A history of efforts to control gonorrheal infection in the eyes of the newborn child.

Ophthalmia Neonatorum

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ONE of the most dramatic and heartwarming achievements of the effort to control venereal disease has been the reduction of blindness in babies resulting from infection with gonorrhea by the mother during birth. The great advances in the prevention of ophthalmia neonatorum were made before the era of sulfonamides and the antibiotics; they resulted from the very simple, so it seems now, procedure of placing silver nitrate solution or other effective silver preparation in the eyes of the child immediately after birth. These preparations, of little value in treatment once the disease is established, are highly effective in preventing infection in the eye. Simple as the procedure is, its introduction as part of the routine of public health and medical practice required devoted and inspired activity by various leaders and groups. The story of these events should be known in order to understand today's laws and practices.

Gonococcal infection in the eyes of a baby, so-called gonorrheal ophthalmia neonatorum, is swift and severe. If untreated, it can lead to blindness in a very short time. In fact, without treatment, about 90 percent of the babies infected with ophthalmia neonatorum will become blind. The most common means of infection is through contamination of the baby's eyes during passage through the birth canal. However, infection of the eyes also can occur if they are contaminated by discharges from another individual with gonorrhea in the child's environment.

Signs of the infection usually appear within 48 hours of birth or other exposure to infected material. One or, usually, both eyelids become swollen; there is profuse discharge of pus; the eyes redden; and, in a short time, the cornea becomes dull and hazy. If treatment is not given, the cornea ulcerates, and an infection develops inside the eyeball. This usually leads to blindness in the infected eye.

Although, according to medical literature, this sequence of events was long known, it did not become the subject of intensive study until the early part of the 19th century. However, clinical syndromes which, in retrospect, can be accepted as probable gonorrheal ophthalmia had been described earlier, and it appears that a relationship between genital disease of the mother and the ocular infection of the child was postulated.

Early Studies

Quellmalz in 1750 insisted there was a connection between leukorrhea in the mother and ophthalmia in the newborn child (*1*). Goetz (*2*) in 1791 accepted this view and wrote a treatise on ophthalmia in the newborn child.

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In 1808, Gibson, an English obstetrician, observed a connection between the strange malady known as "babies' sore eyes" and the discharge present in the birth canal of the mother (*3*). He reported that careful cleansing of the mother's body and the wiping of mucus from the baby's eyes after birth might prevent an infection which often led to lifelong blindness. But his colleagues paid little attention to his advice. At that time, in accordance with prevalent theories on causation of disease, doctors explained to mothers of babies who had lost their eyesight at birth that this condition was due to such causes as the peculiar constitution of the atmosphere or sudden changes of temperature. Colds were assumed to be the cause of inflamed eyes. This belief was so widespread that Cortez, the Spaniard, in 1837 decreed that all babies should be baptized with warm water instead of cold water.

In 1820, Vetch, by experimental inoculation of female genital secretion, was able to produce ocular inflammation, suggesting the truth of Gibson's assertion (*4*). In 1879, Albert Neisser, an assistant professor in the University Clinic of Dermatology at Breslau, described a micrococcus that he believed to be the cause of gonorrhea (*5*). His discovery attracted universal attention, coming at a time when the science of bacteriology was developing and numerous investigators in the bacteriological and pathological fields were beginning to carry on research. However, there was considerable doubt in the minds of many scientists as to the role played by the gonococcus in the production of gonorrhea. This was finally resolved by experimental genital inoculation of both gonococcal discharge and cultured gonococci. Then, in 1881, Hirschberg and Krouse demonstrated the gonococcus in patients with ophthalmia neonatorum (*6*).

In spite of discovery of the causative agent of gonococcal infections, therapy for both genital and ocular infections was highly unsatisfactory. The multiplicity of treatment schedules suggested attests to the essential lack of value of any one of them. Thus, as might have been expected, much attention was given to potential means of prevention of ocular infection.

In 1856, Dr. Karl Sigmund Franz Credé was made director of the lying-in-hospital in Leipzig (*7*). After years of experimental studies, he found an agent which would prevent ophthalmia neonatorum. In 1886 he published his epochal treatise (*8*) in which he stated, " . . . if two percent solution of silver nitrate is dropped in the eyes of newborn infants, immediately after birth, the pus germs producing ophthalmia neonatorum could be killed and the development of the disease prevented." His records showed that the disease developed in only 0.17 percent of the cases in which silver nitrate was used, whereas it developed in 10 percent of the cases in which the solution was not used.

