後はほぼ平衡状態にあると云える。1970年以後，麻疹患者は毎年約9万5千人程度届出されているが，この数値は推定年間出生者数45～50万人の約20％に相当する。ガーナのような国情において，麻疹に感染する率が何％になるかは不明であり，そのうちの何％が発症し，どの程度が医療機関において麻疹と確認されるかは不明であるが――4才までにガーナの子供の90％が麻疹に感染するとも言われる[1]―患者発生届出数が年間推定出生数の20％という値はやや低いようにも思われる。それにしても報告された患者数，死亡者数ともに届出感染症の中では首位にあり，ガーナにとっては最も重要な感染症の一つである。患者の発生数は各地方ともに平均的に分布しているが，Eastern地方に若干多いようである。図2－Aに1969年以降の届出患者数の推移を示した。

Chickenpox　水痘：　1970，71年と急増したが，1972年には微増に止り，1973年には前年より

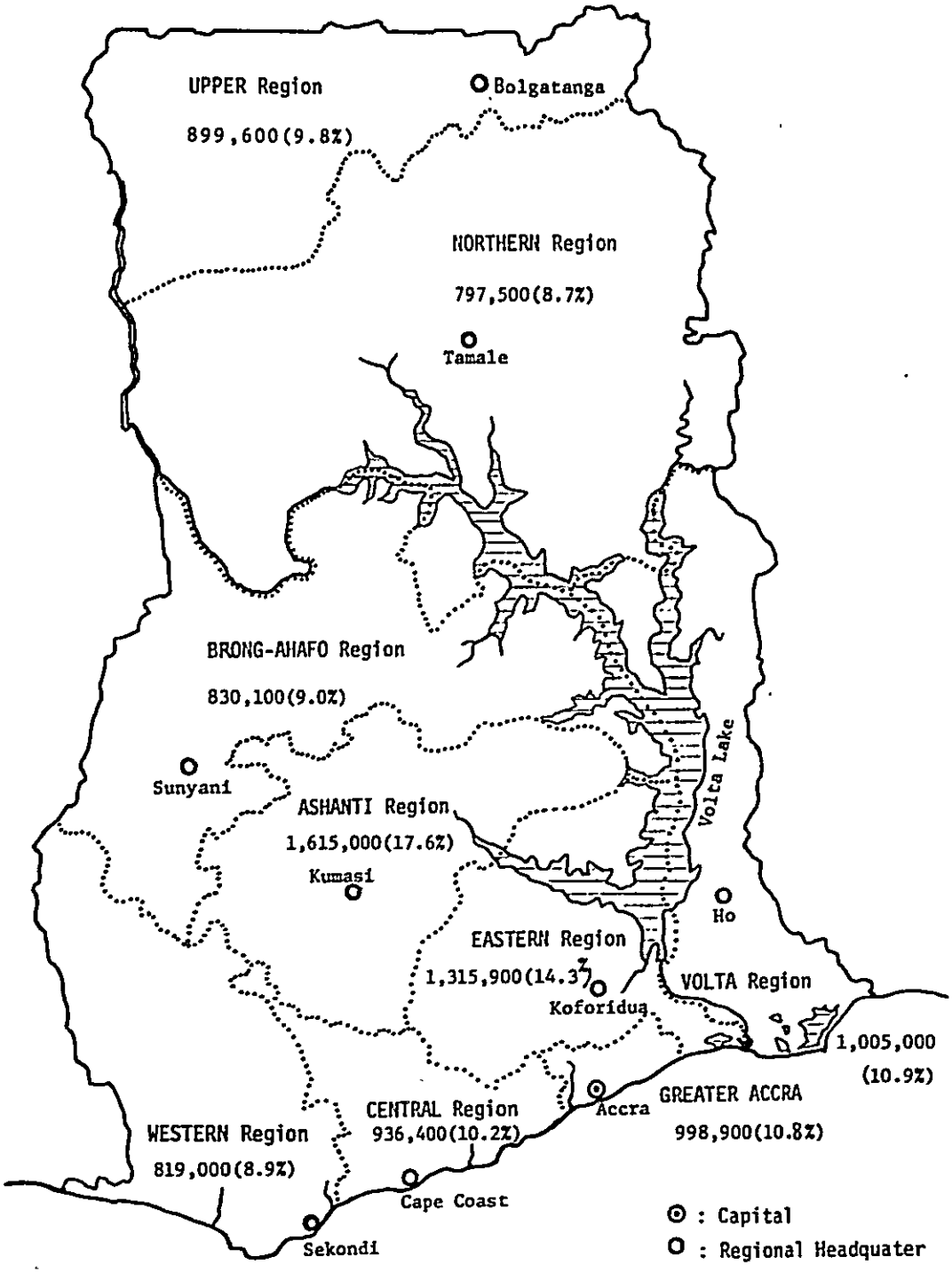

Fig.1. GHANA Regions and Populations
Estimated Population in 1973
9,191,000 (100.2%)

