

The Health Care Cost Crisis And the Growth Potential of the Biotechnology Industry

The health care sector has reached a major crossroads. On the one hand, the aging of the population and the medical possibilities to diagnose and treat more illnesses than before are placing pressures on health care costs. On the other hand, biotechnology applications are expected to spawn cost savings over the long run by, for example, making time-consuming diagnostic methods more efficient and facilitating targeted therapy. In this article we will investigate how the Finnish biotechnology industry could offer solutions to the cost crisis in health care while at the same time spurring development of an internationally competitive industrial cluster.

BIOTECHNOLOGY INDUSTRY'S GROWTH EXPECTATIONS AND COOPERATION BETWEEN SECTORS

Hermans and Kulvik (2004), and Hermans and Ylä-Anttila (2004) present a forecast of the Finnish biotechnological industry's¹ contribution to GDP growth from 2001 to 2006. Biotechnology output is growing relatively swiftly, although from a comparatively modest level. In recent history it has taken decades for industrial sectors based on new technologies to develop. The current production level and growth rate of the biotechnology industry are compared with those of the main pillars of Finnish industry: the paper and pulp industry as well as the machinery and metal industry achieved output levels equal to that of the biotechnology industry today a little over 50 years ago while the electronics industry reached this level about 25 years ago. If the biotechnology industry continues to grow as currently forecast, its production will reach the current output levels of these three industries in 15-30 years.



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Another implication of the forecasts is that the growth of the biotechnology industry into a new main pillar of the economy can be achieved by combining new and old expertise from different industrial sectors. This would enable the different sectors to gain from mutually complementary expertise and marketing capacity. Cooperation could take place between, e.g., the pharmaceutical, food, forest and electronics industries.

SECTORS OF THE BIOTECHNOLOGY INDUSTRY

Biotechnology is often involved in many applications in agriculture and forestry as well as environmental technology. However, most sectors regarded as part of the biotechnology industry are linked either directly or indirectly to health care. Fields linked directly with health care include drug development, diagnostics and biomaterials. For example, the pharmaceutical sector has achieved a significant foothold in the biotechnology industry. Almost 60 percent of Finland's small and medium-sized biotechnology companies indicate that they operate in the pharmaceutical industry or have

ties with clients in the pharmaceutical industry. Fields linked indirectly with health care include functional foodstuffs, enzymes and several research services.

LONG TIME SPANS FOR PRODUCT DEVELOPMENT AND HIGH PROFIT EXPECTATIONS

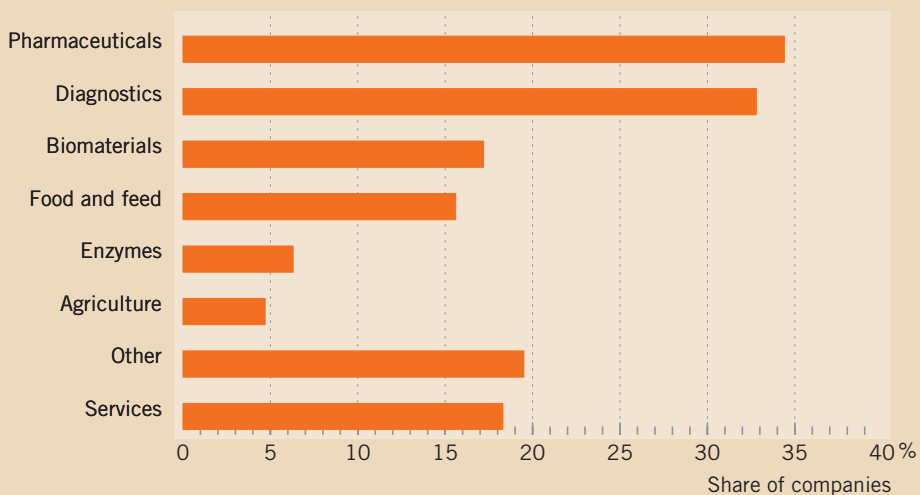
The biotechnology industry is a science-oriented and research-intensive sector. Especially young companies are very research intensive. Consequently, the value of biotechnology companies is based to a large extent on expectations of future earnings. The time spans for developing a product especially in the pharmaceutical industry is relatively long, even exceeding 10 years from initial innovation to the introduction of a product on the market. This is mainly due to strict drug approval procedures. New drugs must be more effective than previous compounds in treating specific illnesses. However, a successful development and marketing spawns possibilities to exploit a considerable, usually global, market potential.

