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Trachoma has been reported in increasing amounts in various prefectures of Japan. There is no authoritative survey known to this office which would confirm or deny the accuracy of diagnoses reported.

Trachoma is a public health problem in that it is a debilitating disease. It is not as significant a public health problem as are other diseases which have rather high death rates. Trachoma can be handled quite successfully as a "treatment project."

As a matter of information, there is attached hereto a summary of trachoma vs inclusion conjunctivitis which is taken from Dr. Phillips Thygeson's article in Viral and Rickettsial Infections of Man by Rivers, which was published in 1948 by the National Foundation for Infantile Paralysis, Inc.

Kyushu CAR

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TRACHOMA vs. INCLUSION CONJUNCTIVITIS

Trachoma and inclusion conjunctivitis are closely related virus infections of the external eye. They differ chiefly in the following respects. Whereas trachoma involves the cornea and forms pannus, has little or no tendency to spontaneous cure, and inevitably produces conjunctival and corneal cicatrization, inclusion conjunctivitis never affects the cornea significantly and always heals spontaneously without cicatricial changes of any kind.

In spite of these important differences the diseases have often been confused clinically and their similarities, both clinical and etiologic, have induced research workers to study them simultaneously; hence their consideration in the same chapter in the present volume.

TRACHOMA
(Synonym: Granular conjunctivitis)

HISTORY

Trachoma is a disease of antiquity, references to it appearing in the earliest records of mankind. Egyptian papyri, such as the Ebers papyrus, mention its complications and treatment, and Hippocrates appears to have been well acquainted with it. During the Crusades and in the course of Napoleon's campaign in Egypt the disease was of major military importance, and troops returning to Europe from the Middle East disseminated it widely. Of all ocular affections trachoma has always been the one of greatest world-wide military, economic, and social consequence. Unfortunately, it retains that pre-eminence to this day in spite of intensive campaigns in many countries to reduce its incidence.

The highest incidences is reached in Egypt and the Middle East where more than 90 per cent of the population is affected, but the infection is widespread in all the countries bordering the Mediterranean, in Russia, and throughout the Orient. In the United States it is still prevalent among the Indians and among the mountain whites along the so-called "Daniel Boone Trail" although the incidence in both groups is rapidly decreasing.

In 1907, Halberstaedter and Prowazek described the cytoplasmic inclusion bodies characteristic of the disease, and in 1912 Nicolle, Blaisot and Cuenod reported the first positive filtration experiments which they performed with modified Berkefeld V filters. The work of other investigators has shown the virus to be of large particle size and a member of the psittacosis-lym-phogranuloma venereum group of viruses. Trachoma virus studies have been greatly handicapped, however, by the failure to obtain cultivation in tissue culture and by the fact that the only susceptible animals (monkeys, baboons, and apes) fail to develop an infection certainly identifiable as trachoma.

The recognition by Lee (1938) and others that the disease was susceptible to sulfonamide therapy marked a turning-point in its history.

CLINICAL PICTURE

The incubation period of trachoma, as determined from experimental human inoculations, is from five to seven days. The onset may be insidious or fulminating, depending apparently upon the amount of inoculum. Mild onset is observed most commonly in children, particularly in the heavily infected countries such as Morocco, Tunisia, and Egypt. In such cases there may be not external signs of the infection, except perhaps a slight ptosis of the lids, but when the upper lids are everted a follicular hypertrophy of the upper tarsal conjunctiva is displayed. The acute onset is characterized by acute conjunctival inflammation with dense infiltration and papillary hypertrophy. There is superficial inflammation of the cornea, particularly of the upper limbus region, and not infrequently swelling of the lids and mild preauricular adenopathy. The exudate may be abundant and mucopurulent in character. The acute stage tends to last for several weeks, and is then followed by subacute and chronic stages in which the exudate becomes scanty and the symptoms minimal.

Regardless of whether the onset is insidious or acute, the disease tends to progress in much the same way over a period of months to conjunctival and corneal cicatrization. In the late stages, deformity of the eyelids with cicatricial entropion may occur and vision may be markedly reduced by cicatrization from pannus and recurrent ulcers. In unusually severe cases, tear-function may be lost and the complications of keratitis sicca added to the picture. Secondary bacterial infection complicates more than 50 per cent of cases in this country and a much higher percentage in the Middle East and Orient. After apparent healing there is often a recurrence of reinfection. There has been nothing to indicate that any immunity develops.

PATHOLOGIC PICTURE

The earliest recognizable pathologic manifestation of trachoma is the development of the characteristic cytoplasmic inclusion bodies in the conjunctival and corneal epithelial cells (Wilson, 1937). This is followed by subepithelial infiltration with small round cells, plasma cells predominating, and by the development of lymphoid follicles. Subepithelial infiltration of the cornea is followed by blood vessel invasion in the form of pannus. Advanced stages are characterized by cell necrosis, and finally by cicatrization. All the pathologic changes in trachoma affect the upper half of the conjunctival sac and cornea more prominently than the lower.

Although the subepithelial infiltration is mononuclear in type, the exudate is composed chiefly of polymorphonuclear cells. This is particularly true in the acute stages of the disease and is in no way dependent upon secondary bacterial infection. In contradistinction, the exudates of conjunctival infections with typical viruses, such as epidemic keratoconjunctivitis virus and herpes simplex virus, are characteristically mononuclear.

