

Immunology

Putting breaking medical news into practice

Immunology is the complex and exciting branch of biomedical science concerned with the physiological responses of the body's immune system, the recognition of self and not self, and all the biological, serological, and physical chemical effects of immune reactions. The field covers autoimmune disease, hypersensitivities, immune deficiency and transplant science among others.

One of the most diverse and dynamic biopharmaceutical market, immunology is forecast to reach over \$138 billion in worldwide sales by 2016, with a compound annual growth rate (CAGR) of 2.3

IT IS NO SURPRISE THAT THE BLOCKBUSTER DRUG TO TREAT MULTIPLE SCLEROSIS, REBIF[®], WAS DEVELOPED IN WESTERN SWITZERLAND.

percent and is expected to account for nearly 20 percent of the global pharmaceutical market by 2016¹. Recent bibliographic studies rank Switzerland first for the number of publications in immunology, and second and third respectively in molecular biology and pharmacology², demonstrating the vibrancy of research in the country. It is no surprise that the blockbuster drug to treat multiple sclerosis, Rebif[®], was developed in Western Switzerland.

Emerging diseases, micro-organism drug resistance, as well as personalized medicine and changing public health priorities provide a wealth of opportunity in the immunology field. The BioAlps region is uniquely poised, with its combination of fundamental research and applied sciences, to bring to market innovations in diagnostics, vaccines, monoclonal antibody and drug therapies.

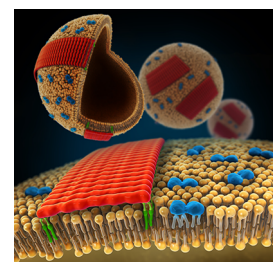
The field of immunology converges with the field of oncology and research in the NCCR Molecular

Oncology³ and the Ludwig Institute for Cancer Research, which are researching tumour immunology and immunity, and cancer immunotherapy. Multinational companies such as UCB Farchim, who recently built a CHF 300 million production unit in the region, and MerckSero, market leading products in immunology, notably autoimmune disease, which are manufactured in state-of-the-art facilities in Switzerland. Founded by the previous head of Nestlé Global Research, the start-up AC Immune is developing innovative therapeutics with "best in class" potential against Alzheimer's Disease and other conformational diseases along three axes: vaccines, antibodies and small molecules.

NovImmune, founded by cDNA cloning inventor Bernard Mach, specializes in discovering and developing compounds to treat the underlying causes of inflammatory diseases and immune-related disorders and AC Immune is a biopharmaceutical company and a leader in Alzheimer's disease (AD) drug development, developing innovative therapeutics against AD along three axes: vaccines, antibodies and small molecules, was elected by the World Economic Forum as Technology Pioneer 2009 for its accomplishments as an innovation leader and for its breakthrough technologies.

It is this particular blend of academic knowhow and commercial savvy that is the reason why molecular diagnostics and point of care testing are specialties of the region, with companies like Abiomic, Augurix and Biocartis working closely with leading academic institutions to leverage knowledge and science.

The Swiss Institute of Bioinformatics (SIB) manages several bioinformatics core facilities that help scientists around the world conduct their research and analyse their data, helping scientists understand cellular biology and systems.



AC IMMUNE Leader in precision medicine of neurodegenerative diseases

Co-founded in 2003 by CEO Prof Dr Andrea Pfeifer, recognized in 2009 as Technology Pioneer by the WEF and other recognitions such as the BioAlps Award 2013, AC Immune is dedicated to improve the lives of patients suffering from Alzheimer's and other neurodegenerative diseases. AC Immune closed with their partner Genentech an exclusive out-licensing agreement (\$300 million) for its anti-Abeta antibody in 2006 and a second exclusive worldwide license agreement, research and commercialization collaboration for anti-Tau antibodies (\$418 million) in 2012 and a licensing agreement for anti-Tau therapeutic vaccine (\$509 million) with Janssen Pharmaceuticals in 2015. Following its initial public offering on the NASDAQ in 2016, they raised approximately another USD 57.8 million. The Company's pipeline features nine therapeutic and three diagnostic product candidates to address a broad spectrum of neurodegenerative indications to prevent and modify diseases caused by misfolding proteins, such as Alzheimer's disease with four candidates in clinical trials.

¹ <http://www.competitivelandscapeseries.com/immune-and-inflammatory/presentations/>

² <http://www.swissbiotech.org/research>

³ <http://www.nccr-oncology.ch>

GROUND-BREAKING RESEARCH LEADS TO THE MARKET

The complex field of immunology benefits from the cutting edge research available in Western Switzerland, offering the opportunity to discover new products. The combined strength of the region's research institutions, teaching and research hospitals, and technology centres, provide an environment conducive to research and development, with to bring new diagnostics, vaccines and treatments to world markets.

