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Molds and Bacteria in House Dust and Furniture Stuffing

Mary Ann Swaebly

MOLDS AND BACTERIA IN HOUSE DUST AND FURNITURE STUFFING[1]

MARY ANN SWAEBLY

University of Minnesota, St. Paul

At the present time pollens are considered as the primary excitants of respiratory allergy. Fungi are next in importance. To date bacteria have not been extensively studied in this regard.

Since the discovery of the allergenic nature of house dust by Cooke in 1922 and the authenticated reports of clinical cases of mold allergy by VanLeewon and Cadham in 1924, numerous sporadic attempts have been made to correlate the two. Some clinical data seem to substantiate the theory that molds in house dust and furniture stuffing are responsible for the allergenic nature of these items, but controlled experiments have given conflicting evidence. These inconclusive results may be due, at least in part, to the lack of thorough quantitative studies of house dust and furniture stuffing for fungal content. It is also possible that bacteria present in these materials may be partly responsible for their allergenic properties. This work aimed to study these items from several sources to determine their culturable micro-flora.

The 76 house dust samples tested were collected from vacuum sweepers from homes in the Twin Cities area. Mold and bacterial counts were obtained by standard assay methods using the dilution technic. Malt-salt agar was used as a medium for the molds, while beef-peptone agar was used for the bacteria.

The mold count ranged from 6,000 to 3,200,000 per gram, the average being 179,966 and the majority of samples containing between 10,000 to 100,000 molds per gram. The organisms most commonly encountered in the assays were species of Penicillium and Aspergillus, with Rhizopus and Mucor occuring in fairly large numbers in some of the samples.

Fourteen of these samples were assayed for bacteria and the bacterial counts ranged from 1,144,000 to 20,000,000 per gram, the average being 10,700,000. Figures 1 and 2 show the variation in numbers and kinds of fungi and bacteria that occurred in assays of two representative samples of house dust.

New furniture stuffing materials, including cotton, kapok and foam rubber were obtained from furniture manufacturers and supply houses in the Twin Cities. Assays of these materials showed that in general, these materials contained fewer micro-organisms than house dust, but they are by no means free of molds and bacteria. Of the new stuffing materials tested, cotton contained the most molds and foam rubber the least, the range being from 11,000 molds per gram incotton to 1,000 in foam rubber. The bacterial count in new stuffing ranged from over ten million bacteria per gram in cotton to almost zero in the foam rubber.

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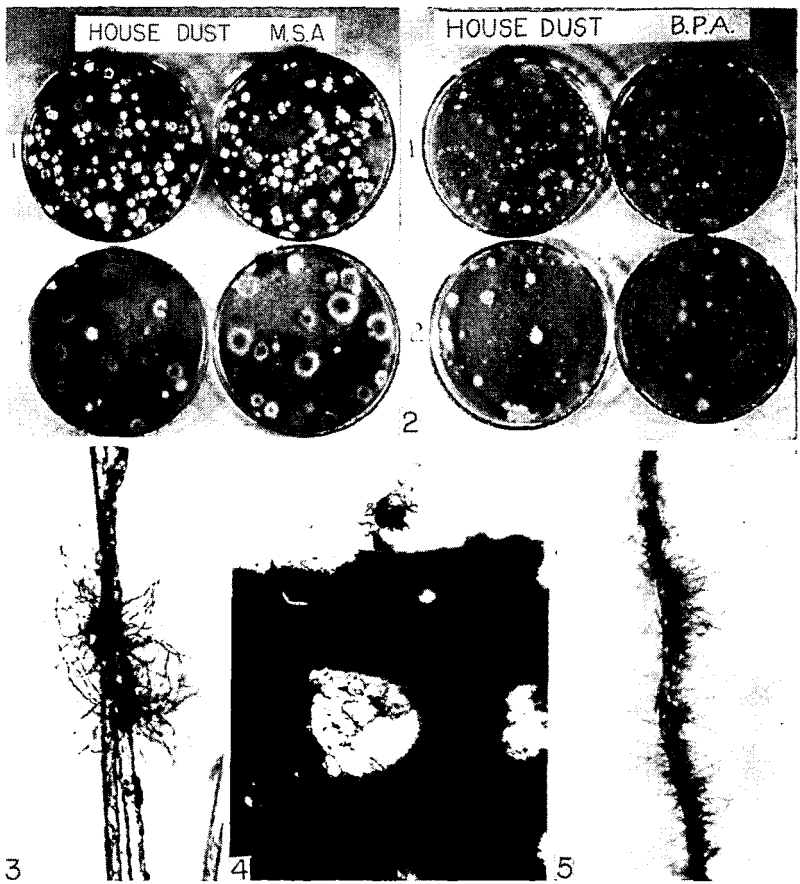

