

tary maladies, to accept the conclusion that it was a coincidence. If we accept the other view, that the healthy, non-hemophilic state of this woman's third son was due to chlorid of calcium administered during the third trimester of pregnancy, we are face to face with the conclusion that it is possible by medicinal substances given to the mother in the last three months of gestation to cure the unborn infant of a malady which no medicines in after-life are capable of curing. Here I am tempted to leave the question. Certainly it is far easier to take it that just as this woman had four brothers, only one of whom was a bleeder, so of her three sons two were bleeders and the third was not; even with the most hereditary complaints some members of a family escape. It was a coincidence and nothing more that antenatal treatment was instituted in the case in which the hereditary influence was going to fail! But, there are some circumstances which encourage me to express the opinion that after all there is a chance that the treatment in this case may have something more than a coincidental relation to the healthy state of the third infant.

In the first place it may be taken, from what is known of the physiology of the fetus and more particularly of placental transmission, that the chlorid of calcium given to the mother reached the fetal tissues; there is no reason to doubt that the iron, arsenic, and strychnia did also. In the second place there is evidence that chlorid of calcium is beneficial in hemophilia after birth, and there is also evidence that hemophilia, if persistently treated in postnatal life, shows a certain amelioration. In the third place there is in the extraordinary power of recovery possessed by the fetus, a factor which must not be left out of account in dealing with all questions of antenatal treatment. When we remember the marvellous power of growth and tissue-building which the fetus displays, a power so great that in one month of intra-uterine life the body weight is quadrupled, we are led to ask ourselves whether this wonder of construction may not be accompanied by an equally great wonder of reparative energy? If there be a greatly exaggerated *vis medicatrix naturæ* in the fetus, is it not possible that even the hereditary maladies may, if properly influenced, show a tendency to cure during antenatal life. May it not be that medicines acting upon the organs and tissues, while these are still in the stage of construction, may be more efficacious than when they act upon structures which are, as it were, set either for health or disease. In the meantime the case and these comments on it are placed before the profession. *In judicando criniosa est celeritas.*

24 Melville Street.

THE PREVENTION OF PULMONARY TUBERCULOSIS IN PREDISPOSED CHILDREN.*

JOHN A. ROBISON, A.M., M.D.

Attending Physician to Cook County and Presbyterian Hospitals;
President of Chicago Society of Internal Medicine, Etc.
CHICAGO.

Before the discovery of the bacillus tuberculosis heredity was supposed to be of great importance as a causal factor of tuberculosis, but its importance is rapidly fading into the distance in the opinion of bacteriolo-

gists and phthisiologists, who believe more in the direct contagion theory. Norbury states that "in the light of modern scientific inquiry infection has supplanted direct heredity as the etiological factor *par excellence* in tuberculosis." Direct transmission of the bacillus is claimed to be extremely rare, although authorities agree that this rarity will be less when the observations have been more extensive.

It is claimed that cases of tuberculosis occurring during childhood are due to direct or indirect infection in nearly all cases, statisticians claiming the infection occurs in an increasing ratio during the first and second years of life from 9 to 38 per cent.

The pendulum has been swinging toward the bacillary origin of the disease so long that there is danger of losing sight of the other important causal factor of infectious disease, the condition of the tissues which permit and favor the growth of infectious diseases. It is to protest against neglecting this phase of the subject that urges me to discuss the question in this paper. As physicians whose aim is not only to cure, but prevent disease, we must not neglect to consider the predisposing factors. I stoutly maintain that we must give equal consideration to the two factors—heredity and the bacillus.

Authorities differ as to the percentage of predisposition, but average is about 38 per cent. When we consider that 38 per cent. of the consumptives give an hereditary history of the disease, there need be no apology for presenting the subject for your consideration.

