been devised and are now on sale. The destruction of the sputa of consumptives should be a routine measure in both hospital and private practice. Thorough boiling or putting it into the fire is sufficient. It should be explained to the patient that the only risk, practically, is from this source. The chances of infection are greater in young children. The nursing and care of consumptives involve very slight risks indeed if proper precautions are taken. The patient should occupy a single bed.

A second important general prophylactic measure relates to the inspection of dairies and slaughter-houses. The possibility of the transmission of tuberculosis by infected milk has been fully demonstrated, and in the interest of public health the state should take measures to stamp out tuberculosis in cattle. Systematic veterinary inspection of dairies, particularly in the large cities, should be made, and full power granted to confiscate and kill suspected animals. The abattoirs should be under skilled veterinary control, and the carcasses of animals with advanced tuberculosis confiscated. There is, however, much less danger of infection through meat than through milk.

(*b*) *Individual.*—A mother with pulmonary tuberculosis should not suckle her child. An infant born of tuberculous parents, or of a family in which consumption prevails, should be brought up with the greatest care and guarded most particularly against catarrhal affections of all kinds. Special attention should be given to the throat and nose, and on the first indication of mouth-breathing, or any obstruction of the naso-pharynx, a careful examination should be made for adenoid vegetations. The child should be clad in flannel and live in the open air as much as possible, avoiding close rooms. It is a good practice to sponge the throat and chest night and morning with cold water. Special attention should be paid to diet and to the mode of feeding. The meals should be at regular hours and the food plain and substantial. From the outset the child should be encouraged to drink freely of milk. Unfortunately, in these cases there seems to be an uncontrollable aversion to fats of all kinds. As the child grows older, systematically regulated exercise or a course of pulmonary gymnastics may be taken. In the choice of an occupation preference should be given to an out-of-door life. Families with a marked predisposition to tuberculosis should, if possible, reside in an equable climate. It would be best for a young man belonging to such a family to remove to Colorado or southern California, or to some other suitable climate, before trouble begins.

The trifling ailments of children should be carefully watched. In the convalescence from the fevers, which so frequently prove dangerous, the greatest caution should be exercised to prevent catching cold. Cod-liver oil, the syrup of iodide of iron, and arsenic may be given. As mentioned, care of the throat in these children is very important. When the tonsils are chronically enlarged they should be removed.

XIII. Treatment of Tuberculosis.

I. **The Natural or Spontaneous Cure.**—The spontaneous healing of local tuberculosis is an every-day affair. Many cases of adenitis and disease of the bone or of the joints terminate favorably without the aid of medicines. The healing of pulmonary tuberculosis is shown clinically by the recovery of patients in whose sputa elastic tissue and bacilli have been found; anatomically, by the presence of lesions in all stages of repair. In the granulation products and associated pneumonia a scar-tissue is formed, while the smaller caseous areas become impregnated with lime salts. To such conditions alone should the term healing be applied. When the fibroid change encapsulates but does not involve the entire tuberculous tissue, the tubercle may be termed involuted or quiescent, but is not destroyed. When cavities of any size have formed, healing, in the proper sense of the term, does not occur. I have yet to see a specimen which would indicate that a vomica had cicatrized. Cavities may be greatly reduced in size—indeed, an entire series of cavities may be so contracted by sclerosis of the tissue about them that an upper lobe, in which this process most frequently occurs, may be reduced to a third of its ordinary dimensions. Laennec understood thoroughly this natural process of cure in tuberculosis, and recognized the frequency with which old tuberculous lesions occurred in the lungs. He described *cicatrices complètes* and *cicatrices fistuleuses*, the latter being the shrunken cavities communicating with the bronchi; and suggested that, as tubercles growing in the glands, which are called scrofula, often heal, why should not the same take place in the lungs?

There is an old German axiom, "*Jedermann hat am Ende ein bischen Tuberculose*," a statement partly borne out by the statistics showing the proportion of cases in persons dying of all diseases in whom quiescent or tuberculous lesions are found in the lungs. We find at the apices the following conditions, which have been held to signify healed tuberculous processes: (1) Thickening of the pleura, usually at the posterior surface of the apex, with subadjacent induration for a distance of a few millimetres. This has, perhaps, no greater significance than the milky patch on the pericardium. (2) Puckered cicatrices at the apex, depressing the pleura, and on section showing a large pigmented, fibrous scar. The bronchioles in the neighborhood may be dilated, but there are neither tubercles nor cheesy masses. This may sometimes, but not always, indicate a healed tuberculous lesion. (3) Puckered cicatrices with cheesy or cretaceous nodules, and with scattered tubercles in the vicinity. (4) The *cicatrices fistuleuses* of Laennec, in which the fibroid puckering has reduced the size of one or more cavities which communicate directly with the bronchi.

