cement is still hot. On cooling, the cement may become hard. This indicates an insufficiency of xylol, and it is then necessary to reheat the mixture and add more xylol. When cool the glue should have the consistency of molasses.

In applying the glue a small camel's hair brush is used. The consistency of the glue allows plenty of time to apply it smoothly and in the exact amount required.

Copal glue thus prepared is not sufficiently tenacious to hold pieces together when strong forces are exerted which tend to separate the pieces. Consequently it can not be used for the original type of chamber described by Sandison, which was glued together before insertion into the ear. But it is tenacious enough to hold together either the tops or the bottoms of the newer types of chamber, since the forces exerted are such as to press the glued portions closer together, while the forces which act so as to separate the top from the bottom are resisted by nuts and bolts.

When parts of the transparent chambers have been cemented in the manner described recently (Clark *et al.*, '30) it is necessary for them to stand for at least 24 hours—preferably longer—before insertion in the rabbit's ear, on account of the susceptibility to irritation on the part of living tissues toward a trace of free xylol.

Although up to the present time this glue has been used only for the purpose for which it was invented, its qualities should prove useful in sealing total mounts, especially of specimens cleared in oil of wintergreen.

Thanks are due to Dr. S. E. Pond for information regarding types of glues, to Dr. O. V. Batson, who suggested the use of copal, and to Dr. E. R. Clark, at whose instigation the studies were made.

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CELLOPHANE COVERS FOR PETRI DISHES FOR KEEPING OUT CONTAMINATIONS AND STUDYING THE EFFECTS OF ULTRA-VIOLET LIGHT

ORDINARY petri dishes, with loosely fitting glass covers, are not altogether satisfactory for use in research on pure cultures of certain organisms, particularly fungi, because of the difficulty of preventing contaminations. By means of a simple technique covers of cellophane may be applied, making it possible to keep the cultures almost indefinitely without danger of contamination. Furthermore, they may be examined as often as desired under the low power of a microscope, without exposing them to contamination, for the flexibility of the cellophane makes it possible to bring the objective close to the organism.

In addition to maintaining the purity of cultures, cellophane offers a tremendous advantage in the investigation of the effects of ultra-violet light on various organisms in pure culture. Ordinary glass covers transmit hardly any of the ultra-violet spectrum, and the best of the special ultra-violet transmitting glasses are impenetrable to the very short wave-lengths. Cellophane, on the other hand, is nearly as transparent to the extreme ultra-violet as air, and as it is only .025 to .03 mm thick, the percentage transmission, as compared to air, must be close to 100. Cultures may thus be irradiated by any wave-length of ultra-violet, from the shortest to the longest, over any length of time and for any duration of exposure, by placing an appropriate filter on the cellophane cover, without exposing the culture to contamination. In some experiments, now almost complete, conducted on several species of fungi, some very interesting results were obtained by means of this procedure. It is a distinct improvement over former methods, in which the glass cover of the petri dish was removed in order to study the effect of the extreme ultra-violets.

The application of the cellophane covers is quite simple and not time consuming. The percentage of contaminated cultures, after a period of a month, was reduced from about 20 per cent. to 0.5 per cent. by applying cellophane covers according to the following method. Some of the cultures were carried around in the pockets of my coat for several days without subsequent contamination.

The cellophane is cut into square sheets, about 6 by 6 inches, and sterilized by placing in 60 per cent. alcohol in a flat glass dish for half an hour. The cultures are inoculated in the usual manner. It is necessary to exercise some care in transferring the cellophane onto the petri dish. Best results are obtained by placing the petri dish culture next to the dish containing the cellophane saturated with alcohol, lifting the top of the petri dish with the thumb and forefingers and then drawing a sheet of cellophane across the top of the bottom part of the petri dish with the third and fourth fingers, thus avoiding at any time exposing the culture to any bacteria or spores that might otherwise fall into it. The glass cover can now be replaced to press down the cellophane, and then removed again and a rubber band applied to hold the cellophane around the sides. If this is done carefully, no alcohol will get into the medium, and in a few minutes it will evaporate out of the cellophane, leaving it perfectly dry, transparent and tightly stretched across the top of the dish. If the culture is to be kept for any length of time,

it is necessary to replace the glass cover of the petri dish to keep the medium from drying up. It may be removed, however, as often as desired, in order to examine the culture with a microscope, or irradiate it with ultra-violet light. Cultures can be conveniently labeled with india ink directly on the cellophane.

