# Innovation Intelligence. Healthier Futures.


Today's pharma and life sciences organizations face research and business decisions that call for data from a vast information landscape spanning science, global regulatory patterns, market trends, supply chain dynamics, and healthcare management. Elsevier Innovation Intelligence for Life Sciences delivers that data, but more importantly, **they integrate and support them** with analytics and services to extract relevant insights.

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# Harness the potential of your scientific data to shape healthier futures

Life sciences R&D organizations require **access to data and analytics solutions,** often curated from a vast information ecosystem, to compete in a rapidly evolving landscape that encompasses advances in scientific research, global regulatory patterns, market trends, and supply chain dynamics.

**Elsevier Innovation Intelligence for Life Sciences offers scientific intelligence solutions that help accelerate informed risk and development decisions, which enable you to shape healthier futures.**

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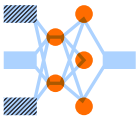
The Elsevier Innovation Intelligence for Life Sciences portfolio provides a variety of intelligent R&D solutions, including:

Reliable, authoritative, and relevant data in an array of formats

Domain experts with experience and a thorough understanding of complex life sciences data



Semantic technology that enables the integration of heterogeneous datasets for superlative digital transformation

## At the threshold of a new era

Pharma and life sciences industries today encounter challenges unlike any they have faced in the past.

Knowledge production far outstrips personal processing capacity.

Value chains, and thus regulatory laws, span international borders.

Market and social trends call for more effective and affordable healthcare.

These challenges are complex and can make or break the successful launch of much-needed therapies.

# A transformation is needed

More than accessing information to address these challenges, organizations must integrate disparate data and capture the multifaceted nature of problems in analytics that explore the frontiers of knowledge and predict the outcomes of actions.

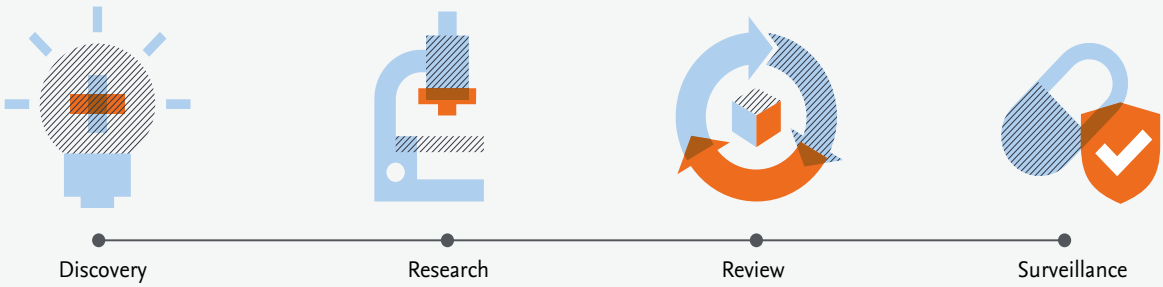
**Elsevier Innovation Intelligence for Life Sciences is an ecosystem of knowledge and analytics products that take enterprises from data to insights.**

Here's how.

| Development Stage | Curated Scientific Information | Content Analytics and Harmonization |
|---|---|---|
| Target identification & validation | **PharmaPendium:** Scrutinize targets in light of regulatory experience with approved therapies | **Elsevier Professional Services**<br>Partner with our team of data science and domain-specific experts to help customize, structure, and solve complex data challenges<br><br>**SciBite**<br>Transform and integrate previously unusable but scientifically relevant textual content into machine-readable clean data |
| | **Reaxys:** Substantiate target-molecule relationships with quality compound property data | |
| | **ScienceDirect & Scopus:** Capture the full scope and trends in research on diseases, targets, or biomarkers | |
| | **Biology Knowledge Graph:** Leverage interconnected biological cause-and-effect relationships to evaluate and select targets | |
| From hit identification to lead optimization | **PharmaPendium:** Enhance lead profiles and assay parameter selection with data from existing clinical trials | |
| | **Biology Knowledge Graph:** Design and troubleshoot assay development with insights from biological networks | |
| | **Reaxys:** Gain insights from compound properties to advance leads quickly and safely; use AI to find successful synthesis routes | |
| | **ScienceDirect & Scopus:** Stay informed about market and research trends that impact lead compound prioritization | |
| Post-market surveillance & follow-up studies | **Embase:** Manage drug life cycle and effective surveillance using the most widely recommended international biomedical database | |
| | **PharmaPendium:** Monitor, identify, and interpret safety signals on a timely basis to quickly act and manage risk strategies | |
| | **ScienceDirect & Scopus:** Augment post-market insights with comprehensive research insights or find experts for collaborations | |
| | **Biology Knowledge Graph:** Review growing data on molecular interactions to update safety reports and maximize a drug's life cycle | |