The inclusion bodies occur in numbers varying in proportion to the clinical severity of the disease and are most numerous in scrapings from the upper tarsal and upper limbus regions, i.e., from the areas of maximum disease intensity. They are most numerous in the superficial layers of the epithelium, are rarely seen in the basal layers, and never occur in the cells of the follicles or in the subepithelial layers.

EXPERIMENTAL INFECTION: HOST RANGE

The only experimental animals found to be susceptible to trachoma virus are, in the order of their susceptibility, apes, baboons, and monkeys. Unfortunately, none of these animals develops pathologic changes characteristic of human trachoma, i.e., pannus and cicatrization. The experimental disease they do develop, moreover, is self-limited and appears only as a follicular conjunctivitis which cannot be differentiated with certainty from the follicular conjunctivitis produced by inclusion conjunctivitis virus, or even from the spontaneous folliculosis with which monkeys, baboons, and apes are frequently affected (Wilson 1930; Bland, 145). The inclusion bodies characteristic of trachoma have been found in the experimental disease in apes but never in the experimental disease in monkeys or baboons. This paucity of inclusions is believed to be due to the mildness of the experimental disease in which there are neither inflammatory signs nor exudate. That the disease is actually trachoma, however, has been established by Nicolle, Blaisot and Cuenod (1912), and by Bland (1944), who succeeded in transferring the experimental disease from its animal hosts to human volunteers who in turn developed typical trachoma.

Experimental infection in human beings has been accomplished on numerous occasions and has usually had an acute onset and abundant inclusions.

ETIOLOGY

The cause of trachoma is a virus of large particle size belonging to the psittacosis-lymphogranuloma venereum group of viruses. It appears in the conjunctival and corneal epithelium and in the exudate in the form of elementary bodies (Fig 34A) which, when stained according to Giemsa's methods, measure about 0.25 micron in diameter. The elementary bodies occur free in the exudate and intracellularly as aggenerations known as inclusion bodies. Mature inclusion bodies are made up almost entirely of elementary bodies. Larger forms (Lindner, 1910a) are seen commonly in young inclusion bodies (Fig. 34B) and occasionally free in the exudate. They are coccobacillary and bipolar staining, show division forms, and vary in size up to 1.5 microns in length.

The inclusion body is a virus colony in which the elementary and initial bodies are embedded in a carbohydrate matrix composed principally of glycogen (Figs. 34C, 34D, 34E, and 34 F) (Rice 1936). The evolution of the inclusion body in the susceptible cell requires about 48 hours. Multiple infection of cells is common (Fig. 34G). The existence of a toxin is suggested by the fact that toxins have been demonstrated for other members of the psittacosis-lymphogranuloma venereum

group (Rake and Jones, 1944) and that important subepithelial changes occur in trachoma even though the virus appears to be limited strictly to the epithelial layer. In this connection, it is noteworthy that attempts to infect the subepithelial layers of the conjuctiva by injecting trachoma virus through the skin of the lids failed but that subsequent direct inoculation of the conjunctival in the same subjects succeeded (Michail and Vancea, 1932).

The virus is rapidly inactivated by drying, by alternate freezing and thawing, and by incubator temperature (37°C.). Its thermal death point is 45°C. maintained for 15 minutes (Julianelle, 1938). At refrigerator temperature or in 50 per cent glycerol it can be preserved for as long as a week. Sulfanilamied has no virucidal effect in vitro (Julianelle and Smith, 1942). All attempts to cultivate it in vitro have failed, even when human conjunctival and corneal epithelium have been employed. Trachomatous conjunctival epithelium rapidly loses its infectivity for baboons when it is cultivated in tissue culture (Thygeson 1939). Group antibodies for the psittacosis-lymphogranuloma venereum group of viruses have been demonstrated in sera from trachoma patients, (Rake, Shaffer and Thygeson, 1942), but no evidence has been advanced to suggest that they are concerned in the clincial course of the disease or in developing immunity to it. Monkeys and baboons that have recovered from experimental trachoma show no immunity to reinfection and the second infection runs the same clinical course as the first.

The virus filters with difficulty and only through the coarse grades of filter, such as the Berkefield V candle and gradocol membranes of 0.6 micron A.P.D. or above. If an active filtrate is to be obtaind, the elementary bodies must pass the filter. This was demonstrated in the experiment of Thygeson, Proctor and Richards (1935) in which a human volunteer was inoculated successfully with a gradocol filtrate (0.6 micron A. P. D.). The original material, consisting of ground epithelial scrapings from trachomatous Indian children, contained abundant inclusions. Elementary bodies were demonstrated in the bacteria-free filtrate on centrifugation and inclusion bodies were numerous in the experiemental disease at onset.

DIAGNOSIS

The diagnosis of trachomas can usually be made on the basis of the following clinical signs: (1) follicle formation, most prominent on the upper tarsal region, (2) trachomatous pannus, which can be recognized in its incipience early in the disease on slitlamp examination of the upper limbus region, and (3) conjunctival cicatrization.

Laboratory diagnosis is based on the finding of the cytoplasmic inclusion bodies and on cytologic changes in expressed follicular material. Although the inclusions are morphologically identical with those of inclusion conjunctivitis, in trachoma they are much more numerous on the upper tarsal conjunctiva than on the lower and in inclusion conjunctivitis the situation is reversed (Braley, 1940). In expressed follicular material from trachoma, necrotic changes not found in other follicular diseases of the conjunctiva are to be seen in the form of cell debris, pale staining cells, and numerous macrphages loaded with cell fragments (Thygeson, 1946).