As that master of the subject of the pedigree of disease, Jonathan Hutchinson, says: "We must take cognizance not only of the bacillus itself but also upon the state of the tissues upon which it is implanted. The possibilities of inheritance are twofold. It may be that the bacillus itself may pass bodily or potentially with the sperm or germ from parent to child, or it may be that a condition of tissues liable to its attacks, but for the time free from its presence, may be the result of transmission. If we are permitted to name the tissue condition, which is prone to favor the development of the tubercle bacillus, the name 'scrofula' will perhaps be convenient for the present. A child may then inherit 'scrofula' without the bacillus, or the bacillus without 'scrofula,' or, what probably is most common, both may be present together."

If this view of the heredity of disease is correct, we may take it for granted that the following propositions are admitted: 1. Healthy individuals possess certain degrees of immunity to tuberculosis, as well as other infectious diseases, and this immunity is transmitted to the offspring. 2. If one parent is tuberculous the immunity is weakened; if both parents are tuberculous, the immunity is lessened to a greater degree, and there is engrafted on the progeny a cellular nutritional weakness which permits the invasion of the infective germs. Perhaps it would be more nearly correct if we were to say that such individuals have an "infective predisposition," for they are especially liable to other forms of infection, such as influenza, etc., and their children inherit the same susceptibility. The reason they become tuberculous is because the tubercle bacillus is so omnipresent. 3. Children of tuberculous parents are easily infected, directly or indirectly.

Granted, therefore, that these statements are true, what can be done to prevent the subsequent development of tuberculosis? As Holmes has remarked, the preventive treatment should commence with the ancestors. Stirpiculture, or the improvement of the race,

* Read at the Fifty-second Annual Meeting of the American Medical Association, in the Section on Diseases of Children, and approved for publication by the Executive Committee of the Section: H. E. Tuley, Edwin Rosenthal and Samuel W. Kelley.

is the most potent means to be used to eventually eradicate tuberculosis. The education of the people in stirpiculture would mean the improvement of the coming generations, but of course has nothing to do with the generation already born. But the knowledge that children born of invalid parents are susceptible of improvement is of great value to the present generation. It is our duty to educate parents how to rear children who are predisposed to tubercular disease.

The period of development must be divided into subdivisions: infancy, childhood, youth and maturity. The great aim must be to promote nutrition, to develop the body symmetrically, to educate the mind judiciously, and to inculcate correct habits, physical and moral.

Infancy.—A babe should never be suckled by a tuberculous mother, but by a healthy wet-nurse, or it should be fed with food which is absolutely free from suspicion of being contaminated by the tubercle bacillus. As the babe grows the dietary should contain more fat, and as the salivary glands develop a very slight amount of starchy food should be added. Early a taste for hydrocarbons should be cultivated, so that the patient will not have a repugnance for fatty food as is commonly the case in persons who are inclined to tuberculosis. In a large experience it has been found that consumptives consume an insufficient amount of fat.

As the period of childhood approaches, the diet should contain more carbohydrates, and the inordinate cravings of children for sweets should not be curbed too strictly. In my opinion, pure candy in moderation is beneficial to growing children, if given after and not between meals. A point of not minor importance is the giving of water freely to children. As a rule, children do not drink enough water, as it is a great aid to nutrition, dissolving the food so that it can be more easily digested and assimilated, and acts as a solvent for effete material in the body so that it can be better eliminated.

During the period of childhood the diet should contain a greater proportion of nitrogenous food. Nitrogen supplies muscular force, and the demands upon the muscular system increases with the increasing age of the patient and the entering an occupation of some kind.

The period of puberty is a critical one. The physician should supervise the proper development of the physico-moral nature during this period. Enforced ignorance of the sexual laws prevents youth from seeing through the vista of years and perceiving the woes which follow the abuse of the body at a period when nature is attempting to reinforce it in every way and strengthen it against the future invasion of disease germs. Educate the youth in such necessary physiological laws as will tend to preserve the integrity of all the tissues, and maintain nutrition at its highest point.

