

Bioaerosol Test chamber: main specifications

Property	Description
Walls	stainless steel
Measurements (L x W x H)	3 x 2 x 2 m
Volume	12 m ³
Maximum airflow	11,750 L/min
Filters	HEPA inlet and exhaust filters
Access	70 x 70 cm door with window and 2 gloves; 1 additional window with glove; 1 air lock; 7 connection ports: 3 for reference equipment (particle sizer and STA samplers) and 4 for external equipment
Aerosol generators	Wet and dry
Particle sizer	15 channel Grimm 1.108; size range 0.3-20 micron; 1.2 L/min; samples each 6 seconds
Reference equipment	2 parallel New Brunswick Scientific STA-203 samplers for sampling live agents; air-to-liquid sampler for OV; various other equipment optional
Temperature control	Accuracy: +/- 2%; range: 15-30 °C under normal climatic conditions
Relative humidity control	Accuracy: +/- 5%; range: ambient up to 80%



Defence, Security and Safety

TNO Defence, Security and Safety provides innovative contributions to the advance of comprehensive security and is a strategic partner of the Dutch Ministry of Defence to build up the defence knowledge-base. We employ our acquired knowledge for and together with contractors.

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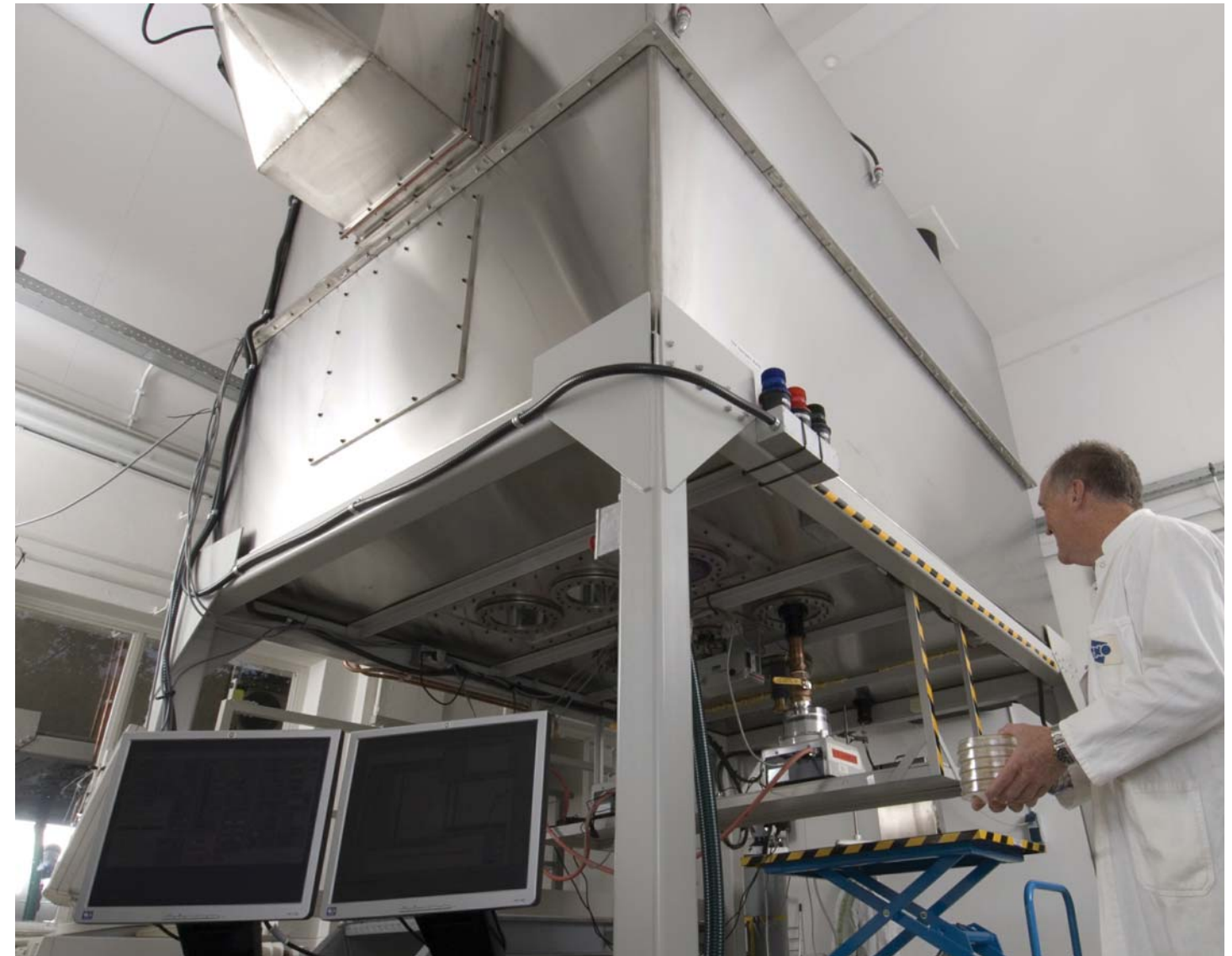
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Testing your Bio-detector

At the TNO Bioaerosol Test chamber



The protection against biological and chemical agents (BC-agents) requires expert knowledge and just the right tools. TNO has both. At TNO Defence, Security and Safety numerous specialists daily work on R&D, including BC-research. Our latest facility is the 12m³ Bioaerosol Test chamber that was installed at Rijswijk, the Netherlands. After a period of testing, validation and optimisation, this chamber is now fully operational. In combination with our other facilities, the Bioaerosol Test chamber enables us to offer a complete and unique range of products and services connected with the protection against BC-agents.