Credé's theory and demonstration were not immediately accepted and were, in fact, met by widespread opposition. However, as knowledge of his experience spread, other clinicians began to apply his findings.

In the United States, Dr. Lucien Howe (*7*) became the leader in the fight against ophthalmia neonatorum. He went to Egypt in 1887 and studied purulent ophthalmia; when he returned to the United States he began his campaign against ophthalmia neonatorum. He established and became the director of the Howe Laboratory of Ophthalmology at Harvard, endowing this institution with $1 million from his own fortune. He campaigned in many States for passage of legislation and drew up model laws for the prevention of this disease. It was largely through his efforts that early legislation for compulsory instillation of silver nitrate in the eyes of newborn children was passed. Dr. Howe was so forceful in his pleas for prevention of blindness that he aroused the New York State Medical Society and the American Ophthalmology Society to become actively responsible for legal work for the control of the disease.

In 1905, influenced by Dr. Howe, the New York City Health Department sent out a bulletin instructing all midwives in the use of Credé solution of silver nitrate in the eyes of the newborn child. The bulletin also reemphasized that all sore eyes must be reported to the health department so that medical investigation could be instituted and treatment given when necessary.

The Governor of New York was so impressed by Dr. Howe's enthusiasm and energy that in 1906 he appointed him to the Commission to Investigate the Conditions of the Blind. Dr. Howe and Dr. Park Lewis, president of the commission, assisted in promoting a detailed census of the blind in New York State, which they presented to the legislature in 1907 (*7*). They were also instrumental in establishing the National Society for Prevention of Blindness.

National Society

Included in the report of the census of the blind in New York State was an article by Dr. Lewis entitled "Needlessly Blind," in which, referring to ophthalmia neonatorum, he said ". . . this is a disease the nature of which is fully understood, which might have been controlled or avoided by simple prophylactic or therapeutic measures at the time the infant came into the world."

In 1908, Louise Lee Schuyler read Dr. Lewis' article and became determined to start a movement to acquaint the public with the menace of ophthalmia neonatorum (*7*), and it was her leadership and intelligence which did so much to popularize the movement and which gave real drive to it. With Edith Holt, she organized groups to discuss ways and means of influencing the legislature and of educating the public in the necessity of using prophylaxis to prevent blindness. Miss Schuyler and Miss Holt then organized the New York State Committee for Prevention of Blindness, a private organization.

It soon became apparent to this committee that blindness was a problem of national importance and in 1915, the National Society for the Prevention of Blindness—a lay organization cooperating actively with the medical profession, particularly ophthalmologists, and with official and volunteer health agencies—was organized. The State committee then became a standing committee of the national society.

The objectives of the national society were:

1. To endeavor to ascertain, through study and investigation, any causes, whether direct or indirect, which may result in blindness or impaired vision.
2. To advocate measures which shall lead to elimination of such causes.
3. To disseminate knowledge concerning all matters pertaining to care and use of the eyes.

In the beginning, the society established a cooperative relationship with agencies and societies, official and volunteer, which had either a direct or an indirect responsibility for the prevention of blindness and the conservation of vision. In 1925, it established such a relationship with the Conference of State and Provincial Health Authorities of North America.

The society prepared and distributed literature of particular interest to ophthalmologists, first securing from them approval of the material, and provided slides and moving pictures for use in lectures. It continues to prepare and distribute literature but no longer has slides and moving pictures available.

In 1928, as a result of educational work by the national society, and recognizing the need for preventive work, the New York Commission for the Blind established a department of prevention of blindness and made Sarah Clendinning, R. N., the director. Under Miss Clendinning's leadership, groups were reached through lectures on the prevention of ophthalmia neonatorum.

Statistics

In 1908, ophthalmia neonatorum was responsible for 28 percent of the blindness among new entrants in blind schools (*9*). In 1933, 11 percent of the new entrants in these schools were blind from this disease; by 1950 this figure had been reduced to 1 percent.