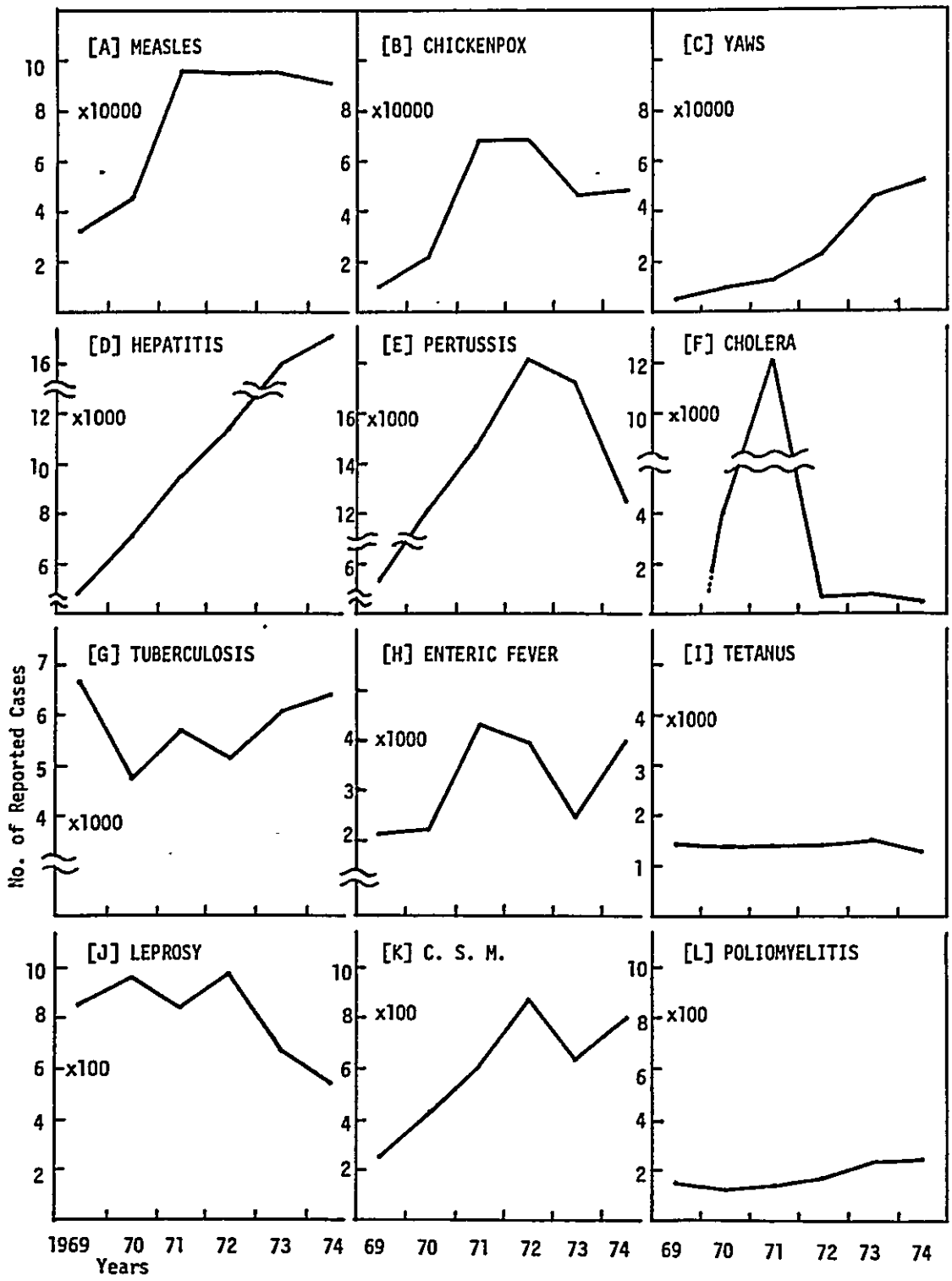

Fig.2 Reported Cases of Infectious Diseases in Ghana (1969-1974)

も約30%減少した。1974年には大よそ前年と同程度であるところから水痘の発生もほぼ平衡に達したものと解される。麻疹同様Eastern地方に多いが，他の地方にも平均的に分布している（図2－B）。

Infectious Yaws, フランベジア： 本症は最近非常な勢いで増加している。1973年には前年の倍になり，1974年には約30%の増加になっている。今や，1956年からの10年間に実施した大規模な撲滅計画の努力も水泡に帰したと見るべきであろうか。本症は北部地方には少いが，中部，特にEasternおよびCentralの両地方は人口比にして明らかに多い（図2－C）。

Infective Hepatitis 伝染性肝炎： いろいろな原因による肝炎が考えられるが，主体はウイルス性肝炎（A型およびB型など）と考えられる。本疾患は1969年には年間届出数が4,700人余りであったが，以後毎年10～30%ずつ増加し続け，1974年現在では約4倍の17,200人となっており，死亡者数も249人で約2.3倍になっている。著者の一人（大立目）はガーナ派遣中にVolta River Basinにおける感染症の疫学調査の一環としてB型肝炎の感染状況の調査を行ったが，Volta 河沿いの一部落の健康な学童のHBs－抗原の保有率が15.6%，HBs－抗体保有率が18.2%という結果を得た。さらに詳細に検討したところ女子の方が男子よりも早くHBウイルスに感染したことを示唆するようなデータも得られた[8]。その原因については追求する余裕がなかったが，興味のある事実である。また，少数例ではあったが肝炎患者の血清中のHBs抗原を検索したが，3/4以上がHBs－抗原陽性で，しかも極めて高い抗原価を示した。これらのことは，ガーナの人々の中にHBウイルスのキャリヤーになっている人が多数いる可能性があることと，肝炎患者の相当な部分がB型肝炎によって占められていることを意味するであろう。肝炎患者の発生届出は1974年は第4位であったが死亡者数は1973，74年ともに麻疹に次いで第2位に上っており，極めて深刻な問題になりつつある。ガーナの肝炎患者発生の地域的分布はやや片寄っており，中部のAshanti 地方とBrong-Ahafo地方，特に前者に多数発生しているが，北部の2地方には少いことが指摘されうる。いずれにしてもガーナの肝炎は急激ではないが着実に増加し続けており，今後，重要な課題になるだろうという点で，ガーナ側の当局者も一致した意見を持っていた（図2－D）。

Pertussis 百日咳： 図2－Eに見られるように1972年まで急激に増加したが，以後減少の傾向にある。1974年の発生届出数は第5位になっており，いぜん感染症の中では多い方であるが，最盛期に比べると約3/4に減少した。Accra地区には多いが Volta 地方および北部の2地方には少い（図2－E）。

Cholera コレラ： 1970，71年の爆発的な流行後，若干の変動はあるものの，概して500人前後の患者が毎年発生しているにすぎない。しかし，本症の最も重要な問題は一部地域にendemicに定着した点である。1974年のコレラ患者の発生状況を見ると海岸部だけに止まらず内陸部にも散見された。また致命率が7.6%と高い点は注目された（図2－F）。

Tuberculosis 結核： 1969年には6600人であった発生届出数が1970年ごろから一時減少した。しかし1973年より再び増加し，17%増となった上に，1974年も前年比9%増加して昔のレベルに戻ってしまった。この1974年の発生届出数，死亡者数はともに感染症の中では第6位に相当しており，結核はいぜんとしてガーナでは大きな比重を占めているように思われる。地域的には主都のアクラ地区，大きな町のあるWestern, Ashanti両地方に発生が多く，Volta, Northern, Upperの各地方には少い（図2－G）。

Enteric fever 腸チフス，パラチフス系疾患： 1972，73年と減少が続いたが1974年に再び急増して71年当時のレベルに復した。1974年の死亡者数は第4位であり，致命率も高く，4.3%である。本疾患はWestern地方および北部の2地方では明らかに少く，中部のB-Ahafo 地方に多いが，概し

て年ごとの差が大きい。例えば，1973年にはEastern地方に多発し，翌74年はB.Ahafo 地方で前年比3倍増という大規模な流行が記録された。これが同年の発生数増加に大きく影響したものと考えられる（図2－H）。

Tetanus　破傷風：　1974年の死亡者数は第3位に下ったものの，今なお毎年1300人前後の患者と200人前後の死亡者が届けられている。致命率は狂犬病を別とすれば感染症の中では最も高い19.4%である。一般にCentral, Accra, Easternの各地方に多く北部の2地方には少い（図2－I）。