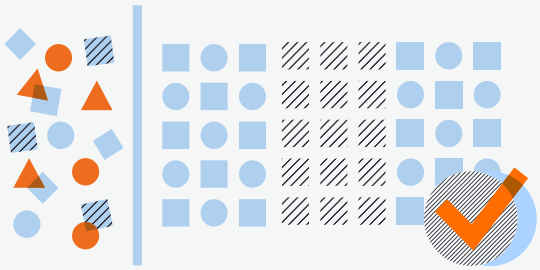
# A name that inspires trust

As a trusted enabler to the world's top pharmaceutical companies and regulatory agencies, Elsevier leverages its expertise and insights in offering transformative outcomes through precision in research, top-notch interoperable technology, and a vast, curated database. At every step of the development pipeline – be it the early discovery or the final review and surveillance stages, we work with you to drive innovation.




## Enabling the curation, integration, and harmonization of data

Life sciences organizations of all sizes need the right scientific intelligence to make accurate, data-driven decisions throughout the development life cycle. However, deriving valuable insights from a gamut of unstructured data can often seem challenging.



Elsevier Innovation Intelligence for Life Sciences enables accurate data-driven decisions through digital transformation and scientific intelligence, delivering unified and interoperable data assets that fuel innovation. We help facilitate your novel discoveries through AI/ML and predictive analytics, improving your R&D productivity and profitability.

## Giving your research an intelligent edge

Elsevier Innovation Intelligence for Life Sciences helps you **innovate faster and smarter** with its domain knowledge in **enabling interoperability** through integration of internal and external datasets.

1. Get access to a vast, rich, and ever-growing **compendium of workflow-ready life science data**
2. Extract and operationalize FAIR-compliant, interoperable data with our **industry-leading capabilities and platforms**
3. Integrate our data into your machine learning and text mining processes using our **support services to drive innovation and prioritize business activities**

**By carefully assessing your needs, Elsevier Innovation Intelligence for Life Sciences designs scientific intelligence solutions that help you achieve your goals.**

# With you at every step of the development cycle

With Elsevier's **data analytics capabilities**, you can **make informed decisions at every step of the drug development pipeline** and streamline literature monitoring for both pharmacovigilance and medical device regulations.

1

## Drug discovery and development

### Innovate faster across the drug discovery and development life cycle

- **Access critical disease and target overview information** to prioritize research focus areas and decide which drug targets to pursue
- **Capture a comprehensive picture** of the properties, reactions, licensing, and sourcing of compounds
- **Examine biological pathways** in humans and test models to reveal molecular mechanisms, new indications, and potential adverse outcomes
- **Scan the competitive patent and market landscape** for novel repurposing opportunities and potential partners
- **Eliminate silos** and facilitate data access across stakeholders

2

## Preclinical and clinical research

### Predict outcomes to make critical development and risk decisions

- **Anticipate preclinical toxicology** through molecular structure analysis
- **Predict human toxicity** based on animal-human concordance studies
- **Organize scientific literature** to increase efficiency, save costs, and streamline regulatory workflows
- **Analyze knowledge of approved drugs** to detect potential safety signals
- **Determine risk factors** for future litigation, post-market

3

## Review and post-market surveillance

### Manage market surveillance effectively to reinforce patient safety

- **Monitor scientific literature** for adverse events in drugs and medical devices
- **Establish uniqueness,** provide evidence of safety, and comply with pre- and post-market regulatory requirements
- **Identify key opinion leaders** and gain competitive intelligence

# Digital transformation – Fueling the promise of data-driven innovation

Digital transformation is fueled by data, but data do not proliferate neatly. The more of it that gets produced, the more challenges emerge around infrastructure, processing, cleaning, wrangling, and sharing.

