

Barcelona: An Innovative Biomedicine Hub in Southern Europe

Barcelona is the epicentre of the most dynamic bioregion in southern Europe, Catalonia. In less than 15 years, the Catalan autonomous government's efforts to build a strong research system have boosted the creation of more than 25 new research centres and a hundred life sciences start-ups. Right now, the BioRegion of Catalonia has 300 biotech, pharma and medtech companies, 50 research institutes, 10 universities offering life sciences degrees, 15 hospitals with noteworthy research activity, 20 scientific and technology parks and large-scale scientific facilities like the Alba-Cells synchrotron and the Mare Nostrum supercomputer. Oncology and nanotechnology stand out as R&D strengths in the Catalan life science sector.

Last December, after the 2012 edition of the BioEmprenedor XXI programme, the organisers carried out an analysis of the five-year history of this biomedical business plans competition, promoted by Biocat, the Barcelona City Council — through Barcelona Activa —, la Caixa, the Chamber of Commerce and Fundació Genoma España (now FECYT). The results are very encouraging: 144 projects submitted, 81 of which have completed the programme and, of these, 47 have created or are in the process of setting up a company.

Catalan entrepreneurs in the biomedicine sector, as the analysis has shown, are mainly from the academic arena (universities and research centres, 46%) and hospitals (11%) and their projects focus on various fields, although innovative medical devices and technology and new biotechnology-based therapies and diagnostic tools dominate. Of the new companies that have come out of the BioEmprenedor XXI programme, 27% focus on providing scientific/technical services (bioinformatics and data analysis, human and animal genetic

diagnostics, diagnostic imaging, biocatalysis and bioprocesses, quality control, biometrics, etc.), while 30% are developing their own products, ranging from innovative drug-delivery devices to functional foods, diagnostic kits and new drugs to treat a range of pathologies, in particular cancer and rare diseases.

From the beginning of the programme, Biocat has been part of the technical committee that evaluates and selects projects submitted by entrepreneurs to participate. From our experience and knowledge of the international biomedicine and biotechnology market and considering the various initiatives to drive entrepreneurship around Europe, it can be stated that these projects are not only highly innovative but also very competitive. The projects submitted by Catalan life sciences companies can stand up against any of their international counterparts, but exist in a more complicated economic context as, in addition to the difficulties generated by the global economic crisis, there a limited number of private investors and committed, specialised funds in this sector. This setting, however, has spurred on the strong international vocation of Catalan biotech and medtech companies.

The more than forty biomedical companies that have come out of the BioEmprenedor XXI programme have come to enrich a sector that has seen exponential growth over the past 15 years, making the BioRegion of Catalonia — and, more specifically, Barcelona, which is home to 90% of the Catalan biopharmaceutical and medical technology sector — a benchmark hub in southern Europe. Catalonia currently has more than 180 biotechnology companies, nearly half of which focus on providing R&D services (CRO, CMO, analysis, diagnostics, bioinformatics, reprofiling, etc.), 40 of which concentrate on research, discovery and production of new therapies and diagnostic systems,

and the remaining 70 of which work in fields like industrial biotechnology, food, and manufacturing nutraceuticals or cosmetics, among others.

Most of these biotech companies were created after 2000, in a process boosted by the Catalan government's strong commitment to research, which has also led to the creation of 25 research centres between 2000 and 2010, some of which are leaders in their field, in areas of study including genomics (CRG), agrigenomics (CRAG), photonics (ICFO), global health (CRESIB), nanomedicine (IBEC and ICN) and oncology (IRB and VHIO, among others). Barcelona is also home to five hospital research institutes (IDIBAPS, IDIBELL, VHIR, IGTP, IR-Sant Pau) that Spain has recognised as centres of excellence. The spin-offs that make Catalonia a leader in biotechnology in Spain have come out, and continue to do so, of the nearly 50 research centres devoted to the life sciences and related disciplines, like nanotechnology or informatics, and of the 10 universities (out of the 12 total) that offer degrees and carry out research in biosciences.

