Streamline your bacterial growth assays

GBS (green) and GFP-GBS (black) grown in CDM media.
Minimise operational time
BMG LABTECH offers single and multi-mode microplate readers extensively used by researchers in microbiology. Whether studying microbiomes, biofilms or synthetic biology, plate readers can help expand your experimental possibilities. The classical bacterial experiment was to acquire a growth curve by drawing aliquots and measuring absorbance at 600 nm in a cuvette. Our instruments provide streamlined solutions enabling a modern approach to monitor growth of multiple samples (6–384 wells) in real-time with no manual intervention.

Increase your experimental output
Our plate readers provide a true “walk-away” solution that reduces user intervention and saves time. Instruments allow fast, automated kinetic detection spanning from seconds up to days. Besides absorbance, our multi-mode readers can detect fluorescent and luminescent signals in the same run. This provides the capability to normalise gene expression to cell density or measure cell growth in relation to O₂ consumption. For higher throughput, all readers are robot compatible and can be easily automated with all of the leading platforms.

Replicate specific growth conditions
Accurate temperature control to 65°C, multiple shaking options with various modes and speeds and the capability to precisely regulate O₂ and CO₂ concentrations in the reader provide the best growth conditions even for the most fastidious microbes.

Customer service, reliability and savings
Free application support for the life of the instrument, and access to our knowledge and expertise ensure the maximum performance of your instrument and the best data from your experiments. With BMG LABTECH, “Made-in-Germany” dependability is by design. Our philosophy is that all instruments must be of the highest standard of reliability and functionality. This makes our readers the lowest cost of ownership and highest brand satisfaction on the market.

"After extensive testing of five different brands of microplate readers, only BMG LABTECH instruments were found to have the sensitivity, durability and reliability required for our applications."

Associate Professor Christopher McDevitt, Group Leader
The Peter Doherty Institute for Infection and Immunity, The University of Melbourne, Australia
Key features to keep both microbes and researchers happy

Temperature regulation
Microorganisms have different optimal temperatures for maximum growth rates. To ensure optimal growth conditions, BMG LABTECH readers offer accurate temperature regulation up to 65°C. The specific incubation zone guarantees a uniform temperature and minimizes evaporation. Temperature values are logged to the signal curve, making it simple to compare events at different temperatures.

Shaking
Most microbes require aeration to ensure growth or to disperse cultures into an even suspension. Three shaking modes as well as adjustable speed up to 700 rpm or optionally to 1100 rpm provide optimum settings for your strain. Additionally, the readers can be equipped with an extraordinary robust transport system for shaking 24/7 where required.

Well scans
Microbial assays are most often non-homogenous. Hence, your experiments may benefit from a signal captured over the whole well-surface in either a spiral or orbital pattern, ensuring the most accurate measurement. More detailed matrix scan options (from 2x2 to 30x30) acquire multiple read points over the well surface and display the signal variation in a matrix. This is extremely advantageous when studying highly non-homogenous samples, such as flocculating bacteria or yeast, and for biofilm forming bacteria, to study biofilm size and shape in more detail.

Multiplexing
If you wish to analyse multiple parameters, measurement of OD600 can be combined with luminescent or fluorescent detection of up to 5 different dyes in the same run. This allows the design and performance of multiplex assays. For instance, the growth of multiple strains with different fluorescently tagged genes can be monitored in the same well, or the growth characteristics and effects from various bioactives can be followed in a single well. For even more flexibility the patented LVF-Monochromator™ allows you to select any wavelength and any bandwidth for your fluorescent or luminescent measurement, providing your lab with the most versatile reader available.

Atmospheric Control Unit
The living environment of microorganisms is diverse; replicating it in a plate reader requires precise control of the atmosphere. The Atmospheric Control Unit (ACU) independently regulates O2 and CO2 inside the reader to establish an environment conducive for growth. This allows long-term measurements at stable O2 (0.1-20 %) and CO2 (0.1-20 %) atmospheres, perfect for the most fastidious organisms. Gas ramping can be programmed to study responses to changing gas conditions in real-time.
Growth of *Neisseria meningitidis* in a BMG LABTECH microplate reader with Atmospheric Control Unit (ACU)

Kerry L. Cutter University of the West of England, Bristol

**Summary**

It is well known that microorganisms need a specific level of carbon dioxide \([\text{CO}_2]\) for growth and reproduction. The period during which this level is increased usually corresponds to the lag phase as the organism is unable to divide until the critical concentration of \(\text{CO}_2\) is reached. *Neisseria meningitidis* is considered to require or benefit from a concentration of \(\text{CO}_2\) greater than atmospheric, hence it is a suitable organism to study \(\text{CO}_2\) effects.

A strain of *Neisseria meningitidis* was used to assess the efficiency of a BMG LABTECH multi-mode plate reader coupled with an Atmospheric Control Unit (ACU) to deliver \(5\%\ \text{CO}_2\).

Growth was determined by detecting absorbance at 405 nm and compared to data obtained on a microplate reader without ACU. The BMG LABTECH plate reader with ACU is able to achieve and maintain a level of \(\text{CO}_2\) required for such a fastidious organism or for cell cultures.

