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WORLD HEALTH ORGANIZATION  
TECHNICAL REPORT SERIES

No. 106

**EXPERT COMMITTEE  
ON TRACHOMA**

**Second Report**

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WORLD HEALTH ORGANIZATION

PALAIS DES NATIONS

GENEVA

MAY 1956

## EXPERT COMMITTEE ON TRACHOMA

### Second Session

Geneva, 7-14 September 1955

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This report was originally issued in mimeographed form as document WHO/Trachoma/67, 11 October 1955.

## EXPERT COMMITTEE ON TRACHOMA

### Second Report \*

The Expert Committee on Trachoma held its second session in Geneva from 7 to 14 September 1955.

The session was opened by Dr P. Dorolle, Deputy Director-General of the World Health Organization. The Committee elected Dr R. Nataf Chairman, Professor P. Thygeson Vice-Chairman, and Professor Ida Mann Rapporteur.

The proposed agenda was discussed and adopted.

### 1. Etiology of Trachoma and Laboratory Research

#### 1.1 Etiology

The Committee recognizes that the cause of trachoma is an agent of the psittacosis-lymphogranuloma (Chlamydozoaceae) group of atypical viruses, at present designated as *Chlamydozoon trachomatis*, and that it is seen typically in conjunctival scrapings, in colony form in epithelial cells as Halberstaedter-Prowazek (HP) inclusion bodies<sup>1</sup> and free in the exudate, especially during the early stages or acute manifestations of the disease, as elementary and initial bodies. The Committee does not consider that any satisfactory proof has been produced of the existence of submicroscopic forms of the virus or of the presence of the virus in subepithelial tissues, but it agrees that further exploration of contrary claims is indicated.

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\* The Executive Board, at its seventeenth session, adopted the following resolution :  
The Executive Board

1. NOTES the second report of the Expert Committee on Trachoma ;
2. THANKS the members of the Committee for their work ;
3. AUTHORIZES the publication of the report ; and, furthermore,
4. REQUESTS the Director-General to prepare from time to time for the Executive Board documentation on the latest developments in the research and control activities in trachoma, with particular reference to the possible development of resistance to antibiotics or other therapeutic agents.

(Resolution EB17.R14, *Off. Rec. Wld Hlth Org.*, 1956, 68, 5)

<sup>1</sup> In view of past confusion of trachoma inclusion bodies with non-specific cytoplasmic material including pigment granules, extruded nuclear substance, various cell granules, etc., the term "HP inclusion body" should be reserved for scientific purposes to indicate a cytoplasmic epithelial-cell inclusion body containing (1) a carbohydrate matrix and (2) elementary and/or initial bodies.

### 1.2 Present state of laboratory research

The Committee has surveyed the present state of laboratory research in trachoma and recognizes that slow but definite advances have been made, particularly in the definition and classification of the etiological agent, in the pathology of the disease, and in the microscopic diagnosis.

The Committee recognizes the importance of the now numerous claims for temporary cultivation of *C. trachomatis* in tissue culture and in the yolk sac and chorioallantois of the developing chick embryo, but is not convinced that, at the time of writing, cultivation in series or in quantity has been accomplished.

The Committee considers trachoma to be a keratoconjunctivitis, as a rule with simultaneous involvement of the cornea and conjunctiva, but would welcome further exploration, from the laboratory aspect, of the development of the virus in corneal tissues during the evolution of the disease.

The Committee has noted with gratification the recent laboratory progress made in the recognition and definition of viruses causing those non-trachomatous follicular conjunctivitides sometimes confused with trachoma (see section 2.4, page 7).

### 1.3 Recommendations for further laboratory research

A great surge forward of knowledge in the diagnosis, epidemiology, control, and even treatment of a communicable disease has commonly followed the successful propagation of its causative agent in vitro or in some convenient laboratory animal. This may prove to be true for trachoma. It is recommended, therefore, that every effort be made to cultivate the virus of trachoma by some workable and generally applicable method, and that it be established without doubt that the virus being cultivated is the real cause of trachoma.

It is suggested that the most promising way to achieve this end is through the intimate collaboration of virologists and ophthalmologists—the virologists to apply the methods most suitable for virus cultivation and the ophthalmologists to verify that the agent cultivated is capable of producing lesions characteristic of trachoma.