Now is the time for education, and it is the time when the mind is apt to receive more training than the body. *Mens sana in corpore sano* is a motto which is forgotten not only by educators but by parents as well. We boast of our public school system, yet there is no method whereby so many budding into maturity can be physically wrecked so readily as by the class method of teaching. The strong and weak are given the same tasks, and the hours are unbroken by physical training, to say nothing of the lack of supervision of the attitude of the scholars in the school room, the want of proper ventilation, and the housing together of children whose vital forces are already lowered by lack of proper food

and hygienic home surroundings. It is encouraging to note the tendency of modern school boards to install gymnasia, and employ competent teachers of physical development. Two-thirds of the period of youth is spent in education, and physicians should see that the parents and teachers give each child who has a predisposition to tuberculosis such thought and care in its mental and physical training as will insure health instead of disease. A harmonious and dual development of the mind and body must be secured. Our school-teachers, as a rule, care more to send the parents reports of the rapid mental development of the children than to supervise the equal mental and physical development.

After the period of education comes the choosing of a vocation. The tuberculous inclined should be advised to choose occupations which would necessitate them to be out of doors the greater part of the time. The open-air occupation, if such that it requires the individual to be active, is the best form of work. Avoid dusty work, and factories, crowded assemblies and violent physical exercises. Newsholme, in his work on vital statistics, states the lowest mortality is in clergymen, railway engine stokers and engineers, farmers, brick-burners, coal merchants, and coal miners. Contrary to what would be believed, coal miners seem to be quite exempt from tuberculosis.

During the time the physician and parent have been guiding the development of the predisposed patient into more perfect maturity, it is necessary to keep in mind that the clothing is a question of importance, especially if the patient be a girl. The whole subject may be compressed in two words: the patient should be *warmly and loosely* clad. By warmly clad is meant sufficient clothing to prevent chilling, and meeting the weather changes by different weights of outer clothing. The clothing should be loose enough to permit free exercise and unembarrassed respiration. A child with a predisposition to tuberculosis should not wear a corset, and the mother who attempts to control the outline of her child's figure by the use of the corset is laying the foundation of tubercular infection by interfering with the processes of nutrition and the development of the respiratory functions of the lungs. Thin shoes, insufficient head covering, or deficient underclothing are the stepping-stones to tuberculosis. But on the other hand excessive swaddling of the body, or the neck and chest should be avoided, as it tends to a susceptibility to cold catching, and sudden changes of temperature can not be so well withstood.

Cleanliness is the great preventer of germ infection. A clean consumptive will not spread the infection, and a clean body does not afford so good a lodging-place for the germs. Therefore, the predisposed must avoid contact so far as possible with persons who are consumptive or should not use any articles used by such.

Hydrotherapy is of great value. It stimulates the nutritive processes, steadies the vasomotor nerves so that they are not so susceptible to sudden changes of temperature, and hardens the individual. It is impossible to enter into this subject in detail, but its benefit is so great to the consumptively inclined, that it is the duty of the physician to give his clients the necessary instruction.

It goes without saying that the hygienic surroundings of the patients must be as good as possible. Clean, well-ventilated, comfortable houses, built upon proper soil, and so arranged as to receive the maximum of fresh air and sunshine, afford the best chances for the predisposed.

And here the value of the open-air treatment is made manifest. The fresh-air sanatoria of our larger cities, and the country vacation clubs are doing a great deal of good in lessening the susceptibility of the poor in our midst. The sad part of it is that these provisions are necessarily of short duration. There should be established throughout the land fresh-air sanatoria for the children of tuberculous parents, and for the orphans of tuberculous origin. At the children's hospital at Ormesson, under the auspices of the French society for the care of tuberculous children, 34 per cent. of the cases were cured, and at Villiers the per cent. was 34.4 cured, or nearly cured. France beats the world in caring for children who have consumption, or have the tendency, having over twenty seaside and mountain resorts. But if we have not the sanatoria we can instruct our patients in sanatorial methods. These instructions should include dietetic, hygienic, balneological, physical and therapeutic methods of the well-known sanatoria.