TREATMENT

Prior to the introduction of sulfonamide therapy in 1938, trachoma was treated by a combination of medical and surgical means. Medical treatment consisted in the control of secondary infection by antiseptic drops, and in the application to the conjunctiva of caustics, such as copper sulphate, silver nitrate, quinine bisulphate, etc. Surgical treatment consisted in the correction of cicatricial deformities, such as entropion and trichiasis, and in the removal of diseased conjunctiva by tarsectomy. The inadequacy of these measures is indicated by the fact that few patients tolerated treatment sufficiently long to obtain relief and that the few cures obtained took from one to many years of continuous medical care.

Under sulfonamide therapy the prognosis of trachoma has changed entirely. In early cases cures can now be expected in a matter of weeks. As in the related virus disease, lymphogranuloma venereum, low dosages and relatively prolonged treatment times (2 to 4 weeks) are required. In the cicatricial stages sulfonamide therapy has proven less satisfactory and surgical intervention for the relief of cicatricial complications is sometimes necessary. Prognosis is poorest in those cases in which tear-function has been lost.

Claims for the efficacy of penicillin therapy have been made (Darius, 1945) but have not as yet been established.

EPIDEMIOLOGY

In the countries of the Middle East, such as Egypt, trachoma is commonly acquired in the first year of life, usually from the mother. In areas in which periodic epidemics of the acute ophthalmias occur, it is often transmitted simultaneously with the bacterial infections (Wilson, 1930). In countries in which the disease is only endemic, as in the United States for example, spread occurs only when there is constant exposure to infection under conditions of poor hygiene such as obtain among the mountain fold of West Virginia, Kentucky, and Tennessee. On the basis of the virus content of epithelial scrapings, it is believed that acute cases are highly infectious and chronic cases only slightly so. In sporadic cases occurring adults it is often impossible to trace the source of infection, but it is believed that eye-to-eye transmission by means of fingers or fomites is possible and that they fly may play an important role (Wilson, 1930). So far no evidence to indicate the existence of a subclinical infection or carrier state has been advanced.

CONTROL MEASURES

The control of trachoma in the countries in which it is pandemic devolves chiefly upon the control of the acute opthalmias (Wilson, 1945). This is now theoretically possible by means of chemotherapy but on practical grounds is limited by lack of funds, the countries in which trachoma is widespread being the ones most economically depressed. Since trachoma is a desease of filth and poor personal hygiene, all measures leading to improvement in the economic condition of the population exert a prophylactic effect. In the United States, the experience of the Indian Service in its attempts to control the disease has illuminated the dramatic effect of the change in therapeutic method. Prior to the introduction of the

sulfonamides in 1938, the extensive antitrachoma campaign conducted in the Indian schools was showing only partial success; as a result of the sulfonamide therapy instituted at that time the incidence of the disease has been strikingly reduced (Forster and McGibony, 1944). In the white population of the United States control consists in the recognition and treatment of the disease, particularly in isolated communities. To this end stationary and mobile trachoma clinics have been instituted in the states of Arkansas, Illinois, Missouri, and Virginia.

INCLUSION CONJUCTIVITIS

(SYNONYMS: Inclusion Blennorrhea, paratrachoma, swimming-pool conjuctivitis)

HISTORY

A benign from of conjunctivitis in the new-born, unassociated with pathogenic bacteria, was described by Morax as early as 1903. Shortly after Halberstaedter and Prowazek discovered cytoplasmic inclusion bodies in trachoma in 1907, Stargardt (1909), and then Schmeichler (1909), noted identical inclusions in ophthalmia neonatorum. In 1911, Lindner reported that he had found inclusions in all but a very few cases of ophthalmia neonatorum of nonbacterial origin, and that he had been able to transmit the disease to the conjunctiva of the baboon and to recover identical inclusion bodies from the experiemtal disease. He defined the clinical characteristics of the disease and named it Einschlussblennorrhoe, or inclusion blennorrhea. In 1910, Wolfrum described two successful inoculations of human beings with inclusion blennorrhea exudate.

Searching for the origin of this disease of the new-born, Halberstaedter and Prowazek (1909) found typical inclusions in scrapings from the genito-urinary tract of mothers of diseased infants and postulated the existence of an inclusion disease of the male and female genito-urinary tracts. This theory was supported by the work of Lindner (1910b) and Heymann (1910), who found inclusions in several cases of urethritis in the male. Later, Fritsch, Hofstatter, and Lindner (1910) produced a conjunctival infection in a baboon with urethral exudate from non-gonorrheal urethritis containing inclusions.

The first filtration experiments were made in 1914. Botteri (1912) induced infection in the eye of a baboon with a Berke-feld V filtrate, and Hebb (1914) confirmed his work by obtaining infection in a human subject with a similar filtrate. Subsequent filtration studies by Thygeson (1934), Tilden and Gifford (1936), and Julianelle et al, (1938) showed that the virus was filterable with relative ease through coarse Berkefeld candles and gradocol membranes.

