

Short communication

Aerobiologic particle sampling by a new personal collector (Partrap FA52) in comparison to the Hirst (Burkard) sampler

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A new personal portable sampler of biologic particles (Partrap FA52, Coppa, Biella, Italy) was used for pollen sampling in comparison with Hirst's (Burkard) fixed device. The aerobiologic samplings were carried out simultaneously outdoors with the two devices coupled on the same axis, during the daytime of 10 dry, nonconsecutive spring days. The total amount and the percentages of the pollens most often trapped by the two collectors were compared by Student's *t*-test for paired samples. The Partrap FA52 showed a highly significant efficacy, quite comparable to that of the Burkard device, in pollen trapping for both the total number ($P < 0.0001$) and the percentages of *Parietaria* ($P < 0.0001$), pine ($P < 0.002$), and grass ($P < 0.0001$) pollens. Therefore, Partrap FA52 proved to be highly effective in obtaining quantitative and qualitative aerobiologic samples in comparison with the commonly used fixed samplers.

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Aerobiology is the multidisciplinary science of the nature and characteristics of biologic particles dispersed in the atmosphere. Pasteur foresaw the scientific importance of this science in 1881 (1).

Stations for aerobiologic survey employing volumetric devices such as Hirst (Burkard, Lanzoni) have been in operation in Italy and other European countries for many years (2). These devices can trap aerobiologic particles such as pollen grains and spores, which can be quantitatively and qualitatively analyzed (2, 3). Aerobiologic samplings at survey stations provide general data about allergen concentrations in the atmosphere of a large geographic area (4); therefore, they are clinically useful, as they may facilitate diagnostic and preventive measures for the treatment of allergic people living in that area (5–7, 8).

Various portable samplers for aerobiologic particles have recently been proposed (9–11); they can collect air samples directly from the microenvironment surrounding each subject. The individual monitoring of aerobiologic particles by a personal

sampler may be of great clinical importance for the atopic subject, providing useful data on the allergenic concentration of the individual environment during everyday life. Therefore, it may allow effective environmental prophylaxis.

The aim of this study was to evaluate the efficacy in pollen trapping of a new personal portable sampler (Partrap FA52) in comparison to a fixed standard Burkard device.

Material and methods

Samplers

Two different samplers for aerobiologic particles were used:

- 1) the Burkard sampler (resembling the Hirst spore trap), used for aerobiologic sampling in Italy and elsewhere in Europe by numerous survey stations for many years
- 2) the personal portable sampler of aerobiologic particles, named Partrap FA52 (Coppa, Biella, Italy).

The second is small, 17×8×3 cm, and is therefore chiefly designed for sampling indoors (Fig. 1A and

B). Both devices have an identical aspiration flow of 10 l/min.