In view of the importance of establishing that the virus under cultivation is the cause of trachoma, it is proposed that the following procedure be adopted: (1) demonstration of HP inclusion bodies (as defined in footnote 1 on page 3) in serial cultures; (2) production, in monkeys or apes, of experimental trachoma capable of transmission in series; (3) demonstration of serological relationship of the cultured virus to trachoma. In all cases the final proof should be the production of typical

trachoma in human volunteers after sufficient passages in culture to eliminate the dilution factor.

Although the Committee deplors the necessity for human inoculation (not at present a dangerous procedure in view of effective chemotherapy), it insists that this criterion be fulfilled, as at the present time experimental trachoma cannot be diagnosed with certainty in hosts other than man. The Committee stresses that the disease produced by experimental inoculation in man should be rigidly differentiated from all forms of non-trachomatous follicular conjunctivitis and that such differentiation should be made by two or more competent observers and should be documented by the results of microscopic examinations of scrapings and biopsies and by photography of the upper tarsal and upper limbal areas.

The Committee further recommends :

(1) that in order to facilitate transport of the virus for experimental purposes first priority be given to studies designed to test the survival of trachoma virus (*a*) in the frozen state, (*b*) after freeze-drying, and (*c*) after suspension in glycerol ;

(2) that special clinical and pathological research be directed to the subject of experimental trachoma in monkeys and apes, to differentiate it from non-trachomatous follicular disease in these animals and to establish criteria for its diagnosis ;

(3) that further work be carried out to determine the reliability of cytologic diagnosis of active trachoma by the examination of (*a*) epithelial scrapings and expressed follicular material, and (*b*) biopsy specimens ;

(4) that further work be carried out on serological reactions in trachoma ; (It is recognized that major studies must await the culture in quantity of trachoma virus, but it is recommended that in the meantime further exploration of the serological relationships of trachoma virus to other members of the Chlamydozoaceae group be carried out. Refined methods of serology with suitable trachoma antigen should be explored, including the haemagglutination-inhibition test, the test for antitoxins, and the fluorescent antibody technique and its modification.)

(5) that further work be done on the possibility of the existence of a toxin produced by the trachoma virus ;

(6) that further testing of the tissue specificity of *C. trachomatis* be carried out to determine whether cells of mesodermic origin are ever parasitized in vivo or in vitro ;

(7) that further exploration of the provocative effect of cortisone and other steroids, caustics, bacterial toxins, etc., be continued, to determine their value both as a test of cure and as a possible means of increasing susceptibility to chemotherapy ;

(8) that extensive in vitro testing of various therapeutic agents be carried out as soon as culture in series of trachoma virus becomes possible ;

(9) that the development of a vaccine should be attempted as soon as culture virus becomes available ;

(10) that the role of insect (arthropod) vectors, particularly flies, in the transmission of trachoma be subjected to laboratory investigation.

## **2. Definition, Diagnosis, and Differential Diagnosis of Trachoma and Non-Trachomatous Follicular Conjunctivitis**

The definition and the criteria of diagnosis (clinical and laboratory) of trachoma are laid down by the Committee as follows :

### **2.1 Definition of trachoma**

Trachoma is a specific communicable keratoconjunctivitis, usually of chronic evolution, caused by an agent at present classified as *Chlamydozoon trachomatis*, characterized by the formation of follicles, papillary hyperplasia, and pannus,<sup>1</sup> and typically leading to scar formation.

### **2.2 Clinical diagnosis**

In making the clinical diagnosis of trachoma, two at least of the following should be present :

- (1) follicles (conjunctival or limbal) ;
- (2) epithelial keratitis most marked in the upper part of the cornea ;
- (3) pannus in the upper part of the cornea ;
- (4) typical scars.

### **2.3 Acute versus insidious onset**

The Committee considers that trachoma may arise as an acute disease even in the absence of secondary bacterial or viral infection ; but this acute onset is rare. Most cases of uncomplicated trachoma are of insidious onset. The term "chronic" should not be used in this connexion.

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<sup>1</sup> Trachomatous pannus is the invasion of the upper part of the cornea by the disease, in the form of cellular infiltration and neovascularization. Residual vessels remaining after the regression of the infiltration constitute inactive pannus.

