



**QIB EXTRA**  
*CLOSTRIDIUM*  
*BOTULINUM*  
**CHALLENGE TESTING**  
**SERVICES**

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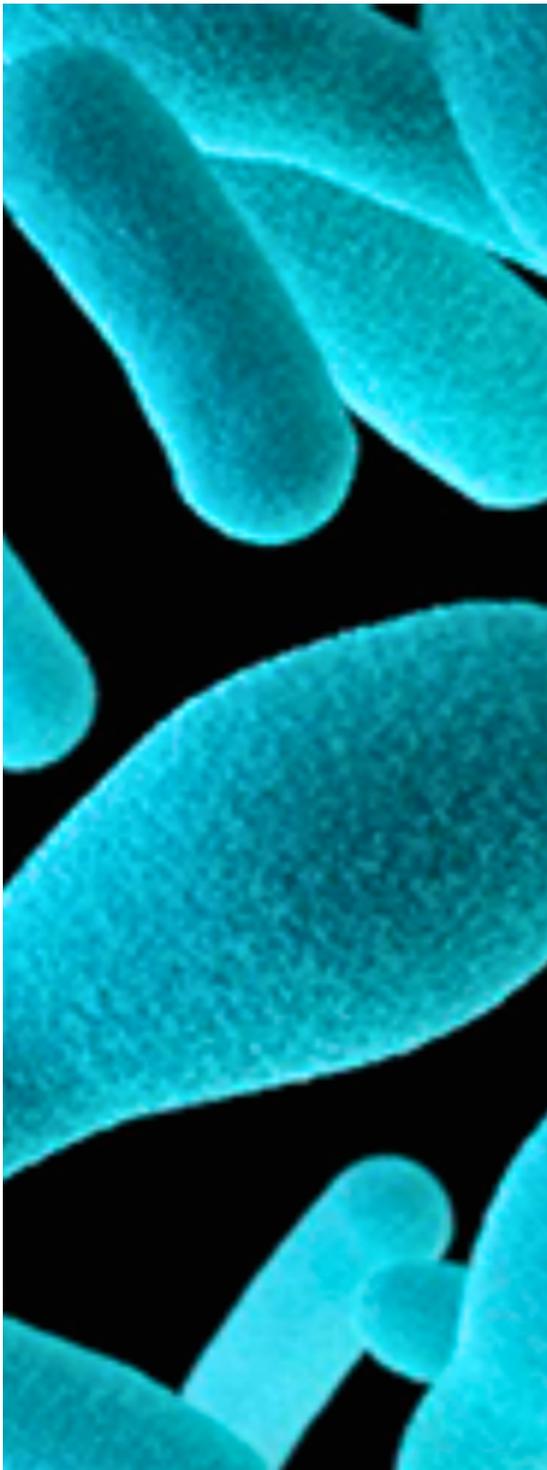
# About QIB Extra



QIB Extra is an ISO9001 accredited, wholly owned subsidiary, of the Quadram Institute Bioscience (QIB) that provides short and long-term, high-quality strategic and applied research. QIB Extra works with both commercial companies and academic partners around the world in the areas of gut health, food safety, nutrition, and allied sectors.

By accessing the world-leading research expertise, facilities and equipment at QIB, QIB Extra works with customers to build both highly focused and multidisciplinary projects to specific customer requirements. QIB Extra facilitates contract research delivery in a cost-effective and timely manner from the design and planning stage, through to the delivery and completion.

# INTRODUCTION TO *CLOSTRIDIUM BOTULINUM*



*Clostridium botulinum* (*C. botulinum*) is a Gram-positive, spore-forming bacterium capable of producing the botulinum neurotoxin in environments with no (or low) oxygen levels.

The botulinum neurotoxin is the most potent toxin known to humans. It causes botulism, a potentially fatal disease characterised by a descending bilateral flaccid paralysis, which in severe cases can result in respiratory failure.

Seven antigenically distinct types of botulinum toxin have been confirmed, types A to G, and many sub-types have also been described. Four of these neurotoxins (types A, B, E and, less frequently, F) cause botulism in humans.