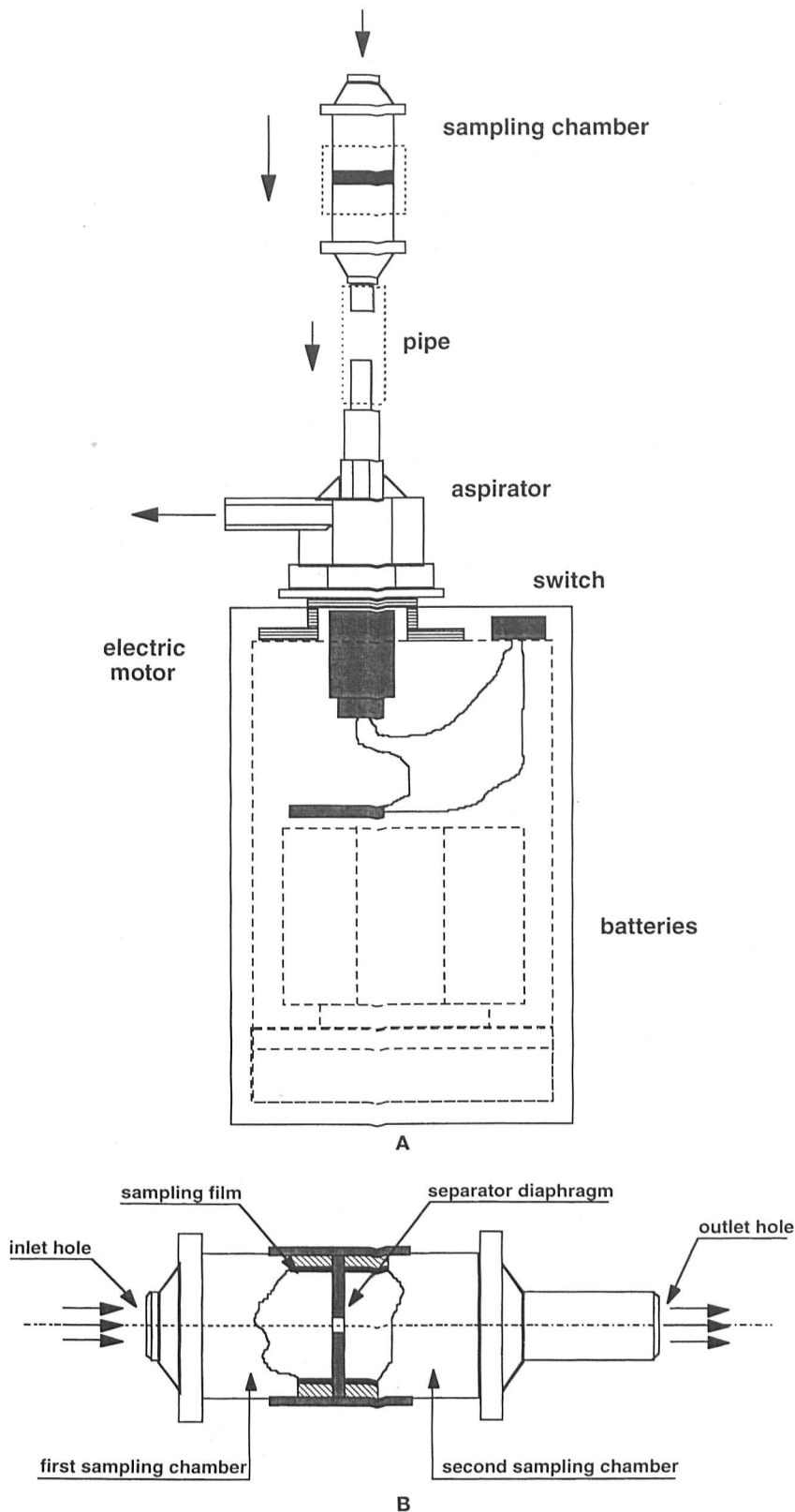


Fig. 1. A and B) Schematic illustration of Partrap FA52 with detail of its sampling chamber (B).

The Burkard sampler was placed on a wind-facing corner of a terrace 16 m above the ground and 6 m from any other building, in the middle of a slope about 100 m from the sea in a region of typical Mediterranean climate.

The Partrap FA52 was placed on the upper part of a Burkard sampler, to which it was fixed by adhesive tape. In this way, the nozzles of both aspiration chambers were situated in parallel on the same vertical plane, 40 cm from each other; a horizontal swing was placed between the two devices to avoid interfering air currents between the aspiration chambers. The samplers could simultaneously rotate as a single block according to the wind direction; therefore, the air was aspirated against the wind direction. The aerobiologic samplings were performed in daytime (the period richest in aerobiologic particles), from 8 a.m. to 8 p.m., on 10 nonconsecutive days of the last spring. Rainy days were excluded from the study because of the low pollen concentration.

Sampling collection and analysis

The Melinex tapes from the two different devices were collected every day during the study, set with glycerinated gelatin, stained with basic fuchsin, fixed on two different slides, and numbered by one technician. The slides were then investigated by two researchers blinded to the sampler source. The slides were qualitatively and quantitatively analyzed by a light microscope with the reading method of parallel smear with tangential microscope fields. Data obtained from both researchers

appeared to be nearly superimposed. The reported results express the mean of the data obtained by the two researchers on the number of both total pollens and the percentages of the single types of the most representative pollens (*Parietaria*, pine, and grasses) captured by each sampler daily.