Leprosy　癩：　1972年まで毎年900人前後の発生届出でほぼ一定していたが1973，74年と減少が続いた。Eastern, Volta, Upperの各地方の発生届出は少いが，NorthernやCentralの両地方にはまだ多い（図2－J）。

Epidemic Cerebrospinal meningitis　脳脊髄膜炎：　ガーナでは数年毎に大きな流行が起るといわれるが，本症は1～3月の乾期に北部のNorthernとUpperの2地方に多数の患者が発生する。これらの地方はサハラ砂漠南部のいわゆるMeningitis Belt に当る。Accra地区でもしばしば発生しているが，この場合はあまり季節性と関係がない。また，*N.meningitidis*以外のものが原因になっているものも多いといわれる。致命率はかなり高く，14.0%に達する（図2－K）。

Poliomyelitis　小児マヒ：　今回取り上げた各感染症の中では発生届出数が最も少いものであり，毎年200人前後の発生しか報告されていない。しかし，ゆるやかながら毎年少しずつ増加が続いている。Accra地区およびAshanti地方に多い。1974年にNorthern 地方にやや多発の傾向が認められたが，果せるかな1975年前半に同地方に多数の発生報告があった。このことはある意味では注意しなければならない。即ち，ガーナの都市部には常時 Poliovirus などが巡り回っている[5,6]ので，それらが免疫のレベルが低い集団にたまたま侵入した場合，その集団内に一気にウイルスが広がり，多くの感染者を出すに至るものと考えられる。今後の問題点の一つであろう。（図2－L）。

以上，各感染症について個々に述べたが，地域的に見ればAccra地区とAshanti 地方はいくつかの感染症において単位人口当りの発生頻度の高いものがある。それに比べてVolta, Northern, Upperの各地方は平均レベルよりも著しく低いものがある。しかしこれらの数字が，実際にその疾患がその地方で少いことを示すのか，あるいは医療施設が少いことによって届出が少いのかは早急には断じられない。即ち，これらの地方はガーナの中でも非常な過疎地帯であり，小さな村落が医療機関から僻遠の地に散在していることが多いし，医療施設自体の数も北部の両地には非常に少い[7]。

以上をまとめると，1973年以後のガーナにおいては肝炎やフランベジアが急速に増加し続けている。1970年ごろ，一時急速な増加を示した麻疹や水痘は1973年ごろより平衡に達したようである。また百日咳や癩のように減少してきたものもあれば，Enteric fever,結核などのように増減の著しかったものもあった。

謝　辞

本報告に引用した各種資料を提供して下されたガーナ大学医学部微生物学教室のProf.S.N.Afoakwa 博士，並びにガーナ厚生省のDr.F.C.Grant部長および同省疫学部門のDr.K.Ward-Brew部長に衷心より謝意を表する。

文　献

1）Min.of Health,Ghana ((1967) : Annual Report of Medical Services of Ghana. p 9, Gov. of Ghana, Accra.
2）Min.of Health,Ghana (1974) : Ghana Monthly Epidemiological Bulletin. 3,(1)—4,(5) 1975
3）大立目　信六(1972)：ガーナ国民の健康と厚生行政，海外技術協力，1972I046—52.
4）大立目　信六(1974)：最近のガーナにおける感染症の傾向。熱帯，8.149—158.
5）Otatume,S.and Addy,P.A.K.(1973) : Enteroviruses in infants in Accra-A prelimi-

nary report. Ghana Med.J. 12,282−286.
6) Otatume,S.and Addy,P.A.K.(1974) : Ecology of enteroviruses in tropics. I. Circulation of enteroviruses in healthy infants in tropical urban area. Jap. J. Micrbiol. 19,201−209.
7) 大立目 倡六 他(1974)ガーナ大学医学部に対する医療協力, ウイルス学および電子顕微鏡学プロジェクト第2次派遣団総合報告書 p161,OTCA医療協力部, 東京
8) Otatume,S.et al.(1976):Seroepidemiological Survey of Hepatitis B Infection in School Children around Senchi Area (Preliminary Report). Ghana Medical J. (in press)。

資料4

GHANA/JAPAN RESEARCH PROGRAMME (PROJECT III - THE SECOND PHASE)

PATHOPHYSIOLOSY AND IMMUNOLOGY PROJECT

1. Studies on Mg-metabolism, Ca-metabolism and Enzymology in in infections and parasitic diseases.
2. Studies on Amino acid metabolism.
3. Quantitative determination of Electrolytes in various tissues in normal Ghanaian and comparative studies with various diseased tissue.
4. Experimental studies on Mg, Ca and Amino acid Metabolism in Mg-deficient animals.
5. Histological and microradiographical studies of bone on the tropical diseases.
6. Congenital dislocation of the hip joint in the newborn in Ghana.
7. Distribution of HLA-antigens among healthy persons and patients in Ghana.
8. Immuno-pathological studies of tropical infections using nude mice.
9. Continution of study of anemia in pregnant Ghanaian women.
10. The immunological response of the pregnant Ghanaian women to infections.
11. Some aspects of the pathophysiology of pre-eclamptic toxaemia and eclampsia.
12. Studies in the pathophysiology of biliary tract disease in the tropical environment with reference to Ghana.
    (1) Patterns of cholestatic jaundice.
    (2) Bile salt metabolism in relation to causation of gall stones.
    (3) Biliary tract disease and the haemoglobinopathy.

1. Studies on Mg-metabolism, Ca-metabolism and Enzymology in infections and parasitic diseases.

Normal values of electrolytes in Ghanaian children were already established by former team. And normal values of enzymes will be established by us.

(a) Comparative studies in patients with malnutrition. (concluding Amino-acid and Protein)
(b) Comparative studies in patients with Sickle Cell Anaemia.
(c) Comparative studies in patients with diarrhoeal diseases.
(d) Comparative studies in patients with cerebral malaria.
(e) Comparative studies in patients with Measles, Poliomyelitis, Infectious hepatitis and Tetanus.
(f) Comparative studies in patients with Onchocerciasis.

Principal Investigator : Japanese Expert
Co-principal Investigator : Japanese Expert
Prof. Y. Asirifi (Dept. of Child Health)
Prof. C. O. Quarcoopome (Dept. of Ophthalmology)
Dr. A. G. Boohene (Dept. of Child Health)
Dr. S. K. Adjei (Dept. of Child Health)
Prof. G. R. E. Swaniker (Dept. of Chemical Pathology)
Dr. Odoe (P. M. L. -Hospital)

2. Studies on Amino acid metabolism.

(a) Protein and Amino acid patterns in normal and malnourished children in Ghana. Especially the relationship among Amino acid patterns, Electrolytes and Enzymes.
(b) Investigation of Inborn errors of Amino acid metabolism in Ghanaian children. For the screening of these

patients, Dr. Sekiba will bring some kits, URITEST, for this analysis from Japan.

