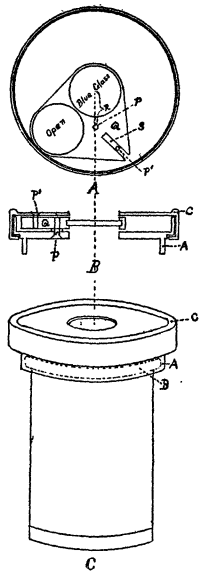
annoying place to get at when throwing the filter on or off frequently, especially if substage lights are used. Breakage and loss is also frequent with filters in this position.

In finer cytological work, where the advantages of contrast of normal illumination with that of the shorter wave filters is appreciable, the rapid shifting of substage filters is very inconvenient. The writer has therefore been using a fixture which introduces the filter at the exit pupil where it can be rapidly and conveniently thrown on or off. This filter is so closely apposed to the eyepiece that the cutting down of eye distance is not appreciable. The fixture also adequately protects the filter from dust, scratches and breakage. It consists of a fixed cap that fits over the eyepiece. To the upper surface of this piece a movable quadrant is attached in which the filter aperture and an open aperture is contained. Either of these apertures can be shifted in place over the lens by simply swinging the quadrant to the right or left on its axis. This is accomplished by means of a movable cap that fits over the fixed part and from which a pin fits into a slot on the quadrant. Any movement of the cap to the right or left will therefore throw the quadrant and its apertures in the opposite direction.

From the diagram it will be seen that this device consists of a machined support block (A) which carries a lip that engages the knurled rim (B) of the eyepiece with a firm push fit. The quadrant (Q) which carries the filter glass rotates freely about the bearing pin (P), which is fixed to the support block. Another machined piece (C) (the movable block) fits concentrically over the fixed block in such a way that (C) can be rotated freely about it with the fingers. The quadrant is slotted at (S) to engage a second pin (P′) fixed to the movable block.



A. Top view with movable cap removed. B. Sectional view. C. Eyepiece with fixture in position.

In the position shown in the plan view the glass filter has been swung into position by simply turning the movable piece (C) to the right. The limit of this motion is reached when the left hand edge of the quadrant abuts against the lip of the fixed block (A), as shown. The radius (R) is such as to swing the filter into correct axial relationship with the eyepiece.

When the filter is not needed the movable piece is turned to the left This carries the quadrant to the right rotating about the fixed pin (P) and impelled by the movable pin (P′). The other edge of the quadrant now abuts against the rim of the block, swinging the "open" part of the quadrant into its correct position.

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SPECIAL ARTICLES

CONTROL OF POWDERY MILDEW AND RED SPIDER ON GREENHOUSE CUCUMBERS[1]

DUSTING greenhouse cucumbers with a high grade sulphur dust is the common method of combating powdery mildew, *Erysiphe cichoracearum*. Such dusts, while generally effective, occasionally fail. In an attempt to find a more efficient method of controlling the disease, cucumber vines in a commercial greenhouse were sprayed with hydrophilic colloidal sulphur, a product recently manufactured by the Ansul Chemical Company. This product is prepared in paste form and is a true hydrophilic colloid.

[1] Published with the approval of the director of the Ohio Agricultural Experiment Station.

Preliminary sprays were applied before mildew made its appearance. These were made to determine the strength of sulphur spray which greenhouse cucumber vines would tolerate and what effect hydrophilic colloidal sulphur would have on the control of red spider, *Tetranychus telarius*.

The following sprays were applied March 23, 1931: 5 pounds of the colloidal sulphur to 100 gallons of water and 10 to 100 with and without 0.5 per cent. Penetrol.

An examination of the vines several days later showed that all sprays gave a perfect kill of spider. The 5 to 100 sulphur sprays caused slight leaf injury and the 10 to 100, rather severe leaf injury. Both

sprays with Penetrol as a spreader caused severe leaf injury.

