Biotechnology Report

TURKEY

PREPARED BY EUROPABIO AND VENTURE VALUATION IN 2009

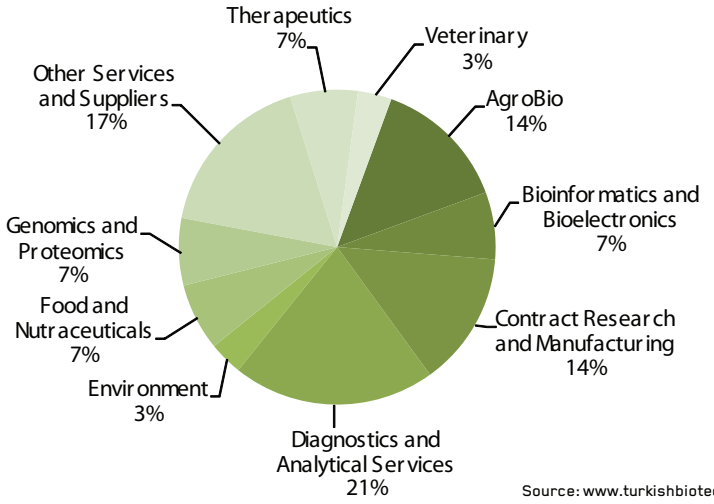
STATUS OF THE TURKISH BIOTECHNOLOGY SECTOR

(Financial data in €)	
17	Total Biotech Companies
2	Biotech-Therapeutic
10	Biotech-Services
5	Biotech-Other
≥1000	Employees
≥500	R&D employees
≥5m	R&D spending*
≥100m	Revenue*
≥1m	Equity Raised*
NA	Government grants*
78%	Percentage of SMEs
0	Percentage of companies publicly owned

* As some private companies do not disclose financial figures the above is based on available information only.

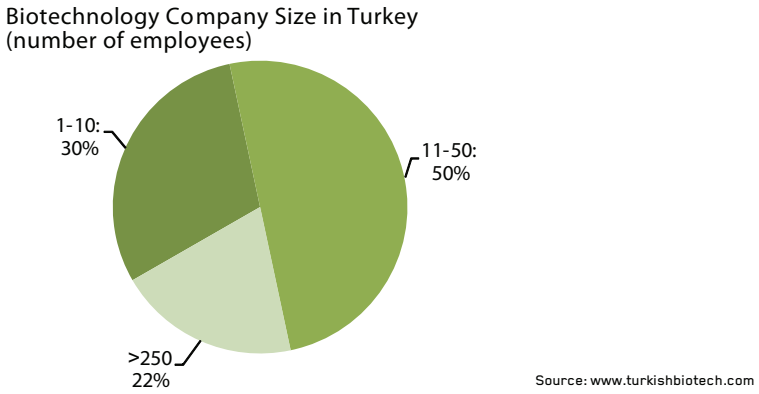
The majority of biotechnology activity in Turkey is focused on agribio research and development. The main revenue generating companies in Turkey are large organisations producing and researching seed and animal feed technologies. One micro enterprise exists that focuses on developing human therapeutics in the area of tissue and organ engineering.

Biotechnology Companies in Turkey
Breakdown by Subcategory based on 29 entries by 17 companies

