

Covaris cryoPREP® with AFA: Enabling High-resolution Diagnostic Metagenomics

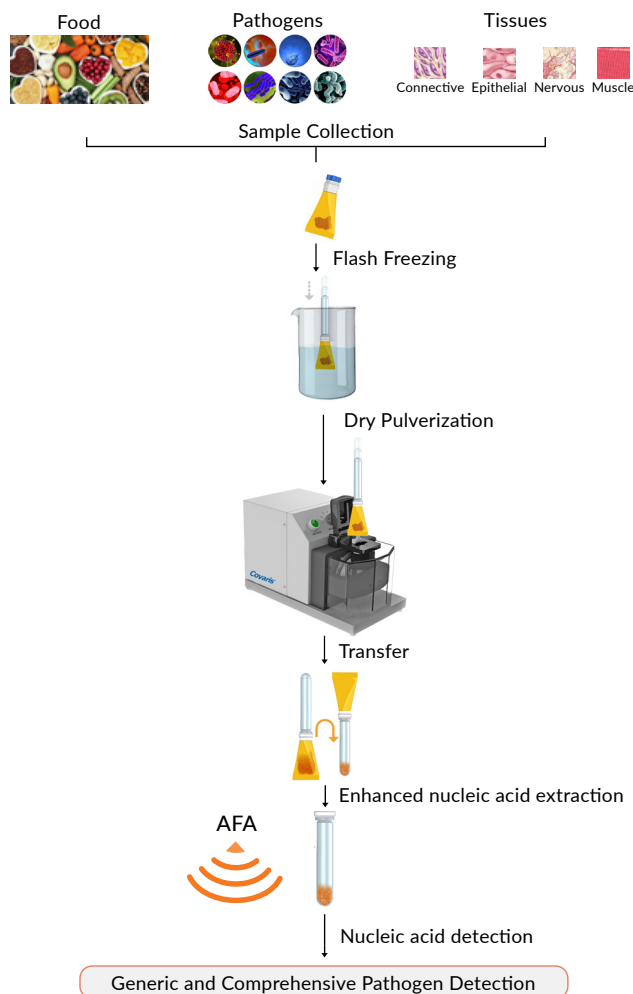
Scientific Relevance

- High resolution diagnostic metagenomics via reliable identification of known and newly emerging pathogens (1) enable:
 - Timely medical intervention for treatment (2,3,4)
 - Rapid human and livestock vaccine development pipeline
 - More efficient food safety monitoring, and recall process (5,6)

Challenges

- Need of an efficient and reproducible sample preparation workflow for standardizing pathogen-independent metagenomics for human and animal health, and food safety
- Nucleic acids are often encapsulated within host tissues within lymph nodes, robust cell and cyst walls or bacterial spores
- Diagnostic metagenomics require efficient and reproducible sample disruption without the risk of carry-over and cross contamination of samples

Workflow



Schematic representation of the CryoPREP workflow for high-resolution diagnostic metagenomics. Sample inputs such as food, pathogens or pathogen containing samples are collected and placed in the centre of the tissue tube. Subsequently samples are flash frozen by submerging the bottom 2/3rd of the tissue tube in liquid nitrogen. Liquefied air is allowed to bubble out for 2-3 seconds followed by immediate insertion of samples into the cryoPREP instrument. Samples are pulverized via impacting with respective power and the cryofractured specimen is transferred directly into respective sample vessel for downstream processing. When working with scarce or very hard to lyse samples it is beneficial to support nucleic acid extraction with AFA in a Covaris ultrasonicator.

Advantages of Covaris cryoPREP

cryoPREP provides a fast, tuneable, efficient, reproducible, and contact-free sample pulverization.

- Compared to other methods, such as bead-beating, cryoPREP provides the most reliable and gentle technique for nucleic acid extraction from various sample inputs (6)
- cryoPREP allows nucleic acid extraction from complex samples enclosed in lymph nodes, cell/cyst walls or bacterial endospores (6)
- Contact-free and closed processing avoids potential cross contamination of samples and release of pathogens
- Cryofracturization with controlled mechanical force ensures efficient and reproducible sample disruption
- Including sample disintegration using the cryoPREP system improves data quality especially for detecting protistan cysts and/or helminth eggs (7)

Advantages of Adaptive Focused Acoustics (AFA)

Supporting nucleic acid extraction with AFA improves yield especially when starting from scarce samples such as biopsy punches. Inclusion of a disintegration step (CP and CP +M220 Focused-ultrasonicator) resulted in longer contigs compared to those obtained without prior disintegration (forBlastocystis). (7)

Suggested Covaris Products

- [CP02 cryoPREP Automated Dry Pulverizer](#)
- [tissueTUBE](#)
- [Focused-ultrasonicators](#)

Citations

- Wylezich et al., [A Versatile Sample Processing Workflow for Metagenomic Pathogen Detection](#). *Scientific Reports*, (2018)
- Wylezich C, Caccio SM, Walochnik J, Beer M, Höper D. [Untargeted metagenomics shows a reliable performance for synchronous detection of parasites](#). *Parasitol Res.* 2020;119(8):2623-2629.

Image References

Getty Images/iStockphoto

- https://www.luminexcorp.com/wp-content/uploads/2014/01/GPP_102314_640x318.png
- <https://schooltutoring.com/help/a-basic-overview-of-the-4-types-of-human-tissue/>