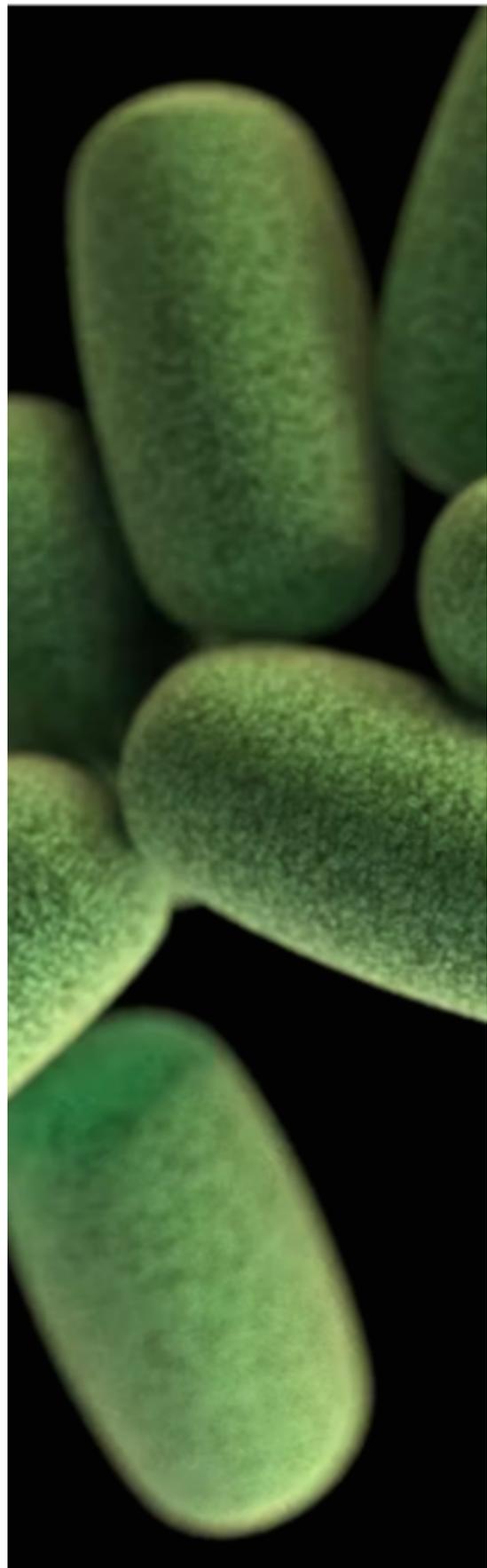
While toxin types C and D are responsible for botulism in animals and birds.

Although initially grouped together based on the ability to produce the botulinum neurotoxin, *C. botulinum* is now recognised to comprise four metabolically and genetically distinct groups: *C. botulinum* Groups I to IV.

Botulinum neurotoxin formation has also been identified in strains of *Clostridium sporogenes*, *Clostridium butyricum*, and *Clostridium baratii*.

The most prevalent forms of botulism in humans are foodborne botulism, which is caused by ingesting toxin already present in foods, in addition to **infant botulism** and **wound botulism**.

The latter two are infections requiring growth of neurotoxin-generating Clostridia in the infant gut or wounds, respectively, and subsequent toxin production.



# FOODBORNE BOTULISM

**Foodborne botulism is a dangerous, potentially fatal disease caused by ingesting botulinum neurotoxins.**

These toxins are produced in foods contaminated with spores of *C. botulinum* when conditions; such as temperature, pH, salt concentration, water activity, and oxygen concentration, are encountered that are favourable for spore germination and outgrowth of the bacterium to form toxin.

Two groups of *C. botulinum* are mainly responsible for causing foodborne botulism in humans:

**Group I (Proteolytic)** *C. botulinum* can form one or more neurotoxins of types A, B, and F, can grow and produce toxin above 10°C, and are a **concern in shelf-stable foods, such as canned or bottled foods**, that have been improperly processed.