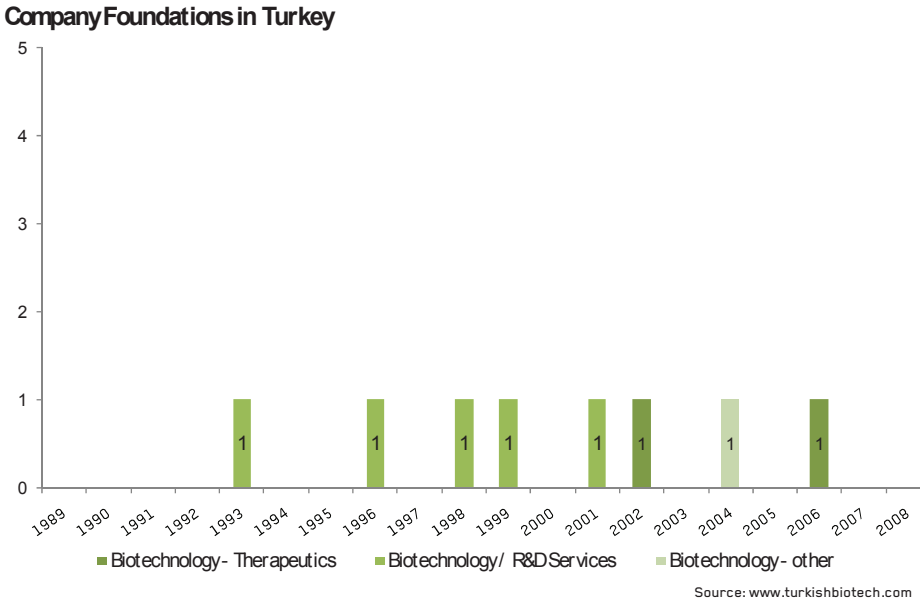


Source: www.turkishbiotech.com

Of the ten companies that disclosed information about their staff, eight qualify as SMEs with less than 250 employees and a further three of these companies are micro enterprises employing less than 10 people. According to records from these same ten companies, there are in total over 1000 people employed in the biotechnology industry in Turkey with over half of them working in research and development. However, the vast majority of these people (over 900) are employed by agribio companies focusing on seed and animal feed technologies. Furthermore, almost 100 people work in the biotechnology services sector, leaving less than 10 employed in human therapeutic discovery.



Turkish biotechnology companies have been sporadically founded over the past two decades mostly as independent foundations.



NOTE: Not all companies reported their year of foundation.

TURKEY – AN INDUSTRY OVERVIEW

The main organisations concerned with biotechnology research and development in Turkey are the Technology Development Foundation of Turkey (TTGV) and the Scientific and Technical Research Council of Turkey (TÜBITAK). They are respectively responsible for raising awareness of R&D and for distributing public funding. TÜBITAK also conducts research in several institutes. Turkey established a biotechnology association in 1986 which generates awareness for the industry.

Although biotechnology has been highlighted as important in the Economic development plan, the industry is still largely in the imitation phase of western countries with little original research being conducted.

Most life science companies in Turkey are generics companies, distributors and subsidiaries of big pharmaceutical, with biotechnology playing a very limited role. Furthermore, related industries are mostly focused on cost saving rather than technology development, lowering the overall level of genuine innovation in the country.

Turkey does have a strong agribio industry focused, among other research topics, on seed engineering, plant libraries for the protection of biodiversity,

and microbial control of insects and plants. The fermentation industry is also historically strong in Turkey with 20% of the world's baker's yeast being produced there.

Political and Economic Environment

As health biotechnology is only just emerging as a priority for the Turkish government, there is not an overwhelming amount of support for companies. R&D research is seen as commercially expensive and few companies are in the position to make the long term investments required.

The majority of the R&D funding available comes from government institutes such as TÜBITAK that distribute EU funds to applicants. Approximately 3% of TÜBITAK supported projects are biotechnology related but they do not necessarily focus on the health science sector. As interest in these funds was historically low and some funds remained unused, the EU chose to reduce their funding contribution. Currently, there is over €200 million available for general biotechnology funding in Turkey from various governmental and EU sources. The government provides approximately 50% of R&D funding in Turkey with just over 40% coming from industry.

"R&D research is seen as commercially expensive and few companies are in the position to makes the long term investments required"

Venture Capital investment is very limited and is only present from large holdings and for very limited projects. There are no investors that specialize in biotechnology and private funding is still rare. Investors are not experienced in biotechnology and the level of awareness about possible potential returns from the industry is low.

Support Infrastructure

The pharmaceutical industry in Turkey is clustered around Istanbul with no particular focal point existing for biotechnology. The R&D that takes place is largely conducted at universities with the individual conducting the research often being the one best placed to benefit from its success. There are some very early stage technology transfer offices emerging but their network is limited. There are few links between academia and industry and even researchers rarely collaborate.

Science and technology parks in Turkey are mostly IT focused with almost no premises easily available for biotechnology companies. Approximately 7% of the firms located in technology parks are active in biotechnology but not necessarily in health.

In 2004, the Ege University Faculty of Engineering, Department of Bioengineering received FP6 funding for the BIOACE project to establish a centre of excellence for bioengineering and biotechnology. Currently the centre focuses on improving networks between stakeholders and supporting human resources through programmes and training.

