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Biotechnology Survey: 2007

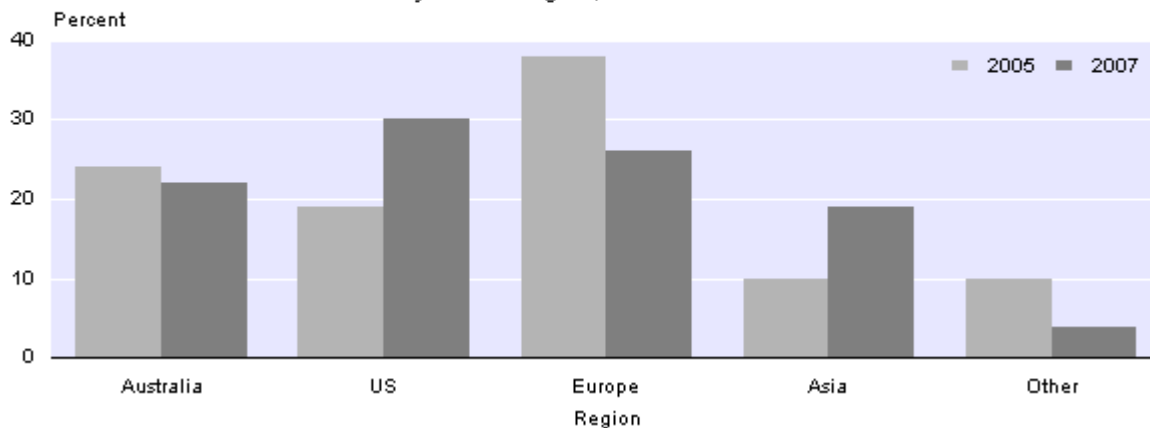
Highlights

- In the last two years 67 percent of biotechnology techniques used in New Zealand were in the research and development stage.
- Twenty-one percent of biotechnology organisations are active in the Auckland region.
- New Zealand organisations were granted 225 biotechnology-related patents in the two years to 30 June 2007.
- Thirty percent of biotechnology organisations that recruited overseas, obtained staff from the United States.

Overseas Recruitment of Biotechnology Staff

Within previous two years

By source region, 2005 and 2007



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There is a companion Media Release published – [Biotechnology Survey: 2007](#).

Commentary

Biotechnology Survey 2007

The Biotechnology Survey 2007 measures the use of biotechnologies and the characteristics of biotechnology organisations, including the use of strategic alliances, information sharing and constraints to biotechnology work. The information gathered is intended to assist in the formation of policies and procedures in support of biotechnology business activity.

Guide to interpreting the data

The following summary highlights the main points to consider when analysing the Biotechnology Survey 2007 results. A full technical description is contained in the Technical notes of this release.

Definition of biotechnology

The definition of biotechnology which is used in this survey is consistent with the Organisation for Economic Co-operation and Development (OECD) recommendations outlined in the draft Biotechnology Statistical Framework (refer www.oecd.org).

The OECD defines biotechnology as "the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services."

The following list of techniques was published by the OECD in 2004 as an indicative guideline of what biotechnology includes:

DNA – the coding: genomics, pharmaco-genetics, gene probes, DNA sequencing/synthesis/amplification, genetic modification.

Proteins and molecules – the functional blocks: protein/peptide sequencing/synthesis, lipid/protein glyco-engineering, proteomics, hormones, and growth factors, cell receptors/signalling/pheromones.

Cell/tissue culture and engineering: cell/tissue culture, tissue engineering, hybridisation, cellular fusion, vaccine/immune stimulants, embryo manipulation.

Process biotechnologies: bioreactors, fermentation, bioprocessing, bioleaching, bio-pulping, bio-bleaching, biodesulphurisation, bioremediation, and biofiltration.

Sub-cellular organisms: gene therapy, viral vectors.

Other: bioinformatics, nanobiotechnologies, other.

