



CORIOLIS μ , AN INNOVATIVE AIR SAMPLER



Sophie DUBACQ

Confidential

BERTIN INSTRUMENTS, MONITOR THE INVISIBLE

Bertin Instruments is a brand of CNIM dedicated to innovative measurement and sampling solutions for key worldwide markets



Life sciences Equipment

(sample preparation, air sampler)



Radiological Instrumentation

(environmental radiation monitoring systems,
radon professional monitoring, radiation
portal monitors, health physics equipment)



Defense, Security and Safety

(CBRN threat detection, gas
detection, optronics)

With the expertise of:



CONTAMINATION SOURCES & TRADITIONAL CONTROL

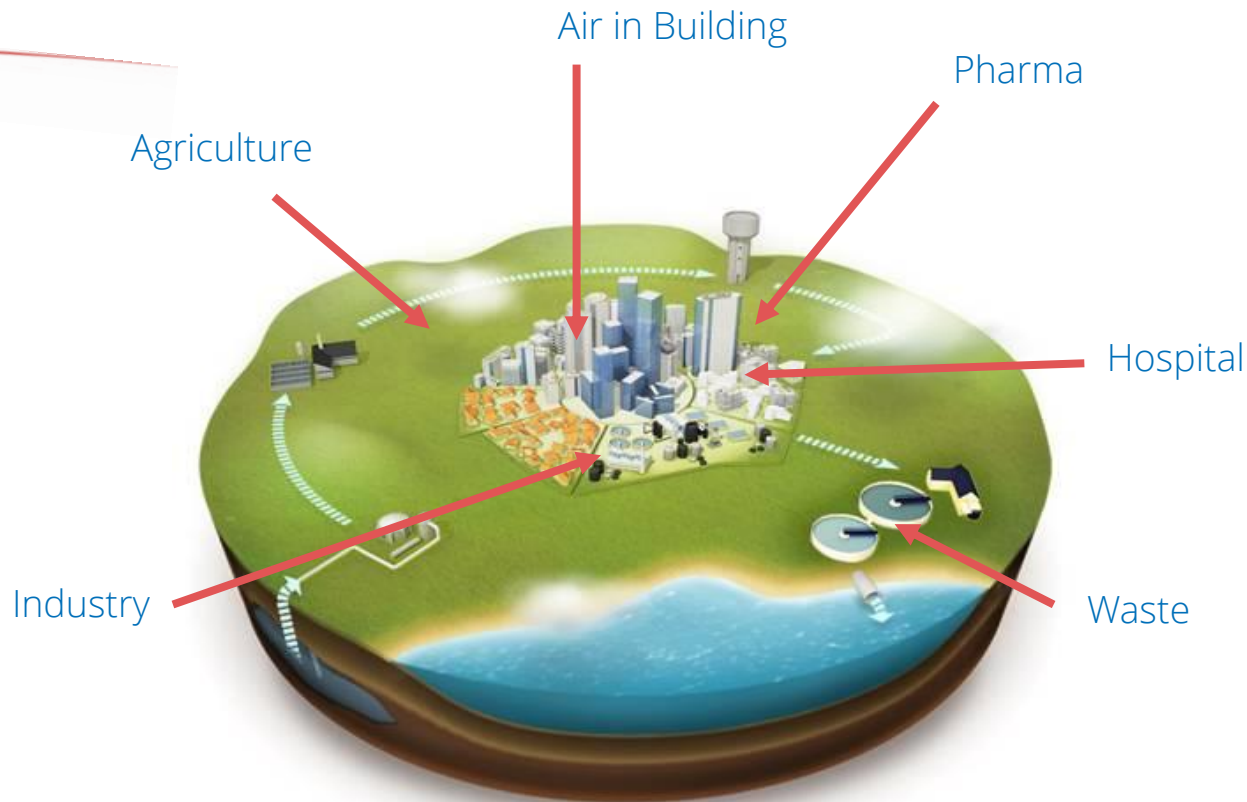
Sources of contamination

- People
- Raw materials
- Water
- Air



Monitoring by

- Passive impaction
- Active impaction
- Filtration
- Impinger



10 YEARS OF WET CYCLONE TECHNOLOGY IMPLEMENTATION



MonaLisa Project

2006-2009

Validation of a new method for pollen and allergen detection



French Army Project

Since 2006

Portable air sampler for airborne pathogens detection



Coriolis μ

Since 2009

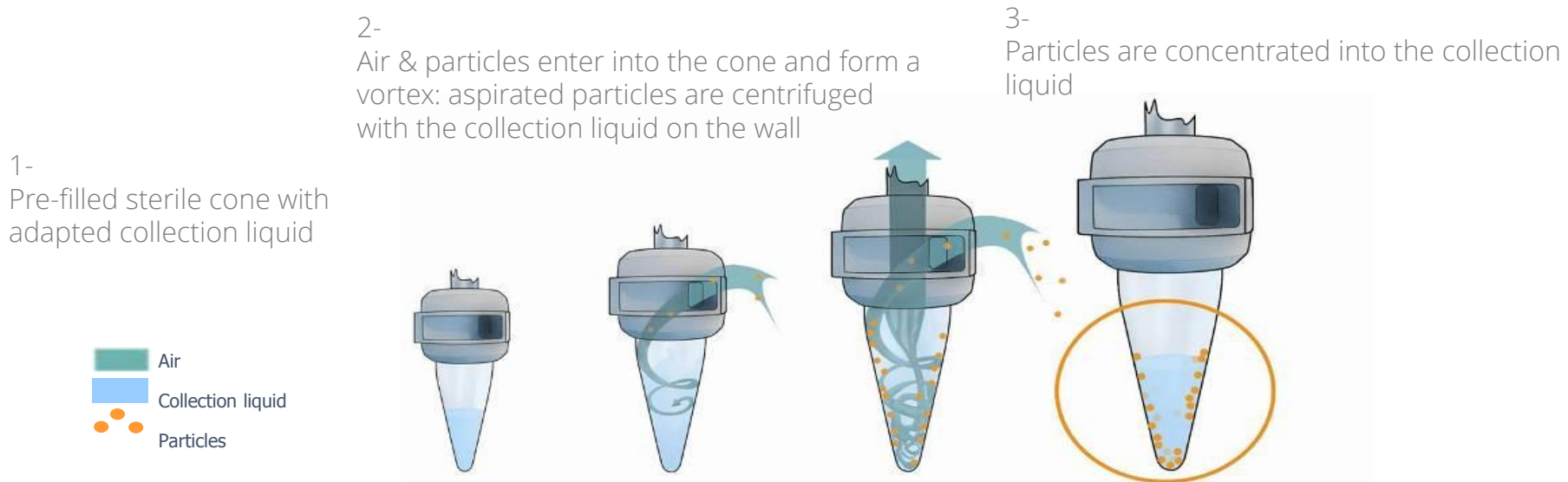
Air Sampler for bio-contamination quality control

CORIO LIS μ , COLLECT MICRO ORGANISMS INTO A LIQUID!



COMPLEMENTARY SOLUTION: CORIOLIS TECHNOLOGY