Now covering the entire BC-chain

TNO Defence, Security and Safety at Rijswijk already operated a comprehensive C-agent test facility. Now we introduce the Bioaerosol Test chamber, the main purpose of which is to test and evaluate B-warfare agent detectors. The chamber will enable users to generate and maintain stable aerosol concentrations in a way that is both reproducible and fully controlled. Alternative uses include decontamination, deposition and agent fate.

TNO is an independent research organisation. This means that end users (military and emergency services) and manufacturers of B-detection equipment may count on our objective and independent advice in all issues connected with B-agents.

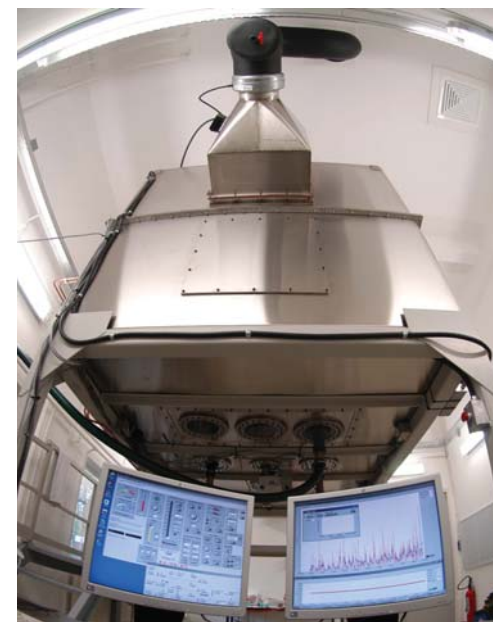
The use of the Bioaerosol Test chamber offers important advantages over outdoor field tests: tests are guaranteed to be fully controlled, reproducible and cost-effective. The chamber has extended facilities for connecting all types of biodetectors, including those built into military vehicles. One additional feature specifically important for military users is our capability to measure diesel soot interference. Client questions include:

- Objective and independent testing and evaluation of existing or new B-detectors (e.g. detection limit, false alarm rate, etc.).
- Support in design and development of new B-detectors.
- Training of operators and researchers.

Bioaerosol Test chamber: better than outdoor tests

The introduction of the Bioaerosol Test chamber has positioned TNO at the forefront of BC-agent research in Europe. Our BC-agent research and

testing cover the entire chain, from detection equipment to e.g. identification technologies, protective gear, medical countermeasures, and facilities to handle pathogenic agents up to and including level 3.



Internationally accepted bioagent simulants

Although the Bioaerosol Test chamber is fully contained and inherently safe, no pathogenic agents are used to generate aerosols. Instead, TNO utilises the internationally accepted bioagent simulants used in the defence programmes of various NATO member states, for absolute safety:

- Spores of the *Bacillus globigii* (BG) bacterium: for modelling spores of the Anthrax bacterium *Bacillus anthracis*. Not harmful to humans, animals or the environment. Concentration: 5-100 ACPLA.
- *Erwinia herbicola* (EH) vegetative cells: for modelling Gram-negative bacteria, including *Yersinia pestis*, *Francisella tularensis* and *Brucella*. Not harmful to humans, animals or the environment, the EH bacterium is a plant pathogen. Concentration: 5-100 ACPLA.
- MS2 virus: this virus is able to infect the *Escherichia coli* bacterium, and is known as a bacteriophage. Concentration: 5-100 ACPLA.
- Ovalbumin (OV): for modelling protein toxins, including ricin and botulinum toxin (dry dissemination). Concentration: 5-50 $\mu\text{g}/\text{m}^3$.

Evaluating the quality of your biodetection equipment

At present there is no international standard for the evaluation of biodetectors. The specifications are mostly established in close consultancy with future end users.

In the view of TNO Defence, Security and Safety any evaluation of biodetection equipment should include:

- Tests with all four standard simulants (BG, EH, MS2, OV).
- Tests at low (5-20 ACPLA, 5-10 $\mu\text{g}/\text{m}^3$) and medium (20-50 ACPLA, 10-20 $\mu\text{g}/\text{m}^3$) aerosol concentrations, with an optional test at high (50-100 ACPLA, 20-50 $\mu\text{g}/\text{m}^3$) aerosol concentration.
- Exposure time of 15 minutes per concentration (event), with clean air intervals to check if test equipment goes out of alarm condition.
- Multiple tests for each event, depending on the required confidence level.
- Use of an interferent, e.g. diesel soot, in combination with simulant.
- Optional use of mixtures of simulants.
- Optional determination of Limit of Detection (LoD test).