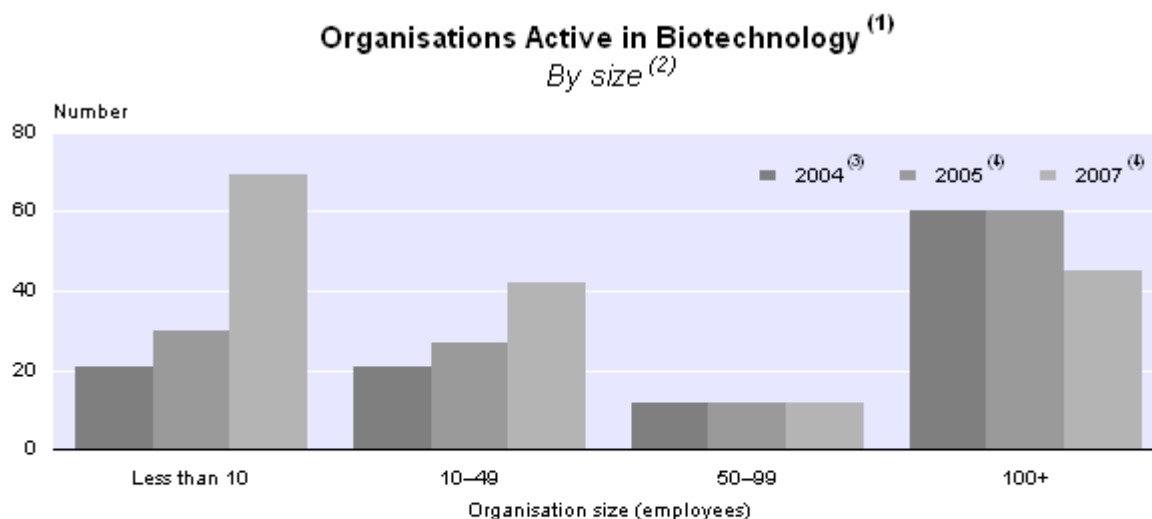
Data collection

The Biotechnology Survey 2007 was conducted as a postal survey of all organisations that were thought to be involved in biotechnology. Further information on the selection and size of the population can be found in the Technical notes of this release.

Organisations active in biotechnology

In order to determine the organisations are actively involved in biotechnology, the survey collects information about past, current and intended future use of biotechnologies. Organisations active in biotechnology are defined as those that either currently undertake biotechnology, or that will in the next two years.

The number of organisations active in biotechnology in 2007 was 168, in increase of one third over the 126 organisations active in biotechnology reported in the Biotechnology Survey 2005, which continues an upward trend from 110 organisations active in biotechnology in 2004.



(1) Organisations active in biotechnology are those currently using biotechnology techniques, or intending to in the future.

(2) Defined by rolling mean employment (RME) count.

(3) The reference period for 2004 data is three years.

(4) The reference period for 2005 and 2007 data is two years.

Note: All counts are random rounded to base 3 to protect confidentiality, so actual figures may differ from those stated.

This increase between 2005 and 2007 is accounted for by growth in the number of smaller organisations conducting biotechnology. Organisations with less than 10 employees increased from 30 in 2005 to 69 in 2007. Organisations with 10 to 49 employees also increased from 27 in 2005 to 42 in 2007. Organisations with between 50 and 99 employees have remained steady at 12. However, there has been a drop in the number of organisations with 100 or more employees, falling from 60 in 2005 to 45 in 2007. This decrease appears to be due to a combination of the restructuring of some large organisations into smaller separate units and variation in levels of reported biotechnology activity.

Use of biotechnologies in New Zealand

The use of biotechnology techniques can be broken down into three categories, according to which development stage the technique was used in. These development stages are:

- research and development (R&D)
- part of the production process
- part of the product sold.