- Particles from 0.5 to 20 μm
- Bacteria, fungi, spores, viruses, pollens, allergens, endotoxins...



HOW CORIOLIS GET OVER LIMITATIONS OF TRADITIONAL METHODS?

Limitation of traditional technologies

Only cultivable flora

Limited Air flow rate

Limited time of collection

Result in days or weeks

Coriolis advantages

Allergens, virus, fungi...

High Air Flow rate (300 L/min)

Long time monitoring available (6h)

Short response time in hours

- High air flow rate: 300 L/min
- Collection from 1 to 10 min,
- Up to 6 hours sampling with Long Time Monitoring
- Light: 3 kg
- Easy decontamination
- Battery operated



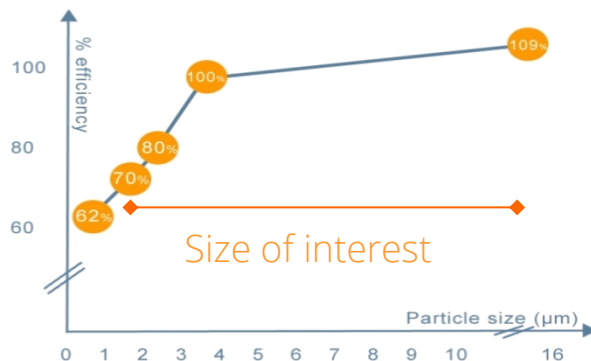
QUALIFICATION BY HPA - UK

- ▷ Physical and biological efficiency of the Coriolis® technology are qualified according to ISO 14698-1 Annex 1- July 2008 requirements

- Physical efficiency: *Bacillus atrophaeus* NCTC 10073



HPA Porton Down (UK)

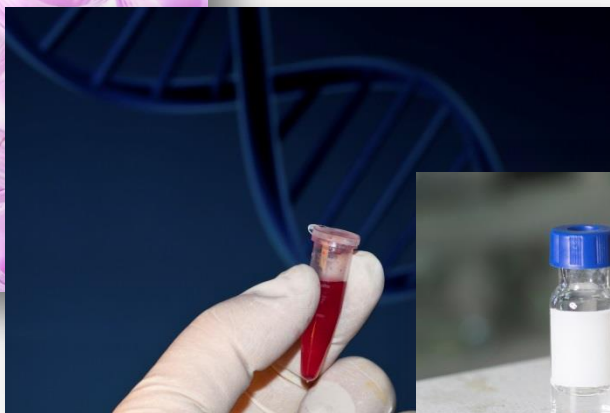


100% for particles > 4 µm

→ d50 < 0.5 µm

- Biological efficiency of 78% for *Staphylococcus epidermidis* ATCC 14990

COMPATIBLE WITH BIOLOGICAL ANALYSIS



DETAILED WORKFLOW FOR IDENTIFICATION BY CULTURE

Sampling

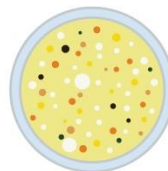
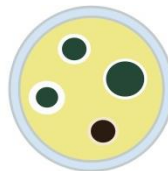
Sample Preparation

