

face of severe insect depredations, this modernized form of excellent forestry involving about a 60 to 70 percent cut based on tree class, beetle hazard and size selection is being practiced on some 20,000 acres a year involving a cut of some 175 million feet.

6. The Klamath Falls operation of the Weyerhaeuser Timber Company is conducting an interesting experiment in very light marking—13 percent or so—by a system called the sanitation-salvage system, on areas of high insect hazard. While this method differs in principle from the maturity selection system, it is a most appropriate and progressive procedure where there is a great threat of insect activity. By this method some 5 million feet of trees will be cut this year, well in advance of the main operation where there is a grave probability of there being serious bark beetle losses.

7. Another private operation merits special mention as an exponent of the new developments in pine silviculture—the J. Neils Lumber Company. On its Klickitat operation it adopted in 1939 in toto the maturity selection principle of cutting and is now harvesting annually about 30 to 35 million feet on a 50 percent cut. These are but a few

examples of the revolution in pine silviculture.

Thus, in these many logging operations in eastern Oregon and Washington on public and private lands two-thirds of a billion feet per year are being cut on a lighter basis than heretofore. This results in an area of perhaps 100,000 acres of cut-over land being left annually in a condition silviculturally superior to the land logged heretofore in the following particulars:

1. More of the productive forest capital is left standing and the non-productive is retired in logical order.
2. Each operating unit is more quickly converted from the stagnant to the growing condition.
3. The mean annual increment is larger.
4. Trees which otherwise might die and be a total loss are salvaged.
5. The hazard of bark beetles and wind is lessened and the danger of fire better controlled.
6. Forest conditions and the indirect benefits of forests are better conserved.
7. The entire working circle is more quickly put under management for protection and salvage.

Tuberculin Testing in High Schools: Its Educational and Preventive Value

S. L. Cox, M.D., Diagnostician

Washington Tuberculosis Association, Seattle

In recent years the tuberculin skin test has become an important factor in the campaign against tuberculosis. The test has been criticized, as a case-finding procedure, the claim being made that relatively few cases of active tuberculosis are discovered by this method. This is quite true, and if evaluated from the standpoint of case-finding alone, the tuberculin testing program would be very expensive and not nearly as effective as some other methods.

The value of the tuberculin testing program also depends greatly upon the type of community in which the work

is carried on. In congested city districts, or in other localities, where the percentage of positive reactors to the tuberculin test is more than one-third of the total number tested, it is generally conceded that mass x-raying of the entire group to be investigated is preferable to doing the preliminary tuberculin tests and then x-raying all the positive reactors. In smaller towns and rural communities, however, where the percentage of positive reactors to the skin test is around 15%, or lower, the procedure of doing the tests first, followed by chest films of the positive reactors, is still a feasible and effective

method, particularly from the educational and preventive standpoints.

If the tuberculin testing program is carried on primarily for its educational and preventive value, then the educational element in the program should, of course, be emphasized. Thorough preliminary work should be done in each high school a short time before the date for the actual testing itself. This preliminary program usually includes the following:

1. A general talk on tuberculosis before the student body by a trained tuberculosis worker.

2. Showing of one or more films that give dependable information concerning tuberculosis and its prevention.

3. Having each student fill out a brief questionnaire, giving information as to his past health record and also whether or not he has had any definite contact with tuberculosis.

4. Have each student take home a mimeographed sheet which explains briefly to the parents the purpose and value of the tuberculin test. This sheet has, at the bottom, a consent slip which the parent signs and this written consent of the parent is turned in at school by the pupil before the tests are given.

In doing the actual testing we do not place emphasis on mere speed in getting the tests done, but take time to answer any questions, brought up by the students, and also to explain different points as we go along. This is also supplemented by the giving of additional information when we read the tests. We now have a small mimeographed sheet—one for positive reactors and another for those who are negative to the test—giving a brief explanation concerning the reaction to the test, and one of these explanatory sheets is sent home to the parent in the case of every student tested.

Following the reading of the tests, which is done approximately forty-eight hours after the tests are given, the physician has a personal interview with each student who had a positive reaction to the test. This includes a chest examination, as well as a brief check-up of the general physical condition—teeth, throat, general nutrition,

etc. The main objective, however, in having the interview, is to explain to the individual student somewhat more in detail the significance of a positive reaction to the tuberculin test; urge these young people to follow good general health habits; advise them to have an x-ray film of the chest to be sure the lungs are approximately normal; and also stress the importance of re-examinations (including x-ray of the chest) at reasonable intervals in succeeding years. The School Nurse, or Public Health Nurse, also makes a home call wherever a boy or girl has had a positive reaction to the tuberculin test and gives information to parents in regard to the significance of a positive reaction. Those negative to the skin test, and this means about 85% of those tested in small towns and rural communities in the state of Washington, are advised to have the test repeated at least every other year until the individual is twenty years of age or older. This is on the assumption, of course, that the test has remained negative.

If a tuberculin-testing program is carried on along the general lines indicated above, we feel that it is a very valuable procedure, and one that should be of great help to this group of young people who in a few years will be heads of families and the homemakers in our various communities. These individuals should not only be able to apply this knowledge in the prevention of tuberculosis in their immediate families, but also be a source of dependable information concerning tuberculosis and its prevention for neighbors and others in the community.