The use of biotechnology techniques has remained reasonably stable over the last two years. Of the techniques used by New Zealand organisations in 2007, 67 percent were at the R&D stage, 21 percent were as part a production process and 13 percent were as part of the product sold. These results are also consistent with finding from previous biotechnology surveys, which showed the greatest use in the R&D stage. Corresponding figures from 2005 were 66 percent of biotechnology techniques used at the R&D stage, 20 percent at the part of the production process stage, and 14 percent at the part of the product sold stage.

Specific uses of biotechnology techniques

Process biotechnology in the production stage was the most common form of biotechnology reported. This is followed by DNA – the coding, as part of the product sold and R&D stage, and proteins and molecules at the R&D stage.

A further breakdown shows that DNA sequencing/synthesis/amplification and cell/tissue culture, tissue engineering account for the most common types of biotechnologies used, both 38 percent, at the R&D stage. Fermentation and bioprocessing accounts for 27 percent of the development within the part of the production process stage. At the part of the product sold stage, fermentation and bioprocessing accounts for 11 percent of biotechnology used.

Biotechnology area of application

In 2007 the most common area of biotechnology application in New Zealand was the environmental area at 32 percent, which is similar to 2005. This was followed by plant improvement, plant growth, functional foods/nutraceuticals, biomanufacturing and medical diagnostics/devices, all reported at 25 percent.

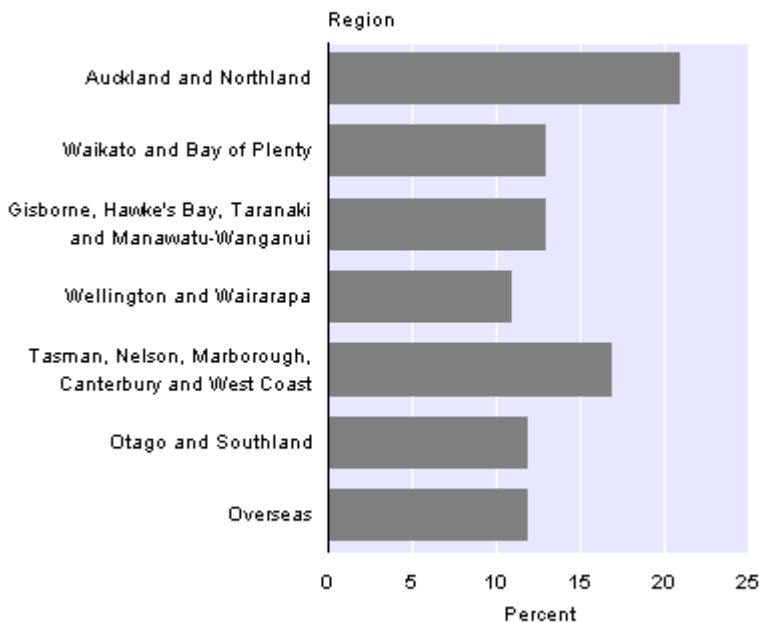
Biotechnology use by region

Regional breakdowns of biotechnology use were collected for the first time in the 2007 survey. Most biotechnology organisations are active in Auckland region, (21 percent), followed by the upper South Island region, (17 percent). Levels of biotechnology are similar across the rest of the regions within New Zealand, ranging from 11 to 13 percent. New Zealand organisations can also carry out biotechnology activities overseas, 12 percent of organisations active in biotechnology indicated they were undertaking work in overseas locations.

Regional Use of Biotechnology⁽¹⁾

Within previous two years

By region, 2007



(1) Organisations active in biotechnology are those currently using biotechnology techniques, or intending to in the future.

Across all regions, human health and agricultural biotechnology (other than animal health) were the two predominant areas of biotechnology at 22 and 23 percent. These were followed by animal health and industrial and environmental biotechnology being undertaken, both at 16 percent. Least common was biotechnology in the area of medical devices at 8 percent.

Biotechnology patents

In the two years ending 30 June 2007, 225 biotechnology-related patents were granted to New Zealand organisations. This compares with 189 biotechnology-related patents granted in 2005. The highest number of patents (108) were granted to the private sector, compared with 93 in 2005. This was followed by 75 patents granted to the public sector (including State-owned enterprises) and 48 patents for the higher education sector.