In 1923, Dr. Taliaferro Clark and Dr. J. W. Kerr of the Public Health Service wrote: "It has been conservatively estimated that ophthalmia neonatorum is responsible for 20 percent of blindness in the United States. Blindness is not a reportable disease; therefore, statistics had to be gathered largely from institutions for the blind throughout the United States. For this reason, the figures compiled represent only those children that are institutionalized in blind schools" (*7*).

A report issued in 1926 (*10*) showed that in 1907, 28 percent of the blindness in the United States was due to ophthalmia neonatorum; in

1913–17, blindness from this cause had dropped to 19 percent; in 1918–22, it was 16.5 percent; and by 1926, or within 18 years, a decrease of 51.3 percent had occurred.

Before 1930, the most complete and authentic information on the blind was assembled by the Bureau of the Census (*11*). However, this information was incomplete. Only a few State commissions had compiled reports of ophthalmological findings. For causes of blindness, the Bureau of the Census could give only data based on the statements made by blind persons themselves instead of reports of ophthalmological examinations. In many ways, the data were inconsistent and inadequate and often were completely lacking. A special conference was called by the American Foundation for the Blind and the National Society for the Prevention of Blindness to discuss methods of improving statistics on blindness. In 1930, the Committee on Statistics of the Blind was organized and still is sponsored and financed jointly by these two groups.

Early Enactments

In 1922, the Sanitary Code of New York City stated (*12*) ". . . it shall be the duty of every physician, nurse, midwife, or other person in attendance on a confinement case to instill in the eyes of a newborn child immediately after delivery—1 percent solution of silver (nitrate) or an equally effective agent in order to prevent the development of ophthalmia neonatorum."

In 1926, according to a report by the National Society for the Prevention of Blindness, 20 States had definite enactments requiring the use of prophylaxis in the eyes of every newborn child. (Fifteen of these were Alabama, Arizona, Delaware, Georgia, Idaho, Iowa, Maryland, Michigan, Missouri, Rhode Island, Tennessee, Texas, Virginia, West Virginia, and Wisconsin.) Five States—Indiana, Louisiana, North Dakota, Utah, and Washington—had definite enactments requiring the use of prophylaxis under certain qualifying conditions. In 12 States, regulation was under State board of health rulings; Florida and Montana had no law. Thirty States required that the birth certificate indicate whether or not prophylaxis was used and the strength of the prophylactic agent.

Control Measures

Public health workers recognize that the general public is not interested in health per se; a desire for good health is not a dynamic force in securing action to attain it. Even the understanding of the cause of a tragic disease is not essential to action. This situation is exemplified in the ophthalmia neonatorum control program. The cause of the disease is gonorrhea in the mother, yet the early campaigners for preventive legislation practically never mentioned this. They issued pamphlets citing the number of children that were "needlessly blind" because of lack of proper medical care. They discussed methods of educating the public to realize the necessity for using prophylactic measures to prevent "babies' sore eyes" and discussed ways and means of influencing State legislators to pass preventive legislation.

The one exception to this approach was through Dr. William Snow, chairman of the American Social Hygiene Association, an enthusiastic supporter of the program of the National Society for the Prevention of Blindness. He reiterated the known fact that ophthalmia neonatorum would be prevented if gonorrhea were wiped out. At an annual meeting of the American Social Hygiene Association he stated ". . . there are approximately 200,000 blind persons throughout the country and it is estimated that more than 15 percent of those lost their sight because of syphilis and gonorrhea. It is obvious that there is a close relationship between the movement to prevent blindness and the drive to stamp out these diseases."

The campaign for prevention of blindness in babies was directed by and to the socially and economically secure groups. The support of these articulate and well-informed groups has been an important factor in obtaining legislation which required prophylaxis in the eyes of the newborn child. The campaign to eradicate venereal disease during the years 1920–29, although the opposition was neither specific nor ephemeral, did not parallel the success of the ophthalmia neonatorum prevention program. The venereal disease program appeal was made

primarily to middle-class groups, who at that time were reluctant to discuss publicly "sex and social hygiene."

Perhaps control of blindness among babies depends, in the final analysis, upon motivation of the physician, the nurse, or the midwife only, whereas control of venereal disease depends upon the motivation of many individual patients.