In 1,000 autopsies, excluding the 216 cases dead of phthisis, there were 59 cases (7·5 per cent) which presented undoubted tuberculous lesions in

the lungs. I excluded the simple fibroid puckering and the solitary cheesy nodules, unless, in the latter case, there were colonies of tubercles in the vicinity. These 59 cases died of various diseases and at various ages. A majority of them were between forty and sixty. My experience tallies closely with the larger analysis made by Heitler of the Vienna post-mortem records, in which, of 16,562 cases in which the death was not directly caused by phthisis, there were 780 instances of obsolete tubercle—a percentage of 4·7. He excluded, as I have done, the simple fibroid induration. Various observations have been made of late in which the percentage ranges from twenty-seven (Bollinger) to thirty-nine (Massini). In 200 autopsies, in which this point was specially examined, Harris found 38·8 per cent in which there were relics of former active tuberculosis. The statement is made by Bouchard that, of the post-mortems at the Paris morgue—generally upon persons dying suddenly—the percentage found with some evidence of tuberculous lesion, active or obsolete, is as high as seventy-five. These figures show the extraordinary frequency of pulmonary infection and the encouraging fact that in so large a percentage the disease remains local and undergoes a process of arrest or healing.

II. General Measures.—There are three indications—first, to place the patient in surroundings most favorable for the maintenance of a maximum degree of nutrition; second, to take such measures as, in a local or general way, influence the tuberculous processes; third, to alleviate symptoms.

The question of environment is of first importance in the treatment of tuberculosis. It is illustrated in an interesting and practical way by an experiment of Trudeau, showing that inoculated rabbits, confined in a dark, damp place, rapidly succumb, while others, allowed to run wild, either recover or show slight lesions. It is the same in human tuberculosis. A patient confined to the house—particularly in the close, overheated, stuffy dwellings of the poor, or treated in a hospital ward—is in a position analogous to the rabbit confined to a hutch in the cellar; whereas a patient living in the fresh air and sunshine for the greater part of the day has chances comparable to those of the rabbit running wild.

In the majority of cases the treatment has to be carried out at home and often under adverse conditions. Still, much can be done if the patient is kept out of doors in the fresh air for the greater part of each day. In pulmonary tuberculosis *neither the cough, the fever, the night-sweats, nor the hæmoptysis contra-indicates this rule.* Only when the weather is blustering or rainy should the patient remain in the house. It is remarkable how quickly improvement in many instances follows this fresh-air treatment. In cities the patient can be wrapped up and placed on a sofa or in a reclining-chair on the balcony or even in the yard.

The climatic treatment of tuberculosis is simply a modification of this plan. The requirements of a suitable climate are a *pure atmosphere*, an *equable temperature* not subject to rapid variations, and a *maximum amount of sunshine.* Given these three factors, and it makes little difference *where* a patient goes so long as he lives an outdoor life.

The *purity* of the atmosphere is the first consideration, and it is this requirement that is met so well in the mountains and forests. Altitude is a secondary consideration. The rarefaction of the air in high altitudes is of benefit in increasing the respiratory movements in pulmonary disease, but brings about in time a condition of dilatation of the air-vesicles and a permanent increase in the size of the chest which is a marked disadvantage when such persons attempt subsequently to reside at the sea-level.

The temperature of the air is also a minor consideration, so long as it is tolerably equable and not subject to rapid variations. The winter climates of the Adirondacks, of Colorado, or of Davos have the advantage of a steady cold combined with sunshine, just as the resorts of the Southern States and California, and of the south of France and Italy, have a tolerably uniform high temperature with the maximum amount of sunshine. The dryness of the air is certainly an important though not an essential factor. That it is not essential is seen in the good results obtained in the resorts at the sea-level, such as Florida, or even Torquay or Falmouth, on the south coast of England—one of the most humid atmospheres in the world.

Other considerations which should influence the choice of a locality are good accommodations and good food. Very much is said concerning the choice of locality in the different stages of pulmonary tuberculosis, but when the disease is limited to an apex, in a man of fairly good personal and family history, the chances are that he may fight a winning battle if he lives out of doors in any climate, whether high, dry, and cold or low, moist, and warm. With bilateral disease and cavity formation there is but little hope of permanent cure, and the mild or warm climates are preferable.

Whether a patient should go from home or not is a grave question which the physician is called upon to decide. It is undoubtedly, in many instances, a positive hardship to send away a patient with tolerably advanced tuberculosis. With well-marked cavities, hectic fever, night-sweats, and emaciation he is better at home, and the physician should not be too much influenced by the importunities of the patient or his friends. Advanced cases and persons with feeble hearts should never be sent to high altitudes. Of American resorts I prefer the Adirondacks for early cases. The patient should go in October, so as to become gradually accustomed to the cold. It is accessible, the winter climate is admirable, and the camp-life delightful. As the reports of Saranac Sanitarium show, recent tuberculosis does remarkably well. Personally I have seen better results from the Adirondacks than from any other place. Colorado and southern California have this advantage for early cases—they are progressive, prosperous countries in which a man may find means of livelihood and live in comfort.*

* On the question of climate, Yeo's work may be consulted with advantage.