Constraints to biotechnology R&D

The most common constraint to biotechnology R&D faced by organisations was access to capital. Fifty percent of organisations saw this as a constraint, compared with 43 percent in 2005.

As with results from 2005, the next reported constraints were access to qualified biotechnology research and technical experts, and access to suitably experienced biotechnology research and technical experts, both 25 percent in 2007, compared with 24 percent in 2005.

Regulations also continue to be a constraint, reported by a number of organisations, 23 percent saw this as a constraint to biotechnology R&D in 2007. There has been a decrease in organisations that report the implications of the Treaty of Waitangi as a constraint, dropping from 10 percent in 2005 to 5 percent in 2007.

Overseas recruitment of staff

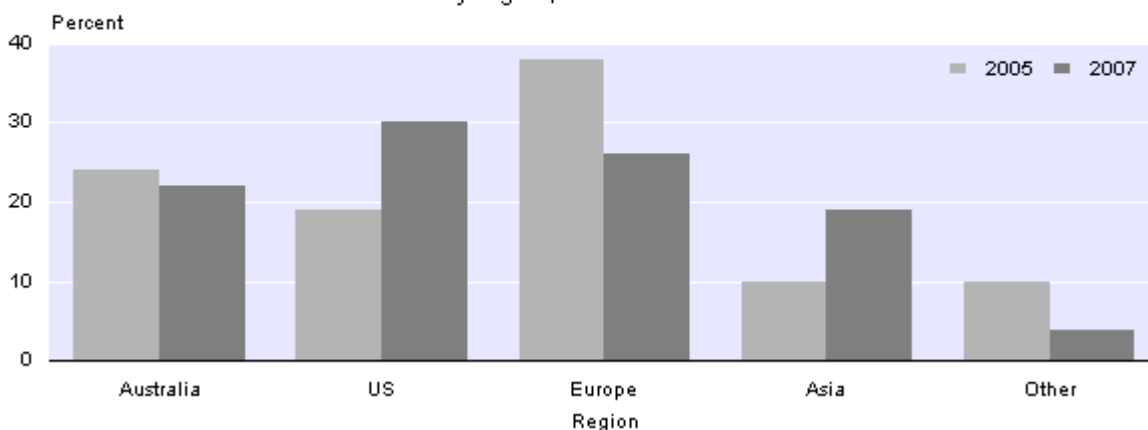
Results show that figures for successful and unsuccessful recruitment of biotechnology staff from overseas have remained reasonably stable from 2005 to 2007, with roughly two thirds of organisations recruiting successfully from overseas.

In 2007 there was a two-fold increase in the proportion of organisations successfully recruiting staff from the United States, with 30 percent recruiting staff from the United States, (up from 19 percent in 2005). Staff recruited from Asia has also increased, from 10 percent in 2005 to 19 percent in 2007. The percentage of organisations with staff recruited from Europe and Australia decreased. These regions were the source of 26 and 22 percent respectively of biotechnology staff recruited in 2007. The corresponding figures for 2005 were 38 and 24 percent respectively.

Overseas Recruitment of Biotechnology Staff

Within previous two years

By region, 2005 and 2007



The principal reason for unsuccessful recruitment of staff remained the inability to match overseas salary levels. Fifty-five percent of organisations reporting they were unsuccessful in their overseas recruitment listed this as a reason, up from 42 percent in 2005. In both years this was the most common reason and was much more prevalent than any other response.

Income, expenditure, exports and staff

Previous biotechnology surveys have published results around biotechnology income, expenditure and exports earnings.

These were collected once again in the 2007 survey, but feedback from key respondents indicated that this information was difficult to distinguish from corresponding overall figures for organisations in industries where bioprocesses are an inherent part of their traditional production process. The same issue also affects the number of biotechnology staff.

