



HDX™



Your protein in focus

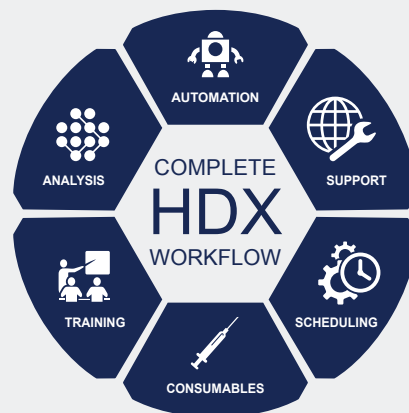
Automated Hydrogen-Deuterium Exchange

Flexibility by design

Since 2002 Trajan has been automating HDX, providing continuous enhancements for rugged HDX sample control and scheduling.

Trajan HDX Workflows are the recognized leader, preferred around the globe by scientists requiring confidence in reproducible results.

Your protein in focus



Automation | Automated Hydrogen-Deuterium Exchange

Flexibility by design

HDX is a well-established analytical technique for protein-ligand, protein-protein, protein-conjugate interactions and protein stability studies.

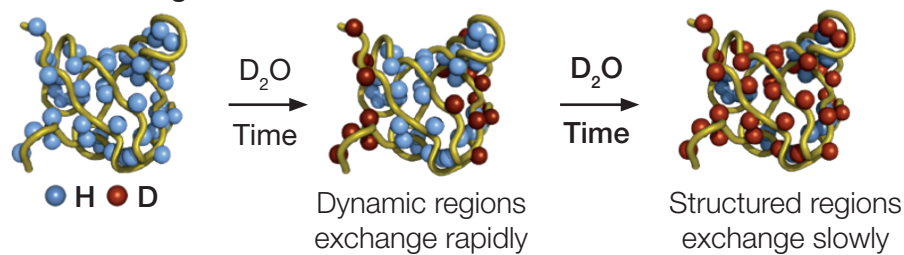
HDX uses variations in deuterium exchange rates between more and less accessible/structured regions throughout a protein, as shown in Figure 1.



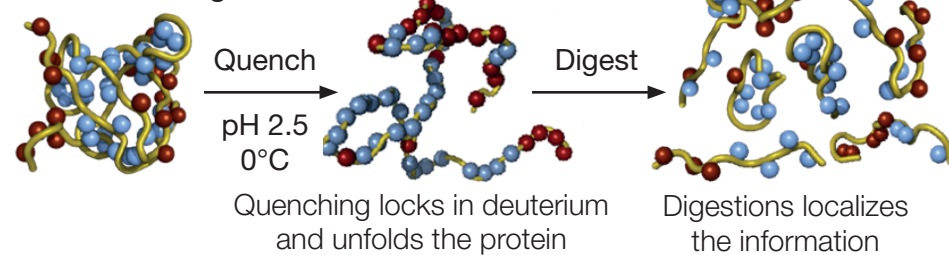
In addition to being faster than other protein techniques like x-ray crystallography, NMR and cryo-EM data can be obtained from samples that are challenging to crystallize and from samples in short supply. It can be used to replicate critical native state conditions, for the most useful results. HDX is an indispensable complementary tool for protein biophysics.

Trajan's HDX Workflows are compatible with bottom-up, top- and middle-down protein analysis studies.

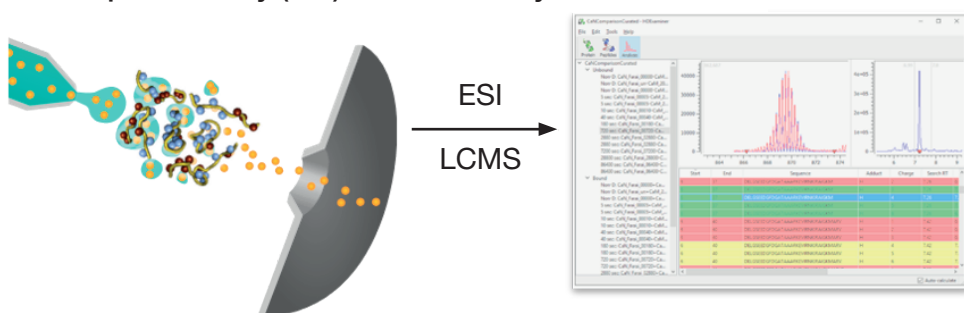
H/D exchange



Quench and digest



Mass spectrometry (MS) and data analysis



Adapted from ©2013 David Weis,
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MS Data at each time point provides
insight into your protein's structure

Figure 1



Our total HDX Workflow covers the complete process: sample input >> the many meticulous steps of preparation >> optimizing mass spec utilization >> clear answers with minimal manual data curation.

