CONFIDENCE BUILDING NEEDS TRANSPARENCY

A summary of data submitted under the
Bioweapons Convention's confidence building measures
1987 - 2003

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The Sunshine Project
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1. INTRODUCTION

This report presents an overview of data submitted by states parties to the Biological Weapons Convention (BWC) in the course of the annual information exchange, the so called Confidence Building Measures (CBMs). For the first time, the content of all submissions from 1987 to 2003 is systematically analysed, summarised and herewith made publicly available.

At the moment, biological arms control is in one of its deepest crises since the BWC was signed in 1972. Efforts to improve the BWC by adding verification measures ended unsuccessfully in summer 2001. At the Fifth Review Conference in 2001 and 2002 states were unable to agree on reopening multilateral negotiations aimed at strengthening the BWC. The next milestone in biological arms control is the Sixth BWC Review Conference at the end of 2006. While states parties to the BWC are unlikely to resume formal negotiations on a verification protocol next year, they should use the opportunity of the upcoming Review Conference to take steps to increase transparency in biological activities world-wide.

As the negotiations on a verification protocol for the BWC – which would have included a legally binding declaration system – failed, the CBMs remain the only agreed permanent multilateral transparency measure for the years to come. It is therefore important to make best use of this mechanism. The report provides an empirical basis for future discussions on an improvement of the CBMs. It presents in chapter 3 a summary of declared facilities and activities that are deemed most relevant for biological arms control: national biodefence programmes, facilities with maximum biological containment, and vaccine production facilities. In chapter 4, a more detailed account of the information declared by countries of particular importance and therefore special responsibility for the BWC is provided.

1.1. Transparency and biological arms control

Because of the "dual use" character of most of the activities in biotechnology, transparency is one of the key mechanisms for strengthening the BWC. Transparency about and the willingness to explain the biological activities performed in a given country are of utmost importance in order to increase confidence in the peaceful nature of activities. Excessive secrecy of military and civilian activities in the biological field will sooner or later lead to misinterpretation and may result in a new biological arms race.

Transparency refers to the availability of relevant information and – in a more extensive understanding – to openness of a system (a government or a company for instance) to external observers. Transparency serves three different purposes: it deters violations of norms, it reassures actors that others are not misusing technologies and goods, and it may also reveal problems that actors have not recognized before. (Florini 1998) Transparency is fostered by: 1) collecting, processing, analyzing and disseminating relevant information, 2) timely, accurate and comprehensive reporting by leader states, 3) rewarding reporting, and 4) removing disincentives and obstacles to reporting. (Mitchell 1998)

The virtues of transparency for the effectiveness of multilateral control regimes have been touted repeatedly and consistently. In order to regulate the behaviour of states and to assess regime effectiveness, actors must have information about the activities they want to regulate. Yet most security regimes fail to produce accurate and timely information making it difficult to assess

actors' compliance and regime effectiveness, and to decide on the evolution of a regime and on sanctioning violations. (Mitchell 1998)

Earlier this year, United Nations (UN) Secretary-General Kofi Annan, in his report *"In Larger Freedom. Towards Security, Development and Human Rights for All"*, called upon all states *"to increase the transparency of bio-defence programmes"*. (A/59/2005: 29) Existing transparency enhancement measures in the area of biological arms control – first and foremost the CBMs in the framework of the BWC – are of limited effectiveness, mostly due to a lack of participation and "follow up". States have so far not been willing to substantially improve CBM implementation.

With its programme "Civil Society and Transparency" the Sunshine Project aims at improving transparency in areas relevant to biological arms control. This report alleviates the lack of "follow-up" for the BWC CBMs by processing, translating and analysing some of the data contained in the CBMs and making the resulting information available to the public.

1.2. History of the BWC confidence building measures

The first CBMs for the BWC were agreed during the Second Review Conference in 1986 *"in order to prevent or reduce the occurrence of ambiguities, doubts and suspicions"*. (BWC/CONF.II/13/II: 6) The CBMs, which took the form of data exchange measures, were extended at the Third BWC Review Conference in 1991. They were not discussed in detail at the Fourth Review Conference in 1996 because at that time efforts were focussed at the work of the Ad Hoc Group which, among other things, was considering a legally binding declaration system. In 2001, at the Fifth Review Conference, states made a number of proposals to improve and broaden the CBMs. However, as the Fifth Review Conference was unable to agree on a Final Declaration, these proposals were not translated into action. Therefore the topics that were agreed in 1991 are the ones that are still valid today:[1]

1. Confidence building measure A:
   Part 1: Exchange of data on research centres and laboratories;
   Part 2: Exchange of information on national biological defence research and development programmes.
2. Confidence building measure B:
   Exchange of information on outbreaks of infectious diseases and similar occurrences caused by toxins.
3. Confidence building measure C:
   Encouragement of publication of results and promotion of use of knowledge.
4. Confidence building measure D:
   Active promotion of contacts.
5. Confidence building measure E:
   Declaration of legislation, regulations and other measures.
6. Confidence building measure F:
   Declaration of past activities in offensive and/or defensive biological research and development programmes.