Principal Investigator : Prof. Y. Asirifi
Co-principal Investigator : Japanese Experts
Prof. G. R. E. Swaniker
Dr. A. G. Boohene
Dr. S. K. Adjei
Dr. Quaye (Dept. of Child Health)

3. Quantitative determination of Electrolytes in various tissues in normal Ghanaian and comparative studies with various diseased tissue.

Principal Investigator : Prof. G. R. E. Swaniker
Co-principal Investigator : Japanese Experts
Prof. E. C. Christian (Dept. of Pathology)
another doctor (")
Prof. Y. Asirifi
Dr. Assimeh

4. Experimental studies on Mg, Ca and Amino acid Metabolism in Mg-deficient animals.

For the above studies, Former team have brought Mg-deficient feed from Japan. Many equipments and consumables had been brought already in 1975. But there are a few problems, such as how to get many animals for the experiment and how to keep them.
* Animals house committee (Dr. Afoakwa is this chairman)

Principal Investigator : Japanese Expert

Co-principal Investigator : Japanese Expert
Dr. Assimeh
Prof. G. R. E. Swaniker
Some doctor from Dept. of Physiology
Some doctor from Dept. of Pathology
Some doctor from Dept. of Microbiology

5. Histological and microradiographical studies of bones on the tropical diseases

Principal Investigator : Japanese Expert
Co-principal Investigator :
Dr. T. Nakamura
Dr. E. C. Christian
Dr. K. G. Korsah
Mr. K. Armah
Associate Collaborator : 2 Technologists
2 Technicians

Research Plan

Aims : The programme is aimed to research bone changes of malnutrition and metabolic bone abnormalities in tropical area.

Method : Observation of the histological findings of decalcified specimens and the microradiographical findings of undecalcified ones.

Significance : The results of this study will provide a valid basis for management and treatment of patient.

Facilities

Needed equipments

1) Super soft X-ray apparatus
2) Bone sectioning machine (Cutting, milling & grinding machine)
3) Microscope
4) Apparatus of microscopic photograph

Available equipments

1) Microtome
2) Automatic staining apparatus

6. Congenital dislocation of the hip joint in the newborn in Ghana

Principal Investigator : Japanese Expert

Co-principal Investigator :

Dr. K. G. Korsah
Some from maternity health
Some from child health
Some from community health

Research Plan

Aim : The programme is aimed to find out the frequency of CDH in newborn in Ghana.

Method : It is proposed to examine the newborn that born at the department of obstetrics.

Significance : CDH is very rare in African and frequent in other races. By examining the newborn immediately after birth, pathogenesis of CDH might be clear whether prenatal or postnatal.

Facilities

Available equipment

X-ray apparatus

7. Distribution of HLA-antigens among healthy persons and patients in Ghana.

8. Immuno-pathological studies of tropical infections using nude mice.

Principal Investigator : One or two Japanese experts

Co-principal Investigator : Japanese Expert

Prof. T. Huziwara (Japanese expert)

Prof. S. N. Afoakwa (Head of the Dept. of Microbiology)

Research Plan

Aim : A variety of diseases in man has been known to associated with a specific HLA phenotype. However it remains unclear whether a specific HLA-antigen is related to a tropical disease. Our object is to clarify the correlation of HLA-antigens to tropical diseases. It is useful to study tropical infections with athymic nude mice.

Methods of procedure : Lymphocytes from healthy and ill persons are analyzed for HLA-antigens, using standard anti-sera which will be kindly supplied by Prof. Tuzi, Dept. of Heamatology, Faculty of Medicine, the University of Tokai, Japan.

Significance of research : In order to elucidate immuno-pathological manifestation of the diseases, it is important to clarify the correlation of HLA-antigens

to tropical diseases in Ghana.

9. Continuation of study of anemia in pregnant Ghanaian women.

10. The immunological response of the pregnant Ghanaian women to infections.

11. Some aspects of the pathophysiology of pre-eclamptic toxaemia and eclampsia.

Principal Investigator : Japanese Expert
Co-principal Investigator : Japanese Expert

Collaborating Staff

Technical Supporting Staff

Research

Aims

9) to investigate the anemic condition in Ghanaian pregnant women and to establish the treatment of the anemia.

10) to investigate the immunological changes for Malaria during pregnancy.

11) to investigate the status of pregnant toxaemia in Ghana.

Methods of procedure

9) to continue the study of anemia project II.

10) to find specific antibodies against Malaria in the blood samples from the Maternity Block in the Ghana Medical School.

11) to establish the range of normal blood pressures in all three trimesters.
to estimate the quantity of urinary proteins in normal and toxaemic patients.
into the haemostatic changes in normal pregnancy and toxaemic pregnancy.

Significance of Research

to investigate the actual condition of anemia, toxaemia and infection of Malaria in pregnant Ghanaian and to establish the principal treatment for them.

Facilities

12. Studies in the Pathophysiology of Biliary Tract Disease in the Tropical environment with special reference to Ghana.
(1) Patterns of Cholestatic jaundice.
(2) Bile Salt metabolism in relation to causation of gall stones.
(3) Biliary Tract disease and the haemoglobinopathies.

Principal Investigator : Japanese Expert
Co-principal Investigator : Japanese Expert
Dr. E. Q. Archampong
Dr. G. R. E. Swaniker
Collaborator : Dr. Belcher
Dr. Dakubu
2 Technologists
1 Technician
1/2 Secretary

Research

(1) Patterns of Cholestatic Jaundice.

Aims : 1. To determine the relative surgical significance of the various causes of jaundice in the tropical environment : Gall stones Carcinoma of biliary tract and Pancreas

2. To study the

3. To establish as far as possible practical guide lines for diagnosis.

4. Explore the most suitable treatment modalities for tropical milieu.

Method of Procedure :

A prospective documentation of all cases of jaundice referred for surgical opinion in the Korle Bu Teaching Hospital was begun in January 1975. Information is collected by means of a detailed proforma a specimen of which is enclosed. The standard investigative procedures necessary for diagnosis as scheduled in the proforma are performed. So far endoscopic examination of the upper gastro-intestinal tract as well as retrograde. Catheterisation of the biliary and pancreatic passages with a view to cholangiography and pancreatography has not been possible.

Significance of the Work :

The results of this study will provide a valid basis for surgical diagnosis and treatment. Our preliminary results to our surprise but carcinoma of the pancreas high on the list as the most important cause of obstructive jaundice in Ghana - contrary

to experience elsewhere. Some of these may have been due to carcinomas of the biliary tract but with retrograde transduodenal cholangiography the distinction is difficult to make clinically.

Facilities needed :

1. A gastroduodenoscope set with facilities for catheterisation, radiography and photography. This device has never been used in this centre a trial period would therefore be necessary.
2. Accessories : T-tubes and a supply of the appropriate X-ray photographic plates.