## 2.4 Differential diagnosis

The following forms of non-trachomatous follicular conjunctivitis are recognized by the Committee :

### *Acute follicular conjunctivitis*

1. Inclusion conjunctivitis
2. Acute follicular conjunctivitis, Béal type
3. Epidemic keratoconjunctivitis
4. Acute herpetic keratoconjunctivitis
5. Newcastle disease conjunctivitis
6. Pharyngoconjunctival fever

### *Chronic follicular conjunctivitis (Axenfeld type)*

### *Toxic follicular conjunctivitis*

1. Molluscum contagiosum conjunctivitis
2. Eserine conjunctivitis and conjunctivitis due to other miotics
3. Conjunctivitis due to other animal or vegetable products

### *Folliculosis*

The differential diagnosis of these various types of follicular conjunctivitis is given in tabular form in the Annex (page 19).

## 3. Regional Differences in the Epidemiology and Clinical Aspects of Trachoma

### 3.1 General

It is agreed that differences occur in the clinical and epidemiological picture of trachoma as found in different regions. The principal differences reported are related to :

- (1) age of onset ;
- (2) clinical evolution ;
- (3) frequency of spontaneous cure ;
- (4) frequency of disabling sequelae ;
- (5) response to treatment.

The following factors are admitted to be involved in determining the incidence and type of trachoma found :

- (a) presence of associated bacterial infections ;
- (b) racial susceptibility ;
- (c) presence of conditions of poverty, dirt, overcrowding, and ignorance; these undoubtedly predispose to the spread of trachoma throughout a population, once the causative agent has been introduced ;
- (d) mode of transmission, including social habits and presence of possible arthropod vectors which may be able to contribute to the spread of the disease and especially to that of the associated conjunctivitis ;
- (e) geological and certain climatological factors of the different areas, which particularly favour the formation and dissemination of irritant dust ; dust may produce minor injuries which allow of the entry of the causative organism ;
- (f) nomadic habits ; nomadic persons seem in general to suffer from a less severe form of trachoma than the stationary population.

It is agreed that the following factors do not directly and appreciably affect the development of trachoma :

*Diet.* Trachoma occurs equally in vegetarian populations, in meat eaters, in persons living on a mixed diet, in well-nourished persons, and in persons showing a certain amount of protein, calorie, and vitamin deficiencies.

*Temperature and altitude.* Trachoma can occur in tropical, subtropical, temperate, and cold zones, at sea level and at high altitudes.

The Committee recognizes that in the present state of our knowledge it is impossible to say whether or not different strains of the causative agent exist which could be in part responsible for differences in the chemical and epidemiological picture.

### **3.2 Age of onset**

It is agreed that the more heavily infected a population, the earlier the age of onset.

### **3.3 Clinical evolution**

The clinical differences observed may be due in part to variations of the virulence of the causative agent, but are certainly related to the severity and the frequency of associated conjunctivitis. This factor may indeed dominate the whole epidemiological picture.

### 3.4 Spontaneous cure

It is agreed that spontaneous cure can occur. It is more likely to occur the younger the age of onset and in regions where the associated bacteriological infection is unimportant.

### 3.5 Disabling sequelae

The frequency and the severity of disabling sequelae depend on three factors :

- (1) the severity of the disease ;
- (2) the duration of the disease ;
- (3) the association of the disease with other corneal and conjunctival infections.

### 3.6 Response to treatment

The reported differences may have been due, in a certain proportion of cases, to the long period necessary for the disappearance of clinical symptoms after the completion of treatment. The Committee considers that for a satisfactory assessment of cure a follow-up examination should be made not less than three months after the cessation of treatment. Where an actual difference appears to exist, it need not necessarily be due to a different response of the trachoma or the associated infection to the treatment, but possibly also to other factors which should be investigated.

### 3.7 Investigations

The Committee recognizes that further investigations are necessary, in most of the areas of the world in which trachoma and associated conjunctivitis are common, on the following points :

- (1) the bacterial flora of the eye ;
- (2) the epidemiology of the associated conjunctivitis, with particular reference to seasonal variations ;
- (3) the possibility that trachoma may be associated with conjunctivitis caused by other viruses ;
- (4) the various socio-economic factors, such as occupation, size of family, income, work done by women, sanitation, cooking and working facilities, water and soap supplies, use of eye cosmetics, and similar factors ; these investigations should be carried out by socio-economic and medical teams combined.

The Committee, considering the need for further investigation on the epidemiology of trachoma and its associated infections, recognizes the

desirability of adopting a standard method for epidemiological survey; the proposed methodology is described in section 6.1 (page 12).