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[1] For the current CBM forms see document BWC/CONF.III/23: 25-47. The forms are accessible online at http://www.opbw.org (8 August 2005).

7. Confidence building measure G:
   Declaration of vaccine production facilities.

Every BWC member state must submit a CBM return to the UN Department for Disarmament Affairs by 15 April each year, covering the previous calendar year. If a state has nothing to report or nothing new to report, it can use Form 0, indicating with just a tick whether there is no or no new information to declare on the different CBM topics. The UN collects and copies the CBM returns and distributes them to states parties.[2]

Some states have made their CBM submissions public. Australia posted their CBM returns on the internet in 2002, 2004 and 2005.[3] The USA did the same in 2004.[4] In the late 1980s the Stockholm International Peace Research Institute (SIPRI) was granted access to the CBM submissions for its study on the first three rounds of data exchanges. (Geissler 1990: ix) At least one state, namely Germany, has granted a non-governmental organisation access to their CBM submission on request. A limited amount of public information is contained in the CBM reports that the UN Department for Disarmament Affairs prepared for the BWC Review Conferences. Those documents list in a yes/no format, which CBM forms states have submitted, but do not contain declared data, much less provide analysis or evaluation of those data.[5]

Some state representatives have claimed in the past that the CBMs are "for government use only". When adopting the CBMs, however, states did not specify that access to data would be restricted. Moreover, confidentiality would obviously run counter to the goal of increasing transparency.

1.3. General comments on the use of data from BWC confidence building measures

For this report some of the data contained in the CBMs were processed, translated and analysed and the resulting information is made available to the public. The report focuses on data of particular relevance to biological arms control and on the data provided by particularly important countries. The period this report covers is 1987, when the first CBMs were submitted, to 2003.[6] In this report exclusively data as provided by states parties in their CBMs are presented. These data were not compared with information available from other sources, and hence no statement regarding the correctness or completeness of the data that were presented by states can be made.[7]

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2 Canada has prepared a detailed guide on the CBMs, giving advice on how to collect information, complete the forms and submit the CBM declarations to the United Nations. The guide is accessible at http://www.opbw.org/cbms/Guide_files/frame.htm (8 August 2005).

3 See http://www.opbw.org (8 August 2005).

4 See http://www.state.gov/documents/organization/32486.pdf (8 August 2004).

5 These documents from the Fifth Review Conference are BWC/CONF.V/2, BWC/CONF.V/2/Corr.1, BWC/CONF.V/2/Corr.2, BWC/CONF.V/2/Corr.3, BWC/CONF.V/2/Add.1 and BWC/CONF.V/2/Add.1/Corr.1 and can be found at http://www.opbw.org (8 August 2005).

6 A list of the documents containing the CBM submissions from 1987 to 2003 is provided in Annex I. These documents were used in the preparation of this report.

7 For a few countries CBM data have been compared to open source data. See the sunshine project country reports for France, Germany and Turkey, available at http://www.sunshine-project.de/infos/Laenderstudien/France_BW_Report.pdf, http://www.sunshine-project.de/infos/Laenderstudien/German_BW_Report.pdf and http://www.sunshine-project.de/infos/Laenderstudien/Country%20Report%20Turkey.pdf (8 August 2005).

Analysing the CBM data is a challenging task. First there is the sheer amount of data. CBM submissions between 1987 and 2003 cover almost 11,000 pages. For this report data have been checked several times in order to assure their correctness, but mistakes may still have happened.[8]

Then there is the problem of irregular participation. If a country participated in 1995 for the last time (as for instance Greece did), should one assume that the 1995 data are still valid in 2003? In this report such older information is presented alongside more recent one, indicating the year it was provided. Similarly difficult is to decide whether older information is superseded by newer information or whether newer information is simply an addition to older information.

Another problematic issue is incomplete information. Spain, for instance, did not provide information on funding for their biodefence facilities as required in CBM Form A2iii. Equally, Italy lists a number of vaccine production facilities but does not mention the diseases covered, as required in CBM Form G.

Also problematic are ambiguous questions in the forms themselves. Form A2iii for instance asks for the number of staff working at the biodefence facility, and also for the number of contractor staff working there. It is unclear, and states have handled this differently, whether the first number of staff should include or exclude the number of contractor staff.