The Public Health Service during this period, 1920–29, cooperated with the States in establishing training services in epidemiological studies and research laboratories to determine the causes of blindness. Data were gathered regarding legal provisions for the prevention of ophthalmia neonatorum. Reports concerning venereal diseases as a cause of blindness were published and distributed to State health departments.

Federal, State, Local

Federal authority in health matters does not extend to participation in the exercise of police powers of the State. Federal authority is concerned with interstate and international health problems. The police powers relating to health, safety, and morals within the State borders have been reserved specifically to the States themselves.

The administration of public health in a State is a significant part of general administration. The physician in charge of a State health department has a dual responsibility in the enforcement of health regulations: he must furnish expert professional advice to the State legislators, and, as an administrative officer in the health department, he must protect the health of the people through the control or eradication of disease.

Pennsylvania's experience illustrates State efforts to control ophthalmia neonatorum. In November 1931, the Pennsylvania State Board of Health began an active campaign against ophthalmia neonatorum (*13*). A State law had been passed in 1913, but it left the procedures to be worked out and enforced by the State board of health. The board of health had issued regulations making mandatory instillation of one drop of silver nitrate in the eyes of a newborn child, defined "inflammation of babies' eyes," and required that any evidence of this infection be reported to the local health department. The 1931 campaign, 18 years after passage of enabling legislation, was the result of the widespread failure of physicians or attendants at childbirth to carry out the provisions regarding instillation of a prophylaxis in the eyes of a newborn child, and to report immediately any indication of "sore eyes in a newborn infant."

In the spring of 1951, it came to the attention of Dr. Theodore Appel, secretary of the State board of health, that, of the total enrollment of 289 children in the Overbrook School for the Blind, 51 were blind as the result of ophthalmia neonatorum; and 6 of 45 children who had entered the school the previous year were blind from ophthalmia neonatorum. This situation occurred in spite of the fact that, in Pennsylvania, application of prophylactic treatment to the eyes of a newborn child was mandatory and that "sore eyes" were reportable. Dr. Appel sent out letters to all county medical officers which said, "This Department is deeply concerned to have this law obeyed, and is prepared to enforce it, carrying cases into court when necessary."

Private Organizations

Although State and local authorities are responsible for enforcing health measures, the forces back of most State health legislation are the volunteer groups and private agencies. It was these groups that organized State societies for the prevention of blindness in newborn children; they all became active in preparing legislation to be enacted to prevent ophthalmia neonatorum.

The Illinois Society for Prevention of Blindness is an excellent example of this type of organization (*14*). In 1927, this society began its campaign for passage of legislation making it mandatory that a prophylaxis be instilled in the eyes of a newborn child. Audrey Hayden Gradle, executive secretary of the society, made a survey of the blind in Illinois, which showed that during the years 1921–30, in Chicago, 1,294 babies were hospitalized with ophthalmia neonatorum and 77 babies became blind as a result of this disease. Mrs. Gradle enlisted the sup-

port of many organizations: the Illinois State Medical Society, the State Board of Health, the Parent-Teacher Association, the women's clubs, Lions clubs, and the State Social Hygiene Association. Dr. William Snow of the American Social Hygiene Association assisted Mrs. Gradle by helping her organize standing committees and by making speeches throughout Illinois.

A bill for the prevention of ophthalmia neonatorum was drawn up with the assistance of the law department of Chicago University. It was fought bitterly by antimedical groups whose opposition to medical treatment was based on religious grounds and who flooded the legislature with protests. At that time, very few bills with social welfare implications survived the committee readings. (In Illinois, such bills must have three readings in both the House and the Senate committees and a favorable opinion by the attorney general before they are presented to the legislature for passage.)

An amendment to the bill, sponsored by the antimedical groups, was voted down 112 to 4. This amendment provided that if parents or guardians objected to the use of prophylaxis on grounds of religious beliefs, those persons would be exempt from the law. The original bill passed the Illinois Legislature and was sent to the Governor for his signature. The attorney general gave an adverse opinion that "police powers for the State did not cover the situation, and that individuals had certain fundamental rights which must be protected." Governor Emmerson vetoed the bill and it was sent back to the legislature.

