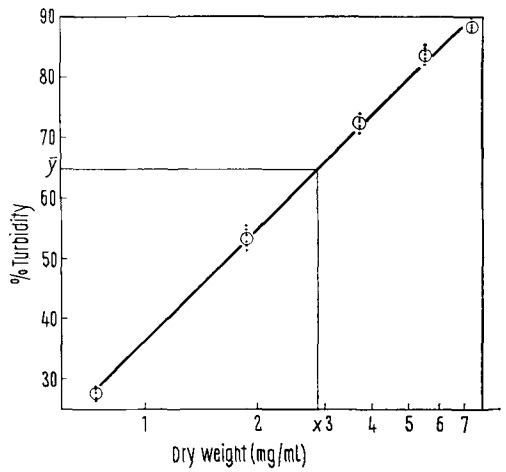
time of growing yeast. Another method was used by TAKAHASHI et al.[2]. They determined cell concentration by packed volume of cells which were collected centrifugally (10 min at 3500 *g*) at the bottom of a measuring tube. There are several preliminary conditions for the application of one of the methods mentioned above. When the cell concentration is determined by packed volume of cells or by the filtration method a rather large volume of sample is necessary.

It is well known that cell yield can be determined more conveniently and this in very small samples by measuring the optical density. For this purpose the hydrocarbon phase must be separated from the culture broth. TANAKA and FUKUI[3] used this method for the determination of cell yield. They prepared the sample for measurement by successive washings with n-hexane and water. However, only few data were given for the relationship between optical density and dry cell yield. Another preparative procedure of cell suspension, implying washing with Aerosol OT and petroleum ether was described by ARIMA et al.[4].

Initially we used in our experiments the following method. 1 ml of sample was pipetted into 25 ml of a solvent mixture consisting of 80% isopropyl alcohol and 20% hexane. Despite immediate measurement of the optical density after addition of the solvent, the cells flocculated immediately and irreversibly through dehydration by the solvent. Furthermore, mineral salts precipitated in the solvent and caused an undesired error. The reproducibility of the results obtained with this method was not within the limits of $\pm 10\%$.

For a turbidimetric assay we used the following simple method advantageously: In taking samples the culture must be agitated vigorously to attain a homogeneous suspension. With a bulb operator the sample is sucked directly from the stirred suspension into the pipette up to the desired mark. One must be careful not to exceed the upper mark of the pipette, since this would cause a considerable sampling error, due to the adherence of the oil phase to the glass surface. The sample is transferred into a centrifuge tube; the hydrocarbon phase adhering to the pipette wall is rinsed into the glass by repeated washings with small portions of hot water. A few drops of concentrated detergent solution such as Teepol are now added. The stoppered tube is then mixed manually for about 2 min and then centrifuged for 15 min at 1600 *g*. The hydrocarbon phase free from yeast cells accumulates as a turbid surface layer. The cells sink quantitatively to the bottom of the glass as a compact sediment. The liquid phases can be sucked up by means of a capillary attached to a vacuum pump. For the measurement of turbidity a desired amount of saline is pipetted into the centrifuge tube and small glass-beads are added. A homogeneous and stable cell suspension is obtained by shaking for 1 min. The method was tested on a *Candida tropicalis* strain cultivated in a medium containing liquid paraffins, and the results are shown in the Figure. As can be seen from the diagram, the amount of yeast dry matter can be determined over a relatively wide range using the same sized turbidometer cell. If the content of yeast cell dry matter exceeds 7 g/l the sample must be diluted. The desired dilution is prepared directly in the centrifuge tubes with physiological saline solution.



Turbidity was determined in a Lange-turbidometer using rectangular cells of 1 mm pathlength. The medium size of yeast cells was 6.7 × 4.0 µ. Regression line for the relationship between % turbidity and content of dry weight of cells; regression equation: $Y = a + bX$; constant $a = -25.7 \pm 1.4$; regression coefficient $b = 62.0 \pm 0.7$; correlation coefficient $r = 0.99$.

It will be realized that the correlation between the turbidity and the yeast dry matter depends on the size and shape of the yeast cells and to a certain degree on the growth conditions. If other strains or substrates are used a new correlation characteristic for those specific conditions must be set up. Despite the fact that yeast dry matter has been determined here with this method, the determination of turbidity alone will in many cases satisfy the demands. Then the benefits of this easy, quick and reliable method become especially apparent.

Zusammenfassung. Es wird eine einfache und schnelle Methode zur Bestimmung der Zellkonzentration in kohlenwasserstoffhaltigen Kulturflüssigkeiten beschrieben. Zur Abtrennung der Kohlenwasserstoffe wird die Probe nach Zusatz von Teepol zentrifugiert, danach die Zellkonzentration durch Trübungsmessung bestimmt.

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A New Air Sampler

In the past, studies of air spora have been made by the exposure of sticky surfaces for various periods. The catches represent a total during the period of exposure and it is not possible to relate them closely to meteorological or other data. GREGORY[1,2], and GREGORY and STEDMAN[3], have shown that the efficiency of these methods is very low and dependent so greatly on the wind speed, that it is almost impossible to give a reliable interpretation of the counts made. This has led to the development by HIRST[4] of a suction-trap which suffers

little from these disadvantages. PERKINS[5] discovered a Rotorod sampler for spot sampling, which was modified by HARRINGTON[6]. Following this PANZER et al.[7] investigated a more useful, convenient and simple 24-h slide spore collector. This apparatus requires attention every 24 h for changing the slides. The writers have devised an inexpensive, easy to operate, efficient and automatic spore collector, which is described below. The instrument is a modified form of spore clock model and PANZER's 24-h slide spore-collector.