Automated HDX provides structural confidence in native states

HDX, especially automated HDX, has uses in development, manufacturing and post-production, providing insight into your protein's tertiary structure, in its native state(s).

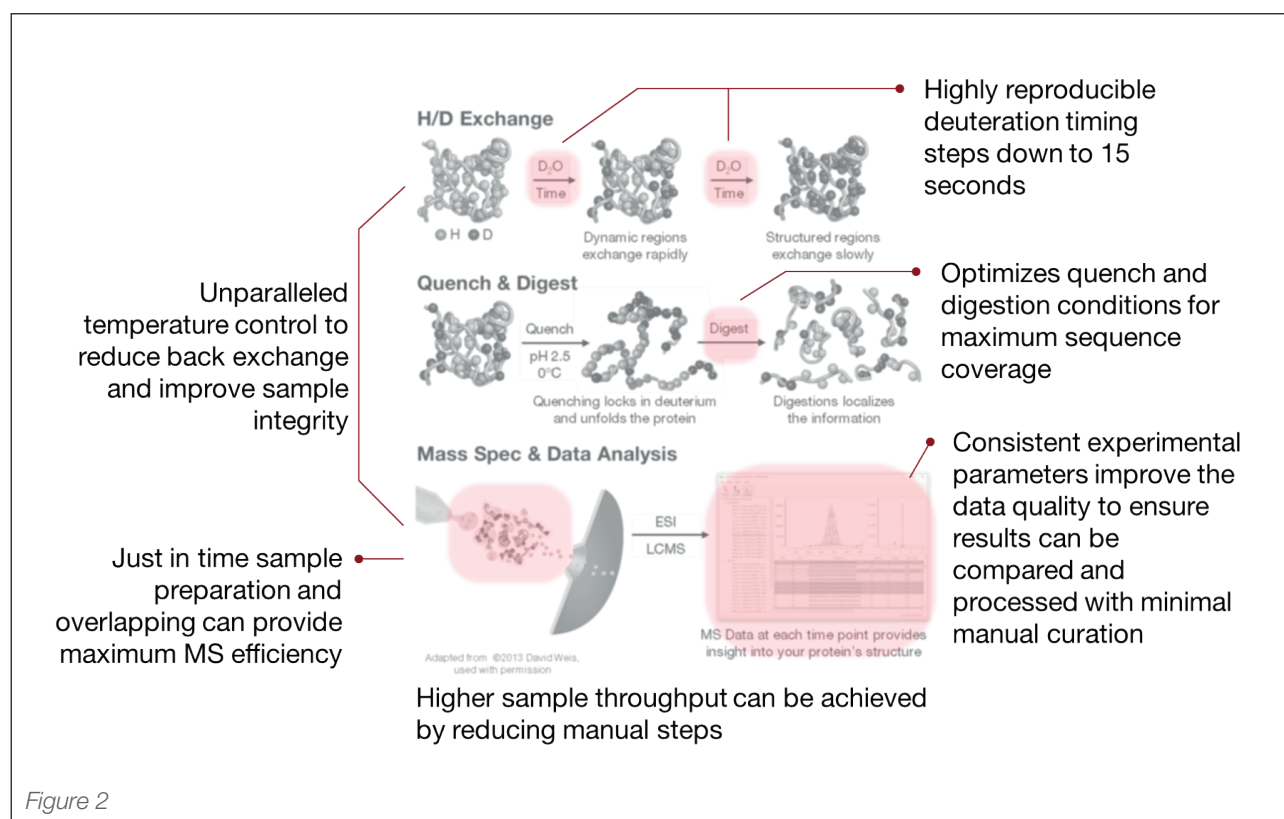
Successful HDX experiments are all about control

With robotic precision, Trajan's HDX Workflow exerts exacting control of all key factors:

- Reproducible accuracy in timing of liquid transfers – overlapped to ensure efficiency.
- Maintained pH control – optimizes quench conditions for maximum sequence coverage.
- Sustained 0°C environment – precision at temperatures from 0°C to biological conditions.
- In-line digestion – fully leverages and identifies ideal digestion conditions.

The result? Exceptional data quality

Figure 2 outlines the specific areas of the classic HDX experiment that benefit directly from Trajan's latest automation platform.



A typical experiment might consist of a dozen time points with replicates for multiple protein samples. Trajan's HDX Workflow schedules the experiment and performs all steps and each time point consistently on every sample.