Following this first attempt it seemed advisable to try a series of sprays with less colloidal sulphur. Four strengths were used: 0.5, 1.0, 2.0, and 4.0 pounds. Four applications of these sprays were made on the following dates: April 11, 20, 27 and May 4. These sprays had no harmful effect on the plants. The 4–100 and 2–100 gave excellent commercial control of spider. Less satisfactory results were obtained with the 1–100 and the 0.5–100 gave very little control. By this time mildew had made its appearance and the plants sprayed with a 1–100 spray or stronger were free of the disease.

On May 4 the manager of the greenhouse became interested and wanted to try some of the colloidal sulphur spray. Accordingly, a complete house, the one with the most severe infestation of red spider, was sprayed using 1.5 pounds of the colloidal sulphur to 100 gallons of water. This spray was very effective and in a week was followed by another using 1.75 pounds of sulphur to 100 gallons of water. No injury resulted and four more sprays were applied at weekly intervals using a 2–100 spray.

After the second and third sprays spiders were scarce and mildew was almost absent. In the adjoining houses spiders were serious and mildew quite prevalent. This one season's experience indicates that red spider and powdery mildew on greenhouse cucumbers can be successfully controlled with hydrophilic colloidal sulphur spray. The strength of spray suggested for greenhouse cucumbers is 2 pounds of the sulphur paste to 100 gallons of water. This gave excellent control and has a wide margin of safety.

This is not the first use of hydrophilic colloidal sulphur spray as an acaricide. DeOng,[2] 1924, found it to be very effective against the red spider *Bryobia pratiosa*. He prepared his sulphur in the laboratory according to Young.[3] His results showed excellent control but he concludes hydrophilic colloidal sulphur would not replace lime sulphur, at least until a cheap method of manufacturing it was devised. The strength of sulphur suggested will cost about the same as lime sulphur and considerably less than nicotine sulphate.

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[2] E. R. DeOng, "The preparation and use of colloidal sulphur as a control for red spider," *Jour. Econ. Ent.* 17: 533–538, 1924.

[3] H. C. Young, "The toxic property of sulphur," *Ann. Mo. Bot. Gard.* 9: 403–435, 1922.

PHAGOCYTOSIS OF BRUCELLA, AN INDEX OF IMMUNITY TO UNDULANT FEVER IN MAN

STUDIES of the phagocytic activity of the polymorphonuclear cells in the blood of man toward the genus *Brucella* have revealed an important relation between this phenomenon and susceptibility and immunity toward undulant fever.

It has been found that the cells of individuals who have never knowingly been in contact with *Brucella* infective materials or who have not had undulant fever, possess little if any phagocytic activity for the organism when mixed with it *in vitro*. The polymorphonuclear cells of those who have handled infective materials, such as cultures or infective tissues, and of those who have recovered from undulant fever have marked phagocytic activity. It has been found from the study of many such cases that from 80 to 100 per cent. of these particular cells will ingest *Brucella* to a marked degree.

During the course of the infection in man the phagocytic activity of the cells will vary. As a rule only slight, if any, phagocytosis will be seen. As recovery takes place, the phagocytic activity of the cells increases rapidly.

There appears to be no relationship between the agglutination titer of the serum and the phagocytic activity of the cells in the same individual. Phagocytosis may be negative when the serum shows a titer of 1 to 2,000, or 100 per cent. of the cells may show a marked phagocytosis when serum agglutinins cannot be demonstrated in a dilution of 1 to 25 or higher.

The phagocytic activity of the polymorphonuclear cells in individuals who have recovered from undulant fever appears to persist for a considerable period of time. These cells of one individual three years after recovery and several one year after recovery show a phagocytosis of 100 per cent.

The technic which we are using in this study is as follows: Blood is collected and mixed with sterile, two per cent. sodium citrate physiological salt solution. The blood cell suspension is added to a suspension of a strain of *Brucella* (turbidity 3 McFarland nephelometer) in the proportion of 1 to 1 and mixed well. The mixture is then placed in a 37° C. incubator for 30 minutes. At the end of this period, the cells are smeared on slides and stained with Hastings blood stain. On microscopic examination, 50 to 100 polymorphonuclear cells are examined. The cells are grouped according to whether they show a marked, moderate, slight or no ingestion of the bacteria.