

# Microbial sequencing solutions

Scalable, simple, fast

TARGETED  
SEQUENCING

GENOME  
SEQUENCING



Ion Torrent™

*life*  
technologies

A Thermo Fisher Scientific Brand

Sequencing for every lab, every budget, every application

# Ion Torrent™ semiconductor sequencing

Ion Torrent™ technology has pioneered an entirely new approach to sequencing by combining simple chemistry and semiconductor technology—translating chemical signals into digital information. The ability to sequence faster, more simply, and affordably enables every researcher to take advantage of the power of next-generation sequencing.

The Ion PGM™ System makes affordable, high-quality next-generation sequencing accessible to scientists around the world. The Ion PGM™ System is a reliable sequencing platform that combines simple sample preparation and data analysis solutions with flexible chip output for ultimate project flexibility. With this system, human disease researchers can perform a variety of targeted gene sequencing applications, such as variant detection in tumor and genetic disorders.

## PROVEN

In just the past two years, scientists using the Ion PGM™ System have produced more than 80 peer-reviewed publications focused on microbiology

## SIMPLE

Affordable whole-genome sequencing enables microbiologists to increase discriminatory power and accuracy while using a single technology



TRANSCRIPTOME  
SEQUENCING



EXOME  
SEQUENCING



TARGETED  
SEQUENCING



GENOME  
SEQUENCING

## FAST

The Ion PGM™ Sequencer is faster than any other sequencer—only 4 hours of sequencing run time to get long-read (400-base) sequencing results

“With the Ion PGM™ Sequencer and its advanced NGS technology, the cost of metagenomic analysis has become affordable for small environmental projects.”

**DR. CHARLIE LI**  
DIRECTOR OF DNA LABORATORY  
EMSL ANALYTICAL, INC.



Join the Ion Torrent™ worldwide development community at [lifetechnologies.com/ioncommunity](http://lifetechnologies.com/ioncommunity)