Specifically, Catalonia is home to 21% of all biotechnology companies in Spain, ahead of Madrid (19%), Andalusia (12%), Valencia (11%) and the Basque Country (10%), and is one of the most dynamic European bioregions, with collaboration projects with various European clusters in France (Paris, Lyon, Toulouse, Montpellier, Bordeaux), Germany (Munich, Berlin), the United Kingdom (Oxford, Cambridge, London), Italy (Turin), the Netherlands, Switzerland, Hungary, Poland and Sweden, as well as with organisations like the Massachusetts Life Science Center, the MassBio Association and the Johns Hopkins Technology Transfer Center, in the United States.

This leading position in biotechnology has been further strengthened by the area's underlying leadership in the pharmaceutical and medical technology sectors. The BioRegion

is home to 45% of all pharmaceutical companies in Spain — including the most important local companies in terms of volume, like Almirall, Esteve and Ferrer Internacional, and the national headquarters of multinational corporations like Novartis, Sanofi and Amgen — and to 50% of all Spanish medical technology companies, with large family-founded corporations, like Matachana and the Werfen group.

The Biocat Directory (www.biocat.cat/directory) has nearly 50 entries for pharmaceutical companies and more than 60 medical technology companies that carry out R&D activities. In total, there are more than 300 biotech, pharma and medtech companies that are driving innovation in biomedicine and are at the core of an ecosystem made up of an additional 250 companies (investors, consultants and professional services, specialised suppliers and engineers), 15 hospitals with noteworthy research activity, 20 science and technology parks, and the aforementioned research centres and universities.

As the *2011 Biocat Report* shows, these research centres, universities and hospitals are home to 435 research groups working in biosciences, with a total of 7981 people, 90% of which focus on research tasks (scientific and technical). Catalan life science companies employ about 22,000 people, half of them carrying out research activities. Catalonia also has three large-scale research facilities, the Mare Nostrum supercomputer (Barcelona Supercomputing Center, BSC), the Alba-Cells synchrotron, and the National Genome Analysis Center, as well as more than 80 public scientific/technical platforms.

And if the number and size of Catalan scientific entities is noteworthy, still more so is their high production level: with only 1.5% of the European population, Catalonia produces 2.98% of all scientific publications in Europe and received 3.48% of the grants awarded by the European Research Council (ERC) from 2007 to 2012, 2.5% of all those granted in the life science arena.

Innovative Ecosystem

At the centre of this ecosystem is Biocat, a body created in 2006 at the



behest of the Government of Catalonia and the Barcelona City Council, in order to coordinate and promote the biotechnology and biomedicine sector in Catalonia.

In 1997, the creation of the Barcelona Science Park (PCB), the first in Spain promoted by a university (UB), saw the beginning of the first experience in creating an innovative ecosystem that brings together higher education, research and entrepreneurship in life sciences. The PCB now has nearly 87,000m² in gross floor area, half of which is laboratories, and is home to one of the largest research facilities in the country — the National Genome Analysis Center (CNAG), three research centres — the Barcelona Institute for Research in Biomedicine (IRB), the Institute for Bioengineering of Catalonia (IBEC) and the Molecular Biology Institute of Barcelona (IBMB-CSIC), foundations, university research groups and bodies, and 57 companies of varying sizes. It is undoubtedly one of the largest in Catalonia and has the most activity in biosciences, but is still just one of the 20 that are located throughout Catalonia.

Parks, biotechnology start-ups, research centres and groups... the significant growth seen in the Catalan research, technology-transfer and innovation system starting in 2000 led the sector's stakeholders to posit the need for a neutral body that, with a transversal view of the whole value chain from basic research to market, could tackle everything from creating support programmes for entrepreneurs and start-ups through advising the

administration and decision-makers on creating sectoral plans and policies.

Thus Biocat was created, a foundation whose Board of Trustees includes representatives from all the sector's stakeholders: the Government of Catalonia — through the Ministries responsible for the economy, enterprise, knowledge, health and, more recently, agriculture, universities, research centres, hospitals and companies — through professional associations of biotechnology, pharmaceutical and medical technology firms.

