MEDICINE

Air War Waged on Germs

Killing air-borne disease-carriers by means of humidity, ultraviolet rays and glycol mist is being investigated in an attempt to check illness.

By LYDIA SCHWEIGER

➤ THE AIR you breathe may guard you against colds, 'flu, pneumonia and the like in the future. Three methods of killing germs in the air are being investigated by scientists.

They are:

1. Humidifying the air 50%.
2. Destroying the germs with ultraviolet rays.
3. Drowning them in an invisible mist of glycol.

Recent experiments indicate that the prevention of nose, throat and lung diseases by "aerial warfare" has become more than just a hope. Scientists at the University of Chicago report that a relative humidity of 50% promises to become a weapon against influenza, pneumonia, strep. throats and perhaps other air-borne diseases.

Influenza virus loses almost four-fifths of its ability to attack when the relative humidity is 50%, Dr. William Lester, Jr., of the University's department of medicine finds.

Dr. Lester exposed white mice to influenza A virus atomized into the air the animals breathed. The amount of virus that killed 100% of the animals at relative humidities of 30% and 80% killed only 22.5% of the animals when the relative humidity was 50%.

May Affect Other Types

The other types of 'flu virus and the virus that causes virus pneumonia may be affected in the same way, though Dr. Lester's report to the JOURNAL OF EXPERIMENTAL MEDICINE does not cover studies on these other viruses.

The striking power, or infectivity, of the air-borne influenza A virus decreased so rapidly at a humidity of 50% that it was impossible, Dr. Lester reports, to get a 100% mortality rate in the mice even by greatly increasing the amount of virus.

Salt seems to play an important part in the anti-virus and anti-germ effect of humidity. At 50% humidity all the mice died when exposed to virus free of salt.

These findings resemble closely those reported last winter by Edward W. Dunklin and Dr. Theodore T. Puck of the University. They discovered that a 50% relative humidity is rapidly fatal to Type I pneumonia germs, staphylococci and streptococci, although viruses were not included in their experiments.

The discovery that humidity kills germs may explain why such diseases spread rapidly at some seasons and not at others. It might give scientific evidence for the phrase, "pneumonia weather," used by our grandmothers.

They suggest using humidity in schools, offices, theaters and the like, to check the spread of disease.

The humidifying would have to be done exactly. A 50% relative humidity is rapidly lethal to the germs studied but they can survive a long time at higher and lower relative humidities.

At 50% relative humidity the pneumonia germs the scientists sprayed into an experimental air chamber were all dead in less than 10 minutes. But at relative humidities of 80% and 20% many germs survived for over two hours.

Humidity Not Uncomfortable

The 50% relative humidity that is deadly to germs would not be uncomfortable for humans indoors. Climatologists have found that whether the air is wet, dry or humid makes very little difference in comfort so long as the temperature ranges between 50 and 68 degrees Fahrenheit. That upper temperature level and the approximately 72 degrees Fahrenheit temperature of the studies with germs are fairly close to each other and to the usual indoor temperatures. Temperatures in the fifties and nineties make a difference in the germ-killing effect of humidity.

The 50% relative humidity kills the germs by dehydrating them to the point where they become most vulnerable to the action of sodium chloride, the ordinary salt we use for seasoning food. When the germs were suspended in distilled water, instead of broth, and then sprayed into the air, they did not die as fast at 50% relative humidity. But when sprayed from a salt solution, or from human saliva, which is the natural way they get into the air, they were rapidly killed, just as when sprayed from broth.

Measurement of the rate of settling of droplets showed that the disappearance of the germs from the air at 50% relative humidity was a true killing process and not a sign of collision of germs with the sides of the air chamber or with each other.

Air disinfection is another promising aid in checking epidemics of colds and influenza. Two methods that have been given extensive trial tests are sterilization with ultraviolet rays and glycol vaporization of air. Both of these methods do kill germs in the air and both have given remarkable results in various trials of their ability to stop or reduce the spread of air-borne disease.

Germ-killing ultraviolet light has for some time been used to check the spread of disease in hospital wards and school rooms and to cleanse the air about the patient in operating rooms. During the war, tests in military barracks in which ultraviolet irradiation of dormitories was done, resulted in a reduction in respiratory illness.

