

ABIOMED - A Company With Heart



ABIOMED

ABIOMED® creates solutions for one of life's most critical components, the human heart. As a global leader in the development of technologies to assist or replace the human heart, their successful products include the AbioCor® Implantable Replacement Heart, the first artificial replacement heart to be implanted in a human patient, and the BVS® 5000, the most widely used advanced cardiac assist system approved by the FDA.

On September 13th, 2002, ABIOMED and its AbioCor product reached a major milestone when a patient passed the one-year mark utilizing this replacement heart. The patient, with an original life expectancy of 30 days or less, became the longest living patient on the battery-powered heart.

Industry: Medical

Core advantages ABIOMED has realized with QA-C:

- Reduced costs, due to greater speed in testing and earlier discovery of errors.
- Faster time to trial phase - fewer prototype and testing cycles.
- Higher confidence in product quality, based on depth & breadth of QA-C testing.
- Developer skills refine using QA-C, yielding better, more robust code development.

Software - At the Heart of the Matter for ABIOMED

Core to the successful operation of ABIOMED's products is the software that runs, monitors and regulates their functions. The critical nature of their mission allows no tolerance for error. With patient lives and the company's reputation at stake, superior product quality and assured patient safety are the number one objectives. These are the driving forces in ABIOMED's development process.

"QA-C has given us a much greater comfort level in our development process."

- Peter Martin
Director, Electronic Systems
ABIOMED

Critical software development has traditionally been a highly iterative process of manual code review, editing, and testing. Historically, ABIOMED has dedicated a large portion of its resources to ensuring its product software quality is impeccable. In earlier products, ABIOMED relied on "Fagan-style"¹ manual code review, along with older code-testing tools such as Lint, a software tool supplied with a variety of proprietary UNIX® operating systems.

Though this approach yielded success, they realized that vast resources were required, and the manual review process still left room for human error. They also knew that the manual inspection process was less effective in leveraging errors into valuable educational opportunities for code developers.

A Critical Function with Critical Requirements

In search of a more thorough and efficient process for producing reliable code, ABIOMED's senior software designer Dana Sawyer began researching the availability of products for deep static code testing – a way of performing extremely thorough and automated code review. While reviewing potential solutions, Sawyer encountered a reference to Programming Research's (PRQA) deep static code testing solution, QA-C.

Sawyer contacted PRQA to discuss his critical requirements, and PRQA immediately provided him with sample testing and reporting on ABIOMED code. Somewhat amazed at the depth and specificity of potential code improvements discovered by QA-C, Sawyer was highly impressed and upon further discussions, convinced his peers at ABIOMED that QA-C was the best solution available to support their critical code development process.



"From the beginning, I found QA-C's user interface very helpful and exceptionally useful in how it allows us to review results and explore the data...When we used Lint more heavily, I would still often use QA-C because it helped us a lot in accessing the results of testing."

– Dana Sawyer, Senior Software Designer, ABIOMED

¹ Fagan, M. "Design and Code Inspections to Reduce Errors in Program Development."

ABIOMED Relies on QA-C

ABIOMED soon discovered that they could use QA-C on a daily or even hourly basis in the code development process, to enforce code standards compliance and provide early error detection. They found QA-C saved them vast amounts of time in the development process, eliminating excessive rounds of compiling, testing and prototyping. Moreover, by using testing reports generated by QA-C, their developers were able to learn from the detailed error descriptions, and rapidly improved their code-writing skills.

Initially ABIOMED used a Lint tool in conjunction with QA-C. The two products were found to be complementary, both catching different types of errors. With later releases however, ABIOMED found that QA-C was capturing virtually all errors, going much deeper than the Lint tool and rendering Lint testing unnecessary. Today, ABIOMED occasionally uses its Lint tool for comparison purposes, but has grown comfortable with relying on QA-C for critical code review on a daily basis.

"With QA-C our prototypes retain much of their integrity, because most defects are caught early... even as our goals evolve and the code changes, our product quality remains consistently high."

– Dana Sawyer, ABIOMED

An Advanced Solution from a Dependable Partner

Working with PRQA staff both at the local and international levels, ABIOMED found that PRQA was not only the premier solution for their needs, but the ideal partner as well. The PRQA representative and associates worked hand-in-hand with Sawyer to identify optimal implementation and usage methodologies for the QA-C solution. From installation and testing to ongoing product updates and top-level technical resources, PRQA provided ABIOMED with a highly service-oriented partner experience. Initial rollout was completed rapidly, and the solution went to active use within a very short period of time.

Sawyer was highly impressed with the engineers and support, both from PRQA headquarters in the UK and from US-based field personnel, giving high marks for the skills, communications, service and success they have provided ABIOMED as a customer.

ABIOMED's product development process entails constant code writing, as new products are conceived, modelled, prototyped and tested. They are now using QA-C on a daily basis in their product development process – confident of its effectiveness, speed and ease-of-use. QA-C was involved in the development of the AbioCor breakthrough implantable replacement heart from day one. Based on the success they have experienced with PRQA, ABIOMED continues to use QA-C in its ongoing development of new products.





A Healthy Outcome

While the benefit and cost savings to using QA-C are not easily measured in specific numbers, both Sawyer and Peter Martin, ABIOMED's Director of Electronic Systems, concur that QA-C has been a tremendous asset in their company's success. Both acknowledge QA-C's role in expediting product development and time-to-market, streamlining costs associated with software testing, and increasing reliability and confidence in ABIOMED's life-critical products.

QA-C helps ABIOMED to improve and retain the integrity of their prototype developments by catching real and potential errors early in the process, allowing production of much higher quality prototypes and maintaining quality levels through the products' evolutionary stages.

ABIOMED also experiences greater comfort in the development and testing process. It's use of deep static testing with QA-C provides a deeper level of assurance – both internally and externally – that everything possible is being done to make their life-support products as safe and effective as possible. Based on the success they have achieved using QA-C, ABIOMED has always been eager to participate in PRQA's technology preview programs, and to offer feedback on PRQA's ongoing product development. This has been an asset to PRQA as well, who highly values feedback and requests from key users like ABIOMED for use in planning new product releases.

On another note, Sawyer also has recognized outstanding value in the user interface (UI) provided by QA-C. He has found QA-C's UI to be extremely functional, offering excellent access to testing results data in different ways.

Contact Us

For further information regarding QA-C, QA-C++ and QA-Verify and compliance module add-ons, please contact QA Systems at info@qa-systems.com where appropriate QA Systems will re-direct you to Programming Research Ltd.

With the confidence QA-C has earned, ABIOMED plans to keep PRQA highly involved in both current and future product development efforts.

QA Systems and Programming Research Ltd

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QA-C, QA-C++ and QA-Verify, offer the closest possible examination of C and C++ code. All contain powerful, proprietary parsing engines combined with deep accurate dataflow which deliver high fidelity language analysis and comprehension. They identify problems caused by language usage that is dangerous, overly complex, non-portable or difficult to maintain. Plus, they provide a mechanism for coding standard enforcement.