EXPLANATION OF FIGURES

Fig. 1. Assay plates from two samples of house dust showing the variety in numbers and kinds of fungi developing on malt-sugar agar. Fig. 2. Assay plates from two samples of house dust showing some of the bacteria obtained on beef-peptone agar. Fig. 3. Fungus mycelium developing on and in kapok fibers. Fig. 4. Mycelium growing on and in the air spaces of foam rubber. Fig. 5. Mycelium developing on a cotton fiber.

The question has been raised as to whether the fungi obtained in these assays of furniture stuffing are accidental contaminants from the air, or whether they could actually be growing on the material. Pieces of the stuffing materials were incubated in moist chambers for a few weeks. Microscopic examination revealed that mycelium was developing directly on the cotton and kapok fibers, and on the surface and in the air spaces of the foam rubber. This is shown in figures 3, 4, and 5. Some of

this mycelium eventually fruited, and Aspergillus and Penicillium sporophores on the material could be observed with the naked eye.

Assays of approximately 30 samples of used furniture stuffing obtained from furniture repair shops in Minneapolis and St. Paul gave mold counts from 150 to almost 115 thousand molds per gram, and in the samples tested to date for bacteria the counts ranged from 17 thousand to a little over a billion bacteria per gram.

The fungal flora of a foam rubber cushion changed both quantitatively and qualitatively with several months use. The moisture content of the cushion also increased 3% in the three months which may account, at least in part, for the change in micro-flora.

As in house dust, the fungi most commonly cultured from new and used furniture stuffing were species of Penicillium and Aspergillus, except in some of the cotton samples where Fusarium predominated. These same fungi are most common in the air within the home while Alternaria and Cladosporium predominate in the outside air during the heavy mold months from May to November. Aspergillus and Penicillium are present in limited numbers in the outside air the year around.

The identification of the bacteria commonly encountered in these materials is now in progress. Many of the bacteria isolated from these materials appear to be those common in soil and plant debris.

THE FLORA OF THE CEDAR CREEK FOREST AREA

JOHN W. MOORE, *University of Minnesota, Minneapolis*

The present study brings up to date our knowledge of the vascular plants of the Cedar Creek Forest area, especially as these are represented in the Herbarium of the University of Minnesota.

The Cedar Creek Forest is located 30 miles north of Minneapolis about one and one-half miles east of Cooper's Corner,[1] Anoka County, Minnesota. A general discussion of the development of the area has recently been given by Wilcox (1950).

The Cedar Creek Forest area falls within the Anoka Sand Plain which was formed during the last stages of the Late Wisconsin Glaciation (Cooper, 1935). This glacier retreated perhaps 10,000 to 20,000 years ago; since that time the topography has changed but little. Upon the denuded, sandy surface a rather diverse vegetation, characteristic of the Canadian Province of North America (Dice, 1943), has been reestablished.

The Cedar Creek Forest area first received serious attention in 1929 when N. L. Huff visited the Isanti County portion of the bog. On the twenty-fourth of June, 1929, he obtained pictures of *Pyrola asarifolia*

[1] This can be reached by State Highway No. 65. From Cooper's Corner the area is accessible by State Aid Roads Nos. 8 and 33 in Anoka Country and by Nos. 36 and 37 in Isanti County.