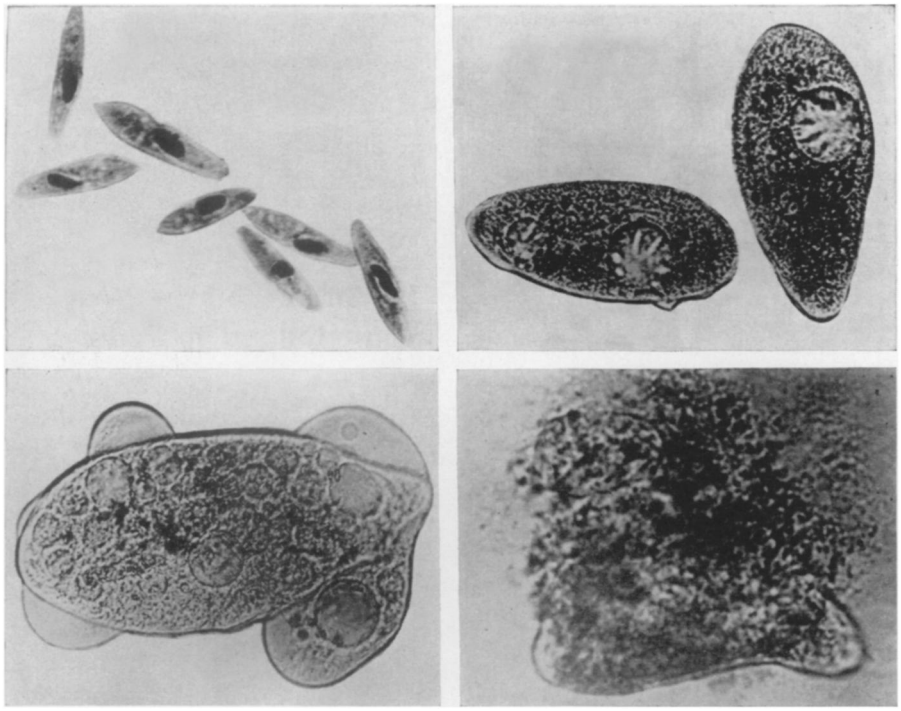
Lamps on Market

A number of sources of this ultraviolet energy, known as bactericidal lamps, are commercially available. Used in conjunction with air-conditioning units or ventilating systems, it purifies the air before it is circulated through the living quarters. The ultraviolet has no effect on the air itself, except for the production of traces of ozone, and is not absorbed by the air through which it passes.

There are several precautions which must be taken, according to public health officials. Because of the danger from over-exposure to ultraviolet light, installations must be made with care, in order to protect the body and the eyes. In addition, the ozone produced by the burning lamps might also be a danger if the air becomes stagnant.

The other scientific weapon, glycol sterilization of the air, has conclusively been proven effective in reducing the number of

KEEPING THE HOME GERM-FREE—Installed in a home's forced air-heating system, the Sterilamp pours out a barrage of bacteria-killing rays that purify the air.



LIGHT RAYS BRING EXPLOSIVE DEATH—Ultraviolet rays kill a microorganism by creating an internal explosion which burst the outer skin. In the upper left, are normal paramecia. After 30 seconds of exposure to a Westinghouse Sterilamp, they become distended, in the upper right. Cell walls continue to swell in the lower left, and the paramecium dies when its skin bursts, lower right.

bacteria in the air. However, no positive statement can yet be made concerning the effectiveness of glycol vapor in lowering the incidence of respiratory diseases.

The JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION (Oct. 2, 1948), in answer to the query of a physician, carried the following statement: "The use of triethylene glycol as a preventive for colds and virus infections is still highly experimental. We lack satisfactory evidence that under the conditions of use which would be practicable in a home, office or factory any significant diminution in the incidence of viral infections can be obtained."

Glycol vapor is sprayed into the air in a mist so fine it cannot be seen. It kills the germs floating on tiny droplets of moisture that may be coughed, sneezed or exhaled by the infected person because its molecules have an attraction for water. They penetrate the moist bacteria and overwhelm them with their chemical concentration. However, glycols are ineffective at humidities below 20% or above 80%.

This invisible, odorless and non-irritating chemical, called triethylene glycol, is a relative of the automobile and airplane engine antifreezes. The method of its use was developed by Dr. O. H. Robertson and associates of the University of Chicago.

Buildings with air-conditioning or ventilating systems can be equipped for glycol vaporization at small cost. Home atomizers are being manufactured that may prove effective in smaller quarters. Several chemical and pharmaceutical companies have installed this apparatus to maintain a sterile atmosphere.

At present, there are many technical problems which complicate the use of this method, such as regulating the humidity, taking bacterial counts to make certain the glycol has been applied properly, and use of dust control measures, for glycol has little effect against dust-borne bacteria.

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GENETICS

Photograph Apparent Genes With Electron Microscope

➤ GENES, which have become virtually an international issue since a recent Soviet ukase declared they don't exist, have apparently had their photographs taken with the aid of the super-magnifying electron microscope. The pictures appear in SCIENCE (Jan. 7), together with an explanatory article by the men who took them, Drs. Daniel C. Pease and Richard F. Baker of the University of Southern California.

They made sections less than one-twenty-five-thousandth of an inch thick of glands taken from the tiny heads of the gnat-sized little fruit-fly, the geneticist's special pet. On these they turned the searching electron beams, that show up in photographs details far beyond the reach of the highest powers of ordinary microscopes.

The photographs disclosed the presence, within the chromosomes, of small, fairly even-sized bits of matter, occupying positions that previous theoretical considerations, backed by mathematical calculations, indicated should be the positions of the genes, the hitherto invisible physico-chemical units that control heredity in plants and animals.

"It seems reasonable to suppose," state the two researchers, "that the discrete particles we have seen are genes."

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CHEMISTRY

New Soap Substitutes Can Help Fight Germs

➤NEW SOAP substitutes which kill germs as well as remove dirt were described to a local meeting of the American Chemical Society in Philadelphia.

A teaspoonful of the new detergents will produce a gallon of suds and match the germ-killing strength of a pound of carbolic acid. Uses can range from cleaning and sterilizing surgical instruments to washing household utensils.

Prof. J. B. Niederl of New York University and Prof. M. E. McGreal of St. John's University explained that the new "multi-cleanser" soap substitutes are called morpholinium alkyl sulfates. The new detergents are made entirely of organic chemicals and do not leave the caustic, slippery feeling on the skin that soap does, the chemists pointed out.

One out of every four or five pounds of cleansers bought for household use last year was a synthetic detergent, Drs. Arthur B. Hersberger and C. P. Neidig of the Atlantic Refining Company of Philadelphia reported at the meeting. This compares with only two percent for the synthetics in 1945 and less than 10% in 1946, they said.

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