Letter to the Editor

Comparison of the Designs of Two Volumetric Spore Traps

Geoffrey M. Wili

Technical director, Burkard Manufacturing Co. Limited, Woodcock Hill Industrial Estate, Rickmansworth, Hertfordshire, England WD3 1PJ.

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Gadoury and MacHardy (2) described the construction of a spore sampler built mostly from polyvinyl chloride (PVC) and compared its performance to that of the Burkard volumetric spore trap. Details of Gadoury and MacHardy's article have been submitted to the British Government scientists who were responsible for the original design and construction of the Burkard volumetric spore trap. The purpose of this letter is to describe many of the distinct differences between the two traps.

The air throughput at the orifice has been increased by 50% (from 10 to 15 L/min) in the PVC trap, and the distance between the sampling orifice and the adhesive surface has been increased from 0.6 mm to 1.0 mm (Fig. 1). These two factors alone would alter the performance of any spore trap. Gadoury and MacHardy (2) stated that increasing the flow rate on the Burkard trap would damage the motor. This is not so.

The many papers published from work with the Burkard spore trap during the 30 yr that it has been available cannot be related to the PVC spore trap (for examples, see 1,3,5–9). Gadoury and MacHardy (2) stated that the PVC trap is more efficient than the Burkard trap, but they gave no details of wind tunnel efficiency tests. They stated that their spore counts were not adjusted for trap efficiency. This is not surprising, because they had not fully considered the overall efficiency. The Burkard trap has been tested in conjunction with the original unit designed by Hirst (4), and the overall efficiency was published (10).

It is surely a sweeping statement to say that "the orifice impaction surface distances of the PVC and Burkard traps were essentially the same...." (2). The increase from 0.6 mm in the Burkard trap to 1.0 mm in the PVC trap would considerably reduce the trapping efficiency for spores with diameters of 0.02 mm or less. Application of silicone grease to the impaction surface would alter the gap distance in an inconsistent manner, particularly if the silicone grease had not first been dissolved in a solvent. Gadoury and MacHardy (2) did not describe how the grease was applied. In addition, it would seem illogical to position the ends of the impaction tape centrally behind the orifice as they did (2), because when the tape is removed the initial spore catch will be split onto opposite ends of the tape.

There are distinct disadvantages in the use of plastics in the construction of spore traps. Plastic materials are susceptible to deterioration from U.V. light and can become very brittle. Their physical dimensions also can change rapidly in adverse environmental conditions. The 1-mm gap between orifice and adhesive surface could not be maintained due to the different rates of expansion between the plastic materials and the metal parts of the recording mechanism. Burkard traps are ruggedly built from stainless steel and cast alloy materials finished in heavy epoxy enamel to withstand long term use in tropical or arctic conditions. They are manufactured to precise standards, particularly such metal parts as the sampling orifice, which has a micron-tolerance finish on its inner surfaces and is coated with polished chrome plating. The greatest problem of spore traps constructed of plastic would appear to be the potential for build up of electrostatic charges as a result of air passing over the trap, especially in hot or dry weather. The electrostatic charges, which would not be effectively reduced by anti-static cleaning, would obviously alter the deposition of charged particles on the impaction surface of the trap.

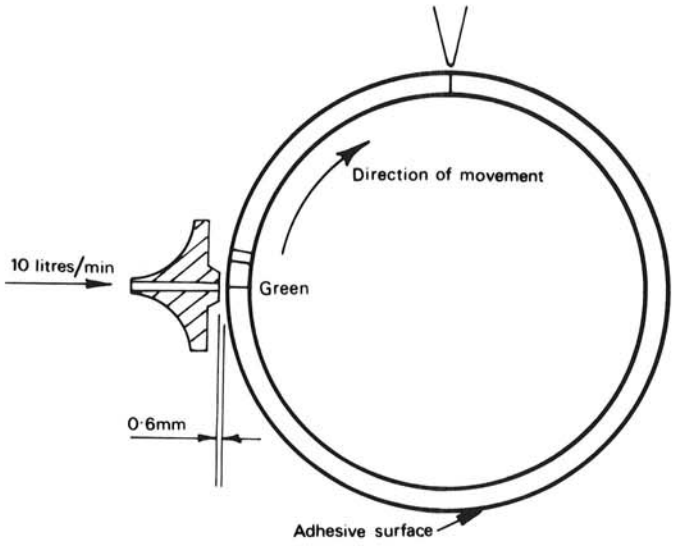

Fig. 1. Diagrammatic configuration of the recording drum and impaction orifice of the Burkard volumetric spore trap. The sampling orifice is mounted horizontally.

Another important question about the PVC trap relates to the measurement of flow rate. Burkard traps have been tested with a hot-wire anemometer, which offers very low resistance to the flow rate. Gadoury and MacHardy (2) provided no explanation of how they measured the flow rate in the PVC trap. The volume of air sampled should be determined both in wind tunnel and field studies. Gadoury and MacHardy (2) apparently did not attempt isokinetic sampling in a wind tunnel.

The current price of approximately $1,200 for the Burkard trap is much less than the $2,000 quoted by Gadoury and MacHardy (2). Until we have physically examined the PVC trap, it will be impossible to comment fully on it; it would appear to have little use for long-term aerobiological studies but may be useful for demonstrating the principle of its operation at the student level.

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