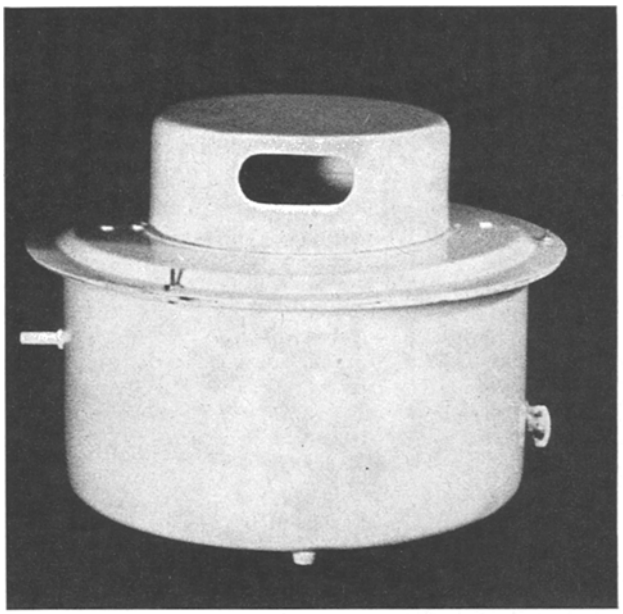

Fig. 1.

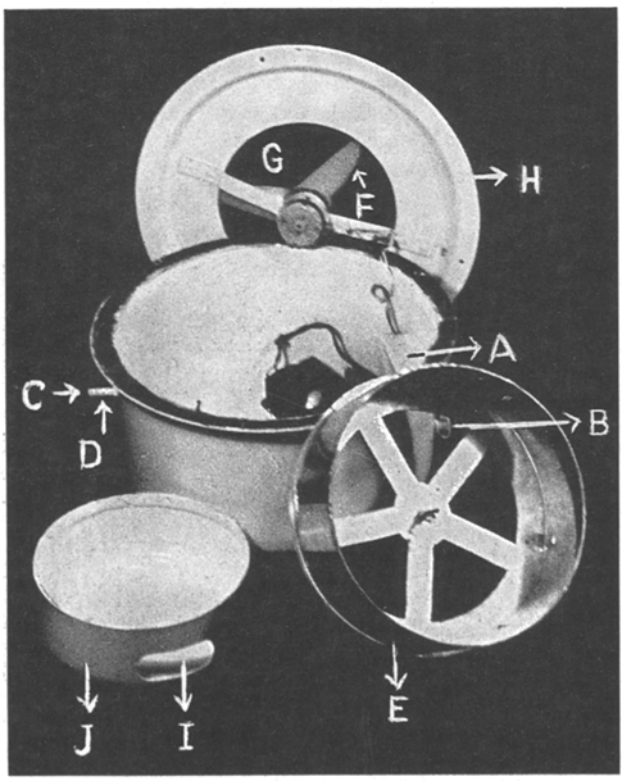

Fig. 2.

The Rotorod sampler is useful only for spot sampling, although its collection efficiency is 85%. The HIRST[4] trap with minimum 45% collection efficiency has the disadvantages of capital cost, power requirement and unsuitability both for identification in culture and for trapping splash-dispersed spores. The PANZER's[7] slide spore collector with 70% collection efficiency has less retention efficiency and requires attention after every 24 h, whereas the present sampler has 75% collection efficiency, greater retention capacity, and is also economical.

The apparatus (Figure 1) runs on electric power supply and helps to obtain a continuous air sampling for 8 days. The clock (Figure 2A) fixed in the instrument requires rewinding by key (Figure 2B) after every 24 h or after every 8 days, depending upon the clock machine used. The instrument has an orifice (Figure 2C) 0.6 cm in diameter projecting in a copper tube (Figure 2D) 3.0 cm in length which is fixed in the side wall of the apparatus. Air is sucked through at a rate of 5 l/min or 0.17 ft^3/min, impinging on a transparent cellophane tape 1.5 cm in breadth and fixed on a circumference of 67.2 cm of the rotating disc (Figure 2E). This disc is connected with the clock mechanism, arranged inside the instrument. The tape is slightly coated with the glycerol mixed with vaseline and faces the orifice of the copper tube 0.5 cm away from it. The disc rotates continuously with the clock mechanism giving a continuous trace for 8 days. Before the tape is mounted on the glass slides at the end of 8 days, it is divided into 8 equal parts measuring 8.4 cm in length, which are again subdivided into 2 parts measuring 4.2 cm in length. Each piece of the tape now obtained represents the 12 h sampling area for a day or night accordingly.

The tape for 12 h is mounted on a slide in glycerine jelly. Scanning is done by dividing this tape into 12 equal parts, each part representing one hour's trace area.

The air is sucked through the tube with the help of a small fan (Figure 2F) having 3 prongs and fixed in the circular opening (Figure 2G) in the cover (Figure 2H) of the sampler, so as to force air out of the collection chamber causing a negative pressure. An exhaust hole (Figure 2I) measuring 6×2.7 cm is kept in a lid (Figure 2J) of the apparatus.

The instrument is made up of a simple aluminium tin. It is a round box 8.5 inches in height with its lid. The outer circumference is 82 cm. The electric consumption is about 8 kWh per month. The apparatus is economical, cheap, efficient and easy to operate and would be useful as a handy tool for aerobiologists.

Zusammenfassung. Beschreibung eines verbesserten Luftprobensammlers zur Bestimmung von Keimzahlen in der Luft.

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