Culture and results

10 min

10 min

24 hours



DETAILED WORKFLOW FOR IDENTIFICATION BY QPCR

Sampling

Sample prep

DNA extraction

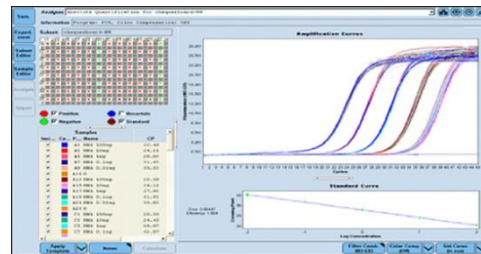
qPCR reaction & analysis

10 min

1 min

30 min

60-90 min



APPLICATION & CASES STUDIES

POLLUTION & ENVIRONNENT



- ▷ Outdoor surveillance / Bioburden
- ▷ Indoor Air Quality: public health, prevention of diseases and allergies (e.g. in offices, child-care-centers, schools...)
- ▷ Pollen dispersal / cross pollination / Crop diseases
 - Example : Kiwi crop (bacteria disease PSA-V (*Pseudomonas syringae* pv *actinidiae* - virulent))
 - Greenhouse cultivation
 - Field experiment
- ▷ Epidemiology study (ex.: Oak oidium Inra 33 Cestas Dynamique temporelle de dépôts de spores)



CASE STUDY: COMPOSTING SITE

Investigation on the simultaneous presence of amoebae and Legionella in the compost piles and in the bioaerosols developed from pile fermentation

- 250 L/min, 4 min. sampling (1m³)
- Culture analysis
- The protozoa were cultured on non-nutritive agar plates covered with E.coli as a food source.
- Legionella spp. were cultivated on GVPC agar plates and by co-culture with axenic Acanthamoeba polyphaga for two weeks.



Figure 1: Composting station with released bioaerosol during fermentation of compost heap.

Figure 2 : Coriolis® Air Sampler at work over a compost heap.

CASE STUDY: BARCELONA SUBWAY



Investigation of the air quality in the Barcelona Subway system during a cold period:

- 200L/min for 10 min
- Inside trains, platforms and lobbies
- Detection by QPCR & sequencing
- Low concentration of Influenza A&B
- High level of bacterial bioburden (10^4 bacteria/m³)



ANIMAL SCIENCE & VETERINARY



- ▷ Coriolis can be used to monitor the air for potential contaminants that are a health risk
- ▷ Areas with High animal densities / livestock houses / CAFO (Confined animal feeding operations)
 - Swine confinement building (barns), Turkey confinement house, Poultry barns, Dairy barns, Duck-fattening unit, Cattle industries
- ▷ Animal disease outbreak
 - Disease transmission among animals
 - ex.: foot and mouth (FAM) disease, avian influenza, Newcastle disease...)



CASE STUDY: POULTRY CONTAMINATION

Aflatoxin B₁ detection in Poultry units with qPCR.
Aflatoxin B₁ has been recognized to produce cancer in human liver.

- 300 L/min
- 3 indoors samples from 2 different poultry units
- DNA extraction
- Specific qPCR to validate



BT.D46.DA

BIOMEDICAL & HEALTH



▷ Coriolis can contribute to detect :

- Virus and infectious agent such as MERS, H1N1, SRAS ...
 - Bacteria
 - Fungi: Aspergillus
- ▷ Early detection of pathogen can help limit the spreading in a hospital unit
- ▷ Coriolis in routine can sustain high-quality of air and limit the risk of hospital-based infections



CASE STUDY: HOSPITAL CONTAMINATION

RSV (Respiratory Synticial Virus) detection in the surrounding patients

- 300 L/min - 5min
- Filtration and concentration of the sample
- 30 air samples, at most 2 days after the diagnostic
- Positive results by RT-PCR RSV real time for 6 samples for 3 children.



RESEARCH & DEVELOPMENT

▷ Every topic related to bio-aerosols:

- Lascaux Cave
- Archeologic Museum
- Amazon forest in Guyana
- Artic
- Coral reef barrier...



CASE STUDY: MERS SYNDROME-CORONAVIRUS DATA & PERSPECTIVES

Use of Coriolis technology

Epidemiological investigation of MERS-CoV infections in bat or camel flocks



Coriolis bio-aerosol sampling surrounding patients & medical staff infected with MERS-CoV



Laboratory studies with Coriolis μ



CONCLUSION

Innovative and comprehensive system



- High Air Flow Rate
- LTM Platform
- Easy to use
- Liquid Sampling → Molecular Analysis
- Compatible with all Market and Application





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