Unfortunately, some confusion arose as to the relationship of the disease to trachoma and to the conjunctivitis with inclusions seen in adults, particularly in bathers in certain swimming pools. Some authors claimed the identity of this adult disease with trachoma but such a conclusion was untenable in view of the self-limited nature of the inclusion disease and its failure to produce pannus or cicatrization. Morax (1933) differentiated it sharply from trachoma and offered evidence, later confirmed by Thygeson (1934) and by Julianelle (1937), to show that the

infant and adult types of conjunctivitis with inclusions, in spite of certain differences between them, were manifestations of a single disease.

Thygeson and Mengert (1936) found that in mothers of babies with inclusion blennorrhea, the genito-urinary disease was limited to the external os of the cervix and to an area of transitional epithelium identical histologically with the epithelium of the conjunctiva. They reported that the infection produced no clinical symptoms in the mothers but that in the fathers it was only occasionally subclinical, usually appearing as a mild, nonspecific urethritis of several months' duration. Knowledge of the genito-urinary aspects of the disease was extended by Thygeson and Stone (1942a) who found the ocular infection to be an occupational disease of obstetricians and gynecologists. They suggested that the genito-urinary disease, although of little clinical significance, was preably widespread through the population. Thygeson (1941) reported that inclusion conjunctivitis responded rapidly to sulfonamide terapy, and later with Stone (1942b) showed that topical applications of the sulfonamides were invariably successful in the treatment of the disease in the new-born.

CLINICAL PICTURE

The incubation period of inclusion conjunctivitis varies from a minimum of five days to a maximum of twelve. In the newborn the onset is acute, a purulent conjunctivitis developing rapidly with intense infiltration of the conjunctiva, particularly of the lower lid. In very severe cases transient pseudomembranes are noted and clinical differentiation from gonorrheal ophthalmia may be difficult. After an acute atage, lasting from ten days to two weeks, the disease gradually loses its intensity over a period of months. The discharge may cease in as short a time as two months, but the conjunctiva rarely if ever returns to normal in less than three months and may show infiltration for as long as a year. Unlike trachoma, however, inclusion conjunctivitis never develops pannus or significant conjunctival cicatrization. It is always self-limited, and persistent chronic infections are unkown.

The clinical appearance of the disease in the adult differs, often rather strikingly, from that in the new-born baby. Typically it presents the picture of an acute follicular conjunctivitis with scanty discharge and preauricular adenopathy; the follicular hypertrophy, unlike that of trachoma, is much more marked in the conjunctiva of the lower lid than in that of the upper. Occasionally, however, a severe infection may appear as a papillary conjunctivitis with moderately abundant exudate. In this form the adult disease more closely resembles the disease in the new-born but has never been known to have the fulminating character so often seen in the latter. The adult disease tends to persist over a longer period of time, sometimes for more than a year. All reported cases, however, have eventually resolved spontaneoulsy without residual conjunctival or corneal changes.

PATHOLOGIC PICTURE

Examination of biopsy material from the disease in the new-born infant at onset shows an infiltration of the conjunctiva ~~fmkd~~ with small round cells, resulting in a many-fold increase in the thickness

of the conjunctiva. The epithelium is infiltrated with polymorphonuclear cells and contains numerous basophilic cytoplasmic inclusion bodies morphologically identical with those of trachoma. The presence of these inclusion bodies is the first recognizable pathologic sign of the disease; they have been demonstrated during the incubation period of experimental human infections. Biopsy material taken late in the course of the infection may show lymphoid follicles, a feature entirely lacking in the early stages.

In the adult the typical pathologic picture is a follicular hypertrophy of the conjunctiva associated with an infiltration of small round cells. The follicles have the same histologic structure as those of trachoma but none of their necrotic aspects. Polymorphonuclear leukocytes predominate in conjunctival scrapings collected during the acute phase, but as the disease becomes chronic there is an admixture of mononuclear cells.

EXPERIMENTAL INFECTION: HOST RANGE

Like trachoma virus; inclusion conjunctivitis virus is infective only for monkeys, baboons, apes, and human beings; baboons and apes are more susceptible than monkeys. Baboons inoculated with exudate develop an acute follicular conjunctivitis, identical clinically with the adult human disease, but the clinical picture of inclusion blennorrhea in the new-born has never been reproduced in animals. Experimental inclusion conjunctivitis in lower animals is somewhat more intense than is experimental trachoma; it is of shorter duration, and its inclusions are relatively easy to demonstrate. Otherwise the two experimental diseases are indistinguishable. Because of the relatively intense character of experimental inclusion conjunctivitis, spontaneous folliculosis does not cause as much confusion as it does in connection with experimental trachoma. The cervix of the female baboon has been experimentally infected with inclusion conjunctivitis virus (Braley, 1939), but all attempts to induce experimental urethritis in the male baboon have been unsuccessful.

ETIOLOGY

The cause of inclusion conjunctivitis is a virus of large particle size belonging to the psittacosis-lymphogranuloma venereum group of viruses. It passes Berkefeld V candles and its diameter, as determined by filtration through gradocol membranes, lies between 0.15 and 0.39 micron (Thygeson, 1934). It is destroyed rapidly by drying but can be preserved for several days in 50 per cent glycerol or at refrigerator temperatures. All attempts to propagate it in chick embryo or in human conjunctivial tissue culture have failed. Group antibodies for the psittacosis-lymphogranuloma venereum group of viruses have been demonstrated in sera from patients with inclusion conjunctivitis (Rake, Shaffer and Thygeson, 1942).