The lists below are non exhaustive and showcase some examples of the work being done in the region.

Find more information in our extensive databases: www.bioalps.org/database and, for the six alpine regions, www.alpslifesciencesearch.com

ACADEMIC INSTITUTIONS AT THE FOREFRONT OF IMMUNOLOGY IN WESTERN SWITZERLAND

Geneva University UNIGE	Department of Pathology and Immunology	Cell biology, T-lymphocytes, growth factors, role of interleukin, general immunology and immunopathology	pathology.unige.ch
University Hospital Geneva HUG	Department of Medical Specialties, Division of Immunology and Allergy	Immunologic mechanisms and clinical outcome associated with living donors, ABO-incompatible grafts and xenotransplantation	www.litunige.ch/ltiunige.ch
Ecole Polytechnique Fédérale de Lausanne EPFL	Global Health Institute	Host-pathogen interactions, innate and acquired immunity, HIV, tuberculosis and malaria	ghi.epfl.ch
University of Bern UNIBE and University Hospital Bern (Inselspital)	University Institute of Immunology	Antibodies, antigens, growth factors	www.immunology.unibe.ch
		B-cell, antibody, T-cell and lymphokine research	www.immunologie.insel.ch
University of Lausanne UNIL and Ludwig Institute for Cancer Research LICR	The Ludwig Center for Cancer Research of the University of Lausanne (LICR@UNIL)	Cancer immunobiology and immunotherapy	www.unil.ch/licr
University Hospital of Lausanne CHUV	Immunology and Allergy Research (IAL) and	Antiviral immunity, tolerance in allergy and transplantation, mucosal immunity, T-cell activation and signal transduction and vaccine	www.immunologyresearch.ch
	Vaccine and Immunotherapy Center (VIC)	Vaccinology and translational research	www.chuv.ch/ial
University of Lausanne UNIL, University Hospital of Lausanne CHUV, Ecole Polytechnique Fédérale de Lausanne EPFL, Ludwig Institute for Cancer Research LICR	Swiss Vaccine Research Institute (SVRI)	Immunology, HIV, malaria, TB and cancer vaccine development, of virology and of adjuvant/delivery technology	www.swissvaccineresearchinstitute.ch

SAMPLE LIST OF LARGE AND SMALL COMPANIES IN THE IMMUNOLOGY FIELD IN THE BIOALPS CLUSTER

ABIONIC	IgE allergy diagnosis	www.abionic.com	INFLAMALPS	Development of anti Tumour Necrosis Factor (TNF) receptor compounds	www.inflamalps.com
AC IMMUNE	High affinity ligands and misfolded Abeta protein, SupraAntigen™ Technology and the chemical Morphomer™ platform	www.acimmune.com	MERCK SERONO	Novel therapeutic based on drugs modulating pathogenic mechanisms in rheumatologic diseases and autoimmune pathologies	www.merckgroup.com
ADC	Antibody drug conjugates (ADCs) for treatment of solid and hematological cancers	www.adctherapeutics.com	NOVIMMUNE	Therapeutic monoclonal antibodies for the treatment of inflammatory diseases and immune-related disorders	www.novimmune.com
ANERGIS	Continuous overlapping peptide (COP) allergy vaccines	www.anergis.ch	PHARMALP	Probiotic nutritional supplements	www.pharmalp.ch
AUGURIX	IgA and IgG immunochromatography	www.augurix.com	SHIRE	Immunoglobulins	www.shireswitzerland.ch
CSL BEHRING	Plasma-derived products and biotherapies	www.cslbehring.ch	TRANSCURE BIOSCIENCES	Humanised immune system (HIS) and HIV mouse models	www.transcurebioservices.com
DEBIOPHARM	Drugs for indications in therapeutic areas: immunology, metabolism, infectious diseases	www.debiopharm.com	UCB FARCHIM	Innovative medicines and solutions to treat severe diseases of the immune system or of the central nervous system	www.ucbsuisse.ch
INCYTE INTERNATIONAL	Therapeutics small molecules for immuno-oncology treatment	www.incyte.com	VIFOR PHARMA	Fermentation, isolation and purification processes for bacterial products, analytical and immunopharmacological characterisation	www.viforpharma.com

The fact sheet provides a view of the key players in the sector at any given time; it is not comprehensive and is subject to regular updates. This current edition was updated in Spring 2018.



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