Finally, it is the province of the physician to warn parents of the danger of neglecting the so-called benign children's diseases, such as measles, whooping-cough, influenza, tonsillitis, adenoids, etc. The feeble-minded are especially liable to tubercular disease. The acute diseases may be the preparers of the soil for tubercular infection, and they should not be neglected. *Nutrition* is the foundation stone on which to rear the preventive treatment.

It is impossible in the time allotted to me to crystallize all the thoughts on this subject, but if my theme shall be discussed and its importance magnified, and some practical method of instituting preventive measures throughout the United States whereby the increasing army of consumptives may be lessened, no apology need be offered for the mediocrity of this communication.

DISCUSSION.

DR. T. F. WOOD, Angola, Ind.—The subject has been handled in a way to be commended. I wish, however, the essayist had said something about the prevention of the marriage of individuals who are not only predisposed, but are really consumptives. I believe this is one of the great sources of tuberculous disease, and yet our hands are tied, as it were, regarding that phase of the subject. Many physicians dare not discuss this subject, lest they become unpopular and lose business; nevertheless, it is an important matter, and we should speak without fear or favor on this vital point. To-day the statutes of almost every state allow any person, even in the last stages of consumption, to marry and rear children, and in this way transmit the disease to those yet unborn.

DR. WADSWORTH WARREN, Detroit—One point in the latter part of the paper appealed to me especially, and I desire to give it additional emphasis. I refer to the necessity of warning the parents of these children regarding the care of these little ones during an acute infectious disease, or even when they are inflicted only with a mild laryngitis or pharyngitis. Very often these apparently innocent disorders lower the child's powers of resistance so much as to afford a suitable culture medium for the tubercle bacilli; attention to the mouth, throat and pharynx, and to the removal of adenoids and enlarged and patulous tonsils is of great importance.

DR. JAMES A. WORK, Elkhart, Ind.—With reference to clothing, I would say that I believe we should instruct parents more with reference to the changing of the clothing in accordance with the changes in the weather. We know how great and sudden are the changes of the weather in this country, and I think the clothing should be adapted to meet these changes.

DR. CLIFTON SCOTT, Des Moines—The author emphasized the importance of teaching young children in the public schools certain things in regard to abuses which do them

harm about the age of puberty. It seems to me that children thus instructed in school would be taught how to prevent the diseases in their own children when they become parents. This can be done by teaching them in the public schools that such persons should not marry. This would be better, in my opinion, than legislation, which will surely increase illegitimacy.

DR. COLUMBUS G. SLAGLE, Minneapolis—I desire to lay stress on malnutrition. I have been in the habit of telling my patrons and friends that consumption does not begin in the lungs but in the stomach. This may not sound very scientific, but it appeals to the popular mind, and I think does good by impressing upon them the importance of a proper dietary. Another point is in regard to fats. One of the most practical lessons I ever learned was in the University of Louisville when I was a student. Professor J. B. Flint always asked any one suspected to be tuberculous if he liked fat, and such persons usually replied in the negative. At one time he was examining a patient far advanced in tuberculosis, and this question about fats was, to the surprise of the professor, answered in the affirmative. So surprised was he that the question was repeated and was answered again in the affirmative. The professor then turned to the students, and expressed his belief that the patient had lied. He then went on to impress upon them the importance of tuberculous individuals eating fats, and particularly those persons who had an aversion to fats because ordinarily they were the very ones most likely to fall victims to tuberculosis.