# Microbial sequencing applications

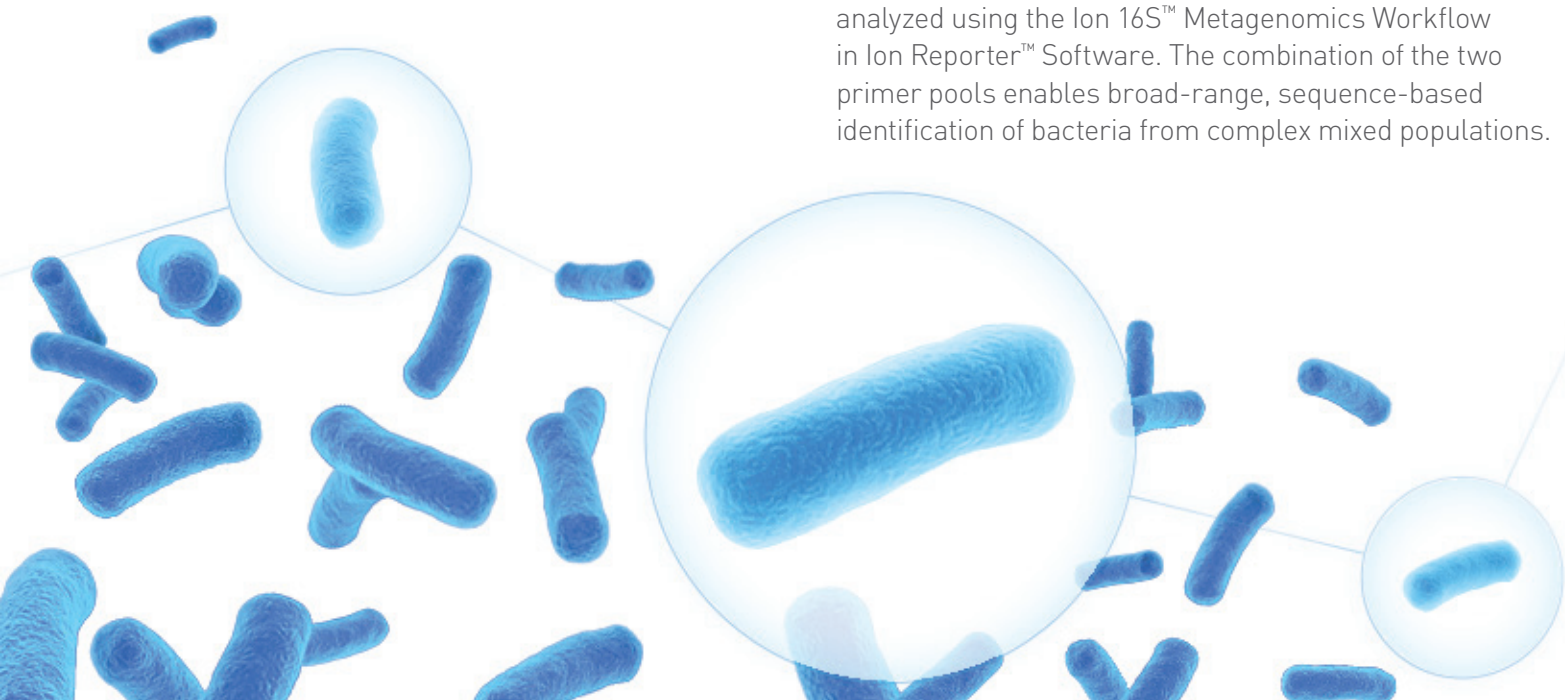
## Discovery and characterization

Whole-genome shotgun sequencing offers important new opportunities for the discovery and characterization of microbial organisms. For researchers characterizing the genomic structures of microbes, *de novo* sequencing and assembly of complete genomes is an important step. Ion Torrent™ semiconductor sequencing has revolutionized *de novo* sequencing for microbial research by providing a simple, low-cost system that is designed to deliver accurate results in less than a day. With 400-base sequencing on the Ion PGM™ System, sequencing assembly metrics are better than ever, giving you a fast path to whole-genome sequencing.

## Metagenomics

Ion semiconductor sequencing accelerates and simplifies metagenomics research by using whole-genome or targeted sequencing of the bacterial 16S rRNA gene (16S sequencing). By eliminating the need to clone samples prior to sequencing, one of the main biases in sampling is removed. Direct sequencing of samples on the Ion PGM™ System can be performed quickly, and with more amplicons, to deliver better discrimination between organisms. Unlike other next-generation sequencers, the Ion PGM™ System enables you to read through low complexity sequences with ease.

The Ion 16S™ Metagenomics Kit uses two primer pools to amplify seven hypervariable regions (V2, V3, V4, V6, V7, V8, and V9) of bacterial 16S rRNA. The amplified fragments can then be sequenced on the Ion PGM™ System and analyzed using the Ion 16S™ Metagenomics Workflow in Ion Reporter™ Software. The combination of the two primer pools enables broad-range, sequence-based identification of bacteria from complex mixed populations.



The Ion Community allows researchers to openly share methods and data, to both evaluate the technology and build on it. We have opened our protocols, datasets, and source code to the world to enable the community to drive application development.



16S metagenomics analysis is easy with Ion Reporter™ Software. Ion Reporter™ Software enables the identification (at genus or species level) of microbes present in complex polybacterial samples, using both curated Greengenes and premium curated MicroSEQ® ID 16S rRNA reference databases. The Ion Reporter™ metagenomics workflow also provides primer information, classification information, percent ID, and mapping information. It's easy to interpret population diversity for your research at any taxonomic level with the interactive display.

### Bacterial typing research

Fast and accurate typing is essential to monitor or characterize bacteria or viruses, to elucidate bacterial transmission chains, or to research health and disease conditions in specific human populations. Ion semiconductor sequencing paired with Ridom™ SeqSphere+ automated software enables any microbiologist to use a genome-wide approach to bacterial typing. Instead of sequencing just a few regions of interest, the Ion PGM™ System enables rapid, low-cost complete-genome sequence information. By using hundreds to thousands of genes for typing, the result is higher discrimination and more accurate typing of individual strains. Within a working day, a specific isolate can be sequenced and characterized, potentially providing real-time answers for disease outbreak monitoring in the future.

### Viral typing research

To target the prediction of patterns of evolution and emergence of disease agents, the Ion PGM™ System paired with PathAmp™ FluA reagents and the Pathogen Analyzer Plugin for Torrent Suite™ Software provides a streamlined workflow for complete influenza A genome sequencing. Researchers can produce influenza A typing in under a day, with highly accurate sequence data that enable more effective research of influenza samples. In the future this may allow you to refine the selection of vaccine strains and to improve predictions of future antigenic characteristics.



“Research using next-generation sequencing technology makes whole influenza genome sequencing much easier, and much less expensive than older sequencing techniques, when used appropriately.”