(2) Bile salt metabolism in the West African in relation to the causation of gall stones.

Aims : 1. To determine the influence of bile salt metabolism on gall stone formation in Ghanaians.
2. To determine the changes in biliary circulation of bile salts in cirrhotic patients.
3. To determine the influence of bile salt excretion on other biliary constituents.
4. To determine changes in bile salt metabolism in diseases associated with Cholelithiasis.

Method of Procedure :

Attempts would first be made to determine the size of the bile salt pool in the Ghana. Using a radioactive dilution technique 14_C labelled chenodeoxycholate would be fed orally or administered intravenously to various categories of subjects and rate of disappearance estimated in serial samples of duodenal contents. Preliminary studies would be bile salt and cholesterol metabolism will be determined.

carried out to try out the method on dogs. Initially, efforts would be concentrated on normal subjects and patients with gall bladder disease (calculous and non calculous) but studies would be widened later to include the so-called diseases of civilization - pancreatitis, ischaemic heart disease, peripheral vascular disease diabetes, etc.

The relationship of cholesterol to bile salt metabolism will be studied by feeding isotopically labelled cholesterol and trace its degradation in the liver to bile salt. The equilibrium state between

Significance of the Work :

This may provide information on the initiation of gall stone formation. It may also provide a basis for prophylaxis of cholelithiases and similarly, this may apply to other " diseases of civilization ".

Facilities already existing :

(i) The counting facilities of the Nuclear Physics Unit - Department of Medicine

(ii) Laboratory facilities of the Department of Chemical Pathology.

(iii) Animal laboratory of the Medical School.

Facilities required :

(i) Densitometer (Bitatron TLD 100)

(ii) Chromoscan with thin layer attachment (Joyce Loebl)

(iii) Gas-liquid Chromography set.

(iv) Duodenal intubation set.

(3) Biliary Tract disease and the haemoglobinopathies. This is a joint project with the Director of Institute of Clinical Genetics, Accra. A proforma of the study is enclosed for information.

資料5

UNIVERSITY OF GHANA MEDICAL SCHOOL

P.O. Box 4236,
Accra.

Ref: MS/G-5A PT.5

27th June, 1977.

RESEARCH COORDINATING COMMITTEE

I enclose herewith a copy of the minutes of the emergency meeting of the Research Coordinating Committee - Ghana/Japan Medical Cooperation held on Friday, 24th June, 1977.

Please let me have any suggestions for amendment as soon as possible.

(B.P.Y. Klutse)
SECRETARY
COORDINATING COMMITTEE

Distribution:

Prof. C.O. Quarcoopome
Prof. K. Hoshishima
Prof. T. Hudziwara
Prof. K.G. Korsah
Prof. E.C. Christian
Prof. M. Kudo
Prof. Y. Asirifi
Prof. S.N. Afoakwa
Prof. S.K. Addae
Dr. S. Otatsume
Dr. A.A. Bruce-Tagoe
Dr. Peter Lamptey
Dr. M. Watanabe
Dr. T. Nakamura
Dr. Y. Kurobane
Mr. N. Asahi

cc: Prof. H.H. Phillips, Dean
The Executive Secretary
The Librarian
The Senior Asst. Registrar

MINUTES OF THE EMERGENCY MEETING OF THE JAPANESE EVALUATION TEAM WITH MEMBERS OF THE RESEARCH COORDINATING COMMITTEE - GHANA-JAPAN MEDICAL COOPERATION HELD ON 24TH JUNE, 1977 IN THE CONFERENCE ROOM

Present

Prof. C.O. Quarcoopome - Chairman
Prof. K. Hoshishima
Prof. T. Hudziwara
Prof. K. G. Korsah
Prof. E. C. Chistian
Prof. M. Kudo
Prof. Y. Asirifi
Prof. S. N. Afoakwa
Prof. S. K. Addae
Dr. S. Otatsume
Dr. A. A. Bruce-Tagoe
Dr. Peter Lamptey
Dr. M. Watanabe
Dr. T. Nakamura
Dr. Y. Kurobane
Mr. N. Asahi
Mr. B.P.Y. Klutse - Secretary

The Chairman welcomed members of the Japanese Evaluation Team on behalf of the Dean and expressed the Dean's regret at not being able to be present because he had had to attend an emergency meeting of the Executive Committee of the Academic Board of the University of Ghana. He said that as had been the custom, the members expected a certain measure of briefing on the Japanese Evaluation Team's findings during their tour of the various departments. Professor Hoshishima expressed special thanks to the Medical School on his own behalf and on behalf of his colleagues for the special cooperation the Japanese Medical Scientists in the Medical School, especially Professor Hudziwara, had been receiving from their Ghanaian counterparts. He said they have had the chance to see the laboratories in the various departments they had visited and he was satisfied with the conditions of the various equipment in these departments. He further noted that notwithstanding the energetic cooperation being received from their Chanaian counterparts, it has not been possible for Professor Hudziwara yet to start his project.

Professor Afoakwa, Head of Department of Microbiology informed the meeting that Professor Hudziwara could not start his research work because the research equipment needed for the project arrived only recently and so were his personal effects. He said from his personal conversation with Professor Hudziwara,

he observed that what was required was a little time to enable Professor Hudziwara settle before undertaking any research work.

The Chairman at this time invited participants to make individual reports to enable the Evaluation Team assess the extent of any problems they might be facing. Professor Kudo, Leader of the Japanese Research Team in the Medical School was the first to speak. He informed the meeting that Professor Addae had already briefed the Evaluation Team and that he, Professor Addae, would send in a written report. He noted however, that as far as he was aware, the main problem facing them in the Department of Physiology where part of the Research Programmes were being undertaken, was a common store room for the storage of the various components of research equipment, reagents and other elements of research because as of now the items are stored in various rooms and it is difficult to have easy access to them when they are urgently needed. He said the research programmes in progress in the Department of Physiology included

1) Sodium potassium transportation in Sickle Cell Membrane.
2) Morphological Studies in the Membrane of Sickle Cell Patients

Professor Addae who contributed to Professor Kudo's statement added further that apart from the above mentioned projects, the following were also in progress:

a. Mineralocorticoids, ACTH in Sickle Cell Disease
b. Total Body Water Exchangeable
c. Sodium in Normal Ghanaian and Sickle Cell Patients.

Professor Afoakwa, in his contribution, noted that he had nothing to report except to re-state that there should be a meeting to rephase research programmes where necessary so that if some other departments are to use the facilities at the Department of Microbiology then there could be proper coordination and correlation of activities.