Infectious units of inclusion conjunctivitis virus are elementary bodies, which, when stained according to Giemsa's method, have a diameter of about0.25 micron. Masses of them can be seen in cells in the form of inclusion bodies (Fig 34H) or they occur free in the exudate in acute cases (Fig 34I). In addition to the elementary bodies, [illegible], larger forms first described by Lindner (1910a) and known as initial bodies ,

are seen in young inclusions and occasionally free in the exudate (Fig 34J). They appear to be the forms produced in the first few divisions of the virus within the cytoplasm of susceptible cells. In the inclusion body the virus appears as masses of elementary and initial bodies embedded in a carbohydrate matrix identical with that described for trachoma virus by Rice (Thygeson, 1938). The inclusion bodies are limited strictly to the superficial layers of the epithelium (Braley, 1938). This applies also to the genito-urinary infection in the female (Fig. 34K). The existence of a toxin has been postulated to explain the subepithelial changes which occur. The virus is not affected by sulfonamides in vitro, but the disease is rapidly cured by sulfonamide therapy. Morphologic observations indicate that the sulfonamide probably acts by preventing development of the virus in vivo rather than by killing it.

Lindner suggested that trachoma virus and inclusion conjunctivitis virus were originally identical, that inclusion conjunctivitis virus, as a result of its sojourn on the mucous membranes of the genito-urinary tract through countless generations, eventually lost its ability to produce pannus and cicatrization, and that the two viruses bear a relationship to each other similar to that exhibited by the viruses of vaccinia and variola. Up to the present time no data to support this hypothesis have been submitted, however. Moreover, Allen (1944) reported that inclusion conjunctivitis virus has not taken on any of the characteristics of trachoma virus after serial conjunctival transfer on 40 human subjects. In this connection, Braley (1939) made the interesting observation that trachoma virus could produce infection of the cervix of the female baboon.

DIAGNOSIS

The clinical diagnosis of inclusion conjunctivitis in the infant is facilitated by its delayed onset (5 to 12 days) and by the characteristic conjunctival thickening and coxcomblike appearance of the lower fornix. Clinical diagnosis, however, must be confirmed by the finding of inclusion bodies. Since trachoma never develops in new-born infants in the first week or two of life, the demonstration of inclusions is pathognomonic of inclusion conjunctivitis in the infant.

In the adult an acute follicular conjunctivitis with mild preauricular adenopathy always suggests inclusion conjunctivitis. The absence of corneal changes is the clinical basis for differentiation from trachoma, but differentiation from other forms of acute follicular conjunctivitis cannot always be made clinically. For the latter purpose laboratory diagnosis based on the finding of cytoplasmic inclusions is conclusive, except, of course, with respect to trachoma from which supplementary differentiation on clinical or cytologic grounds must be made. As noted above, the expressed follicular material from trachoma shows necrotic changes never seen in follicular material from inclusion conjunctivitis.

Group antibodies for the psittacosis-lymphogranuloma venereum group of viruses, which have been reported, have no diagnostic significance in inclusion conjunctivitis.

Inclusion blennorrhea is the most important type of nongonococcal ophthalmia neonatorum and clinical laboratories in all hospitals should be capable of diagnosing it, particularly in view of the serious social

consequences which may result from confusing it with gonococcal ophtalmia. It is important that epithelial scrapings be taken instead of the exudate films used for determining bacterial infections.

TREATMENT

Prior to the introduction of sulfonamides, no form of therapy had had any effect on inclusion conjunctivitis. Sulfonamide therapy, however, is highly successful and may effect a clinical cure in as short a time as five days. Topical sulfonamide therapy, period of ten days in the form of 5 per cent sulfathiazole or sulfadiazine ointment, has been uniformly successful in the newborn infant and irregularly successful in adults. The lesser efficacy of topical therapy in adults is believed to be due to the dilution of the ointment by the tears, a negligible factor in new-born infants who have little or no tear-function in the first few weeks of life. Oral administration of the sulfanomides has been invariably successful in adult cases, however, relapses are almost unknown. No instance of a sulfonamide-resistant virus strain has as yet been reported. Secondary bacterial infection is not a problem.

Penicillin has not been effective in the treatment of inclusion conjunctivitis (Thygeson, 1947).

EPIDEMIOLOGY

Eye-to-eye transmission of inclusion conjunctivitis is extremely rare and no epidemcis have been shown conclusively to be traceable to ocular infection. The epidemiology is believed to parallel that of gonorrheal ophthalmia as seen in the United States and European countries. The genito-urinary disease, like gonorrhea, serves as a reservoir from which infection of new-born eyes occurs during childbirth and from which sporadic adult infections develop as a result of accidental transfer of the genito-urinary exudate to the eye. The eye disease would in all probability cease to exist if it were not for the genito-urinary reservoir of virus. Doctors and nurses dealing with new-born infants and gynecologic conditions have been accidentally infected with inclusion conjunctivitis (Thygeson and Stone, 1942a), just as they have been accidentally infected with gonorrheal ophthalmia. Swimming-pool infection was a problem before chlorination was introduced, the virus being transmitted through the water from the genito-urinary tract to the eye; cases are still being reported from small lakes and unchlorinated pools. Figure 34L shows the extraordinary number of virus elementary bodies which have been found on occasion in scrapings from the cervix and indicates what an abundant source of contamination the genito-urinary tract can be.