Most emerging business advice available to Turkish companies is built around risk and IP management development. The various support structures remain under developed and uncoordinated.

The workforce

The research culture is not particularly strong in Turkey. Life sciences courses are available at the universities and include instruction in the latest

technologies. However, students do not emerge from their education with adequate laboratory and industry experience or with training on how their university education can be applied to industry. Although courses are available, enrolment in life science programmes in Turkey is not on the rise with actual declines in the number of applicants for several consecutive academic years.

As a result, there is a shortage of experts and qualified professionals. The availability of experience management is also low. Moreover, many who do complete a scientific education leave Turkey for more favourable employment opportunities abroad.

Technology and intellectual property

In 1995, Turkey adopted patent laws similar to those of the EU and subsequently large companies opened local subsidiaries to distribute their products. The patent office is as yet not very sophisticated with most patent applications requiring support from abroad to process. Currently patent disputes are decided in a non-specialised court with inconsistent outcomes due to the lack of expertise of legal professionals in the sector. In the near future, however, patent disputes will be held in a specific court with a specialised judge more suited to this particular type of legal action. Both associations and private companies exist that advise on IP topics.

"In 1995, Turkey adopted patent laws similar to those of the EU and subsequently large companies opened local subsidiaries to distribute their products"

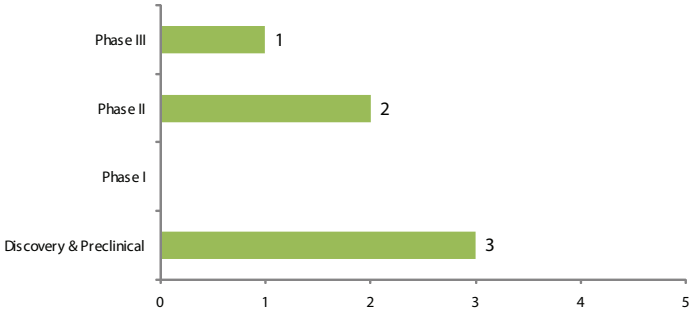
Turkey has very few patent applications per capita with less than 10 patents related to biotechnology issued between 2002 and 2005. The publication and citation rates are also low compared to the EU average, but are rising, particularly in the area of agribio.

Technological innovation in Turkey is underdeveloped with universities largely following developments in other parts of the world instead of conducting original research and very few small labs making value added products. The little research that does develop is rarely taken to further stages due to lack of funding and resources for activities such as clinical trials. The government has begun to initiate some programmes aimed at increasing the overall level of innovation in the country.

Products in the Pipeline:

There are at least three therapeutic products in preclinical development, two in Phase II, and one in phase III clinical trials in Turkey.

Turkey Therapeutic Product Development Pipeline



Source: www.turkishbiotech.com

NOTE: Only therapeutic biotechnology products are included in the pipeline graph. Furthermore, as some privately held companies do not wish to disclose their product pipeline this graph is based on available information.

DEVELOPMENT CAPACITY INDEX

DCI 12

The development capacity index was calculated for Turkey according to the description in Appendix A and can be used to compare the status of the Turkish biotechnology sector with that of the other new Member States and candidate countries. It consists of a qualitative factor of 10 and a quantitative factor of 115.

KEY FEATURES

3 positive key features:

- Biotechnology R&D support organisations are well established
- Biotechnology was underlined as a potential for development in the national Economic development plan
- Companies exist with products in the pipeline and high potential

3 negative key features:

- The pharmaceutical sector is mainly focused on generics, hence the small importance of healthcare biotechnology
- Cooperation and networking between biotechnology stakeholders is limited
- There is limited use of available funding and limited commercialisation of innovation (companies are focusing on cheaper production rather than innovation)

Turkey has a good base for biotechnology to grow on, but specific programmes for healthcare biotechnology are needed.