**Group II (Non-proteolytic)** *C. botulinum* can form either type B, E, or F neurotoxins, is a psychrotrophic bacterium that can grow and produce toxin during chilled storage at 3°C and above. Botulism due to non-proteolytic *C. botulinum* has often been **associated with cured, vacuum packed, salted, dried, or smoked meat and fish** that have been subjected to time and/or temperature abuse.

Due to the severity of the intoxication caused by the botulinum neurotoxin, many Food Standards organisations around the world have *C. botulinum* guidelines in place to ensure the safety of commercially produced food products.

# FOOD CHALLENGE TESTING SERVICES

**QIB Extra provides *C. botulinum* challenge testing based on identifying the formation of the botulinum neurotoxin in test products during defined storage conditions to help you make evidenced based decisions when determining a product's shelf life.**

Our approach focuses on detecting the toxin rather than the presence of the pathogen. This is because there is evidence that production of the toxin can occur in the absence of any detectable bacterial growth. Toxin detection at **QIB Extra** is achieved without animal testing. Our results, though, are comparable in sensitivity with the mouse bioassay.



Our experts have many years of experience in the field of food safety and *C. botulinum*, with an excellent and proven track record of publications and involvement in the regulatory framework that has contributed to the improvement of food safety in the UK and elsewhere.

# BESPOKE CHALLENGE TESTS FOR *C. BOTULINUM*

**Our challenge tests are tailored to meet the specific requirements of the customer.**

**QIB Extra** can provide expert advice to assist in defining the necessary experimental parameters. This is required to provide sufficiently robust scientific data to support risk management decisions.

Many of the challenge tests we perform for our customers involve non-proteolytic *C. botulinum* and chilled foods, specifically testing for botulinum neurotoxin types B and E.

However, **QIB Extra** also conducts challenge tests with proteolytic *C. botulinum* and temperature-abused or ambient-stored foods, focusing on testing for botulinum neurotoxin types A and B.



## CUSTOMISED CHALLENGE TESTS: TAILORING SOLUTIONS TO YOUR SPECIFIC NEEDS AND PRODUCT REQUIREMENTS



A typical challenge test for a chilled food product with *C. botulinum* might be:

- A cocktail of spores from selected non-proteolytic *C. botulinum* type B and type E strains are used to inoculate the product test packs.
- Uninoculated control test packs are also included as a control.
- The test packs are incubated at a defined incubation temperature (in the UK this is typically 8°C) and defined time period.
- A series of sampling time points during the incubation period are defined depending on the shelf-life of the product.
- An agreed number of replicate packs at each sampling time are tested for botulinum neurotoxin types B and E in both inoculated and uninoculated packs.
- Each test data point is also run as an analytical replicate.
- Toxin concentration is calculated against a matrix-matched calibration curve.

# Food Challenge Testing Team

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**Dr Martin Webb**  
*Clostridium botulinum* Lead Consultant

As the lead consultant of QIB Extra's Food Challenge Testing team, Martin guides Challenge Testing projects from initial discussions to the reporting stage.

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**Dr Alan Brailsford**  
QIB EXTRA HEAD OF OPERATIONS

As the Head of Operations at QIB Extra, Alan leads all non-scientific discussions and negotiations with clients.

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**Chris Tallent**  
QIB EXTRA CONTRACTS  
ADMINISTRATOR

Acting as the main point of contact for all non-scientific actions relating to your access or project needs, Chris will aid in leading your project needs forward.

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You can contact us on our contacts page:

[www.qibextra.co.uk/contact-us](http://www.qibextra.co.uk/contact-us)

Alternatively, you may call us on:

**+44 (0) 1603 255001**

Our team will work with you to understand your project needs, answer your questions and provide you with a tailored project proposal that uses sound scientific principles to meet your objectives.

Over the years, we have been fortunate to work with many large and small organisations from all over the world. We believe the world-class research expertise we offer can have a real impact on your business and that we can deliver access to this expertise in an efficient and professional manner.

Thank you,

**QIB EXTRA OFFICE TEAM**



# Let's Work Together

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