#### **4. Recent Advances in the Treatment of Trachoma, with Special Reference to Methods Suitable for Mass-Treatment Campaigns**

1. The Committee recognizes that numerous field trials have demonstrated during the last three years the efficiency of the scheme of treatment recommended in its first report<sup>1</sup> for clinical forms prevailing in different parts of the world.

Experience has also proved that this type of treatment can be applied in practice, with satisfactory results comparable to those obtained among individual patients, to large groups of the population, such as school-children, under various field conditions in different regions.

2. The Committee considers that it is not in a position at present to lay down the definite lines of treatment which are the most economical in time and material. It has, however, received evidence from different regions which suggests that the frequency of the daily applications of an active antibiotic may be reduced without appreciable loss of efficiency from the originally proposed four applications per day to only two.

It is not clear, however, how far such a reduction of daily applications is related to the total period of treatment necessary to obtain a cure of the disease. The Committee therefore recommends that scientifically controlled experiments should continue to be carried out on these lines.

3. The Committee also recognizes that satisfactory results have been obtained by the use of other antibiotics than those originally recommended. Further large-scale work is therefore desirable on the action of the newer antibiotics,<sup>2</sup> either alone or combined with sulfa drugs or other methods, or compared with sulfa drugs alone. Such observations should include investigation of the possibility of development of resistance to the drug.

4. The Committee agrees that the results of the trials undertaken to establish the possibility of indirect control of trachoma by an attack upon the associated conjunctivitis seem to be promising. Reports of the results of short-term prophylactic treatment directed to the associated conjunctivitis, and repeated at intervals during the year, as indicated by local seasonal incidence, confirm the earlier work demonstrating that a considerable proportion of cures of the underlying trachoma can be obtained.

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<sup>1</sup> *Wld Hlth Org. techn. Rep. Ser.*, 1952, 59, 4

<sup>2</sup> Chloramphenicol, erythromycin, synthetic tetracyclines, magnamycin, etc.

Continuation of these trials appears fully justified, again taking into consideration the possible development of resistant bacterial strains.

5. Recent evidence also suggests that activity against trachoma is possessed by repository drugs, such as benzathine penicillin G. Further trials of such preparations are justified.

## 5. Criteria of Cure of Trachoma

The Committee recognizes that at present there is no sure method of knowing when the agent of trachoma is definitely destroyed or rendered inactive. It therefore recognizes the necessity of laying down, first, simple criteria applicable to mass campaigns, and second, the more meticulous and scientific procedures necessary for individual examinations and for immigration requirements.

### 5.1 Mass campaigns

In mass campaigns, the examination should be made by the naked eye and with a loupe. In the absence of trichiasis, the following should be considered as the minimum requirements :

- (1) absence of trachoma follicles ;
- (2) inactive pannus (absence of corneal infiltration) ;
- (3) absence of hyperaemia ;
- (4) smoothness of the conjunctiva even in the presence of scars.

In cases complicated by trichiasis, this condition must be relieved surgically before the evaluation is made. A period of at least three months and preferably six months should elapse between the end of treatment and the evaluation.

### 5.2 Individual cases

In individual cases, the following criteria should be applied when possible :

- (1) confirmation of all the above with the biomicroscope ;
- (2) absence of epithelial keratitis on examination with fluorescein and the biomicroscope ;
- (3) negative findings on microscopic examination of scrapings and biopsies ;
- (4) failure of reactivation procedures.

For immigration purposes the minimum requirements should be (1) and (2).

It is to be noted that, in countries where non-trachomatous follicular conjunctivitis co-exist with trachoma, the evaluation will be more difficult and a more meticulous examination may be necessary.

In cases where papillary hyperplasia exists without other signs of active trachoma, either conjunctival or corneal, the trachoma may be considered as clinically cured.

The Committee recognizes that it would be desirable that a test of accepted efficacy be evolved, which would provide virological evidence of the cure of trachoma. Some preliminary results suggest that the use of cortisone and related steroids may lead to the validation of such a test. The Committee hopes that investigation concerning this or any other test will be actively pursued.

## **6. The Planning of Anti-Trachoma Projects and their Integration in General Public-Health Services**

The object of an anti-trachoma project is to reduce the incidence of the disease so that it ceases to be a public-health problem. Such a concept includes also the reduction of any associated bacterial ocular infections. It follows that the techniques adopted to attain these ends must be adapted to local conditions. However, although for this reason regional variations are necessary, the Committee considers that the techniques adopted should be as uniform as possible.