Statistical analysis

The results were statistically analyzed by Student's *t*-test for paired samples, comparing data obtained each day from the two sampling devices during the 10 days of the study (12).

Results

During the 10 days of the study, the mean total numbers of trapped pollen grains were 47.6 ± 7.1 (mean $\pm$ SEM) and 45 ± 6.6 per cubic meter, respectively, by the Burkard and Partrap FA52 devices; the data showed a highly significant correlation ($t=1.310$ $P<0.0001$) of efficacy in pollen trapping between the two samplers (Fig. 2).

The Burkard collector trapped $60.1 \pm 7.4\%$ (mean $\pm$ SEM) *Parietaria*, $5.0 \pm 1.7\%$ pine, and $9.1 \pm 5.0\%$ grass pollens in respect to $60.7 \pm 7.9\%$, $4.5 \pm 1.6\%$, and $8.6 \pm 4.7\%$ mean percentage of the same pollens collected by the Partrap FA52 during the 10 days of the study. Therefore, the efficacy of the Partrap FA52 appeared to be highly significantly correlated to that of the Burkard sampler: $P<0.0001$ ($t=0.329$) for *Parietaria*, $P<0.002$ ($t=0.530$) for pine, and $P<0.0001$ ($t=0.736$) for grass pollens (Fig. 3).

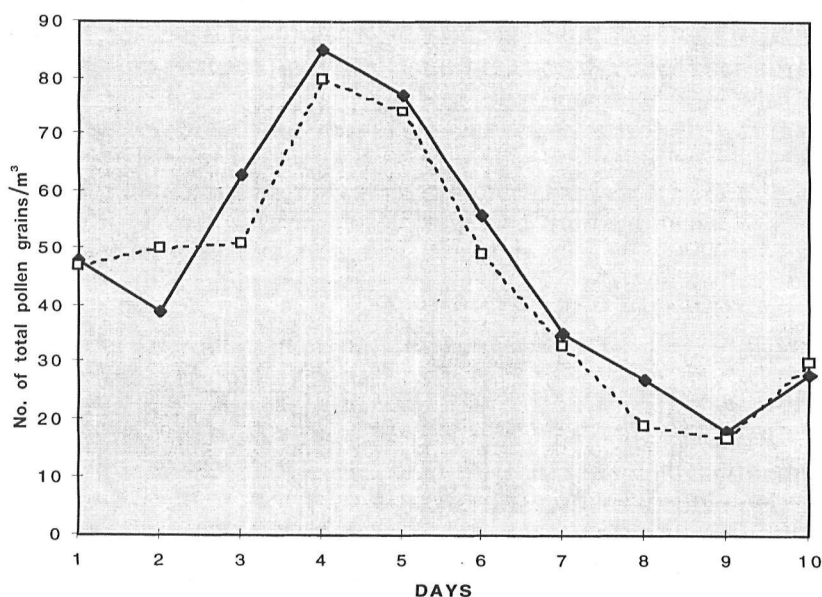


Fig. 2. Comparison of number of total pollen grains (y-axis) trapped by Partrap FA52 (—□—) and Burkard (—■—) during 10 days of study (x-axis). Student's *t*-test: $t=1.310$; $P<0.0001$ (for details, see text).