The impact of these difficulties can be a large variation in reported figures, which are dependant on individual respondent's interpretation of biotechnology definitions or processes. As such, these figures have not been published from the 2007 survey and further investigation will be undertaken to better understand these issues and their impact on financial and employment measures of biotechnology activity.

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Technical notes

This section provides a technical description of the data that has been used to compile this report. It focuses on the data quality and the definitions and processes used for data collection and analysis.

Survey background

The Biotechnology Survey 2007 measures the use of biotechnologies and their uptake by organisations. The survey also asked respondents about the characteristics of their organisations, including the use of strategic alliances, information sharing and constraints to biotechnology work.

Data collection

The Biotechnology Survey 2007 was a postal census of all organisations meeting the population selection criteria. There were two ways in which an organisation could meet the criteria. The first was if certain biotechnology-specific keywords were found to match those in an organisation name on the Statistics New Zealand Business Frame. Statistics New Zealand then supplemented this population with lists from New Zealand Government funding agencies and New Zealand biotechnology associations, as well as the indicator in the Research and Development Survey 2006.

The majority of the questionnaire uses a two-year reference period. Financial information was requested from respondents for the 2007 financial year. The survey was posted out in August 2007.

Comparison between the 2005 and 2007 surveys

A number of changes have taken place between the 2005 and 2007 surveys. The key changes are described below.

Regional data is now collected in two new questions; area of biotechnology by region, percentage of biotechnology employees by region.

Percentage of expenditure in area of biotechnology is now collected and questions collecting information about partnerships and alliances have been expanded to collect more information.

Measurement errors

Given the nature of the data collected, there are limitations on the level of accuracy that can be expected from the Biotechnology Survey 2007. For many enterprises in New Zealand, biotechnology represents only a small portion of their operations, and for this reason it is hard to separate out biotechnology work from other work. Additional information received from respondents in 2007 indicated certain results particularly impacted by this uncertainty. These have not been released and further investigation is being undertaken into these results. Detailed definitions of what should and should not be included as biotechnology were provided on the questionnaire, and phone-in help was available to respondents.

Target population

The population selection methodology was similar to that used by Statistics NZ in the Biotechnology Survey 2005. The only modifications was the inclusion of an extra government funding agency list, supplied by New Zealand Trade and Enterprise, (NZTE) and the reselection of any organisation that answered no to undertaking biotechnology in the 2004 survey. Organisations that reported they did not use biotechnology techniques in the 2005 survey were generally excluded from the population for 2007.

The selection unit for inclusion in the population was set at the enterprise level.

Criteria one

The population included enterprises whose predominant activity was likely to be modern biotechnology.

This category included:

(a) All enterprises on the Statistics New Zealand Business Frame with any of the following keywords in their legal and/or trading names:

- bioinformatics
- bioprocessing
- bioreagent
- biotechnology
- biotransformation(s)
- chromatography
- clonal
- concentrates
- extract
- extraction
- fluid extraction
- functional foods
- genetic(s)
- genomic(s)
- industrial microbiology
- monoclonal
- nutraceutical(s)
- proteomic(s)
- supercritical
- transgenic.

(b) Enterprises on the NZBio membership list.

(c) All institutions on the 2006 Foundation for Research, Science and Technology (FRST) lists of applicants receiving funding to carry out biotechnology-related research and/or development activities.

(d) Local authority sewerage treatment facilities.

(e) All Crown research institutes.

(f) University departments that have an interest in biotechnology.

(g) Microbiology units in metropolitan hospitals.

(h) The New Zealand Blood Service.

(i) All enterprises reporting biotechnology R&D in the Research and Development Survey 2006 conducted jointly by Statistics New Zealand and the Ministry of Research Science and Technology, (MoRST).

(j) All institutions on the 2006 NZTE lists of applicants receiving funding to carry out biotechnology-related research and/or development activities.

