

# HOW TO KILL GERMS WITH VIOLET RAYS

WHAT is thought will develop into a valuable scientific discovery has just been announced by Dr. Frederick G. Keyes, a graduate student of Brown University, Providence, R. I., who has for some months been conducting experiments in sterilizing milk.

Dr. Keyes has hit on a method by which he claims all germs are removed from the fluid without affecting the taste of the milk. He uses the ultra-violet rays, and it is thought that the sterilization of the product will be entirely revolutionized by the scheme which when more fully developed and tested may lead to other more startling and valuable uses.

The researches were made in the Anatomical Laboratory of Brown University under the direction of Prof. F. P. Gorman, who has taken a great interest though not active part in the working out of the problem. It has been proved both to his satisfaction and the satisfaction of Dr. Keyes that the ultra-violet ray system is the best-known method for sterilizing milk, and that it will not destroy the taste as in the case of pasteurization.

In addition to leaving the taste, the rays kill forever every germ in the milk and leave it a food product which is absolutely pure.

The experiments have been conducted by Dr. Keyes with a quartz mercury vapor lamp, the largest and most powerful of its kind in the world. The idea of the lamp is much the same as the Cooper-Hewitt light, except that quartz is used instead of glass. This feature is a unique one, and is the basis upon which the experiments have been worked out.

In the case of the regulation mercury vapor lamps the ultra-violet rays are unable to penetrate the glass while they readily sift through the quartz. The lamp in the laboratory at Brown has a light giving power of 250 candles and it is so bright that a large and dirty piece of plate glass is put in front of it for protection to the eyes of the onlookers.

The lamp as far as can be seen by the casual observer is a very simple affair, consisting simply of the tube and the electrical connections. It was stated at the laboratory that there were even more interesting experiments going on in the same room where the violet ray tests have been made and which may give rise to discoveries fully as important as the action of the light on milk.

Dr. Keyes said it had been found that about ten seconds were required for the action of the rays on the fluid. It is proposed that when large quantities of milk are to be purified to arrange a machine which will allow the fluid to flow underneath the light. At present flat

## Dr. Frederick G. Keyes Tells of the Important Results of Experiments With Milk Made in the Laboratory of Brown University.

pans containing the milk are placed beneath the tube for a few seconds.

"I do not care to hold out promises which may not be fulfilled," said Dr. Keyes as he worked in the laboratory, "but my experiments have led me to believe that in the future the ultra-violet rays are to hold an important place in the scientific world. The study of diseases and their causes has shown that much of the suffering is due to the bacilli which flourish in food products, and it is generally recognized that the impurities in milk are responsible for a large proportion of some diseases.

"The pasteurization of milk has been followed by great improvement in conditions, but there is objection to the Pasteur treatment method, because it is claimed that the taste of the milk is changed. The effect of the ultra-violet rays on milk is different, and although it kills all the harmful germs the taste of the milk is not changed.

"So far as I have been able to determine the only noticeable change is that the milk in its new method loses its animate or 'cowy' odor, something that will

not, in my opinion, cause people to object."

Prof. Gorham, who has been heralded in some quarters as the discoverer of the new method for sterilization, disclaims having done else than assist Dr. Keyes in the experiments. In speaking of the matter he said:

"It will destroy the micro-organisms without doubt. That has been positively proved. But what chemical changes would take place in the milk we have not yet entirely determined. This is to be found out only by lengthy experiments. There may be such a change brought about by the using of the violet rays that the milk would not be suitable for use. It might develop a disagreeable smell or taste, which would render it impossible to use. These are matters yet to be determined.

"About a year ago Dr. Keyes devised an apparatus for utilizing the violet rays, the main feature of which was the making of a lamp of quartz instead of glass. The latter melts at a point far below that at which the quartz will fuse, the latter point being at 4,000 degrees Fahrenheit. The lamp was made for other work than

experimenting with milk, but at my suggestion Dr. Keyes took up milk, and has been working on it since.

"A larger lamp than we are using here has been made by Dr. Keyes for the Massachusetts Institute of Technology, and has been in use by that institution since last Summer. It is a well-known fact that the ultra-violet rays destroy micro-organisms, and have the same effect upon bacteria as heat in the process of pasteurization. Objections to pasteurized milk, however, have been raised because of the chemical changes in the milk produced by the heat, and we have now got to prove if any similar changes are involved by the use of the violet rays."

The most familiar of the ultra-violet rays is, of course, the X-ray, but the generic term for all these is the ultra-violet rays. These may be described roughly as a radiation proceeding from the interior of a glass bulb, the inner atmosphere of which has been reduced to very nearly the unattainable perfect vacuum, and through which a discharge of electricity is made. The discharge of electricity through the tube produces pale

rays that pass through solid substances without being refracted or reflected, and which, strangely enough, find one of their greatest obstacles in glass.

Dr. Keyes is a native of Rochester, N. Y., and early in life he evinced so great an interest in chemistry and science that when he was ten years old he decided to follow scientific studies. He entered the Rhode Island State College, and upon graduation in 1906 he entered Brown, where he has since studied and acted as instructor in chemistry. He has invented a number of instruments and vessels for use in the laboratory, one of the most important being a vacuum stopcock, which is especially useful in his new lamp for experimenting with the ultra-violet rays.

The heat produced in the lamp is estimated at about 4,000 degrees Fahrenheit and a peculiarity of the light is that its effect is softened when it is placed behind glass.

The intense heat which is generated in the tube may be realized when it is stated that the heat melted the glass tubes, thus requiring him to secure quartz, which has an expansion eighteen times less than glass and resists the heat of the rays.

Dr. Keyes has had more than one unusual experience since he began work with the ultra-violet rays, and any time that any of his friends wish to annex a coat of sunburn which will rival that which results from a month's stay at the seashore, all that is necessary to do is to go to the laboratory while the doctor is working before his lamp and sit within a few inches of the light. The result will be that in about two hours one will have been burned more than by the sun in a week. Dr. Keyes has been "ray-burned" half a dozen times in the past year.

The most peculiar feature of the rays was seen after one student who had been troubled with pimples on his face noticed that his complexion cleared and that the pimples had all disappeared. At first it was not realized that the rays were responsible, but other students being similarly affected and their complexions cleared, Dr. Keyes paid more attention to this phase of the matter with the result that he has given the "treatment" to a number of pupils and find that the cure is permanent. Even more severe eruptions have given way to the treatment, and the value of the rays to medicine seems important.

Some of those who have had an opportunity to see and realize what the rays have done agree with the view of Dr. Keyes that there is great possibility of important further discoveries in a scientific way regarding the light in the mysterious lamp over which the doctor now spends a considerable portion of his time.