Dr. Otatsume also added to Professor Afoakwa's contribution. He reiterated some of the research programmes in progress in the Department of Microbiology notable among which is the one entitled "Ecology of Enteroviruses." He said they were collecting specimens at the moment. Asked as to whether they had any transportation problems, Dr. Otatsume and Professor Afoakwa stressed the need to have a departmental car for the transportation of personnel to the various points where they collect the specimens, adding that as of now transportation arrangements are very unsatisfactory.

Professor K.G. Korsah of the Department of Surgery, had nothing to report because, according to him, he had just met his counterpart and that they would discuss the outline of research programmes later on.

Dr. A.A. Bruce-Tagoe, Head of the Department of Haematology informed the meeting that his department was involved in a research in "Anaemia in Pregnancy in the Greater Accra Region". He said they had dealt with 300 cases of which 80% were delivered. This project, he continued, had been in progress for a little over one year. In order to cope up with the number of cases they had to deal with and in order to collect enough material to make any analysis meaningful, he continued, they had had to run special clinics and these had been very helpful. He said his department needed means of transportation and that to follow up cases they needed the services of a Public Health Nurse which they had not been able to procure so far. The Department of Community Health, he continued, had promised to help them in this regard and it is hoped that when the department procures a Public Health Nurse for them follow-ups will be easier.

On the technical side, he said their problem was with equipment, adding that they had not been able to get all the equipment they require for their work. On the question of technical personnel, he said they had tried to employ a full time technician at the level of Principal Research Assistant but noted with regret that the man interviewed and appointed had not taken up his appointment up till now. Another difficulty, he noted was with data processing. He said, as a result of very intensive research activities, they had accumulated a lot of data which needed processing but which was proving difficult because they had not had the staff and the proper equipment. On the question of storage of research equipment and other pertinent items he reiterated what Professor Kudo had said about research equipment being allocated one Storage Room. He however added that items intended for different Research Projects should be clearly marked. This process of codifying and indexing of items will make it easier to keep a tag on which projects were consuming more and what was needed and at what time in order to forestall the possibility of some Research Projects grinding to a halt for the lack of research materials. In this regard it was proposed that a separate store-keeper should be employed and kept under the control of the Research Coordinating Committee. It will be the duty of the store-keeper to perform all duties that are expected of a store-keeper and to inform the Leader of the Japanese Research Team monthly about the stock levels of the various items. It was further recommended that in order to make this exercise successful, monthly stock taking, should be undertaken.

Professor Christian, Head of the Department of Pathology said that his department was making research into "Metabolic Bone Changes in Children". He said this project has not taken off the ground because his Chief Technologist who will be playing a very important part is at the moment in Japan and is learning the techniques required for the project. He said they will be collecting specimens from Korle Bu and that by special arrangement they will extend their activities to the Mamprobi Polyclinic.

Professor Asirifi, Head of the Department of Child, in his contribution noted that the research programmes in his department was a continuation of the previous one entitled: "Protein and Amino Acid Patterns in Normal and Malnourished Children in Ghana". He said the research work was extended later on to cover other diseases and that the main project is a similar study on Malnourished Children at Princess Marie Luise Hospital. He however stated that his problem was that the material being collected was not enough and that from all indications, their present Japanese counterparts were not working as hard as expected of them. Professor Asirifi further informed the meeting that 1,300 specimens had been collected on a previous project. He also noted that the electrolytes project had run into some problems because the Blood Gas Analyzer had broken down. He was however reassured that a new Blood Gas Analyzer had arrived and that his problems will soon be over.

The representative of the Department of Community Health, Dr. Peter Lamptey, was not happy with the exclusion of that department from the electrolytes project. He was informed that consideration will be given to his complaint and that everything will be done to make it possible to avail the Research Workers of the facilities the Department of Community Health offers for the progress of the research projects.

Data Analysis

Asked to expatiate on the above mentioned topic, he had earlier touched on, Dr. Bruce-Tagoe informed the meeting that the volume of data they had collected as a result of the research work in his department was such that they needed a computer to undertake a successful analysis of the same. Asked as to whether the computing facilities at Legon will not be of help in this case, he informed the meeting that the volume was such that they cannot depend on Legon to do the analysis. He further explained that the work being done now was comparable to the volume of work done under the Danfa Project and that in their case this was even bigger. They therefore need a specialist advice. After some discussion the meeting decided that the

advice should be sought from Professor Ofosu-Amaah and Professor Hoshishima about the possibility of acquiring a computer to be used in analysing data collected under Project III Phase ii of the Ghana Japan Research Programme.

Draft Proposals for Project III Phase ii

After the meeting had received the above report, the Draft Proposals for the next phase of the Ghana Japan Research Programme, namely Pathophysiology and Immunology Programme was discussed. Various comments were made by members present and the following proposals were put forward:

1) That writing protocols for each programme should be made mandatory.
2) That for the smooth running of the projects the various ramifications of a programme should be fanned out to the various specialists in all departments who will then work out their bits and then tag in these bits with the results received from other specialists.
3) That each programme should have two Principal Investigators, one Japanese and one Ghanaian.
4) Finally, it was proposed that when protocols are presented the Research Coordinating Committee should meet to discuss them to enable proper coordination and phasing.

The meeting next discussed the draft proposals seriatim and made the following suggestions:

i. Item 1: Here it was suggested that each item should be developed into a separate protocol with a broad base to include other aspects which will make the research work more meaningful. Professor Ofosu-Amaah and Dr. Peter Lamptey were suggested as the Co-principal Investigators. The list was extended to an 'h' with 'g' carrying the title "A study of Schistosomiasis"; 'h' with the title "Trauma and Infections of the Bone".
ii. Item 3: Add "Department of Community Health with Professor Ofosu-Amaah as one of the Co-principal Investigators.
iii. J. Expert will be Dr. Sekiba.
iv. Item 4: Add Professor Phillips as one of the Co-principal Investigators.
v. Item 5: Add Professor Ofosu-Amaah as one of the Co-principal Investigators.
vi. The draft on Item 6 with the title: "Congenital Dislocation of the Hip Joint in the New-born in Ghana was criticized and critically examined. It was thought that since Congenital Dislocation of the Hip Joint is not a common phenomenon in Ghanaians, the rule of relevance should be applied in order to determine the acceptability of the programme. After a lengthy discusssion it was decided that a decision should be taken when a protocol for the research programme is written.

vii. Items 7 & 8: Add "Immunoglobins after HLA-antigens. The sentence now reads: "Distribution of HLA-antigens among healthy persons and patients in Ghana. Include Professor A.K. Foli, Dr. S. Odamtten, Professor K.G. Korsah and Dr. A.A. Bruce-Tagoe among the Co-principal Investigators.

viii. Items 9, 10 & 11:

Item 10: Add Dr. Odamtten to the Co-principal Investigators.