**STEVE GLAVAS**  
HEAD OF NGS PLATFORM  
SWEDISH INSTITUTE FOR COMMUNICABLE DISEASE CONTROL  
STOCKHOLM, SWEDEN

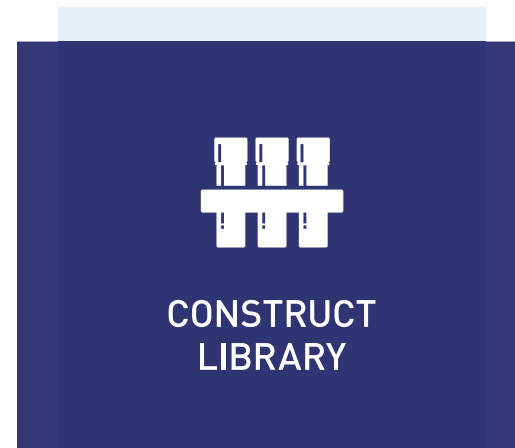
With three sequencing chips to choose from, you can select the amount of sequencing throughput required for your specific application—to help save time and money.



# Microbial sequencing single-day workflows

Streamlined sample preparation and application-specific data analysis solutions have further simplified microbial sequencing, leading to significant breakthroughs across all areas of microbiology research.

Ion Torrent™ offers a full solution for *de novo* sequencing of microorganisms as well as a solution for bacterial and viral typing research. These workflows help speed your time-to-results with automated template preparation, fast sequencing runs, and data analysis packages optimized for your microbiology research. Our 400-base sequencing kit enables long, accurate reads, offering you the best assembly metrics.



## APPLICATION

## PRODUCTS

### Discovery and characterization

Ion TrueMate™ Library Plus Kit

OR

Ion Xpress™ Plus Fragment Library Kit  
(50–100 ng or 1 µg of DNA)

OR

Thermo Scientific® MuSeek™ Library Preparation Kit  
(50 ng DNA)

### Bacterial typing research

### Metagenomics

Ion 16S™ Metagenomics Kit

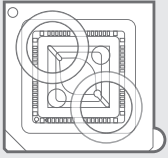
### Viral typing research

PathAmp™ FluA Reagents as input

Ion Xpress™ Plus Fragment Library Kit

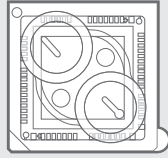
OR

Thermo Scientific® MuSeek™ Library Preparation Kit



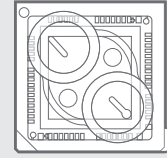
314

Ion 314™ Chip  
1 million wells  
400–550 thousand reads  
for 400-base sequencing



316

Ion 316™ Chip  
6 million wells  
2–3 million reads  
for 400-base sequencing



318

Ion 318™ Chip  
11 million wells  
4–5.5 million reads  
for 400-base sequencing



## PREPARE TEMPLATE



## RUN SEQUENCE



## ANALYZE DATA

Ion Chef™ System  
for automated template prep  
and chip loading

OR

Ion OneTouch™ 2 System and  
Ion PGM™ Template OT2 400 Kit

Ion Chef™ System

OR

Ion OneTouch™ 2 System and  
Ion PGM™ Template OT2 200 Kit

Ion PGM™ Sequencer  
Ion PGM™ Sequencing 400 Kit

Ion PGM™ Sequencer  
Ion PGM™ Sequencing 200 Kit

Torrent Suite™ Software  
DNASTAR® SeqMan® NGen®  
Software

Torrent Suite™ Software  
MIRA Assembler  
Ridom™ SeqSphere+ Software

Torrent Suite™ Software  
Third party software

Torrent Suite™ Software  
Pathogen Analyzer Plugin

# Microbial sequencing solutions with the Ion PGM™ System

**Proven:**

Over 80 peer-reviewed publications focused on microbiology alone

**Scalable:**

Sequence a single *E. coli* genome or multiplex thousands of viruses in a single run

**Simple:**

Simplify your MLST and PFGE with a single workflow—get more answers faster

**Fast:**

Ideal for everyday microbial sequencing

“We chose the Ion PGM™ System because  
it is ideal for microbial sequencing.  
It provides us with the throughput  
flexibility, read length, and data output  
that fit our needs for both basic and  
urgent projects.”

**SONG NIAN HU, MD**

RESEARCHER, PHD SUPERVISOR  
BEIJING INSTITUTE OF GENOMICS  
CHINESE ACADEMY OF SCIENCES  
BEIJING, CHINA

Learn more about microbiology research using the  
Ion PGM™ System at [lifetechnologies.com/ionmicrobial](http://lifetechnologies.com/ionmicrobial)



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