SOURCES

BIOTECH GATE COMPANY DATABASE

The Turkish Biotechnology Database (www.turkishbiotech.com) part of the global Biotechgate database (www.biotechgate.com)

Survey from Turkish Association of Biotechnology; 2008

Company interviews; 2008-2009

Ege University, Faculty of Engineering Department of Bioengineering – Bioengineering and Biotechnology within the Turkish Academia; 2008

BIOSFER Ltd. – KBBE-NET for Turkey: An Initiative to Transform Global Threats into Opportunities; 2008

BioPolis – Inventory and analysis of national public policies that stimulate research in biotechnology, its exploitation and commercialisation by industry in Europe in the period 2002-2005 – National Report of Turkey; March 2007

Pharmaceuticals and Biotechnology in Croatia – Attractive Investment Opportunities; 2007

Prepared by:

BİYOTEK Turkish Association of Biotechnology

APPENDIX A: CALCULATION OF THE DCI

The Development Capacity Index (DCI) was developed as a means of representing the development status of a country in a format that allows comparison with other countries and regions. The resulting value indicates the respective countries' relative rank among their peers and considers both the existing state of affairs (represented by the quantitative factor) as well as the potential for development (represented by the qualitative factor). A higher DCI indicates the presence of a more advanced biotechnology industry and a more favourable environment for future growth.

Evaluation of the Qualitative Factor:

The qualitative factor was used to evaluate the framework available for the development of the biotechnology sector. Factors considered were existence of a pharmaceutical industry, level of government support, availability of public and private financial support, existence of a qualified workforce, establishment of technology transfer offices and technology parks, and general awareness of patenting and the IP protection processes.

As shown in the following table, each factor was assigned a weight based on the subjective assessment of its relative importance for the evaluation of a country's development potential. Each factor was then evaluated for each country based on information gathered from literature, and interviews with local stakeholders and companies. A rating was assigned for each factor ranging from 0 (non-existent) to 4 (excellent) and individual ratings were summed to give the total qualitative factor for that country.

QUALITATIVE FACTOR	WEIGHTING	RATING	POINTS	WEIGHTED POINTS
Pharma Industry (existing know-how)	2	Non-existent	0	0
		Minimal	1	2
		Average	2	4
		Good	3	6
		Exceptional	4	8
Government Support	2	Non-existent	0	0
		Minimal	1	2
		Average	2	4
		Good	3	6
		Exceptional	4	8
Public Financial Support	3	Non-existent	0	0
		Minimal	1	3
		Average	2	6
		Good	3	9
		Exceptional	4	12
Private Financial Support	3	Non-existent	0	0
		Minimal	1	3
		Average	2	6
		Good	3	9
		Exceptional	4	12
Qualified Workforce	3	Non-existent	0	0
		Minimal	1	3
		Average	2	6
		Good	3	9
		Exceptional	4	12
Tech Transfer	4	Non-existent	0	0
		Minimal	1	4
		Average	2	8
		Good	3	12
		Exceptional	4	16

Tech Parks or Clusters	4	Non-existent	0	0
		Minimal	1	4
		Average	2	8
		Good	3	12
		Exceptional	4	16
IP Protection Awareness	4	Non-existent	0	0
		Minimal	1	4
		Average	2	8
		Good	3	12
		Exceptional	4	16

Evaluation of the Quantitative Development Factor:

The quantitative factor was calculated based on the number of biotechnology companies present, their category of activity (therapeutics, services and other biotechnology sectors), and the number of products under development. Parameters were all individually measured with emphasis placed on smaller and medium sized companies conducting research on human therapeutics, as these are considered to be the drivers of innovation for the industry.

Within each country, points were assigned per company depending on the type of company, number of employees, products on the market and products in development, as shown in the following table. Fewer points were attributed to products on the market as this is an indication of existing industry and know-how, whereas the development of new products indicates the potential for growth.

It is to be noted that few companies chose to disclose their product information therefore these parameters have only a small impact on the overall DCI. It was assumed that all biotechnology companies developing therapeutics had at least one product in the pipeline.

Factor	Points
Biotechnology therapeutics company	5
Biotechnology services company	1
Other biotechnology company	3
< 10 employees	5
10-100 employees	4
100-500 employees	3
500-1000 employees	2
> 1000 employees	1
no data or 1 product in development	1
2 products in development	2
3 products development	3
4 products development	4
5 or more products development	5
1-2 products on the market	0.25
3-5 products on the market	0.5
5-10 products on the market	0.75
10-20 products on the market	1
more than 20 products on the market	1.25

Points calculated for all companies in the country were then summed to give the total quantitative factor for that country.

Prepared by:

www.europabio.org

www.venturevaluation.com

Information about the project can be found at www.14allbio.eu

All company details and data are available on:

www.biotechgate.com