

# Reducing experimental variability with high-purity research chemicals



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When experimental results don't match expectations, where do you begin troubleshooting? Checking instruments? Recalibrating systems? Reviewing analytical methods?

Often, the search starts with the tools and techniques used to run the experiment. But sometimes the source of the problem is far more subtle.

Trace impurities in research chemicals can quietly influence reactions and measurements long before scientists realise they are there.

As analytical techniques become more sensitive and modern research depends on increasingly precise measurements, the impact of these contaminants is becoming harder to ignore. Even minute amounts can interfere with reactions and distort analytical signals.

Scientists and engineers who are working to solve some of today's biggest challenges - from developing life-saving therapies to advancing safer energy storage - need to understand why impurities form and how high-purity research chemicals minimise their impact to ensure reproducible, reliable results for the science of tomorrow.

## Where do impurities originate?

An impurity is any substance present in a research chemical that is not part of the intended formulation. These contaminants can originate from several sources, including:

- **Manufacturing residues**, such as unreacted starting materials, synthesis intermediates, reaction by-products, residual solvents, or trace metals from catalysts and manufacturing equipment
- **Packaging and handling contamination** can introduce particulates or other substances during filling, packaging, transport, or routine laboratory use
- **Storage degradation and environmental exposure** cause impurities when chemicals react with oxygen, light, heat, or air during storage, producing degradation that alters chemical stability

Even minor impurities have major consequences

The impact can be significant, particularly in scientific environments where the margin for variability is small.

This can lead laboratories to question otherwise sound materials, repeat experiments unnecessarily, and spend valuable time troubleshooting results rather than advancing their work.

**How to mitigate:** Select Karl Fischer reagents, water standards, and auxiliaries engineered specifically for accurate moisture determination, such as Hydranal™, which offers dependable products across challenging matrices.

## Chromatographic analysis

Chromatographic techniques represent other areas where chemical purity is critical. Methods widely used in pharmaceutical development, environmental monitoring, food safety testing, and metabolomics research rely on increasingly sensitive instrumentation. The ability to detect trace compounds has improved dramatically. Modern LC-MS systems, for example, can detect compounds at parts-per-trillion levels, allowing researchers to identify extremely low concentrations of analytes.



High-purity solvents from Chromasolv™ are specifically designed to deliver low baseline noise and consistent detector response across sensitive LC, LC-MS, UHPLC, and GC workflows.

## Chromatographic techniques represent other areas where chemical purity is critical

### Moisture determination

In lithium-ion battery research aimed at developing safer, more sustainable energy storage technologies, controlling moisture contamination is crucial. Trace amounts of water can degrade electrolytes and reduce battery performance.

Researchers commonly rely on Karl Fischer titration to detect and quantify moisture in these materials. But the reliability of that measurement depends on the quality of the reagents used in the analysis. If the inputs themselves introduce variability - such as residual moisture or inconsistent reagent performance - the results may indicate that a sample falsely exceeds acceptable limits or falsely meets them, leading to potential recalls for poor performance or premature failure.

This extraordinary sensitivity also means trace impurities in solvents can quickly become problematic. Contaminants may appear as unexpected peaks in chromatograms, increase baseline noise, or interfere with the detection of target compounds.

A laboratory analysing pesticide residues in food may observe an additional peak that appears to indicate contamination. If that signal originates from a trace impurity in the chromatography solvent rather than the sample itself, the analysis could produce a false positive and require additional investigation or repeat testing - again, wasting valuable time and resources.

**How to mitigate:** Use chromatography solvents manufactured and packaged to minimise contamination.

### Biosynthesis applications

In fields such as pharmaceuticals and biotechnology, experimental reliability directly affects development timelines and regulatory outcomes. An oligonucleotide synthesis process compromised by input impurities may require additional validation, reduce yields, or disrupt reaction pathways.