DR. COLLINS H. JOHNSTON, Grand Rapids, Mich.—In this connection I desire to speak of a paper published in Virchow's Archiv, in May, 1900, in which it is maintained, on the basis of 500 autopsies performed at Zurich, that 99 per cent. of the human race who attain the age of 30 show, on postmortem, lesions of tuberculosis. From this it would seem that almost every one is infected with tuberculosis at some time or other. I wish to insist that one can not have tuberculosis without the tubercle bacilli. Osler maintains that there are only 20 cases on record of persons who have been born with the disease. Undoubtedly there is a predisposition in certain families to tuberculosis, the same as there is to scarlatina, diphtheria, and other infectious diseases. The one most certain method for the prevention of tuberculosis not only in children but in the community at large is to prevent the dissemination of the tubercle bacillus. This is a matter which rests largely in the hands of the medical profession and state boards of health. The State Board of Health of Michigan in 1891 began a campaign against tuberculosis by disseminating throughout the state literature dealing with this subject. Whenever a case of tuberculosis is reported to the local board of health, it is immediately sent to the secretary of the State Board of Health, and this officer sends literature to the family, explaining in detail the proper methods of caring for sputum. In this way, in the last ten years, the death-rate from pulmonary tuberculosis has been very materially reduced.

DR. C. A. KELSEY, Minneapolis—I have been exceedingly interested in this paper, and was very glad to see the position taken by the author regarding the necessity for fats. It is a point which we should bear in mind, for I think the majority of persons having children with a tendency to tubercular troubles seem to have the erroneous impression that these children must not have fat. In regard to the valuable remarks of the last speaker, I would say that, if I understand the germ theory, none of us can hope to escape these ubiquitous germs. I do not mean to say that I would discourage taking proper care of the sputa, but does it follow that the diminution in the mortality in the State of Michigan is due wholly to the care of the sputa? Can we not claim something for improved hygiene in fortifying the system against the attack of the germ. In tubercular wards, nurses of good constitution can remain constantly without becoming infected with tuberculosis. Let us not, however, lose sight of the importance of building up and fortifying the system against the attacks of these germs, developing a physical system in the rising generation which can withstand these noxious organisms.

DR. I. J. K. GOLDEN, Chicago—The main thing in the prevention of tuberculosis among children is to educate them not to be afraid of water. The parents of such children are usually afraid to have their children bathe lest they may catch cold. For the same reason these children are very warmly clad. I am of the opinion that this practice tends rather to favor than to prevent tuberculosis. Tuberculous children should be made to bathe daily, and if not too warmly clad they may not be so susceptible to tuberculosis. I am opposed to the present craze for woolen clothing. If they catch cold, no matter; let them develop a little antitoxin in the system. If laws were passed to prevent the marriage of tuberculous individuals or of those predisposed to this disease, I am afraid there would be nothing but bachelors, and the population of the world would soon vanish.

DR. ROBISON, in reply—I am glad that this subject has brought out such a full discussion, and that the paper has received your sanction on most of the points presented. Some of the states have already framed laws regarding the prevention of marriage of the unfit. Most of these laws have been directed towards preventing the marriage of those infected with venereal disease. In time, by the process of education, the people will learn to dread this disease. Within the last five years the newspapers have helped us to educate the public; yet even lawyers and judges and public men know almost nothing about tuberculosis. I think the subject of infectious diseases should be taught in the public schools just as much as botany is taught. Malnutrition is certainly the starting point of tuberculosis. The case of the woman who liked fats, mentioned by Dr. Scott, seems to me to be the exception which proves the rule. The giving of fat by aiding nutrition prevents the disease. Osler's statistics regarding the transmission of tuberculosis should not be taken as authoritative; for, in the first place, the observations have not extended over a sufficient length of time, and the opportunities for carrying on such investigations are very limited. If you will consult the records of the veterinary surgeons, you will find that the percentage of cases of direct transmission in animals is much larger than 2 per cent., and it is probably true also of the human. The Brompton Hospital for Consumptives has been in existence for two centuries and a half, yet it has been found that the disease is rarely taken by the nurses. In our general hospitals in this country I am sorry to say the internes and nurses do frequently develop tuberculosis. In a hospital in Chicago we have had three internes who have died of tuberculosis in one form or another, although it is quite possible that they may have had the disease before entering the hospital. I will say, however, that the methods of prevention in a general hospital are not so strict as in special hospitals. It is the custom, though obviously wrong, to use a broom in cleaning out the wards of our general hospitals.