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SPECIAL ARTICLES

THE EFFECTS OF BREED ON GROWTH OF THE EMBRYO IN FOWLS AND RABBITS

T. C. BYERLY[1] has recently made an important study of the weight of chick embryos in two different breeds of domestic fowls and in their reciprocal hybrids. He reaches the conclusion that breed does not affect the size of the embryo except as it affects the size of the egg previous to incubation. This is contrary to the conclusion reached by Painter[2] and by Castle and Gregory[3] in the case of the rabbit, which leads Byerly to question the correctness of the rabbit findings.

In the rabbit studies it had been found that the size of the egg at the time of fertilization is no greater in Flemish Giant rabbits than it is in Polish (a very small breed), but that the average birth weight of a Flemish Giant is nearly double that of a Polish. It is obvious accordingly that Flemish embryos increase in weight faster than Polish embryos prior to birth, as they are well known to do subsequently. Since there is no discoverable difference in cell size between Flemish and Polish rabbit embryos (Painter), it is clear that the former must contain *more* cells, and this means that cell multiplication must proceed more rapidly in the development of Flemish than in that of Polish rabbits. Castle and Gregory have found such a difference in evidence as early as 48 hours after mating. Byerly questions the adequacy of the data submitted in support of this conclusion. To this criticism we offer no objection at this time because we have made additional observations, which will be presented in a paper[4] now in press, showing that the difference in number of blastomeres and in mitoses is clearly present at still earlier stages, *viz.*, 40 and 41 hours after mating.

The case of the chick embryo is more difficult because the size attained by the embryo at the time of hatching, which corresponds roughly with the birth weight of the rabbit, is strictly limited by the weight of the egg prior to incubation. A large chick can not hatch from a small egg. Nevertheless, it is possible to derive from Byerly's observations clear indications as to whether breed (*i.e.*, genetic constitution), does or does not influence embryo size prior to hatching, while there is still an unexhausted supply of nourishment for the embryo to draw upon.

The two breeds studied by Byerly in pure matings and in reciprocal cross matings were White Leghorn and Rhode Island Red, which for brevity we may call the White and the Red breeds, respectively. Red hens average about one third larger than White, or as 100:138 in mean body weight. The mean egg weight of the Red breed was also slightly greater, 60.5 grams as compared with 58.4 grams, the mean egg weight of the Whites. Whether the energy content of the Red egg is greater is unknown, as the relative weight of shell and relative size and composition of the yolk are unknown. Byerly directs his attention chiefly to a comparison of the weight of the embryo when removed from the yolk in White as compared with Red eggs throughout the incubation period. It appears from his observations that the blastoderm of the egg, when removed from the yolk, prior to incubation is heavier in the White breed than in the Red. For the White breed, the mean weight is 0.0030 grams; for Reds, 0.0028 grams. Whether the difference is due to a larger amount of formed cellular material[5] or to a larger amount of adhering yolk is unknown, but whatever its nature, the difference persists throughout the first nine days of incubation, in which the embryos taken from White eggs are slightly heavier than those taken from Red eggs. Subsequently, *i.e.*, from the 10th to the 19th days of incubation, the Red embryos are heavier. This is shown both in Byerly's Table 1 summarizing his more numerous observations and in his Table 3 summarizing the data obtained under specially controlled conditions, "from hens of the same age and receiving the same diet, from eggs of the same weight and incubated in the same incubator at the same time."

Nevertheless the hatching weight of chicks in the two breeds is substantially the same, which points to total egg size as a factor limiting the size of the chick prior to the time that it begins to receive nourishment from other sources.

The more rapid growth of Red embryos, after the initial handicap of a smaller blastoderm had been overcome, and before total egg size had entered as a limiting factor just prior to hatching, is completely

[1] *Jour. Morphol. and Physiol.*, 50, December, 1930.
[2] *Jour. Exp. Zool.*, 50, 1928.
[3] *Jour. Morphol. and Physiol.*, 48, September, 1929.
[4] *Jour. Exp. Zool.*, 59, April, 1931.

[5] Possibly in the White breed cell increase in the blastoderm proceeds farther than in the Red breed before coming to a standstill previous to incubation. If so, we can understand why this initial advantage persists for several days before the more rapid growth rate of the Red breed overtakes it.