CONTROL MEASURES

Control measures parallel those applicable to the control of gonorrheal ophthalmia, except that the Crede silver-nitrate prophylaxis does not prevent inclusion blennorrhea. The intracellular habitat of the virus no dobut serves to protect it from the action of the caustic. Recent studies suggest that topical sulfonamide prophylaxis may be effective. Control of swimming-pool infection would seem to depend upon proper chlorination. In a survey of university swimming pools, all

properly chlorinated, Thygeson and Stone (1942a) found no instance of infection. This was in sharp contrast to the number of cases studied which were known to have been contracted in unchlorinated pools.

Simple precautions regarding the cleanliness of hands are sufficient to prevent transfer of the infection from a patient with the ocular disease to attendants. In nurseries, however, careful isolation should be enforced to prevent transfer from infant to infant.

CLASSIFICATION

Although the viruses of trachoma and inclusion conjunctivitis possess the essential properties of viruses, i.e., filterability, inclusion body formation, and obligate cell parasitism, they are set apart from the typical large viruses, such as those of vaccinia and fowl-pox, by a number of distinguishing properties. These include their susceptibility to chemotherapy, the basophilic character of their inclusion bodies, and their intracellular cycle of morphologic variation.

The similarity of the viruses of trachoma and inclusion conjunctivitis to psittacosis virus was noted by Thygeson in 1934, and several other atypical viruses with basophilic inclusions and intracellular cycles of morphologic variation have been identified since then. With the essential properties of viruses, but differing from typical viruses in the properties enumerated above, these organisms constitue a transitional group midway between the typical large viruses and the rickettsiae. In this connection it is interesting to note that Coles (1941) working on conjunctivitis oxen, sheep, and goats from which he recovered rickettsialike organisms, called attention to their morphologic variation and pointed out that a typical rickettsia such as Rickettsia ruminantium showed the elementary-initial-body type of morphologic variation and was even sulfonamide-sensitive.

Some authors (Busacca, 1933; Cuenod and Nataf, 1935) have recommended, on the basis of staining characteristics and morphology, that the agents of trachoma and inclusion conjunctivitis be classified with the rickettsiae. Since one of the essential features of rickettsiae is the existence of an arthroped host, however, and there are no arthroped hosts for trachoma or inclusion conjunctivitis, or in any of the other diseases whose causative agents belong in this group, such a classification would seem to be unjustified. It has indeed become increasingly apparent that the group should be set apart from both the typical viruses and the rickettsiae. To this end, a number of proposals for definitive terminology have been advanced, all of them giving credit to Prowazek in one way or another for his original observations on trachoma virus which was the first member of the group to be described. The suggestion having prierity is that of Moshkovsky (1945) who proposed the family name of "Chlamydozoaceae" for the group and the names "Chlamydozoon trachomatis" and Chlamydozoon oculogenitale" for the viruses of trachoma and inclusion conjunctivitis respectively. "Chlamydozoa" or "mantle-body" was the term employed by Halberstaedter and Prowazek in their original description of the agent of trachoma.

HEADQUARTERS EIGHTH ARMY
UNITED STATES ARMY
Office Commanding General
APO 343

AGMGPH 720

26 August 1949

SUBJECT: Public Health Technical Information

TO: See Distribution

1. Transmitted herewith are 6 items of public health technical material for information and guidance.

2. This material is non-directive and is not to be construed as granting additional authority or changing existing directives or policy.

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1 Incl
6 Items

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VENEREAL DISEASE TREATMENT

1. The venereal disease prevention law (Law 167, dated 15 July 1948) and the implementing Ministry of Welfare ordinance (No. 45, dated 24 September 1948) set the pattern for handling venereal disease.

2. This subject requires constant surveillance if ground is to be gained. Education, easily obtained diagnosis and treatment, and contact tracing by trained and sympathetic health department personnel all contribute.

3. The law recognizes that treatment must be free where people cannot pay for it, and so authorizes the prefectural governor to have financial assistance provided from government funds when he deems it necessary, with treatment to be continued until the person is noninfectious.

4. Subsidies from the ministry to the prefecture should not be considered the limiting factor for free or part-pay treatment. The law states complete treatment is for "so long as their disease is liable to infect others" (Article 15). This dictum has no relation, per se, to the ministerial subsidy. The prefecture obviously may have larger financial assistance responsibility than that provided from ministry funds. A subsidy should not becloud the basic issue, which is to provide complete treatment until the person is noninfectious.

5. Some prefectures with large segments of population in the lower social economic bracket should expect to have a percentage larger than the national average of venereal disease patients who cannot pay for treatment.

MALARIA CONTROL

The presence of Malaria in Shiga Prefecture constitutes a public health problem and affords an opportunity to describe methodology that would be similar for many communicable disease projects.

The steps in carrying out a Malaria Control Program in a prefecture are as follows:

1. Ascertain where Malaria is present and locate on a spot map.

2. Ascertain prefecture wide the index of vector population, breeding foci, and plot on a map.

3. Mark breeding areas and flight range of vectors from the breeding foci.

4. Make estimates for each of several control methods (permanent and temporary) and estimate costs.

5. Co-ordinate between Health Department and Municipal Engineering Department an estimate of all the means available without additional capital out-lay for labor, machines, and materials. If additional capital out-lay required, make estimates.