TUBERCULOSIS OF ANIMALS IN SOME OF ITS RELATIONS TO HUMAN TUBERCULOSIS.*

D. E. SALMON, D.V.M.
WASHINGTON, D. C.

It is not necessary to consume time in demonstrating the importance of a thorough consideration, from every point of view, of the subject of tuberculosis. The importance of such a study is now generally recognized. As smallpox was the great medical problem at the close of the 18th century, so tuberculosis was the most urgent problem at the end of the 19th century. According to Newsholme,¹ smallpox reached its highest point in England in 1796, when 18.5 deaths out of every 100 total deaths were caused by that disease. Tuberculosis was apparently at its maximum in England and Wales

in 1838, when 17 deaths out of every 100 total deaths were caused by phthisis,² and if the deaths from other forms of tuberculosis could be added the maximum smallpox death-rate of 1796 would be surpassed. The death-rate from tuberculosis, and particularly from phthisis, has been greatly decreased in England and Wales since the date mentioned, but in 1896 the deaths from all forms of tuberculosis still equaled 10.5 out of every 100 total deaths.

At the beginning of the 20th century we find the mortality from smallpox insignificant compared with what it was at the beginning of the 19th century. In England and Wales in 1896 it was as low as 1.8 per million living. That is, there were only as many deaths from smallpox in 1896 among 2,000,000 people as there were among 1000 people in 1796. In other words, there was but one death in 1896 from smallpox where there were 2000 in 1796.

I have dwelt upon these facts with some detail because this tremendous reduction of the death-rate from one of the most serious diseases of mankind was accomplished by a study of one of the diseases of animals and the application of the knowledge thus obtained to human sanitation. This great advance in medical science and in the ability to prevent disease demonstrates the practical value of a knowledge of comparative pathology, and of a sincere effort to apply this knowledge in the formulation of measures for the control of the diseases of man.

Taking up the problem of tuberculosis, we find that the disease is caused by a bacillus so exacting in its conditions of growth that it can hardly be expected, in its virulent form, to multiply elsewhere than in the animal body or under the artificial environment supplied by the laboratory. The source of virulent tubercle bacilli is, therefore, either a person affected with tuberculosis, or one of the lower animals affected with that disease. When we consider the facts which have been demonstrated by the studies of comparative pathology, we can not but be impressed by the conclusion that there is a great culture ground and reservoir for tubercle bacilli outside of the human body, and existing principally in the bodies of the domesticated animals which supply some of the principal articles of human food. This well-known condition of affairs is, it seems to me, sufficient justification for a review of our knowledge of animal tuberculosis and the relation which it bears to the human form of the disease.

We must go abroad for most of the statistics of tuberculosis in animals, and while it is more frequent in European countries than here, we can learn from them as to the conditions which are likely to develop here as the animal population becomes more dense, and providing the spread of the infection remains practically unrestricted. The slaughter-house statistics of Prussia show 14.6 per cent. of the cattle and 2.14 per cent. of the swine to be tuberculous; in Saxony the percentage is 29.13 with cattle and 3.10 with swine; in the city of Leipzig the figures are 36.4 per cent. with cattle and 2.17 per cent. with swine (Siedamgrotzky). Of 20,850 animals in Belgium tested with tuberculin in 1896, 48.88 per cent. reacted (Stubbe). Of 25,439 tested in Denmark from 1893 to 1895, 49.3 per cent. reacted, and of 67,263 tested from 1896 to 1898, 32.8 per cent. reacted (Bang).

The British "Royal Commission appointed to inquire into the effect of food derived from tuberculous ani-

* Read at the Fifty-second Annual Meeting of the American Medical Association, in the Section on Hygiene and Sanitary Science, and approved for publication by the Executive Committee of the Section.

1. Vital Statistics, 3d Ed., p. 211.

2. Dr. Ransome, Lancet, July 11, 1896.