Item 11: Add Drs. Ankra-Badu and E.B. Larbi to the list of Co-principal Investigators.

ix. Item 11: Add Dr. Klufio, Dr. J.B. Wilson, Dr. Swaniker and Dr. Bruce-Tagoe to the list.

x. Item 12: Add Professor B.Y.A. Andoh, Dr. R.I.A. Fenuku and a representative of the Department of Pharmacology.

General Comments

A reprensentative of the Department of Physiology wanted to know how the Department of Physiology fitted into the Second Phase of the Third Project in view of the title namely, "Pathophysiology and Immunology Project" and the fact that the Department of Physiology hardly figures prominently in any of the Research Projects in progress. He was informed that as had been stated at the beginning of the discussion, this was a draft proposal and that he should propose the ways in which the Physiologists can participate.

Another member wanted the meeting to consider the possibility of the cultivation of malarial parasites in vitro and the development of vaccines as part of the Ghana-Japan Medical Research Programme. Members felt that this was a very original and welcomed the idea and promised to give due thought to the proposal at the right time.

Another member wanted to know what should be done in the case of some of the items needed for the research projects not being available in Japan. He was informed that arrangements already existed to procure any such items from any other available source.

Maintenance and Supply of Equipment

Another member was of the opinion that there had been deliberate neglect of some of the equipment donated under the Ghana-Japan Medical Research Project because though some of these equipment existed in some departments, it appeared once the Japanese counterparts using the equipment leave the country, no effort is made to maintain them. He made particular reference

to the Ophthalmology Unit of the Department of Surgery where some equipment had been lying unused for some time due to disrepair. He was however informed that this was not deliberate and JICA which undertakes the repair of these equipment, normally sends equipment specialists in rotation because it works on limited funds. In the circumstances the specialists cannot repair all the various equipment in the Medical School. This should not however be construed to imply deliberate neglect.

Japanese member wanted to know whether provision is normally made in the budget of the Medical School for the Ghana-Japan Medical Research Programme. He was informed that provision is normally made for Ghana-Japan Medical Research Programme and that it is only when the School had to import any item for the use of the research scientists working on any of the programmes that the School will run into problems because of the unavailability of foreign exchange.

The meeting finally decided that the various parties should write up their protocols and that these should be submitted by September 30, 1977.

In conclusion, the Chairman thanked the meeting, especially the Japanese Evaluation Team for their active participation in the discussions and hoped that they would have a nice stay in the country.

資料6

THE OUTLINE OF THE RESEARCH PROTOCOLS OF THE 2ND PHASE OF THE 3RD PROJECT

Supervisor: Prof. T. Huziwara

A) Electrolytes and amino-acids metabolism, and liver function.

1: Comparative studies in patients with malnutrition

Principal Investigators: Japanese Expert
Dr .. Y. Asirifi (Child Health)

Coprincipal Investigators:
Dr. S.K. Adjei (Child Health)
Dr. A.G. Boohene (Child Health)
Dr. G.R.E. Swaniker (Chemical Pathology)
Dr. B.Y.A. Andoh (Biochemistry)
Dr. S. Ofosu-Amaah (Public Health)
Supporting Technical Personnels

2: Comparative studies in patients with sickle cell anaemia

Principal Investigators: Japanese Expert
Dr. S.K. Adjei (Child Health)
Coprincipal Investigators: Dr. B. Tagoe (Heamatology Unit)
Dr. S.K. Addae (Physiology)
Dr. J.A.A. Mingle (Microbiology, EM Unit)
Dr. A.K. Foli (Medicine)
Supporting Technical personnels

3: Comparative studies in patients with diarrhoeal diseases

Principal Investigator: Japanese expert
Dr. S. Ofosu Amaah (Public Health)
Coprincipal Investigators: Same as A-3 puls
Dr. S.N. Afoakwa (Microbiology)
Supporting Technical personnels

4: Comparative studies in cerebral malaria:
Same as A-3

5: Comparative studies in patients with measles, poliomyelitis, Infectious hepatitis and tetanus.
Same as A-3

6: Comparative studies in patients with Onchocerciasis:

Principal Investigators: Japanese expert
Dr. C.Q. Quarcoopome (Ophthalmology Unit)
Coprincipal Investigators:
Same as A-3

7: Comparative studies in patients with Shistosomiasis
Principal Investigators: Japanese expert
Dr. W.A. Chinery (Microbiology)
Coprincipal Investigators:
Same as A-3

8: Inborn errors in aminoacid metabolism in malnourished children.
Principal Investigators: Japanese expert
Dr. S.K. Adjei (Child Health)
Coprincipal Investigators:
Dr. S.K. Quaye (Child Health)
Dr. G.R.E. Swaniker (Chemical Pathology)
Dr. G.L. Boye (Pharmacology)
Dr. W.H. Blamkson (Biochemistry)

9: Electrolytes in various tissues in health and diseases
Principal Investigators: Japanese expert
Dr. E.C. Christian (Pathology)
Coprincipal Investigators:
Dr. Y. Asirifi (Child Health)
Dr. G.R.E. Swaniker (Chemical Pathology)
Dr. Assimeh (Public Health)

10: Experimental studies on Mg, Ca and aminoacid metabolism in Mg deficient animals.
Principal Investigators: Japanese expert
Dr. H.H. Phillips (Physiology)
Coprincipal Investigators:
Dr. S.K. Addae (Physiology)
Dr. Assimeh (Public Health)
Dr. S.E. Odamtten (Pathology)
Dr. K.K. Adjepon-Yamoah (Pharmacology)
Dr. S.N. Afoakwa (Microbiology, Head of Animal Care)

B) Bone diseases in tropical country

1: Histological and microradiological studies of bones on the tropical diseases.
Principal Investigators: Japanese expert
Dr. E.C. Christian (Pathology)
Coprincipal Investigators:
Dr. T. Nakamura (Japanese expert)
Dr. K.G. Korsah (Surgery)
Dr. K. Armah (Surgery)
Dr. S. Ofosu-Amaah (Community Health)
Dr. S.E. Odamtten (Pathology)
Dr. K. Dokubu (Nuclear Medicine)
Dr. Mingle (EM Unit)

2: Congential dislocation of the hip joint in the newborn in Ghana.

Principal Investigators: Japanese expert
Dr. K.G. Korsah (Surgery)

Coprincipal Investigators:
Dr. T. Nakamura (Japanese Expert)
Dr. J.B. Wilson (Maternity Health)
Dr. S.E. Ofosu-Ammah (Community Health)
Dr. F.K. Wurapa (Community Health: Head of Danfa Project)
Dr. J.M. Blankson (Child Health)
Dr. F.K. Nkrumah (Child Health)

C) Virological and Immunological studies of tropical diseases.