6. Preferably, prepare estimate for alternate methods and summarize advantages and disadvantages.

7. Present to fund-granting authority for determination of appropriate method.

8. Execute selected plan with definite responsibility fixed for each component.

9. Maintain vigorous temporary control measures of mosquitoes if long range corrective methods are adopted.

10. Assure that all Malaria cases are under treatment.

11. Keep progress records showing Malaria incidence, vector population, and vector breeding.

THE NONMEDICAL PUBLIC HEALTH OFFICER

The lack of physicians for public health officer positions has necessitated the detail of Branch Immaterial officers, or enlisted personnel to these positions. By and large the nonprofessional incumbents have done a good job.

In regard to the attitude considered appropriate in such an instance, it is suggested that:

a. No professional opinions be attempted, even if requested.

b. Medical public health plans should be left to the Japanese Officials and to the regional public health officer.

c. Surveillance and guidance should not be rendered in medical professional subjects.

d. The regional public health officer should be apprised freely of any questionalbe situation.

e. Reports and routine administration should be handled as well as possible under the circumstances.

After reorganization is accomplished, it is expected that all public health officer positions will be filled by physicians.

FISH INSPECTION

Fish are food. However, various concepts of fish as a food seems to prevail, and there is a tendency on the part of many engaged in the marine products industry to assume that the practice of cleanliness is useless and unnecessary. Fish must be handled with the same attention to cleanliness and sanitation afforded any other food, and this fact cannot be emphasized too often.

The Food Sanitation Law (No. 233) defines the term "food" as meaning "all articles used for food or drink", which obviously includes fish. Further, the importance of fish in the diet of the Japanese people merits emphasis on seafood sanitation with a view to markedly improving the quality of fisheries products at the time that they reach the ultimate consumer.

Limitations of fuel, ice and other items having to do with the fish industry should in no way modify decisions of inspectors as to whether products being examined are fit for human consumption or whether they should be condemned.

The health department can do much by appropriate reporting of conditions so as to expedite the correlation of all factors that bear on the delivery of good quality seafoods at consumer level.

O Alexander

SCHISTOSOMIASIS JAPONICA IN KYUSHU

Dr. T. Kibata

Schistomiasis japonica has long been endemic in the Saga and Fukuoka prefectures in the areas adjoining the Chikugo River. The results of stool examinations officially carried out in the past years at different districts showed in the major involvement areas average 17.5% and in the other minor involvement areas average 1.5% of the natives were egg-carriers, although in the worst, very small spotted areas showed more than 50% of egg-carriers. The disease is considered of possible danger to personnel of the Occupation Forces.

The area of endemicity follows closely the tributaries of the Chikugo River in the Saga Plain, involving a total area of approximately 100 square miles. This region, one of the few large flat areas in Japan, is almost completely agricultural. It is composed largely of rice paddies, which are frequently submerged during the Spring and Summer rainy seasons. There is a complex interconnecting system of ditches and canals, all flowing ultimately into the Chikugo River.

Intermediate Host

The only known intermediate host of Schistosom japonica is the Katayama Snail. This species abounds in the endemic regions of Schistosomiasis along the Chikugo River. The snails are usually found in wet soil or mud on the banks of ditches and canals. They are usually near or above the water line, often lying in grasses. Rarely, a few may exist on the bottom of shallow ditches the year around. Most are able to survive the winter in crevices. The number of snails varies with the amount of water present, and also the season. Usually more are found in very wet areas and in the months of April and May.

The incidence of cercaria infestation also shows seasonal variation, the greatest percentage being usually in April and May, before rice transplanting. Also, the snails in slow flowing ditches and canals often contain more cercariae than those found in swift streams. Because of developmental disturbance produced by the parasite, infested snails are generally smaller than cercaria-free snails.

It was discovered in 1913 by K. Miyairi, Professor of Hygiene at the Kyushu Imperial University, and his co-worker, M. Suzuki that the Katayama snail is the intermediate host of Schistosoma japonica. They had found this type of small snail

Basic: Report, "Schistosomiasis Japonica in Kyushu", by Dr. T. Kibata, (cont'd).

in ditches between rice-fields in an endemic region of Schistosomiasis japonica in Saga prefecture. The results of their various experimental studies proved this snail to be the intermediate host of Schistosoma japonica. This snail was not previously known, and has since been called "Katayama-gai" or "Miyairi-gai" in Japan. The technical name finally adopted in 1915 was Katayama nosphora. This term was given by Robson, who together with Leiper, was sent from England to the Far East to study intermediate hosts of Schistosomas.

In the same areas two other types of snails are found. These are not intermediate hosts of Schistosoma japonica. They are known by the colloquial names "Goohina" and "Tanishi". These two types of snails are much larger than the Katayama. They are used for food by the natives.

Clinical Features

Almost all clinical Schistosomiasis in this region is treated by two Japanese physicians who have had much experience with the disease. Their observations and statistics form much of the basis for the following discussion.