On one hand, Biocat is a benchmark for knowledge in the biomedicine and biotechnology sector in Catalonia, also playing the role of observatory, with tools like the aforementioned Directory of companies and organisations in the sector, which currently has more than 800 entries that, more than just a description of the organisation and its activities, provide information regarding the companies' services and products — with detailed data on the pipeline-development phases — and financial structure. Every two years, Biocat also compiles a report on the state of the sector in Catalonia — published in 2009 and 2011, and the 2013 edition in the works — which is complemented by other publications available on the organisation's website (<http://www.biocat.cat/en/publications>).

On the other hand, Biocat drives projects and programmes that aim to boost the sector's potential while facilitating collaboration among all the members of the cluster and with international stakeholders — in particular public/private

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partnerships that facilitate knowledge transfer, training and guidance for entrepreneurs, acting as an accelerator for their projects, improving access to funding and to the market for biotech SMEs, fostering internationalisation and favouring maximum awareness and projection of the biocluster's capacities and assets.

Various initiatives fall under this framework, including those to attract benchmark international events in the sector to Barcelona, like BioEurope Spring (BES), which will be held in the Catalan capital for the second time from 11 to 13 March 2013 and is set to surpass the level of success seen at the previous edition held in Barcelona in 2010, in participation and number of partnering meetings. Biocat coordinates, along with the Barcelona City Council, the Local Host Committee for this event, which expects to receive more than 2100 delegates, including those from nearly one hundred Catalan companies.

Biocat supports the internationalisation efforts of Catalan life science companies by organising missions to strategic markets (China, Brazil, India, USA, etc.) and coordinating delegations to events like the BIO Convention in the United States, where from 2008 Catalan companies have made up more than half of the Spanish Pavilion.

Also in an effort to promote international projection, but above all the exchange of knowledge, Biocat, in collaboration with la Caixa, promotes B·Debate - International Center for Scientific Debate Barcelona (www.bdebate.org/en), created in 2008. Each year, the centre holds between 12 and 15 top-notch scientific events to debate topics on the frontiers of knowledge in fields related to the life sciences.

Biocat has also promoted the creation of two new themed networks to facilitate and promote collaboration among public and private bodies working in the fields of oncology (Oncocat network, <http://www.oncocat.org/principal.php?idiom=eng>) and nanobiomedicine (BioNanoMed Catalunya alliance, <http://www.bionanomedcat.org/index.html?idioma=eng>), two of Catalonia's strengths in biomedical research and innovation. Specifically, oncology is the main field of study for 17% of



the 435 research groups in the life sciences; at least 20 biotechnology and pharmaceutical companies carry out R&D in oncology, and have new diagnostic products and therapies in various stages of development, some already on the market; and two of the five large hospital institutes — VHIR and IDIBELL — are renowned for their research in this area.

A total of 25 organisations — research groups and centres, and companies — make up the BioNanoMed alliance, which promotes the application of nanotechnology in biomedicine. This field is very new and is advancing very quickly, above all regarding new drug-delivery methods to boost efficacy, administering drugs directly to diseased cells and thus reducing side-effects. Catalonia leads bionanomedicine research in Spain, and Barcelona is among the top cities in the world in terms of number of publications in this field.

Diseases of the central nervous system are another important focus of both public research and business R&D efforts in Catalonia. Alzheimer's, Parkinson's, Huntington's and Multiple Sclerosis are some of the diseases that are being studied most. This includes centres like IDIBAPS and the Pasqual Maragall Foundation, as well as up to 20% of all active research groups, but also companies like Bionure, Intelligent Pharma, Neurotec Pharma, Oryzon, Palo Biofarma and SOM Biotech, among others.

This dynamic biocluster with powerful assets is the result of the country's commitment over the past 15 years, which must be maintained today despite the complex economic

situation, or precisely for this reason. In the long term, only a knowledge-based economy that can generate value-added products that improve quality of life for everyone will be sustainable. Health is a key arena in this sense, and it will continue to generate a growing market. Sustainability requirements in public health systems are moving us towards more preventative healthcare and personalised medicine, in which new lifestyles and eating habits will keep us healthy longer and in which, thanks to knowledge of the genetics of disease, it will be possible to prevent disease and alleviate the effects earlier. Biotechnology has a lot to offer in this arena and Catalonia wants — and is prepared — to play a leading role in these developments.

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