Criteria two

The second part of population selection attempted to identify enterprises whose predominant activity was not modern biotechnology, but were considered likely to engage in some modern biotechnology activity. This category includes all enterprises on the Statistics New Zealand Business Frame with any of the following key words in their legal and/or trading names:

- biological
- bioscience(s)
- diagnostics
- health
- life science(s)
- pharmaceutical(s)
- pharmaceuticals
- science(s)
- scientific
- serum.

The third part of the population selection process involved selecting all enterprises that have geographical units on the Statistics NZ Business Frame with one of the following ANZSIC codes:

A0301 Forestry

B1101 Black coal mining

B1200 Oil and gas extraction

C2121 Milk and cream manufacturing

C2129 Dairy product manufacturing

C2161 Bread manufacturing

C2182 Beer and malt manufacturing

C2183 Wine manufacturing

C2331 Pulp, paper and paperboard manufacturing

C2543 Medicinal and pharmaceutical product manufacturing

C2544 Pesticide manufacturing

L7810 Scientific research

L7829 Technical services nec

O8431 Higher education

O8611 Hospitals.

Enterprises were removed from criteria two population selection if they had GST sales of less than \$5 million.

Response rate

The target overall response rate for the Biotechnology Survey 2007 was 90 percent. The survey achieved an actual response rate of 96 percent, including a 100 percent response rate of enterprises which were identified as being key to the survey.

The population for the Biotechnology Survey 2007 consisted of 512 enterprises.

Imputation

No imputation was conducted for the Biotechnology Survey 2007

Definitions

ANZSIC

Australia and New Zealand Standard Industrial Classification system – New Zealand version 1996.

Biotechnology

The application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.

The following list of techniques was published by the OECD in 2004 as an interpretative guide as to what biotechnology includes:

DNA – the coding: genomics, pharmaco-genetics, gene probes, DNA sequencing/synthesis/amplification, genetic engineering

Proteins and molecules – the functional blocks: protein/peptide sequencing/synthesis, lipid/protein glyco-engineering, proteomics, hormones, and growth factors, cell receptors/signalling/pheromones

Cell and tissue culture, and engineering: cell/tissue culture, tissue engineering, hybridisation, cellular fusion, vaccine/immune stimulants, embryo manipulation

Process biotechnologies: bioreactors, fermentation, bioprocessing, bioleaching, bio-pulping, bio-bleaching, biodesulphurisation, bioremediation, and biofiltration

DNA and RNA vectors: gene therapy, viral vectors.

Other: bioinformatics, nanobiotechnologies, other.

Enterprise

A business or service entity operating in New Zealand. It can be a company, partnership, trust, estate, incorporated society, producer board, local or central government organisation, voluntary organisation or self-employed individual.

Goods and services tax (GST)

Respondents are asked to exclude GST if possible in the financial figures provided in the questionnaire. If they have not, Statistics New Zealand takes out GST to make all enterprises comparable.

Employees

The number of employees is defined by an enterprise's rolling mean employment (RME) count. RME is a twelve-month moving average of the monthly employment count (EC) figure. The EC is obtained from taxation data.

Research and development (R&D)

Research and experimental development comprising creative work undertaken on a systematic basis in order to increase the stock of knowledge. Any activity classified as R&D is characterised by originality. Investigation is a primary objective.

Statistics New Zealand Business Frame

A register of all businesses operating in New Zealand.

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Next release ...

Biotechnology in New Zealand: 2009 will be released in April 2010.

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Tables

The following tables can be downloaded from the Statistics New Zealand website in Excel format. If you do not have access to Excel, you may use the [Excel file viewer](#) to view, print and export the contents of the file.

List of tables

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2. Types of biotechnology used in New Zealand, within previous two years, 2007
3. Biotechnology use by development stage, within the previous two years, 2005, 2007
4. Area of biotechnology application, within previous two years, 2005, 2007
5. Regional use of biotechnology, within previous two years, 2007
6. Biotechnology patents granted, within previous two years, 2005, 2007
7. Constraints affecting biotechnology research and development, within previous two years, 2005, 2007
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