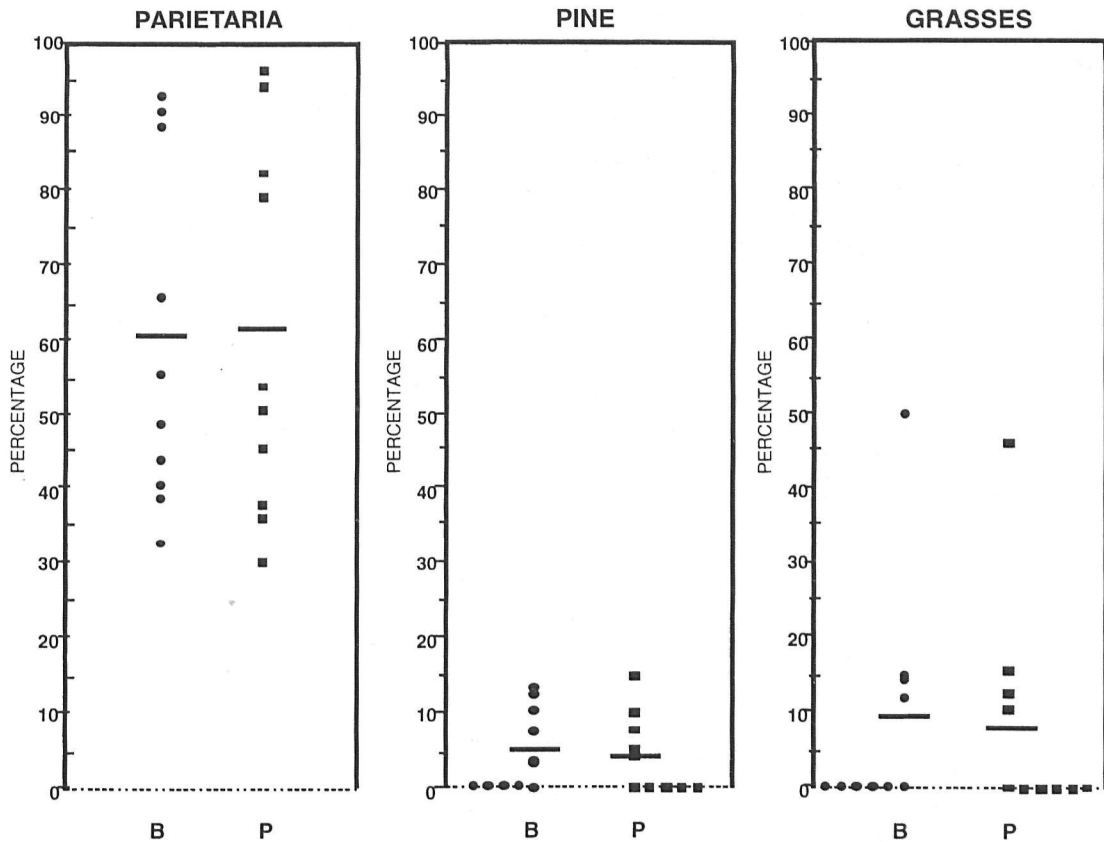


Fig. 3. Comparison of percentages of *Parietaria*, pine, and grass pollens trapped by Burkard (**B**) and Partrap FA52 (**P**) during 10 days of study. Student's *t*-test for paired samples: *Parietaria*, $P < 0.0001$, $t = 0.323$; pine, $P < 0.002$, $t = 0.530$; grasses, $P < 0.0001$, $t = 0.736$.

Discussion

Comparing the results obtained by the two studied sampling collectors, we observed a very good correlation in both the amount and the types of pollens trapped by the two devices during the same days of the study. Moreover, by placing the two different samplers at a suitable distance on the same axis and separating them by an interposed surface, we were able to obtain samples without interference between the two collectors.

These similar results can be broadly justified since the two devices were designed for a similar purpose: environmental aerobiologic sampling. Nevertheless, it must be remembered that the fixed Burkard collector is used for volumetric aerobiologic sampling outdoors. It is usually placed on a roof or terrace, and it is powered by an electric motor; in addition, it is difficult to move because of its large size and weight. On the other hand, the new personal portable sampler Partrap FA52 has been designed to detect aerobiologic particles in the microenvironment of each person. It can work close to the subject since it is powered by a battery, allowing portability. The small and light Partrap FA52 is easy to carry and to use.

In conclusion, the personal portable sampler Partrap FA52 proved to be highly effective in obtaining quantitative and qualitative aerobiologic samples in comparison with the commonly used fixed samplers. Besides, Partrap FA52 is inexpensive and can be easily handled; therefore, we consider it a useful tool for aerobiologic sampling of the indoor environment of atopic subjects in order to take prophylactic measures against inhalant allergens.

Acknowledgments

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