New configuration is the fastest automated workflow

The new standard and extended parallel platforms allow your investment to grow with the field, bringing the speed and flexibility to your laboratories.

Access:

More protein types

More flexibility

More capacity



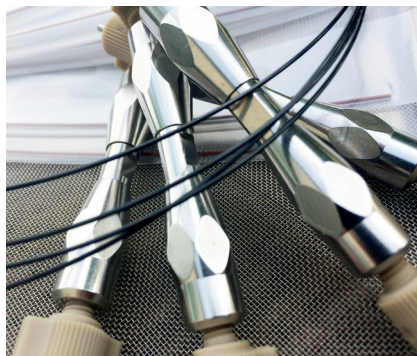
Flexibility by design

The total HDX platform

Faster answers

Powerful information on protein structure in days – not weeks.
Move more quickly, make better decisions.

With HDExaminer, swiftly and easily analyze data from any MS instrument to get a complete picture of the overall deuteration behavior of your protein.



Expert training

Trajan Scientific and Medical is the global expert in HDX automation. Our in-house specialists and experienced partners offer the best training and consulting available to achieve your HDX goals.

Consumables designed for HDX

Columns and fluidics specifically designed to optimize all aspects of the HDX user experience. From ease of use to reliability and sample stability, your success is our number one goal.

ProDx Protease columns are designed to perform with lower carryover, lower backpressure, and better digestion characteristics at 0°C for longer lifetimes.

ProDx Protease column



2.1 mm ID, bio-inert, glass-lined, stainless-steel column, 30 mm length, rated to 20,000 psi





SUPPORT

Automation at its finest

The most efficient system control, with unique temperature set points at all stages of the experiment to ensure reliable data. Sustained 0°C environment reduces back exchange, improves sample stability and overall reproducibility.

Our Chronos for HDX software offers a streamlined interface for HDX users and automatically overlaps time points for maximum MS efficiency.

Combines ease of use with advanced options, allowing promotion of user-defined parameters to the sample list, giving the operator control over all aspects of the method without complication.



Supporting more operation modes in more places than ever

With over 40 years combined experience in HDX and coupled to our unparalleled relationships with the global leaders in the technique worldwide, our HDX automation continues to offer application support for an ever-expanding portfolio of options.

New features and integrations now offer you better access to membrane proteins, proteins at biologically relevant temperatures, and even more flexible protein regions than ever before.

Trajan's HDX Workflows are supported directly by Trajan in Europe, Australia, Japan and the USA, and through partners in the Middle East, India and beyond.

Service you can trust

Our CTC manufacturer-certified service team is available to assist you in person, by phone and remote session.

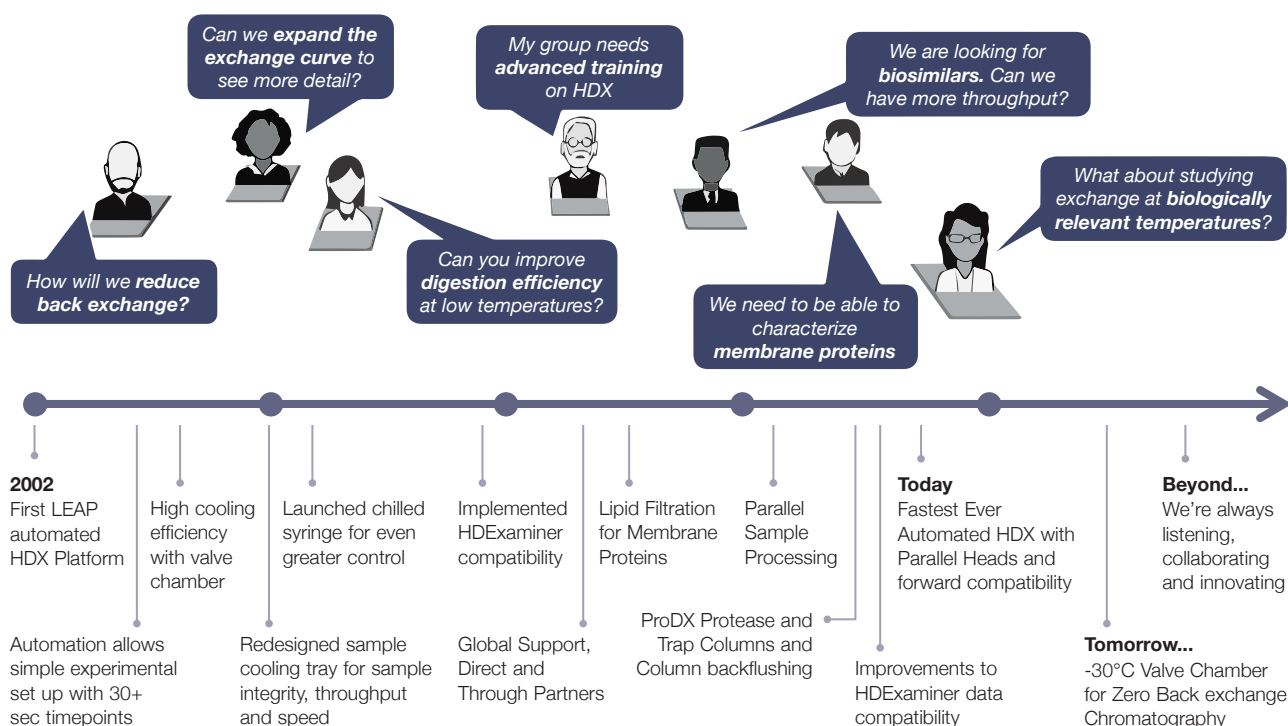
Now offering local time zone support in US, EU, ANZ and Asiatic time zones.