And last but not least, when using CBM data it is extremely important to keep in mind that only a limited number of states have participated. The picture that is provided below is therefore necessarily an incomplete one.

2. PARTICIPATION OF BWC STATES PARTIES IN THE CONFIDENCE BUILDING MEASURES

States parties to the BWC are politically bound to hand in a CBM submission every year. Not doing this brings countries into technical non-compliance with the BWC. A large number of BWC states parties fall into this category, seriously undermining the biological weapons control regime.

Only a few states provided information on a regular basis as required. There are only eight countries that submitted CBM returns in every single year between 1987 and 2003. These are Canada, Finland, Germany, Netherlands, Norway, Russia, Spain and USA.

Over the years, usually less than one-third of states parties submitted information. With 53 CBM submissions, participation peaked in 1996 – the year of the Fourth Review Conference – when states expected a verification instrument for the BWC in the near future. The number of CBM submissions per year is shown in figure 1. In the five-year period 1999 to 2003, 22 countries provided information annually (Argentina, Australia, Belarus, Canada, China, Cuba, Czech Republic, Finland, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Romania, Russia, Slovakia, South Korea, Spain, Switzerland, Turkey and the USA).

Since 1987, 87 states parties have taken part in the process at least once. This means, though, that more than 40 per cent of BWC member states never submitted any information until 2003. Among those that have never participated are Algeria, Bosnia and Herzegovina, Ethiopia, Ghana, Indonesia, Kenya, Lebanon, Libya, Malaysia, Morocco, Nigeria, Oman, Pakistan, Singapore,

[8] The author is thankful for comments and corrections at irishunger@versanet.de.

Sudan, Uruguay, Venezuela, Viet Nam, Yemen and Zimbabwe.[9] The growing number of states that submitted CBMs at least once is shown in figure 2.

Figure 1: Number of CBM returns by BWC states parties in the years 1987 to 2003

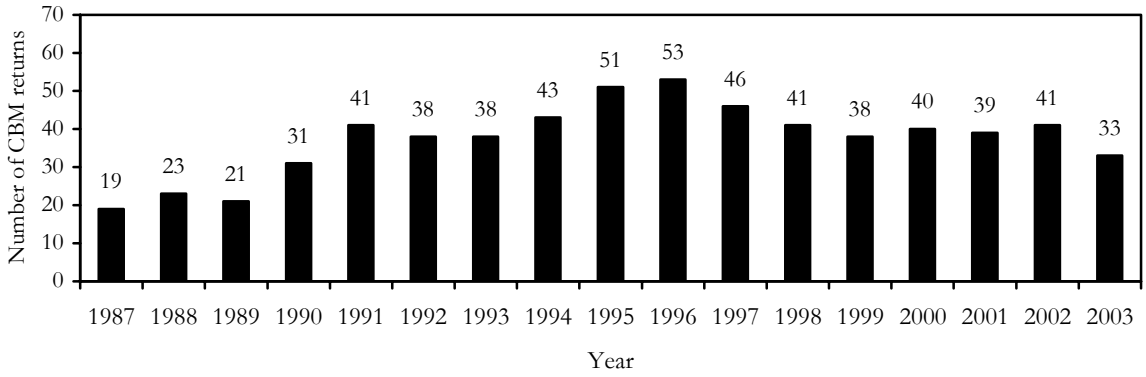
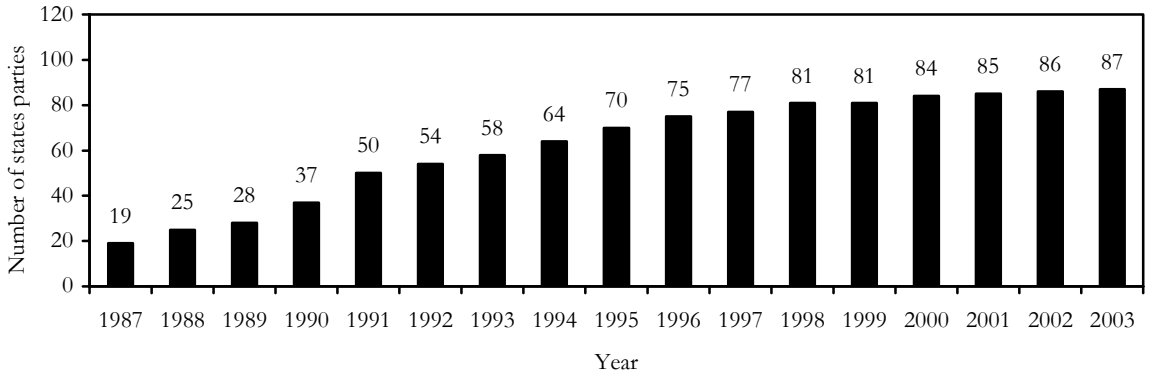


Figure 2: Number of states parties that submitted CBMs at least once



Eastern European countries and Western states took part much more frequently than members of the Non-Aligned Movement (NAM). Over the past ten years, almost all Western states and four-fifths of Eastern European countries participated at least occasionally, compared to only one-third of NAM states.