Under this section reference may be made to the question of the treatment of tuberculosis in sanitaria. The larger cities should build special institutions within easy access by railway, with pleasant surroundings, in which early cases of pulmonary tuberculosis among the poor could be systematically treated. Advanced cases should not be admitted, but should be cared for in separate wards of the city hospitals. Sanitaria for the care of recent pulmonary tuberculosis among the well-to-do classes are also urgently needed. The results obtained at Falkenstein near Frankfurt a. M. (which certainly has nothing special, as far as climate is concerned) and at the Saranac Sanitarium illustrate how much can be done by method and care.

III. **Measures which, by their Local or General Action, influence the Tuberculous Process.**—Under this heading we may consider the specific, the dietetic, and the general medicinal treatment of tuberculosis.

(*a*) *The Specific Treatment.*—A glycerin extract of the cultures of tubercle bacilli was found by Koch to have a specific action upon tuberculous tissue. The influence of this tuberculin, as it is called, is best seen in lupus, upon which it exercises an extraordinary effect, unique in the history of the action of remedies. An injection of one milligramme is followed, in a few hours, by intense constitutional and local reaction. The affected tissues swell enormously, and the adjacent parts are deeply congested. Crusts form upon the surface, the swelling and inflammation gradually subside, and after several injections the lupus masses gradually disappear and are replaced by a white cicatricial tissue. Even in advanced cases of long duration the action is, in a majority of cases, prompt and beneficial. There is a great difficulty, however, in getting rid of the final remnants of the lupus tissue, and a combination of scraping with the tuberculin will probably always be needed.

In internal tuberculosis the remedy, in very early cases, may, as shown by Koch's reports, prove actually curative; unfortunately, it was employed in all classes of cases. In pulmonary tuberculosis it is a remedy to be used with the greatest caution. Of twenty-three cases in which we have used it at the Johns Hopkins Hospital, only three were benefited; in the others the action was either negative or actually detrimental. It should not be employed in cases with fever or with much consolidation. In many cases it seems to aggravate the general and local symptoms.

We are at present in the reaction wave, after being buoyed up by hopes that at last a remedy had been obtained which was positively curative in all forms of tuberculous lesions. It will probably be several years before we can speak with decision upon the true position of this remedy. Meanwhile our knowledge warrants us in urging extreme caution in its use. The recent reports of Schede indicate that the remedy has a very positive value in tuberculous arthritis when combined with other measures.

(*b*) *Dietetic Treatment.*—The outlook in tuberculosis depends much upon the digestion. It is rare to see recovery in a case in which there is persistent gastric trouble, and the physician should ever bear in mind the fact that in this disease the *primæ viæ* control the position. The early nausea and loss of appetite in many cases of phthisis are serious obstacles. Many patients loathe food of all kinds. A change of air, or a sea voyage will promptly restore the appetite. When this is impossible, and if, as is almost always the case, fever is present, the patient should be placed at rest, kept in the open air nearly all day, and fed at stated intervals with small quantities either of milk, buttermilk, or koumyss, alternating if necessary with meat juice and egg albumen. Some cases which are disturbed by eggs and milk do well on koumyss. It may be necessary to resort to Débove's method of over-alimentation or forced feeding. The stomach is first washed out with cold water, and then, through the tube, a mixture is given containing a litre of milk, an egg, and one hundred grammes of very finely powdered meat. This is given three times a day. Sometimes the patients will take this mixture without the unpleasant necessity of the stomach-tube, in which case a smaller amount may be given. I can speak of the advantage of this plan in cases in which the gastric symptoms have been obstinate and distressing, and the general expression of opinion is, in such instances, very favorable to this plan of treatment.

In many cases the digestion is not at all disturbed and the patient can take an ordinary diet. It is remarkable how rapidly the appetite and digestion improve on the fresh-air treatment, even in cases which have to remain in the city. Care should be taken that the medicines do not disturb the stomach. Not infrequently the sweet syrups used in the cough mixtures, cod-liver oil, creasote, and the hypophosphites produce irritation, and by interfering with digestion do more harm than good. On the other hand, the bitter tonics, with acids, and the various malt preparations are often in these cases most satisfactory. The indications for alcohol in tuberculosis are enfeebled digestion with fever, a weak heart, and rapid pulse. A routine administration is not advisable, and there is no evidence that its persistent use promotes fibroid processes in the tuberculous areas. In the advanced stages, particularly when the temperature is low between eight and ten in the morning, whisky and milk, or whisky, egg, and milk may be given with great advantage. The red wines are also beneficial in moderate quantities.

(*c*) *General Medical Treatment.*—No medicinal agents have any special or peculiar action upon tuberculous processes. The influence which they exert is upon the general nutrition, increasing the physiological resistance and rendering the tissues less susceptible to invasion. The following are the most important remedies which seem to act in this manner:

Creasote, which may be administered in capsules, in increasing doses, beginning with one minim three times a day and, if well borne, increasing the dose to eight or ten minims. It may also be given in solution