Approximately 40 cases per year are treated. It is known that many more chronic cases exist asymptomatic. There is wide variability in case incidence locally, depending on terrain factors and preventive measures. In some villages surveys reveal over 50 infestations; in others, nearly none. New cases are observed almost exclusively in the Department of Pediatrics at Kurume Medical College. Between 1928 and 1940, 147 new cases were seen. In 1941, 13 new cases were diagnosed. All records for the following three years were lost. In 1945, new cases were seen. Because of the frequently mild onset of symptoms, it is certain that many more new cases occurred; however no accurate estimate has been made. Of the 147 cases occurring between 1928 and 1940, 70% occurred from June through October; 91% were in males; all were in patients under 17 years of age.

Of a series of acute cases numbering 99, the following varieties were encountered:

(1)	Typhoid-malarial	63.6%
(2)	Acute colitis	19.2%
(3)	Enteritis, bloody	3.0%
(4)	Peri-appendiceal (palpable tumor)	1.0%
(5)	Nephritic	4.0%
(6)	Respiratory (pneumonia, bronchitis)	3.0%

Basic: Report, "Schistosomiasis Japonica in Kyushu", by Dr. T. Kibata, (cont'd).

In most cases, red, itchy skin lesions were found on the legs, occurring 3 to 5 weeks after infection. These are frequently eczematoid when seen in the clinic. Urticaria has not been observed. No deaths during this phase have been recorded.

A subacute clinical picture is described, lasting 3 to 4 months and resembling tuberculosis. Prominent symptoms are malaise, anorexia, weakness, especially of leg muscles, abdominal pain, and moderate anemia.

After 2 or 3 years, hepatomegaly and splenomegaly are noted. The liver is often enlarged up to the fourth intercostal space and down to the umbilicus. Subsequently, fibrosis and decrease in size take place, the so-called "parasitic liver cirrhosis". Commensurate with hepatic atrophy and portal stasis, weakness, and enaciation ensue. The spleen often enlarges past the midline and down to the iliac crest. At this stage hematemesis is one of the most frequent causes for hospitalization. Since infection in youth is so common, physical and mental development is retarded to the point where cretinismus is suggested. However, such patients are often able to lead a fairly normal existence.

Diagnostic Criteria included:

(1) Possibility of exposure due to residence in endemic area.
(2) Rash on legs in acute cases.
(3) Eggs in stool.
(4) Fever.
(5) Eosinophilia up to 80%. Leukocytosis 10.000 to 15.000, up to 40.000.
(6) Sed rate up to 140.
(7) Splenomegaly and hepatomegaly in chronic cases.
(8) Urobilinogen in the urine.
(9) Positive "Schist-reaction".

This test consists in the intradermal injection of antigen prepared from an extract of dried adult parasites. This test is highly regarded by local physicians. In a test series the following results were obtained:

	Cases	"Schist-reaction"
(a)	36 acute cases	Positive in 32
(b)	15 recovered cases	" in 13
(c)	50 cases with eggs in stool	" in 50
(d)	50 apparently normal persons with no eggs in stool	Negative in 50

Preventive Measures

Preventive measures are of several kinds, designed to eliminate contamination of soil with eggs from feces; to destroy cercaria; to destroy snails; and to prevent people from entering infested waters.

(1) In 1938, rubber boots were issued to families in endemic areas. This was of little value because of an inadequate supply and because of the ignorance of the local people.

(2) Prohibition of fishing.

(3) Burying straw in ditches during dry periods.

(4) Improvement of flow through canals. Dredging was of some value, but frequent repetition is necessary. Laying concrete beds was extremely effective, clearing up completely infestation in some areas. This was begun in 1935, but soon after abandoned because of insufficient funds.

(5) Cesspool system. In one community drop of infestation from 52% to 35% occurred between 1934 and 1937 when a system of separating tanks was installed in each home. By this method fecal material was allowed to settle 3 months before withdrawal for fertilizer.

(6) Introduction of natural enemies such as fire-flies and ducks. This was unsuccessful due to failure to adapt to the local environment.

In general, it is believed that the disease could be completely eradicated by some of the above methods, if sufficient funds were available. All attempts at control had ceased at the onset of the war, and thus far none have been resumed.

Treatment

In the treatment of acute cases, excellent results have been obtained with intravenous sodium antimony tartrate, 0.3% in 5% dextrose. A general plan is 10 cc the first day, 20 cc the third day, and 30 cc on alternate days thereafter for 20 or 30 doses. Toxic reactions were rare in adults, but arthralgia and cough were frequently noted in children. Newer complex salts of antimony have been used, but were discarded due to the occurrence of many toxic reactions.

Conclusions

The endemic area is small and closely circumscribed. Deaths from Schistosomiasis have been few. Danger to the Occupation Forces is minimal. Intensive effort with adequate funds can eradicate the disease entirely.

ONE SUSPECTED CASE OF SMALL POX IN YAWATA CITY DIAGNOSED
ON THREE SEPTEMBER ONE NINE FOUR SEVEN PD END

HILTON

Sept

Plain

CHARLES L. BACHTEL
1st Lt, Sig C
Adjutant

Priority

Public Health & Welfare Section GHQ SCAP

CG 8th Army
Attn: Public Health Officer
G-2 Sec

CG First Corps
Attn: Public Health Officer
G-2 Sec

CG 24th Div
Attn: Surgeon

CLB 040100

1. Administration, Public Health
2. Beverages, Poisonous
3. Communicable Diseases, Animal

Schistosomiasis

Infection with Schistosoma.