SLOVENSKI STANDARD
kSIST-TS FprCEN/TS 16868:2015

Zunanji zrak - Vzorčenje in analiza cvetnega prahu v zraku in glivične spore za alergijsko omrežje - Volumetrična Hirstova metoda

Ambient air - Sampling and analysis of airborne pollen grains and fungal spores for allergy networks - Volumetric Hirst method

Außenluft - Probenahme und Analyse luftgetragener Pollen und Pilzsporen für Allergienetzwerke - Volumetrische Hirst-Methode

Air ambiant - Échantillonnage et analyse des grains de pollen et des spores fongiques aériens pour les réseaux aérobiologiques - Méthode volumétrique de Hirst

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Ambient air - Sampling and analysis of airborne pollen grains and fungal spores for allergy networks - Volumetric Hirst method

Air ambiant - Échantillonnage et analyse des grains de pollen et des spores fongiques aériens pour les réseaux aérobiologiques - Méthode volumétrique de Hirst

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This draft Technical Specification is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 264.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (FprCEN/TS 16868:2015) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

This document is currently submitted to the Formal vote.

Introduction

Biological particles (pollen and fungal spores) are present in the air, causing health impacts at various levels. In Europe, nearly 18 % to 20 % of people suffer from pollinosis due to pollen and/or fungal spores. Pollen grains and fungal spores are considered in some Member States as an air pollutant as well as particles suspended in the air ($PM_{10,2,5}$). In Europe, European Aerobiology Society (EAS) in coordination with International Association for Aerobiology (IAA) manage problems of sampling, analysis, quality control, development and information.

For the sampling and analysis of biological particles different methodology and operating procedures are used.

Sampling equipment is diversified (see Annex A). Analysis is based on optical light microscopy for identification and counting pollen grains and fungal spores.

Elements and reagents used during sampling and analysis have very specific properties and require to be handled carefully.

Given the close relationship between aerobiology and other sciences, one of the main aims is that information on airborne biological-particle counts should be of use in a wide range of disciplines and fields of application, including aerobiology, biodiversity, agriculture, forestry, phytopathology, meteorology, climatology, forensic science, bioterrorism, and health (sensitization and allergy).

1 Scope

This European Standard specifies the procedure to sample continuously and analyse the concentration of airborne pollen grains and fungal spores in ambient air using the volumetric Hirst type sampler [1] [2] [3] (see Annex A).

This European Standard describes both the sampling and the analysis procedures for the purpose of allergy networks. For the other tasks mentioned in the introduction, other specifications may be required.

2 Normative references

Not applicable.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
accuracy
closeness of agreement between a measured quantity value and a true quantity value of a measurement

3.2
bench
long work table in a workshop or laboratory

3.3
clockwork
mechanism with a spring and toothed gearwheels, used to drive a mechanical clock, toy, or other device

3.4
combined standard measurement uncertainty
obtained using the individual standard measurement uncertainties associated with the input quantities in a measurement model

3.5
defatted
surface conditions after clearing with a fat removing substance

3.6
drum
cylindrical device for the mounting of a sticky tape

3.7
exine
outer layer of the wall of a spore or pollen grain, also called an exosporium

3.8
eyepiece
lens or combination of lenses in an optical instrument through which the eye views the image formed by the objective lens or lenses; ocular

3.9
flow meter
instrument for measuring the flow rate of a fluid in a pipe

3.10
flow rate
amount of fluid (e.g. air) that flows in a given time

3.11
fungal spore
reproductive unit capable of giving rise to a new individual with or without sexual fusion

3.12
hood
metal cover or canopy for a stove, ventilator, etc

3.13
impaction
sampling of airborne particles by inertial separation on any surface (e.g. of an adhesive)

3.14
magnetic stirrer
object or mechanical device used for stirring something

3.15
magnification
magnifying power of an instrument, e.g. this microscope should give a magnification of about x 100

3.16
microscope
optical instrument having a magnifying lens or a combination of lenses for inspecting objects too small to be seen or too small to be seen distinctly and in detail by the unaided eye

3.17
objectives
optics (in a telescope, microscope, camera, or other optical system), the lens or combination of lenses, that first receive the rays from the object and form the image in the focal plane of the eyepiece, as in a microscope, or on a plate or screen as in a camera

Note 1 to entry: Also called object glass, object lens, objective lens.