For more information please refer to BMG LABTECH application note 155.

Monitoring bacterial cell-to-cell communication “quorum sensing” using a BMG LABTECH microplate reader

K.E. Elobgbozin and G.K. Robinson Dept. of Biosciences, University of Kent, Canterbury, CT2 7NJ

**Summary**

Bacteria communicate by producing, detecting and responding to low molecular mass molecules known as autoinducers (AI) in a process called quorum sensing. The process is well-described in *Vibrio fischeri*, an organism that turns bioluminescent with high cell density. The molecule responsible for bioluminescence development is N-3-oxo-hexanoyl-L-homoserine lactone [3-oxo-C6-HSL].

A BMG LABTECH microplate reader detected bioluminescence of *V. fischeri* to report on quorum sensing and related it to the cell density determined by OD\(_{600}\) measurements. *V. fischeri* strains mutated in genes required for luminescence development were exposed to 3-oxo-C6-HSL to study cell-to-cell communication. Combining luminescence and absorbance measurements enabled to monitor microbial growth at the same time with bioluminescence. This means that a specific signal and an internal control can be acquired to allow a ratiometric read-out.

For more information please refer to BMG LABTECH application note 199.
Growth of Campylobacter using a microplate reader equipped with ACU

R.D. Haigh, J.M. Ketley Department of Genetics, University of Leicester

Summary
The bacterium Campylobacter jejuni causes food poisoning with symptoms of abdominal pain, diarrhea and fever. C. jejuni is cultured at 37-42°C, 5-8% O₂ and 10% CO₂ as this mimics conditions found in the intestine of its hosts. Here, a comparison of C. jejuni growth studies performed in 8 ml scale were compared with growth curves obtained in a 96 well microplate. The atmosphere was controlled with a VAIN workstation or the Atmospheric Control Unit of a microplate reader, respectively. Optical density at 600 nm to assess biomass was acquired in a cuvette or directly in the microplate. The comparison of growth of Campylobacter in tubes and in 96 well plates demonstrates that this fastidious organism can be transferred to a 96 well format. This is made easy by the design of the BMG LABTECH microplate reader providing temperature control, shaking and atmospheric control.

Expression of a stable GFP mutant in Group B Streptococcus. Growth, detection and monitoring.

Matthew J. Sullivan and Glen C. Ulett, School of Medical Science, and Menzies Health Institute Queensland, Griffith University, Gold Coast, Queensland, Australia

Summary
Streptococcus agalactiae [also known as group B streptococcus (GBS)] is associated with various diseases such as neonatal disease, sepsis, arthritis, pneumonia, meningitis, skin and soft tissue infections. Host colonization and virulence are mainly studied using microscopy and fluorescent biomarkers. Strategies for labelling GBS with fluorescent biomarkers have so far been limited to antibody-based immunostaining methods and non-specific protein/DNA stains.

Green fluorescent protein (GFP) expression is a common labeling method for bacteria, enabling their identification in complex samples or monitoring of their subcellular locations in eukaryotic host cells. Recently, stable expression of a green fluorescent protein mutant [GFPmut3] with enhanced fluorescence intensity in GBS was reported. Validation and stability of GFPmut3 expression in GBS cultures was measured by the CLARIOstar® multi-mode plate reader and its fluorescence intensity, fluorescence polarization and absorbance measurement capabilities.
Green fluorescent protein (GFP) expression is a common labeling method for bacteria, enabling their identification in complex samples or monitoring of their subcellular locations in eukaryotic host cells. Recently, stable expression of a green fluorescent protein mutant (GFPmut3) with enhanced fluorescence intensity in GBS cultures was reported. Validation and stability of GFPmut3 samples or monitoring of their subcellular locations in eukaryotic cells was measured by the CLARIOstar multi-mode plate reader in GBS. Strategies for growth, detection and monitoring of C. jejuni with symptoms of abdominal pain, diarrhea and fever.

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Our innovative absorbance-only microplate reader has the flexibility to perform assays quickly and easily in microplates or via the built-in cuvette port. This spectrometer-based absorbance plate reader captures a full UV/vis spectrum in less than 1 second. Its speed and simple push button operation make it the leading microplate reader for absorbance measurements.

The Omega series offer true flexibility to provide you with the perfect reader to fulfill your requirements. From an absorbance-only SPECTROstar or luminescence-only LUMIstar to a fully-equipped POLARstar Omega with up to seven detection modes. Your chosen instrument can also be upgraded at any time if you need more features or additional detection modes.

The CLARIOstar Plus is the ideal instrument for assay development. Our most flexible multi-mode plate reader comes equipped with our patented LV Monochromator™, filters, and spectrometer. Flexibility combined with the best sensitivity of its class, and our newly developed Enhanced Dynamic Range technology make it the ideal reader for assay development.

What else should you know

For more information please refer to BMG LABTECH application note 329.

For more information please refer to BMG LABTECH application note 329.