On June 1, 1931, before the bill came up again in the legislature, the *Journal of the American Medical Association* carried a two-page editorial defending the bill. The Legislative Reference Bureau assured the Illinois Society for the Prevention of Blindness that the police power of Illinois was unlimited when loss of life and limb was concerned and that loss of eyesight ranked as equivalent to loss of life and limb. Helen Keller sent an open telegram to the legislature espousing the proposed legislation. Labor leaders wrote letters and lobbied for its passage, but the bill lost by six votes.

Mrs. Gradle did not give up the fight. She immediately began her campaign in preparation for the next session of the legislature. She went into the 51 legislative districts, organized committees in each district, made 350 speeches. She secured the support of leading obstetricians, who, at their own expense, testified before the Judiciary Committee. Mrs. Gradle kept 3,114 members of her standing committees working.

In January 1933 the bill was again introduced in the Illinois State Legislature. A new governor and a new attorney general were now in office. The bill was passed on April 18, 1933, and became effective on July 1, 1933. Under Illinois law, the enforcement of the provisions of the law became the duty of the State board of health.

A private agency such as the Illinois society has the advantage of "singleness of purpose," and acts as a catalyst. Other State societies for the prevention of blindness immediately began working on preventive legislation, emulating the courage and persistence of the workers in Illinois.

Constitutionality of Laws

The validity of the law requiring mandatory use of prophylaxis in the eyes of the newborn child and the reporting to the State health department of "inflammation of eyes" has been tested in court many times. In the case of *Medlin* v. *Bloom*, Massachusetts Supreme Court, 1918 (*15*), in an action of tort for defendant physician's negligence in caring for eyes of a newborn whereby the child becomes blind—whether defendant failed to treat the child's eyes with nitrate of silver or not after birth, and if not, whether the blindness was due to such omission as the proximate cause of the blindness—it was held to be a question for the jury to decide.

In this action the judge in the lower court instructed the jury, in substance, that "failure of the defendant to report the case ('inflamed eyes') to the State board of health as promptly as he should have done under RL 75 as amended by Statute 1905, chapter 251, section 2, was immaterial and was not to be considered as evidence of negligence." The lower court found for the defendant.

The Supreme Court of Massachusetts held that: "If you find the defendant violated the provisions of the act of 1905, that is evidence of negligence on part of the defendant." The court further held that "the evident purpose of the statute is that the board of health may be informed without delay of the existence of the most serious disease which may affect young children, so that immediate and scientific treatment may be received and blindness prevented. Such failure was evidence of neglect, and the decision of the lower court reversed and remanded."

In the case of *Dietsch* v. *Moyberry* (*16*), Ohio Appellate Court, 1942, it was held that the court is bound to take judicial notice of rules and regulations of the State board of health promulgated under statutes relating to investigation and report all cases of inflammation in the eyes of the newborn, under General Code, section 1248–1 to section 1248–5. The court held that the purpose of the statute is twofold: (*a*) to benefit the newborn by preventing blindness, and (*b*) to relieve the public from the burden of supporting another blind child.

The court held that violation of such a statute was "negligence per se." The lower court found for the defendant but the Court of Appeals reversed the decision in favor of the plaintiff. This decision was based on the element of omission by the defendant in his duties to the plaintiff—his failure to notify the State board of health of the inflamed condition of the infant's eyes. This charge of negligence of the defendant had been omitted by the judge in the lower court in his general charges to the jury on negligence of defendant. Verdict was for the plaintiff, and the case was reversed and remanded.

Treatment

Since the discovery of penicillin, which is highly effective in the treatment of ophthalmia both locally and systemically, it has been shown that local ocular penicillin has prophylactic value. The proponents of silver nitrate prophylaxis opposed its abandonment in the treatment of ophthalmia neonatorum, although they admitted that a 1-percent solution of silver nitrate does cause chemical conjunctivitis in a high percentage of cases. This condition is not serious, however, and there is no record of silver nitrate prophylaxis, properly performed, causing injury to an infant's eyes. The proponents of penicillin prophylaxis maintain that this antibiotic is equally efficacious in the prevention of ophthalmia neonatorum and has none of the objections leveled against silver nitrate.

The California State Board of Health amended its regulations pertaining to prophylaxis for ophthalmia neonatorum in June 1953 (*17*). The change provided for use of either 1 percent of silver nitrate in wax ampule or penicillin ointment. They accepted penicillin ointment as the only approved antibiotic preparation and recommended it on the basis of (*a*) data obtained from controlled clinical studies indicating its effectiveness and (*b*) ease of administration (*18*).