PUBLIC HEALTH CARE PROBLEMS SPAWN EXPERTISE

There are several national diseases in Finland, the treatment of which have considerable effects on the Finnish economy. The direct costs of health care constitute only a portion of the total costs as, for example, the impact of absenteeism and pensions can be even more significant from a macroeconomic standpoint.

The national diseases have to some extent steered the allocation of domestic research resources, which has spawned internationally significant areas of expertise in medical science and related fields. Finland's one payer health care system has facilitated a comprehensive patient case record scheme, which in combination with numerous centre of excellence -rated clinical institutes creates a unique base for biotechnology development carried out in Finland. The research knowledge and demand for its commercial applications arising from these kinds of public health care needs

Sectors of Biotechnology Companies



Source: ETLA.

ETLA S04.2/74

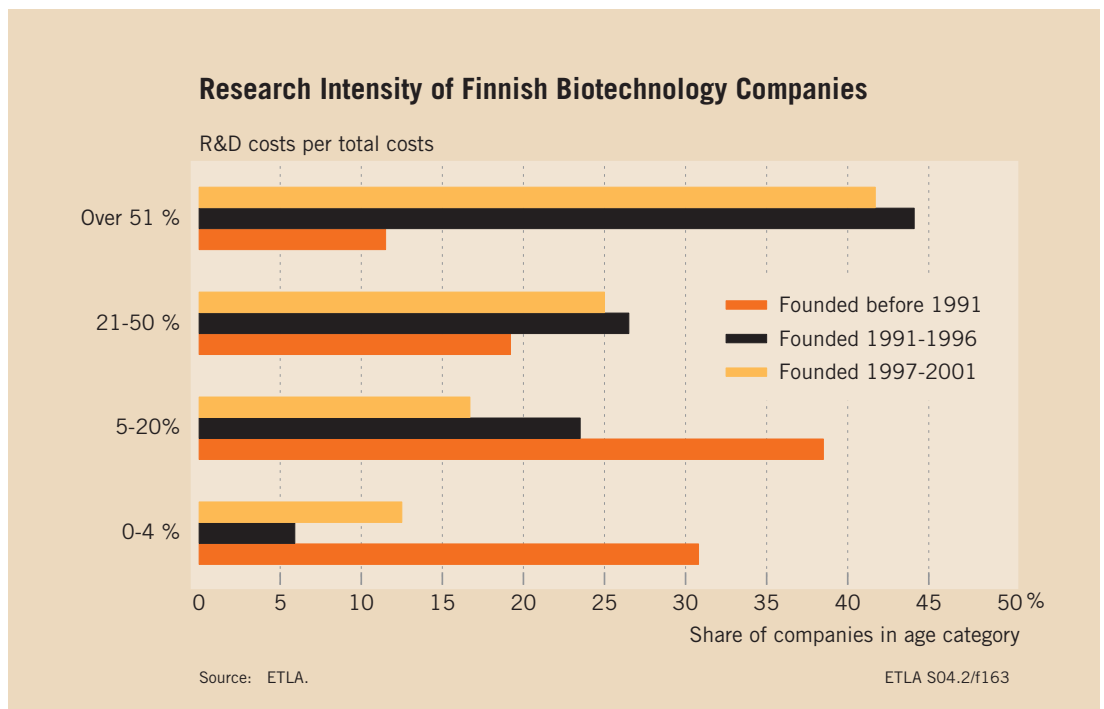
enable the domestic market to be used as a commercial test market. Cooperation with end users of health care products promotes the product development of biotechnology companies and development of service concepts as well as prepares companies' products and services to enter the highly competitive international markets.