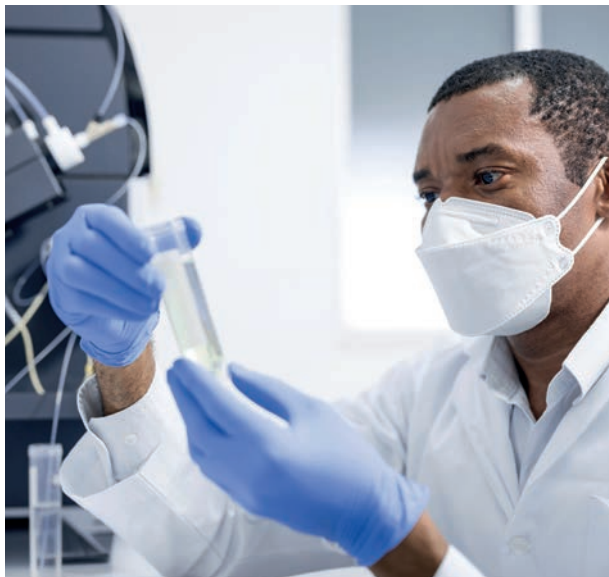
Peptide synthesis presents similar challenges. Contaminants in reagents can derail coupling reactions, producing incomplete sequences or unexpected by-products that force researchers to repeat entire synthesis runs.

**How to mitigate:** Select biosynthesis solvents and reagents produced under tightly controlled conditions. Burdick & Jackson BioSyn™ helps protect reaction pathways and maintain consistent synthesis performance from early research through scale-up.

## Routine laboratory workflows

Even in everyday analytical chemistry, purity remains essential. Routine tasks - from sample preparation to instrument calibration - depend on consistent inputs. If they contain impurities or vary between batches, laboratories may experience subtle shifts in measurements or unexpected instrument responses that require additional troubleshooting.

**How to mitigate:** Choose products manufactured with strict quality controls. Fluka™ acids, bases, buffers, salts, and high-purity solvents provide dependable performance for everyday analytical chemistry workflows where consistency matters most.



## Trust the purity of your research chemicals

For laboratories working across any number of applications, reliable research chemicals have become just as important as the instrumentation used to measure them. Your research chemical provider plays an important role. They must deliver products engineered to minimise contaminants and perform consistently from batch to batch.

Research Chemicals from Solstice Advanced Materials support this level of reliability for demanding workflows in the modern lab. Throughout Solstice's Hydranal, Chromasolv, Fluka, and Burdick & Jackson BioSyn portfolios, each product is made through tightly controlled production systems and packaged to protect chemical integrity from production through use:

- **ISO-certified manufacturing and quality systems** ensure strict process control, safety standards, and consistent product specifications
- **Dedicated production lines and reactors for specific solvent classes** reduce cross-contamination and preserve chemical purity during manufacturing
- **Multi-stage purification and filtration processes** help maintain low background values and consistent analytical performance in sensitive workflows
- **Dual-phase quality testing at interim and final stages** verifies reproducibility and stability before products are released
- **Proprietary cleaning processes for bottles and packaging** prior to filling reduces contamination risk
- **Packaging engineered to protect purity** includes containers designed to prevent leaching, moisture ingress, and degradation during storage and transport



Comprehensive documentation, including Certificates of Analysis (CoA) and Safety Data Sheets (SDS), are released with every batch, and Solstice has a global support team that understands your chemistry. The Solstice LabReady™ service can customise blends and formulations to help reduce preparation errors and further minimise contamination risks. Custom packaging is also available.

Together, these resources provide the responsive guidance, validated methods, and support needed to keep your research moving forward.

When scientists can trust the purity and consistency of their research chemicals, less time goes to troubleshooting variability and labs can focus on advancing the discoveries that shape tomorrow.

**To learn more about Solstice Research Chemicals, visit [go.solstice.com/lab-and-research-chemicals](http://go.solstice.com/lab-and-research-chemicals)**



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