In recent years, **data science has evolved** and yielded exciting new ways of extracting insight and value from scientific data sources, leading to **new breakthroughs and more promising outcomes for patients.**

However, the process of capturing, normalizing, structuring, and enriching data for digital transformation applications can be daunting. Elsevier has been on an extended journey digitizing information from different types of content, resulting in **advanced technology, expertise, and data that is ready to be applied** to your digital transformation efforts.

If you are looking to drive new insights from AI models, custom applications, and third-party tools, Elsevier has data, technology, and professional services skill sets to support your efforts.

## Expertly curated data include:

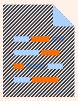
Chemical structure, reaction, and bioactivity data

MedDRA adverse events, doses, routes, PK data, metabolizing enzymes and transporters data, efficacy data, and more

Full-text book data from 42,000+ eBooks representing 18 major scientific, technical, and medical subject areas

Biomedical literature indexed with the "Emtree" vocabulary used as a standard for pharmacovigilance, systematic reviews, and competitive intelligence

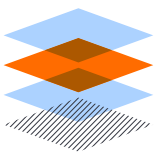
Full-text journal data from 2,500+ journals representing 24 major discipline areas



Source-neutral abstract and citation data

# Technologies that support making your data Findable, Accessible, Interoperable, and Reusable (FAIR)

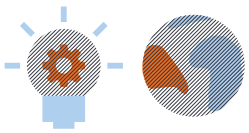
Ontology management software that **recognizes and ingests multiple publicly available ontologies, and enables the creation of custom ontologies** from both public and proprietary ontologies



A named entity recognition (NER) tool that **rapidly scans and semantically annotates raw text (up to 1 million words per second)** with entities from over 50 biopharma and biomedical topics

A semantic search tool that **unlocks data from across your organization by analyzing millions of documents from multiple public and private sources** (e.g., MEDLINE, clinicaltrials.gov, PDFs, SharePoint, full-text journal literature, etc.).

# See how actionable insights are leading to healthier futures...



## Building a semantic search capability for the Knowledge Center of one of the top 5 pharma companies in the world

For a leading pharma company, **the SciBite team and its technology helped harmonize information** from internal documents, patent data bases, grants data, biomedical literature, and clinical trial information and make it searchable and accessible.

At the same time, **custom-controlled vocabularies and ontologies were create**d to satisfy terminologies and concepts.

The results of this project included efficiency gains through **greater accuracy and relevance, less material to read, fewer search strings to maintain, and the flexibility to export data** for AI/ML or other purposes.

In addition, using sentence-level searching revealed previously unknown cooccurrences and new discoveries.

## Informing a predictive model to screen preclinical candidates for adverse reactions

*In vitro* and *in silico* **predictive toxicology models** can be used to **identify adverse reactions at an early development stage.** However, they require **reliable, quantitative data on adverse event incidence rates** for calibration and training.

Working with a top 5 pharma company, Elsevier used a test set of 865 FDA-approved small molecule drugs, for which we extracted adverse reaction incidence rates from clinical trials, drug labels, and literature.

To ensure **statistical robustness and comparability between drugs,** Elsevier identified patient numbers and the monotherapy status of the underlying trials. Using a combination of public and proprietary natural language processing tools, Elsevier supplemented the extracted incidence rates with dosage, route of administration and formulation data.

To compare the results from clinical trials with data from post-market reports, we performed a disproportionality analysis using FAERS data.

The customer received **two severity-ranked datasets** with accompanying detail based on lifecycle phase in which the adverse event was experienced (i.e., clinical trial or post-market). **These datasets were used to inform predictive models.**

## Deriving more value from in-house bioassay data

A top 10 pharmaceutical company recognized the **potential of the huge volumes of bioassay data** that they had generated, but **struggled to gain insights** from this valuable resource.

A lack of standardization across their data repositories, including LIMS and other bioassay databases, resulted in great difficulty for interpretation.

**SciBite enriched its species, gene, and bioassay vocabularies** with customer-specific terms and synonyms to ensure that all relevant information would be recognized.