Any project should be developed in four stages :

- (1) preliminary epidemiological survey ;
- (2) pilot projects with varying techniques ;
- (3) the mass campaign itself ;
- (4) integration of the project in the normal activities of the public-health service.

### **6.1 Preliminary epidemiological survey**

#### **6.1.1 Methodology**

The Committee considers that, in conducting a preliminary survey, the following standardized plan should be followed to determine the trachoma index<sup>1</sup> and the general pattern of the disease in the community.

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<sup>1</sup> The trachoma index comprises all stages of trachoma, including Tr IV (see footnote on page 13).

The latter concept includes such factors as the usual age of onset, the probable source of infection, the environmental factors favouring transmission, the clinical course, the sequelae, and the distribution of the disease among different age, ethnic, and occupational groups. The Committee therefore recommends the collection of as many of the following data as possible in each case :

Name  
 Address  
 Age  
 Sex  
 Ethnic group  
 Religion (if important epidemiologically)  
 Occupation  
 Standard of living (if a satisfactory index can be defined)  
 Family relationship and status  
 Stage of trachoma ; whether treated or not  
 Presence of associated ocular infection  
 Visual status resulting from trachoma and conjunctivitis <sup>1</sup>  
 Presence of other ocular or general disease, including nutritional condition  
 Microbiological picture (if practicable)

The Committee recommends that these data be collected by probability sampling and that they be analysed according to recognized statistical methods. In order to get a clear picture of the pattern of the disease, the

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<sup>1</sup> Stage Tr IV in the recognized MacCallan classification of trachoma must necessarily include persons whose trachoma has healed with preservation of normal sight and also those who are blind from corneal complications. From a public-health and scientific point of view this is not sufficient, since it is essential to know how many persons are capable of full employment, how many (by reason of impaired sight) are capable of restricted employment, and how many are blind and therefore a charge on the community. For this reason, the following additional information is required in cases of Tr IV :

Tr IV Normal sight  
 Tr IV Impaired sight

Tr IV Economically blind (according to the non-specific definition of blindness in : World Health Organization (1948) *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death*, Geneva, vol. 1, p. 126, and endorsed by the Expert Committee on Health Statistics in its third report — *Wld Hlth Org. techn. Rep. Ser.*, 1952, **53**, 38 — i.e., “inability to do any kind of work, industrial or otherwise, for which sight is essential”)

preceding data should not only refer to the total incidence in the population, but also be broken up into the following age-groups :

0- 1	} If possible, to be also given for each separate year
2- 4	
5- 9	
10-14	
15-19	
20-29	
30-39	
40-49	
50-59	
60 & +	

#### 6.1.2 *Recommended techniques of examination*

The Committee recognizes that the results of surveys carried out with different techniques of examination are not directly comparable with each other. It should, for example, be stated in all reports whether a biomicroscope was used or not. The Committee recommends that this should be used as often as possible. An acceptable form of portable apparatus would give a minimum magnification of 15-20 diameters. It should be capable of working from batteries or accumulators and on various electrical supplies.

The Committee recommends for trachoma studies the use of a polychromatic stain based on Giemsa for the examination of smears and scrapings from the conjunctiva. It is to be noted that scrapings from the upper tarsus, upper fornix, and upper limbus have the greatest diagnostic value.

In the survey of associated bacterial conjunctivitis, the Committee recognizes the impracticability of individual cultures and considers that adequate information may be obtained from scrapings and smears. It is recommended that scrapings from the upper tarsal conjunctiva and outer canthus, and exudate from the inner canthus, be placed on a single slide for examination after staining with the Gram or other bacterial stain.

In some circumstances it may be necessary to carry out repeated examinations on the same small representative group, not only during the seasonal epidemics, but also at periodic intervals (e. g., monthly) throughout the year.

#### 6.2 **Pilot projects with varying techniques**

Pilot projects should be carried out on smaller selected representative groups to assess the value and practicability of various methods of control

best suited to the local, social, and epidemiological conditions.<sup>1</sup> These projects should also be used for the training of personnel.

### 6.3 Mass campaign

The mass campaign should be planned according to the results of the pilot projects. The Committee considers it desirable to keep at least one sector under close scientific control to provide continuous data for the evaluation of progress and the assessment of final results. The methodology recommended for the preliminary survey should be used throughout.