1: Distribution of HLA-antigens and immunoglobuline in health and diseases in Ghana

Supervisor: Prof. T. Huziwara
Principal Investigators: Japanese expert
Dr. S.N. Afoakwa (Microbiology)

Coprincipal investigators:
Dr. F.K. Wurapa (Community Health)
Dr. Y. Asirifi (Child Health)
Dr. A.A. Bruce-Tagoe (Haematology Unit)
Dr. G. Kelemem
Dr. A.K. Foli (Medicine)

2: Immuno-pathological studies of tropical infections using nude mice.

Supervisor: Prof. T. Huziwara
Principal investigators: Japanese expet
Dr. R.K. Anteson (Microbiology)

Coprincipal investigators: Japanese expert
Dr. S.N. Afoakwa (Microbiology)
Dr. J.A.A. Mingle (EM Unit)
Dr. E.C. Christian (Pathology)

D) The pathophysiology of biliary tract diseases in tropical environment with special reference to Ghana.

Principal investigators: Japanese expert
Dr. E.Q. Archampong (Surgery)

Coprincipal investigators:
Dr. S.K. Addae (Physiology)
Dr. K.K. Adjepon-Yamoah (Pharmacology)
Dr. Y.A. Andoh (Biochemistry)
Dr. G.R.E. Swaniker (Chemical Pathology)
Dr. E.C. Christian (Pathology)
Dr. K. Belcher (Surgery)
Dr. K. Dakubu (Nuclear Medicine)

資料7

UNIVERSITY OF GHANA MEDICAL SCHOOL

Phone: 65401, 66987/98
P. O. Box 4236
Accra

My Ref. No. MS/G-5A
Your Ref. No. Form A4 (20.4.77)

24 June 1977

Embassy of Japan
ACCRA

EQUIPMENT REQUIRED IN THE JOINT RESEARCH PROJECT UNDER THE MEDICAL COOPERATION PROGRAMME BETWEEN JAPAN AND GHANA IN 1977 - 1978

The details of equipment and chemicals for the Third Project between the Japanese experts and their Ghanaian counterparts for 1977 - 1978 are as follows:

1. CO_2 Cell Culture Incubator
2. Chemical Balance (Analytical)
3. Immuno-electrophoresis
4. Fraction Collector
5. Light Microscope with automatic photo device
6. Phase Difference Microscope
7. High-Speed Refrigerated Centrifuge
8. Enzyme Analyser
9. Electrocardiography
10. Electrophonography
11. Super Soft X-ray Apparatus
12. Milling Machine for Hard Tissues
13. Grinding Machine for Hard Tissues
14. Infra-red Spectro Photometer
15. Autoclave
16. High Speed Centrifuge
17. Deep Freezer (5 Units)
18. Air conditioner (3 Units)
19. Chemicals
20. Consumable items
21. Others

H. H. Phillips, MB.BS.PhD
DEAN

資料 8

ガーナ大学医学部　第３次プロジェクト実績表

昭和52年11月1日　現在

年　月	昭和51年度 4 5 6 7 8 9 10 11 12 1 2 3	昭和52年度 4 5 6 7 8 9 10 11 12 1 2 3	昭和53年度 4 5 6 7 8 9 10 11 12 1 2 3	昭和54年度 4 5 6 7 8 9 10 11 12 1
調査チーム	6/23 7/13 第２次プロジェクト・エバリュエーション調査 6月8日　第３次プロジェクト（テーマ：病態生理学と免疫学）のR/D 締結 団長：本多憲児（福島県立医科大学第一外科学講座教授） 団員：福島啓一郎（岡　大　衛生学　〃　） 〃：古崎史明（J.I.C.A 医療協力部医療第二課）	6/16 30 計画・打合せ調査 団長：福島啓一郎（福島県立医科大学衛生学講座教授） 団員：渡辺　真（岡　大　整形外科学講座助教） 〃：朝日　稔治（J.I.C.A. 医療協力部医療第二課）		
専門家派遣 所属先・福島県立医科大学 第２次プロジェクト（テーマ・感染症と低栄養）	9/16 園本昭治（産科婦人科学講座助教授） 29 斎藤嘉昭（衛生学講座） 7 古川宜二（産科婦人科学講座） 7 石山　進（小児科学講座） 19 田沼　悟（岡　上　）			
大学教授公開手術等派遣計画	6/23 7/20 福島　啓（産科婦人科学講座教授） 23 20 松本　淳（整形外科学講座教授） 10/1 11/4 本多憲児（第一外科学講座教授） 27 15 藤原智造（組織学講座教授）			
第３次プロジェクト（テーマ・病態生理学と免疫学）	7/8 ―― 7/7 工藤倫夫（生物学講座助教授） 11/3 ―― 11/2 大立日信六（組織学講座講師） 11/21 ―― 11/20 吉田孝雄（産科婦人科学講座） 1/15 ―― 1/1 門井伸統（小児科学講座） 加藤道雄（岡　上　）			
	3/30 ―― → 昭和55年３月29日 藤原智造（組織学講座名誉教授）			
	5/11 ―― 7/10 尾羽根洋司（整形外科学講座）			
	6/12 ―― 2/11 中村　武（整形外科学講座）			
	8/6 6/16 辻　義人（福島県立医科大学学長）			
機材修理専門家班	2/17 3/26	10/25 11/16 レントゲン装置据付　小川常行（日立メディコ株式会社）		
研修員受入 研修先・福島県立医科大学 高級	9/15 30 Prof.H.H.Phillips（ガーナ大学医学部長） 3/24 4/5 Prof.S.R.A.Dodu			
研修員受入 研修先・福島県立医科大学 一般	7/1 ―― 12/18 Mr.Edward Nortei Tetty 1 ―― 18 Mr.David Anim Tete-Donkor 3/3 ―― 9/2 Mr.Edward Albert Yeboah 3 ―― 2 Mr.Kwaku Armah 3 ―― 2 Mr.Thomas Kwesi Johnson 3 ―― 8/18 Mr. Daniel Edmund Laryea 6/23 ―― 10/22 Dr.Sowah Kwade Adjei 7/7 31 Mr.Miguel Francisco Ribeiro 8/1 ―― 11/5 Dr.John Baptist Wilson			

機材供与	実績	70,542（千円）	29,348（千円）（予定額）	
	主な供与機材	イオン化カルシウム分析装置 血液ガス分析装置 X線撮影装置 自動現像機 自動染色装置 大型滑走ミクロトーム マイクロデンシトメーター 蛍光分光位相差顕微鏡 超低温冷凍庫 分光光度計 電気ふらん器 真空凍結乾燥器	超収X線発生装置 硬組織標本薄切機 硬組織薄切標本研磨機 CO_2 転換培養恒温器 免疫電気泳動装置 倒立顕微鏡 赤外線分光光度計 酵素反応速度測定装置 心電心音計 冷却遠心機