Summary

Ophthalmia neonatorum is a reportable disease and must be reported to the State health department in all States. In spite of the fact that the laws in all States require some prophylactic instillation in the eyes of the newborn child (which should prevent this infection), the disease still occurs. The table gives the number of cases of the disease in States which reported to the National Office of Vital Statistics in the years 1946–52. In 1952, only three States—Mississippi, Tennessee, and South Carolina—reported their ophthalmia neonatorum cases to the National Office of Vital Statistics.

Some form of prophylaxis against ophthalmia neonatorum is required by law or State board of health regulations in all States and in the District of Columbia. Thirty-three States require the use of prophylaxis for the prevention of this disease but leave the choice of prophylactic agent to the physician, the midwife, or the nurse in charge of the infant. All States require reporting of "inflamed eyes" occurring shortly after birth to the local health officer, who in turn must report the case to the State board of health.

Some States have qualified the use of prophylaxis for ophthalmia neonatorum; one State

Annual morbidity reports of ophthalmia neonatorum, by States, as reported to the National Office of Vital Statistics, 1946–52 [1]

State	1946	1947	1949	1950	1951	1952
Alabama						
Arizona	11	9	4	7	1	
Arkansas	2	5	3	4	5	
California			11	7	8	
Colorado			1		1	
Connecticut	1	1	1	2	2	
Delaware						
District of Columbia						
Florida	18	30	11	22	14	
Georgia				4	2	
Idaho						
Illinois	421		152	128	32	
Indiana	1					
Iowa						
Kansas						
Kentucky			2			
Louisiana	14	3	6	6		
Maine						
Maryland	27	11	7	3		
Massachusetts	122	308	160	167	91	
Michigan	18	12	14	23	19	
Minnesota					1	
Mississippi	32	53	36	35	34	27
Missouri	1					
Montana						
Nebraska						
New Hampshire						
New Jersey	18	6	8	6	6	
New Mexico			8	5	4	
New York	70	53	25	23	26	
North Carolina						
North Dakota						
Ohio	530	533	474	535	420	
Oklahoma	1	5	3			
Oregon			1			
Pennsylvania	17	20	24	8	8	
Rhode Island						
South Carolina	23	28	18	4	2	2
South Dakota						
Tennessee	6	3	12	13	16	7
Texas	105	96	139	75	82	
Utah						
Vermont						
Virginia						
Washington						
West Virginia		7	53	87		
Wisconsin	7	3	4	4		
Wyoming						
Total	1, 445	1, 186	1, 177	1, 168	774	36

[1] No data available for 1948.

NOTE: No reports were received from States for which no figures are given.

requires ". . . if there is any reason to suspect an infection in the eyes of the newborn, then a prophylaxis must be applied." Another State qualifies the law by not requiring treatment for a minor child if the parent is a member of a recognized denomination whose religious convictions are against medical treatment. Another State provides that ". . . any parent shall not be required to employ such a prophylaxis (as required by State statute) if objections are made in a written statement to physician or midwife in charge of the case.

The reduction of gonorrhea as a cause of blindness from 28 percent in 1908 to 1 percent in 1950 is a feat of preventive medicine of no small proportion. The continued role of gonorrhea in the production of blindness probably is attributable to errors in the method of use of prophylaxis rather than to ineffectiveness of the procedure itself.

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The Salk Vaccine

The development and successful trial of the Salk vaccine against paralytic poliomyelitis is a major step toward control of a crippling disease. It represents the culmination of a truly historic medical and public health achievement.

This development of a successful vaccine places a great responsibility on the physicians, the public health agencies, and the parents in our Nation. I am confident that physicians and health officials will conscientiously conserve and put to best use the supply of vaccine. Parents should cooperate with them. As the supply increases, there will be enough for all who wish to be immunized.

Within our time, therefore, we can expect to see effective control of crippling polio. I offer my sincere congratulations to all who have contributed to this grea. effort to protect future generations from the specter of poliomyelitis.

—LEONARD A. SCHEELE, Surgeon General,
Public Health Service, April 12, 1955.