The Committee recognizes that experience gained since the publication of the first report has shown that the most suitable methods to be adopted will necessarily vary in different countries, depending on such factors as :

(1) the type of trachoma, whether pure or complicated by associated infections, its incidence and distribution ;

(2) local social conditions, e. g., psychological and religious factors, the educational status of the population with particular reference to the possibility of the development of self-treatment, the economic resources and personnel available ; in some areas, it may only be possible to treat schoolchildren, whereas in others the entire population may be available for treatment ;

(3) the practicability of collaboration with school-teachers and the public-health organization.<sup>2</sup>

In order to reduce cost, the Committee considers it advisable, wherever indicated, to explore the possibility of combining anti-trachomatous projects with parallel measures related to other diseases.<sup>1</sup>

As soon as possible, the plan of a mass campaign should be orientated towards less expensive procedures involving the active co-operation of the population. With this end in view, it is wise to institute from the beginning a programme of public-health education, together with the training of lay personnel.

### 6.4 Integration of the project in the normal activities of the public-health service

The Committee considers it of the greatest importance that no mass campaign should be considered as an isolated project, but that it should

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<sup>1</sup> See section 8.4 (page 18) for comments regarding fly-control programmes.

<sup>2</sup> In many places, the enthusiastic co-operation of the schoolteachers has been of the greatest value in the conduct of campaigns. This co-operation should be actively encouraged.

be planned as part of the activities of the public-health authorities and associated with their other work. If this is done, it should be possible for the public-health authorities to maintain the control of the disease after the termination of a campaign.

### **7. Appraisal of Control Projects**

While the generally accepted principles laid down for the appraisal of all public-health projects should naturally be followed, the Committee considers that the evaluation of an anti-trachoma campaign should be based on the following criteria, assessed both on a short-term basis (e.g., three months after the cessation of treatment) where applicable and on a long-term basis (e.g., three years or longer where indicated) :

- (1) percentage of cure or of improvement obtained in the different types and stages of trachoma ;
- (2) incidence of relapses and/or reinfections ;
- (3) change in visual status ;
- (4) degree of cicatrization before and after treatment ;
- (5) comparison of the incidence of complications and sequelae of trachoma and any associated infections in different age-groups before and after treatment ;
- (6) effect on the epidemiological aspect of the disease, including age of onset and mode of contamination ;
- (7) effect on the epidemiological picture of the associated infections.

### **8. International Co-ordination of Research on Trachoma**

The Committee recommends that the following problems be made the object of co-ordinated research with the assistance of WHO.

#### **8.1 Virological research**

The Committee notes that some of the best equipped virus laboratories in which plans are being made for trachoma research are situated outside areas where there is a ready supply of fresh material. The Committee also believes that the chances of successful propagation of trachoma virus would be increased by the collection and study of infectious material from many different parts of the world in the hope of finding a strain of virus which will grow readily in the laboratory.

The Committee therefore recommends that WHO should develop a programme to facilitate and expedite the collection and exchange of trachomatous material. In developing this programme, the following points should be considered :

1. Enlisting the co-operation of a conveniently situated laboratory which would act as a centre or clearing house for the collection and eventually the storage of conjunctival scrapings, biopsy material, sera, etc., from cases of trachoma and related diseases from various parts of the world. The material would be made available to interested laboratories co-operating in the WHO programme for tissue culture, and for serological, pathological, and other studies.

2. The need for further information on the best methods of collecting, packing, and transporting trachomatous and other materials. Co-ordinated research on the survival of trachoma virus under various conditions should be undertaken ; a suitable cheap and expendable shipping-container should be developed and a ready supply of containers ensured.

3. At the present time it appears that the best methods of preserving infectivity in pathological material are either low-temperature freezing (dry ice) or freeze-drying. The facilities available for these procedures should be investigated and, where necessary, improved in areas which are potential sources of material, on air transport routes (for re-icing), and at the laboratory referred to in paragraph 1 above.

4. In order to avoid unnecessary duplication of work, WHO should co-ordinate these activities and ensure that co-operating laboratories are kept informed of the results of these investigations and of the availability of material. Furthermore, the Committee considers that the current activities of WHO in bringing virologists and trachomatologists in touch with each other and with individuals and laboratories in areas where trachoma is prevalent should be continued and where possible expanded in order to encourage and develop research in all areas. With regard to specific problems suitable for co-ordinated research, the Committee directs attention to items (1), (2), (4), and (5) in section 1.3 (page 5).

