

Life sciences



Did you know...

Luxembourg developed with Tokyo the first Parkinson's disease map. The map compiles information from more than one thousand research articles and opens new avenues in the research on neurodegenerative diseases.

Life sciences

Paving the way for personalised medicine

Health sciences and technologies have experienced strong development in Luxembourg in recent years and are currently specialising in the fields of **personalised medicine, diagnostics, bioinformatics and digital health or HealthIT.**

Companies as well as public research laboratories are active in a variety of fields, such as biomedical analyses, compound and biomarker discovery, laboratory and hospital equipment and health-related ICT applications and services.

Personalised medicine is becoming a reality for a variety of diseases, making it possible to develop more **individually targeted care for patients.** In recent years, the focus has therefore been on neurodegenerative diseases, immunology, and oncology.

Advances in the field of personalised medicine are fundamentally changing healthcare services and **creating new opportunities in biomedical sciences.** Luxembourg has been at the forefront of personalised medicine since 2008, when it announced important investments in this field and teamed up with world-renowned research institutes. This initiative led to the creation of the Integrated BioBank of Luxembourg (IBBL), the Luxembourg Centre for Systems Biomedicine (LCSB) and the Lung Cancer Project, now managed by the Luxembourg Institute of Health (LIH).

The research activities of the LIH are concentrated in the areas of oncology, infection and immunity and population health. Research focusing on neurodegenerative diseases such as Parkinson's disease, metabolomics and disease network analysis is conducted by several companies in Luxembourg, most of them working with the LCSB of the university.

A collaborative approach

Luxembourg is ideally placed for companies to cover the entire EMEA (Europe, Middle East and Africa) region, using Luxembourg as a hub to access every important market in Europe. Today, the life sciences sector in Luxembourg attracts researchers from across the globe. They have **access to some of the most advanced biomedical facilities in the world and become part of a multidisciplinary community of scientists.**

Digital health hub

A lot of work in life sciences is virtual and requires cross-border collaboration. Luxembourg's **ICT infrastructure is a key facilitator for international cooperation in the medical sector.** Privacy and security are top priorities when it comes to transferring sensitive biological data, patient records and analyses between medical organisations worldwide.



The Integrated BioBank of Luxembourg offers the only continuing education certificate programme in the Principles of Biobanking in the world, helping scientists learn how to ensure optimal management of biospecimens and bioresources for future research and conservation.

Biobanking

Biobanking plays a key role in helping scientists to learn more about human diseases, their causes, their effects, and to develop better prevention measures, better diagnostic tests and better therapies. IBBL is a public biobanking and biotechnology institute that supplies biological data and analyses to medical research organisations in Luxembourg and abroad.

Offering opportunities for innovation

The House of BioHealth is a unique facility where research meets business in an atmosphere that favours communication and exchange. It hosts both established companies and start-ups specialised in biotechnology, clean technology and ICT. The goal is to stimulate the creation, establishment and growth of companies and the transformation of research results into marketable products and services.

WaferGen: Enhancing Next-Generation Targeted Sequencing

WaferGen develops advanced genetic testing technologies for life sciences and clinical research laboratories. Collaboration with various institutions in Luxembourg has helped the company to gain market traction and to increase their operations year after year. Today, besides development and sales, WaferGen runs a demo laboratory in Luxembourg.

300%

The number of researchers in Luxembourg's public research organisations has increased three times between 2007 and 2014.

x2

The number of life sciences companies in Luxembourg has more than doubled between 2006 and 2013.

Trailblazer



IMPROVING THE EFFECTIVENESS OF WORLDWIDE RAPID RESPONSE

When disaster strikes, every minute counts. Luxembourg is helping to provide faster connectivity and improved coordination for a more efficient humanitarian response – all with one goal in mind: saving more lives.

SATELLITE-BASED TELECOMMUNICATIONS

In 2011, Luxembourg launched **emergency.lu**, a public-private partnership that offers a satellite-based telecommunications platform allowing rapid response to natural disasters and humanitarian missions.

Two hours after an alert is given, teams are airborne. Once they are on the ground, it typically takes less than an hour to connect a telecommunications terminal to an inflatable antenna for a satellite connection. Working in close collaboration with the United Nations World Food Programme, emergency.lu draws on the expertise of three Luxembourg-based companies – Hitec Luxembourg, SES and Luxembourg Air Ambulance (LAA). Ericsson Response is also involved in the project and serves as technical partner.

HAITI

Immediately after the January 2010 earthquake, Haitian President Préval was standing in the ravaged streets of Port-au-Prince holding his cell phone, which he was unable to use to call for

help. Effective aid deployment was impossible because all telecommunications were down. Following Haiti, Luxembourg understood that a solution had to be developed to restore telecommunications within several hours of a major natural disaster in order to improve aid coordination and save lives.

Thanks to emergency.lu, aid workers can now register their phones and laptops on the system to communicate and improve the delivery of critical services.