Available extended support contracts, training and preventative maintenance schedules.

Built on the  SYSTEM

Flexibility by design

Constantly on the forefront of innovation



Trajan's HDX platform is a true global research and production tool.

By listening to and partnering with users and leaders in industry and academia, advancement is responsive and cutting edge.

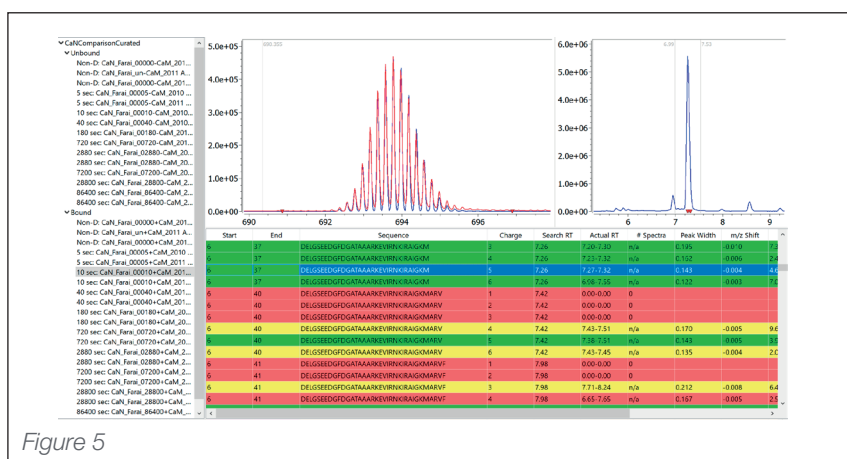
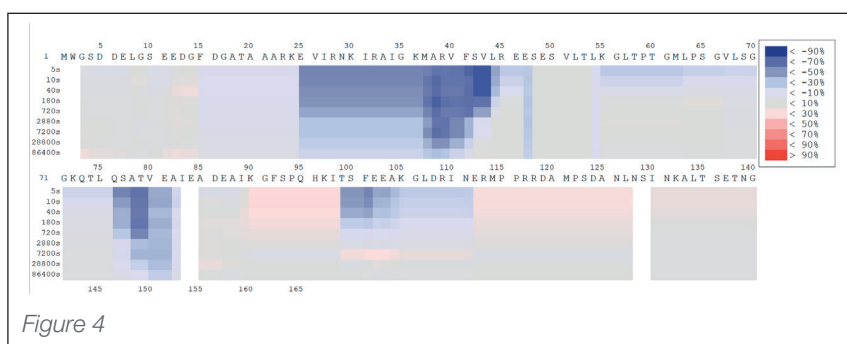
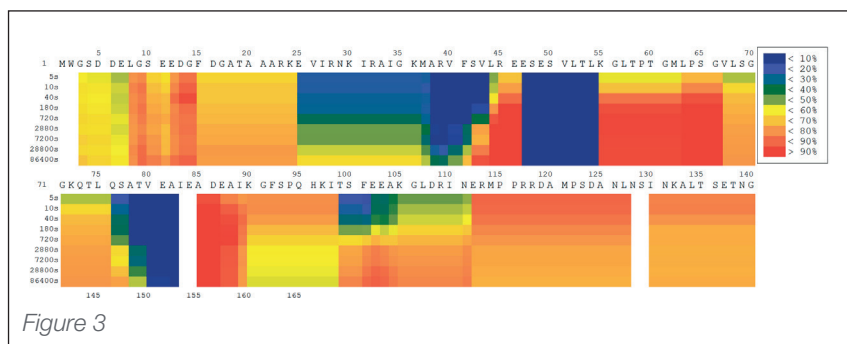
HDExaminer: a complete analytical tool for HDX experiments

The Trajan HDX platform works natively with Trajan's HDExaminer, a complete software solution for HDX analysis, independent of MS data type.