3.18
orifice
opening or aperture, as of a tube or pipe; a mouthpiece with a slotlike opening on the side of the trap

3.19
particle
minute portion of matter

3.20
pollen
male gametophyte of flowering plants, consisting of microscopic grain discharged from the anthers (*Angiosperms*) or from a male cone (*Gymnosperms*)

Note 1 to entry: Each grain contains two male gametes (only one can fertilize the female ovule).

Note 2 to entry: Pollen are transported by wind, water, animals (e.g. insects).

3.21
precision
closeness of agreement between indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions

3.22
repeatability
condition of measurement, out of a set of conditions that includes the same measurement procedure, same operators, same measuring system, same operating conditions and same location, and replicate measurements on the same or similar objects over a short period of time

3.23
reproducibility
condition of measurement, out of a set of conditions that includes different locations, operators, measuring systems, and replicate measurements on the same or similar objects

3.24
sensitivity
in aerobiology, measurement of the proportion of search particle which is correctly identified

3.25
slide
rectangular piece of glass on which an object is mounted or placed for examination under a microscope

3.26
specificity
in aerobiology, measurement of the proportion of non-searched particles which are correctly identified as different from the searched particles

3.27
standard measurement uncertainty
measurement uncertainty expressed as a standard deviation

3.28
suction
production of a negative pressure by the removal of air to force fluid into a vacant space

3.29
taxon
taxonomic group of any rank, such as a species, family or class

3.30
trap
container or device used to collect something

3.31
vacuum
space from which the air has been completely or partly removed

3.32
vacuum pump
pump or device by which a partial vacuum can be produced

3.33
wind vane
mechanical device attached to an elevated structure; rotates freely depending on the direction of the wind

4 Principle

Ambient air is sampled by a volumetric suction system and directed towards a suitably coated sampling surface through a specific orifice oriented towards the wind; the particles contained in the sampled air are deposited by impaction on a continuously moving adhesive acceptor surface. The sampling surface is then examined with an optical microscope in order to identify and count the allergy relevant particles per area (deposition rates). Using this method allows to count particles and subsequently calculate concentrations as a daily mean or a 2-hour mean. The low-volume sampler (10 l/min) allows a continuous sampling for up to seven days [4] [5] [6].

5 Sampling

5.1 Equipment

5.1.1 Apparatus

5.1.1.1 Motorised suction pump

The motorised suction pump shall work 24 hours a day and continuously throughout the year always at the same flow rate. The power supply may be either mains or battery driven (solar panels). The electric motor shall be capable of continuous operation.

The suction system, for instance, a vacuum pump, shall have a regular and continuous flow rate. The flow rate of suction may be adjusted by a flow control valve. The flow rate shall be 10 l/min (±1 l/min).

The flow rate shall be checked at every change of the impaction support with an adapted flow meter (i.e. the flow meter supplied by the same supplier of the sampler).

The flow meter shall be checked annually or less depending on the historical experience.