SciBite then **analyzed the assay names from the legacy database** and **extracted the relevant entities** from each one. Each entity was extracted and mapped to a single, standard vocabulary term to standardize the data.

As a result, the assays could be **consistently and unambiguously tagged** with key metadata, enabling **a wealth of information in bioassay databases to be unlocked** and extracted.

## Finding and evaluating the substances with the best potential

**Early drug discovery requires data from internal, commercial, and published sources.**

When setting up a new research facility with over 20 chemists, Ascentage Pharma Group relied on Reaxys to **provide easy and rapid access to insights,** integrating it with their own electronic lab notebooks.

The team could **easily investigate targets in terms of the chemistry space:** the competitive landscape, structure–activity relationships, ADME properties, and safety profiles; and follow the most promising lead compounds by quickly figuring out the best synthesis pathway and improving synthetic efficiency.

In the first few months after the roll-out, the team of 20 chemists discovered **190 novel compounds, with an average of 12 to 14 synthesis steps.** This enormous workload was only feasible with easy access to comprehensive and reliable insights.

In the words of Dr. Guozhi Tang, Vice President of Discovery, ***"The core value of Reaxys is increased productivity."***

## Accelerating EMA and FDA drug submissions by automating drug-drug interaction predictions

To support its regulatory submissions for the new drug fexinidazole, Sanofi/DNDi needed to **assess the risk of drug-drug interactions** with potential co-medications.

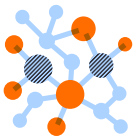
Sanofi/DNDi used **PharmaPendium's DDIRC to predict drug-drug interactions.**

The results of *in vivo* simulations were used to characterize the risk of *in vivo* interaction of fexinidazole with co-medications in the 'drug interaction' and 'PK' sections of its labelling. Sanofi/DNDi included these predictions in the dossier submitted to the agencies.

## Improving the speed and ease of collecting pharmacovigilance data

To conduct clinical trials with their stimulant abuse deterrent (a drug that induces undesirable side effects such as headaches only when stimulants are abused), 4P-Pharma had to provide **regulatory agencies documentation of all the adverse events** that have occurred because of **stimulant misuse and abuse.**

4P-Pharma staff used **Embase to search for literature on effects of stimulant abuse and misuse**. This new application enables 4P-Pharma to build an **optimized search query** designed to filter and find all relevant adverse effects of a medicinal substance.



## Exploring oncology epigenetics with a literature-derived knowledge graph

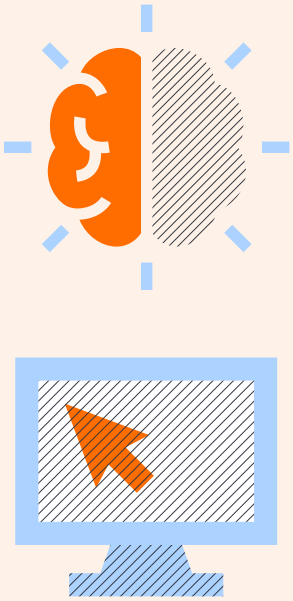
To understand epigenetic alterations in cancer and investigate links between them and drug targets, a top 20 pharma company worked with Elsevier to develop a **large knowledge graph from full-text scientific literature.**

The knowledge graph was successfully used for **semantic search, visualization, and link prediction** between epigenetic modifications and drug targets.

As a result, the company expanded its search space by 10 times and **identified more than 100 testable pathways of drug resistance** across literature; these pathways would have been **impossible to parse manually.**

Moreover, by deploying knowledge graph-embedding models, the team found known true positives as well as **unknown target candidates for further exploration.**

# Insights for shaping healthier futures



As the scientific and healthcare data we generate each day continues to expand and evolve rapidly, so do the ways in which we organize and extract valuable insights from them.

Elsevier Innovation Intelligence for Life Sciences brings you the data, technology, and professional services skill sets you need to support all your R&D efforts and take your enterprise from data to insights.

With the technology and expertise of Elsevier Innovation Intelligence for Life Sciences, harness the unlimited potential of your data to shape healthier futures.

# Elsevier Innovation Intelligence for Life Sciences

For more information about Elsevier Innovation Intelligence for Life Sciences, visit www.elsevier.com/rd-solutions/pharma-and-medical-technology

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