## **8.2 Bacteriological research**

Systematic researches on the bacterial flora of the eye in different regions, as well as studies aiming at the production of efficient vaccines, particularly against the Koch-Weeks bacillus, should be co-ordinated.

## **8.3 Cytobacteriological research**

The research mentioned in item (3) of section 1.3 (page 5) is also recommended for co-ordination.

#### **8.4 Epidemiological research**

With regard to epidemiological problems suitable for co-ordinated research, the Committee directs attention to items (2) and (3) in section 3.7 (page 9).

The Committee has noted with interest the good results obtained in Morocco on an experimental basis in the epidemics of associated conjunctivitis by measures directed against flies. The Committee therefore recommends that studies be continued and co-ordinated on the different species of flies and other arthropods suspected of playing the part of vectors of seasonal epidemic conjunctivitis and trachoma in different regions, as well as on the development of effective and economically feasible methods of fly control applicable to different local conditions.

#### **8.5 Therapeutic research**

The Committee recommends that all the points mentioned in section 4 (page 10) should be made the subject of co-ordinated research in different regions, so that ultimately the results may be compared in order to determine the optimum and minimum schedules of treatment.

### **9. Miscellaneous**

#### **9.1 Trachoma and labour**

The Committee recommends that the question of the relationship between trachoma and labour be adequately studied in view of its national, international, and human implications.

#### **9.2 Diffusion of modern knowledge**

The Committee recognizes that one of the major obstacles to the undertaking of large-scale anti-trachoma measures, rendered possible by recent technical developments, is the lack of diffusion of modern knowledge of the subject. It therefore recommends that all possible efforts should be made to rectify this deficiency by organizing conferences, seminars, training courses, and other types of meeting on a local, regional, and inter-regional basis.

#### **9.3 Publications**

The Committee suggests that the preparation of a series of articles on recent advances in the various aspects of the problem of trachoma should be undertaken. These might form the basis of a monograph.

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Annex

**DIFFERENTIAL DIAGNOSIS OF NON-TRACHOMATOUS FOLLICULAR CONJUNCTIVITIS**

	Onset	Pre-auricular adenopathy	Formation of pseudo-membrane	Cornical involvement	Cytology of exudate	Tissue culture	Serology	Effect of chemotherapy
Acute follicular conjunctivitis Inclusion conjunctivitis	Acute	+	Rare	0	Inclusions ; neutrophils predominant	0	Weak psittacosis-group, complement-fixation antibodies	+
Béal's conjunctivitis	Acute	+++	0	0	Scanty exudate ; mononuclears predominant	0	0	0
Epidemic keratoconjunctivitis	Acute	+++	In about one-third of cases	Diagnostic infiltrates	Scanty exudate ; mononuclears predominant	+	Complement-fixing and neutralizing antibodies	0
Acute herpetic keratoconjunctivitis	Acute	+++	Frequent	Dendritic figures frequent	Scanty exudate ; mononuclears predominant	+	Rising titre neutralizing antibodies diagnostic	0
Newcastle disease conjunctivitis	Acute	+	0	0	Scanty exudate ; mononuclears predominant	+	Neutralizing and anti-haemagglutinating antibodies	0

Annex (continued)

	Onset	Pre-auricular adenopathy	Formation of pseudo-membrane	Corneal involvement	Cytology of exudate	Tissue culture	Serology	Effect of chemotherapy
<b>Acute follicular conjunctivitis (continued)</b> Pharyngoconjunctival fever	Acute	+	0	Rare minor transient infiltrates	Scanty exudate; mononuclears predominant	+	Rising titre neutralizing antibodies diagnostic	0
<b>Chronic follicular conjunctivitis (Axenfeld type)</b>	Insidious	0	0	0	Not characteristic	0	0	0
<b>Toxic follicular conjunctivitis</b> Molluscum contagiosum conjunctivitis	Insidious	0	0	Rare infiltrates	Scanty exudate; mononuclears predominant	+	?	0
Eserine conjunctivitis	Insidious	0	0	Rare keratitis with pannus	Not characteristic	0	0	0
<b>Folliculosis</b>	Insidious	0	0	0	No exudate	0	0	0