HDExaminer is designed with ease of use in mind, offering numerous ways to visualize your data.

These include:

- Deuteration level residue maps give you quick insight into the most important areas for study (Figure 3).
- Protein state comparisons help you to spot differences in ligand-bound vs. unbound, mutant vs. wild type, modified vs. unmodified etc. (Figure 4).
- Zoom in on all individual residue results with isotope clusters, extracted ion chromatograms and color-coded confidence levels (vs. theoretical data). See Figure 5.



Time plots of peptides allow you to see uptake plots with statistical significance (volcano plots). Peptide plotting as residual and butterfly plots allow more classical views of deuteration.

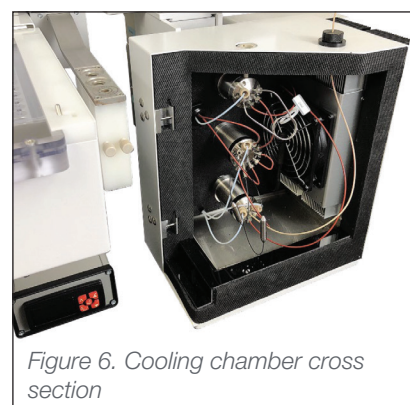
Unique fluidics automation for the best performance

Trajan's HDX Workflows incorporate an advanced cooling chamber (Figure 6) for the trapping and chromatography phases which includes an enclosed valve and column chiller as well as solvent pre-conditioning.

Digestion temperature is controlled independently with the protease column chamber, to allow improved digestion efficiency.

A special 3 valve configuration enables zero-downtime backflushing for retention time stability, extended column life and superior carryover protection.

Optimized fittings and precut tubing ensure maximum reliability and instrument up-time.



Flexibility by design

CHRONECT HDX Compact Workflow



CHRONECT HDX Base Workflow



CHRONECT HDX Parallel (standard) Workflow



CHRONECT

HDX Parallel (extended) Workflow



Specifications	Compact	Base	Parallel (standard)	Parallel (extended)
Automatic syringe selection for extended dynamic range	✓	✓	✓	✓
Chilled syringe for quench / injection	✓	✓	✓	✓
Vial capacity for 100 time point experiments	✓	✓	✓	✓
Optimized valve fluidics for inline digestion and automatic backflushing	✓	✓	✓	✓
Exchange time points down to 30 seconds	✓	✓	✓	✓
Independent protease column temperature control	✓	✓	✓	✓
Trajan ProDx protease columns optimized for low temperature	✓	✓	✓	✓
Dual head for simultaneous operations	-	-	✓	✓
Exchange time points down to 15 seconds	-	-	✓	✓
Forward compatible capacity for future models	-	-	•	✓
Secondary chilled syringe for protein handling	-	-	•	•
Membrane protein filtration	-	•	•	•
96 or 384 well microtiter plate capacity	•	•	•	•

Key:

Standard

Optional

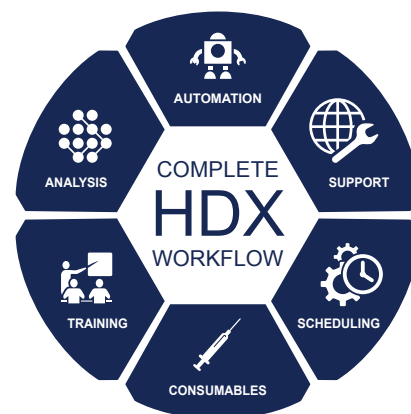


Flexibility by design

Automated Hydrogen-Deuterium Exchange

Your protein in focus

Our turn-key HDX solution is compatible with most MS analyzers, and can extend your current LC/MS capabilities while adding a new dimension to your protein studies.



Visit us at www.trajanscimed.com/products/leap-hdx-automation or contact your regional Trajan Chronect HDX representative for assistance.

Trajan Scientific and Medical

Science that benefits people

Trajan is actively engaged in developing and delivering solutions that have a positive impact on human wellbeing. Our vision revolves around collaborative partnerships that improve workflows, delivering better results.