The tuberculin-testing program, under consideration here, was started in the fall of 1931, so covers a period of approximately ten years. The great majority of the tests have been made with Old Tuberculin in the medium dilution of 1 to 1,000. Two strengths of P.P.D. have been used in a few localities and for a total of something over 1,500 tests. The tests, done with medium-strength Old Tuberculin (1 to 1,000 dilution), were made only once, not being repeated with a stronger di-

lution. We have felt that, from the educational standpoint, it is more effective to test say 10,000 students once than to test 6,000 with a weak solution and then have to re-test some 5,000 of the same people (about 85% negative reactors) over again. There is, of course, some element of error in doing the tests only once, and with a medium-strength solution, but an individual who actually has an active tuberculosis lesion should, in the great majority of cases, react positively to this medium-strength dilution of Old Tuberculin. It is taken for granted that the solution used in making the tests is freshly prepared, the full-strength tuberculin secured from a dependable source, the test carefully done, and accurately interpreted.

It should be very definitely and frankly stated that this single-dose method of doing the Mantoux tuberculin test is not as accurate and dependable as the two-dose method. In institutions such as colleges, universities, nurses' training schools, etc., where time and personnel are available for

the additional testing, the two-dose method is decidedly preferable and should be employed. It is also true that the incidence of clinical tuberculosis is somewhat greater among these young adults than in high school groups, so the testing of these older people should be as accurate as possible.

On the other hand, in the report of the Sub-Committee on Case-Finding Procedures in Tuberculosis*—of the American Public Health Association—this Committee states:

"In the meantime it should be noted that the great majority of all patients with clinically significant tuberculosis as defined above, react not only to all the well-known types of tuberculin, including both Purified Protein Derivative and the various well-known brands of Old Tuberculin, but to small doses of any of them."

There has been a slow, but definite, decline in the percentage of positive reactors during the past ten years. The results for different periods are as follows:

	Tests	Positive	Per cent positive
Sept., 1931 to April, 1935.....	17,191	2,356	13.7 %
May, 1935 to May, 1938.....	15,929	1,890	11.86%
June, 1938 to May, 1941.....	17,509	1,759	10.04%
Total	50,629	6,005	11.85%

It will be noted that the drop in percentage of positive reactors, from 1935 to 1938 was 1.84%, while the drop, from 1938 to 1941 was 1.82%.

It should be remembered that no city children are included in these groups. Tests in Seattle, Spokane and Tacoma have been done by tuberculosis organizations and local health authorities in those cities.

As a comparison, the results among younger children (junior high and lower grades) might be of interest. During the past ten years the following results have been noted:

Junior High and Lower Grade Pupils—

	Tests	Pcs.	% pos.
Sept., 1931 to April, 1935.....	8,026	867	10.8 %
May, 1935 to May, 1938.....	13,156	1065	8.09%
June, 1938 to May, 1941.....	15,967	889	5.56%
Total	37,149	2821	7.59%

also said he felt that every high school pupil should be examined for evidence of tuberculosis at least once during the pupil's high school course.

We have not had the necessary personnel to carry on a systematic follow-up, in later years, of these boys and girls who were positive to the tuberculin test while in high school. The cooperation of School Nurses, County Public Health Nurses, Health Officers and Family Physicians has been utilized as much as possible in getting periodic re-examinations for these young people. There has been a cer-

During the ten-year period a total of 4,497 college students were tested, with 874, or 19.43% positive. Teachers given the tuberculin test during the same ten years totalled 3,904, with 1,470 positive—37.65% of the number tested.

Comparison of these four different age groups shows very definitely the increase in percentage of positive reactors with increase in age of the group tested.

It is well known that the incidence of clinical tuberculosis among students of high school age is very small. Doctor Henry Chadwick † of Massachusetts reports the testing of 60,000 pupils in Middlesex County over a five year period. Positive reactors averaged 20%, or a total of approximately 12,000 positive to the skin test. Only one in 1,500 pupils tested were found to have active tuberculosis (40) cases. Crimm,** of Evansville, Indiana, tested 12,353 high school students over a period of eight years, using Old Tuberculin up to a dilution of 1 to 100. Of this group, 18% were positive to the tuberculin test, but only 0.1 of one per cent had active pulmonary tuberculosis. Doctor Chadwick stated that the tuberculin tests could be used most advantage-

ously, as a screening process, in schools and colleges where the percentage of positive reactors is less than 30%. He tain small percentage of cases, of course, that have broken down with active pulmonary tuberculosis, either while in High School or in succeeding years. Our general observation has been that the number of active cases, developing in this group, has been very small, and we also feel that the likelihood of a physical breakdown, because of active pulmonary tuberculosis, will be definitely lessened among these positive reactors as a result of the educational work carried on in connection with the tuberculin-testing program in the high schools. As indicated above, the home call, made by the Public Health Nurse, helps toward making clear to the parents the significance of a positive reaction to the tuberculin test, and usually enlists the co-operation of the parents in trying to keep these young people in good health.

The tuberculin skin test should never be considered primarily as a case-finding procedure, but its use should be supplemental to other well-established and more effective methods of case-finding. Considered from its educational and preventive aspects, we feel that the tuberculin-testing program among high school pupils and young adults, if properly presented, carefully done, and with as thorough follow-up as possible, is a procedure in tuberculosis control that is worthy of continuation and expansion.

References—

* From "A Manual of Tuberculosis Case-Finding", p. 24. National Tuberculosis Association, 1940.

† Chadwick, Henry. From Massachusetts Tuberculosis League Bulletin, December, 1940.

** Crimm, Paul D. Diseases of the Chest, 7, 378—November, 1941.