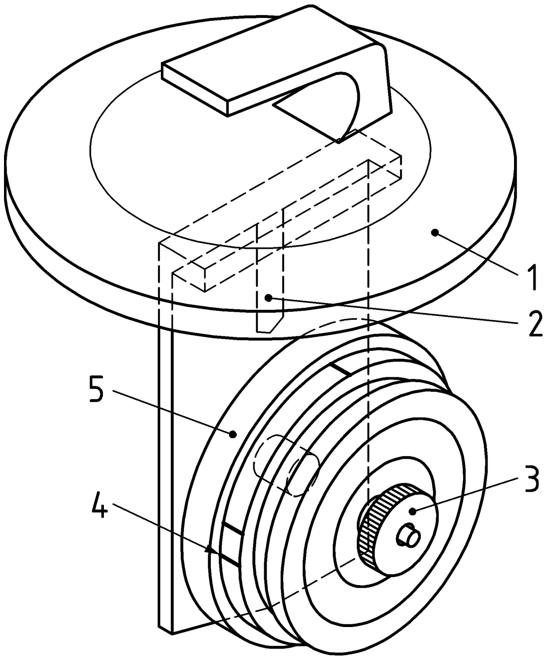
Sampling shall always be continuous and stable. The support shall scroll regularly in front of the back outlet of the orifice; its geometry and the scrolling speed depend on the duration of sampling period requested.

Example for the sampling area:

— A support of 48 mm (tape) with a speed of 2 mm/h: sampling period = one day;

— A flexible support of 336 mm with a speed of 2 mm/h: sampling period = seven days.

The scrolling speed may be adjusted to other sampling period durations. The trap can work with two different impaction supports: a drum (see Figure 1a) covered with a coated transparent tape or a glass slide (see Figure 1b) coated.



Key

1 lid

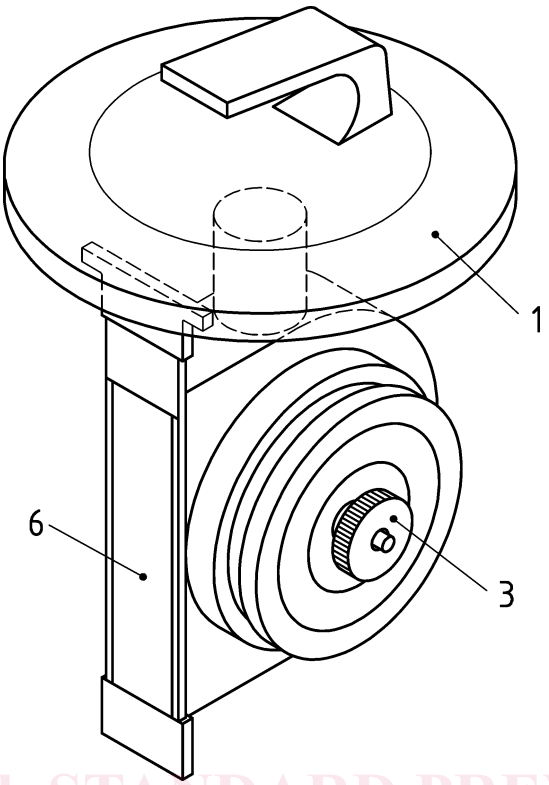
2 start reference pointer

3 lock nut

4 orifice start position

5 trapping surface

Figure 1a — The Hirst volumetric trap showing 7-day lid assembly with drum [5, modified]



Key

1 lid

3 lock nut

6 trapping surface on slide

Figure 1b — The Hirst volumetric trap showing 24-h lid assembly with slide [5, modified]

5.1.1.2 Specific orifice

The orifice shall have the following dimensions (with associated tolerances):

— rectangular opening: 14 mm (±0,1 mm) × 2 mm (±0,1 mm)

— depth of the orifice: > 19 mm

— distance from the inside orifice to the drum without the tape: 0,70 mm (±0,1 m)

The depth allows the non-turbulence of laminar flow and directs the mixture of air and particles towards the coated support. In consequence, an efficient particle impaction for pollen grains and fungal spores, induced by the laminar flow, is ensured.

The outlet of the orifice shall be 0,70 mm (±0,1 mm) of the coated support (see Figure 2 – distance A-B). The distance allows efficient particle impaction for pollen grains and fungal spores. It shall be controlled with a ruler [7] [8] [9].

The orifice should be directed into the air-stream using a wind vane.