Many Finnish research-oriented and technologically advanced biotechnology companies lack, however, business expertise (e.g. Hermans 2003; Tahvanainen 2004). An intensive producer-user relationship offers the companies a unique opportunity to better understand the needs and requirements of domestic but world-leading customers. By serving the demanding domestic customer the companies accrue marketing experience that can successively be exploited in a larger scale by entering the global markets.

VALUE ADDED VIA PRODUCT FAMILIES AND AUXILIARY SERVICES

Targeted therapy is based on a deep understanding of the interactions in an organism even on a genetic level, so that treatment of illnesses can be given on a patient group-specific basis or even on a patient-specific basis. Targeted therapy requires development of diagnostic methods and equipment together with targeted medicines, dosages, or combinations thereof. The biotechnology industry and its auxiliary sectors will have to engage in intensive cooperation and offer comprehensive services and product concepts to client groups and interest groups.

Instead of individual drugs, the comprehensive service and product concept caters to different patient groups by offering customized diagnostic methods, variations of medication, other new treatment methods as well as related equipment and software. As an auxiliary serv-



ice the financiers of health care could be offered end-user training and given calculations of the cost savings vis-à-vis ordinary procedures without targeted therapy.

The comprehensive product concept based on suitable product mixes and related services offers a means for cooperation between biotechnology companies and global distributors with complementary expertise so that the benefits gained by the customer are maximized both in terms of the effectiveness and the cost efficiency of the treatment. Additionally, the knowledge base of small biotechnology companies will become more comprehensive as cooperation with firms in closely related sectors spawns new operative procedures and innovations.

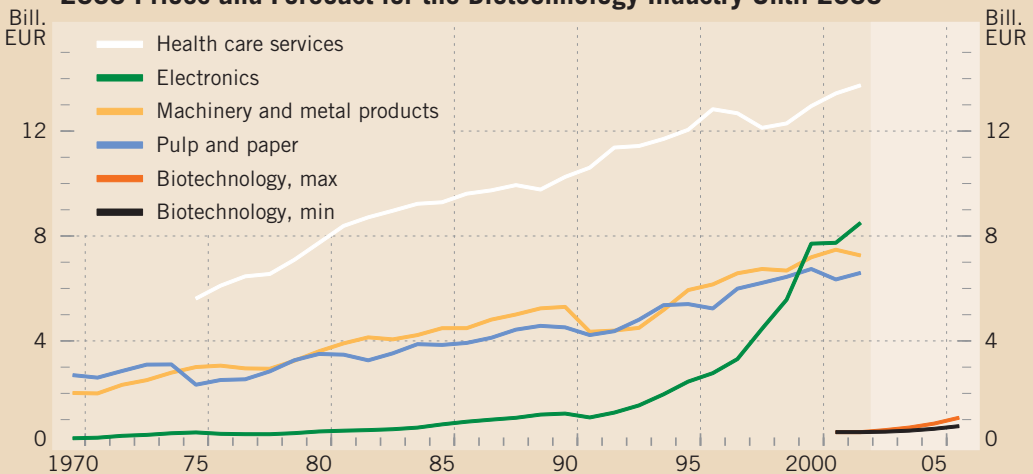
HEALTH CARE COST PRESSURES AND BIOTECHNOLOGY APPLICATIONS

In Finland as in many western countries the aging of the population is spurring upward

pressure on health care costs. At the same time, advances in medical science brings with them new and more effective treatment possibilities. The discovery of previously unknown disease mechanisms and treatment possibilities appears to further increase the cost pressures in health care (OECD 2003.).

Inaccurate diagnoses or a lack of appropriate treatment easily leads to a prolonged illness and thus an increased use of resources such as personnel and medication. Examples of this are strokes and schizophrenia, the former of which is a problem of the elderly population and the latter an illness affecting one percent of the entire world’s population. If more efficient ways can be found to make diagnoses and treat patients that would otherwise need long-term care, even relatively expensive methods can generate considerable cost savings. As an example of this, we have included a case study.