TRANSPORTATION DURING EBOLA OUTBREAK

Luxembourg Air Ambulance is a non-profit founded in 1998 that operates **rescue helicopters and ambulance aircraft** worldwide, saving human lives and preserving people's health. In 2015, LAA put new medical equipment for the transportation of patients with highly infectious diseases into operation. This medical evacuation module can be used to transport Ebola patients safely, while ensuring that the crew and the airplane don't come into contact with the pathogen. The development of this special isolation ward for the Learjet 45 XR took several months and covered all medical and aeronautical requirements. Pilots, medical staff and ground handling staff were also required to take a special training course in cooperation with Doctors Without Borders. Cargolux operated several flights to Monrovia during the Ebola crisis and provided medical supplies during critical times. ●

emergency.lu

The entire service chain – including air transport, satellite infrastructure, terminals and related services – is funded by Luxembourg and provides:



FAST TRACK DIAGNOSTICS

Fast Track Diagnostics (FTD) is one of the leading global suppliers of real-time PCR multiplex **testing for infectious disease detection**. Rare infections such as Ebola can quickly spread and become a general health hazard. The FTD test is simple to use and minimises uncertainty in the diagnosis. ●

ADVANCED MATERIALS TO PREVENT CONTAMINATION

DuPont Tyvek® protective clothing – produced by DuPont de Nemours Luxembourg – is designed to keep wearers safe by repelling liquids and aerosols while remaining permeable to both air and water vapour.

Due to its outstanding qualities, it was the **personal protective equipment chosen for the workers dealing with the aftermath of the nuclear disaster in Fukushima, Japan**. Healthcare workers and

other involved in fighting the deadly Ebola virus rely on **Tychem®**, another DuPont brand that includes an entire line of **protective garments and accessories that helps prevent contamination**. ●

Trailblazer



ACHIEVING PERFECTION IN NICHE LOGISTICS SERVICES

As an intercontinental hub for logistics value-added services, the Grand Duchy helps to ship special goods and merchandise safely while minimising risk.

Luxembourg is proud to be leading the way in pharmaceutical Good Distribution Practice (GDP) certification. It is the **first airfreight gateway to be fully GDP certified according to WHO and EU GDP guidelines.**

Alongside fully GDP certified logistics providers such as Arthur Welter, DB Schenker, Expeditors, Kuehne+Nagel, Panalpina, SDV and Wallenborn, Cargolux and LuxairCARGO have also decided to go through this certification process, making them,

350_m

At lux-Airport, the maximum distance from the cargo centre to the furthest aircraft parking space is 350 metres.

respectively, the first cargo airline and the first airport handling agent in the world to become fully GDP certified.

ENSURING THAT TEMPERATURES REMAIN CONSTANT

One of the greatest challenges for the safe shipment of these goods is **ensuring that temperatures remain constant.** When goods arrive at the Luxembourg airport, trucks only have to travel a short distance to reach the LuxairCARGO Pharma & Healthcare Centre. Thanks to this sophisticated logistics set-up, time and temperature sensitive products can be shipped from a pharmaceutical plant in Germany to a distribution site in the Midwest of the United States in only 36 hours without any changes in temperature.

Luxembourg is breaking new ground with the **first-ever GDP-certified trade route.**

A memorandum of understanding was signed in 2015 between airport operators **Hong Kong Air Cargo Terminals** and Luxembourg airport. The goal is to maintain GDP standards for all healthcare-related shipments that travel between the Hong Kong and Luxembourg airports. ●

HORSE-POWER: SPECIAL HANDLING

Every year Cargolux flies up to **3,000 horses** in next-generation horse stalls loaded onto its Boeing freighters. With a single racehorse worth up to \$5 million, horses are precious cargo that require very special attention. Noah's Ark of the skies does not only include live animals, as high-end car manufacturers regularly airfreight **racing cars** boasting 750 horsepower. ●

LE FREEPORT

Located adjacent to the Air Cargo Terminal of Luxembourg airport, Le Freeport provides a sophisticated, **highly secured logistics facility for managing and storing art, fine wines, jewels, precious metals, cars and other valuable goods.** With its **state-of-the-art climate-control system,** Le Freeport Luxembourg offers optimal storage conditions. Valuable goods can be

delivered straight from the tarmac to the storage room with no road transport involved, significantly reducing transfer costs and the risk of loss or damage, while offering a high degree of accessibility and security. To ensure **strict control and oversight,** goods can only be introduced into Le Freeport through specialised forwarders who are licensed by the Luxembourg Customs authorities. Goods that arrive through the airport

and are stored at Le Freeport are suspended from VAT and customs duties, while those that exit Le Freeport must be declared to Customs. Officials are physically present at the facility and have the right to inspect goods at anytime. All service providers working within Le Freeport must also comply with stringent regulations on antimoney laundering and combating the financing of terrorism. Le Freeport is well suited

for the **storage of valuable works of art** and is particularly interesting for art collectors and museums of neighbouring countries. While remaining in the VAT suspension regime, works of art stored at Le Freeport can be displayed in museums or art fairs under a temporary admission and importation system. ●