Value Added by Health Care Services and Main Pillars of Industry in Year 2000 Prices and Forecast for the Biotechnology Industry Until 2006



Sources: ETLA, Statistics Finland.

CONCLUSIONS

It is possible that biotechnology applications will have a crucial impact on the public health and the health care costs of the future. Owing to the current cost structure of the healthcare system it is worthwhile even from a macroeconomic standpoint to support research and development targeting also chronic illnesses and the aging population. This has important consequences for the public health since it arguments for the allocation of resources to patients whose treatment might otherwise be confined owing to economical reasoning.

The Finnish biotechnology industry is facing an exacting, yet potent phase even in the domestic markets. The value added by health care services is considerable compared to any other sector. If successful, biotechnology can offer significant savings with respect to the health care production costs, which justifies the comparison of the value added by health care services with the current value added by the biotechnology industry.

The combination of top-notch research integrated with internationally renowned domestic clinics in several areas important for the public health, governmental support schemes and a one-payer health care system can be regarded as producing a unique combination in favour of Finnish biotechnological research and development. The interests of the players are aligned: to develop procedures that can reduce the human and economic burden induced by our major diseases. Finally, a success on the domestic markets may later be realized also in the form of exports of product and service concepts to international markets.

Case Study

Use of biotechnology and related fields in treating strokes: more efficient treatment and decrease in total cost of treatment (Kaste 2004)

In 1999 cerebrovascular diseases caused treatment costs of EUR 440 million and the aging of the population is estimated to cause a doubling of acute treatment by the year 2030 (Fogelholm, Rissanen ja Nenonen 2002). Stroke is the most common type of cerebrovascular disease. It requires several days of acute treatment, which has led to an increase in treatment costs. Patients suffering from stroke require an average of about 2.5 years of treatment, which in the Helsinki region corresponds to a costs of approximately 100,000 euros (Kaste, Fogelholm and Rissanen 1998, Finne-Soveri 2003).

The neurological emergency department of the Helsinki University Central Hospital (HUCH) has started to treat stroke patients with ultra-acute thrombolysis, in which the critical blood clot is removed by dissolving it. Thrombolysis is part of an efficient and costly treatment chain consisting of prompt patient screening, fast computer-aided neuro-imaging and diagnostics, timely thrombolytic therapy, and a consecutive treatment based on special expertise in a separate stroke unit. The thrombolysis must at present be initiated within 3 hours after the first signs of a stroke. The thrombolytic agent alteplase is a glycoprotein produced utilizing recombinant DNA technology, and the costs of the product alone exceed thousand euros per dose.

Stroke is a disorder plaguing the elderly population in particular and it is interesting that development of effective and expensive comprehensive treatment applied at the right time has proven to generate significant savings from a society's perspective.

In 2002 about 8 percent of the stroke patients coming to the HYKS neurological clinic received thrombolysis, and by the end of 2003 the number had doubled. About 60 percent of the patients receiving thrombolysis recovered. The total cost savings with respect to the recovered patients was about 84,000 euros per patient (Lindsberg, Roine, and Kaste 2000, Finne-Soveri 2003); the savings represents over 80 percent of the non-recovering patients' total treatment costs. The total savings to Helsinki and Uusimaa municipal hospitals in 2002 was about 756 000 euros (Kaste 2004). Most of the savings comes from the costs after the first year (Kaste, Fogelholm, and Rissanen 1998), where health care personnel costs constitute the most significant share of the costs.

"The timely and efficient treatment of stroke victims is the cheapest alternative for society in economic terms, but for the patient it is like winning the lottery." (Kaste 2004.)

Markku Kaste, Duodecim 2004

FOOTNOTE

¹ In this article, the biotechnology industry refers to business activities seeking to exploit commercial applications of modern biotechnology research.

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