3. INFORMATION ON BW-RELEVANT ACTIVITIES IN THE CONFIDENCE BUILDING MEASURES

3.1. What are BW-relevant activities?

When discussing biological weapons (BW) and the technologies necessary for their development the term "dual use" appears frequently. "Dual use" means that equipment, agents, technologies and knowledge used in producing a biotechnology product such as medicines or food can be used also to produce BW. "Dual use" is a feature not exclusive to biotechnology. To different

[9] A complete list of states parties to the BWC and their participation or non-participation in the CBM data exchange is provided in Annex II.

degrees, all technologies can be used for good or bad. But the degree of "dual useness" is particularly high in the biological sciences and at times only a very thin line separates legitimate from illicit activities.

But while it is true that many activities in the biological field have a strong "dual use" character, qualifications have to be made. There are certain activities that have a very limited use for peaceful purposes, and even activities that cannot be justified with peaceful intentions at all. Clearly offensive activities are work on BW munitions and delivery systems for such munitions. Such work can never be justified as peaceful. It is prohibited without any qualification by Article I of the BWC.

Of extremely limited non-offensive use is work aimed at enhancing characteristics of agents that make them more suitable as weapons, such as: 1) enhancing infectivity and pathogenicity of agents, 2) improving transmissibility, 3) altering agents to evade current detection methods, 4) enhancing resistance to current therapeutics such as antibiotics or resistance to host immunological defences, 5) improving the ability of an agent to remain viable and virulent during production, weaponization, storage, transport and during and after release into the environment, 6) facilitating the dissemination of agents as a fine particle aerosol, or by contamination of food or water sources. (Zilinskas et. al. 2002) Close to the hostile side of the spectrum are also the mass production of biological agents that have no commercial application, and open air field testing of live biological agents.

Activities at the hostile end of the spectrum are carried out most often in biodefence programmes. Many states have enlarged existing or created new biodefence programmes in the last decade. Biodefence activities quite often involve creating offensive capabilities in the name of biodefence.

Of the CBM topics, most relevant in terms of biological arms control are data on national biodefence programmes, because they are likely places of "dual use" activities close to the hostile end of the "dual use" spectrum. In addition, information on vaccine production is relevant, because it indicates large production capacities and relevant know-how, which are both necessary for a large scale BW programme. Data on BL4 laboratories are also of relevance, because it is likely that particularly dangerous activities such as making biological agents more pathogenic or increasing their transmissibility are carried out under high biological containment to prevent damage to the environment and/or keep the activities secret.

These three topics – biodefence programmes, maximum biological containment and large production capacities – were also important declaration triggers in the draft verification protocol to the BWC. (BWC/AD HOC GROUP/55: 28-38) In the following, the CBM data on those three topics – contained in CBMs A1, A2 and G – are analysed.

3.2. Information on biodefence programmes

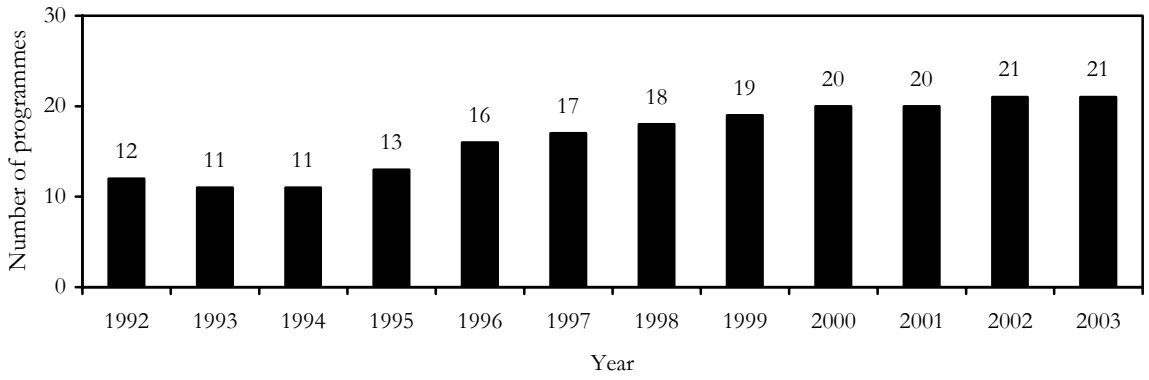
CBM form A2 asks for information on *"national biological defence research and development programmes"*. Besides an overview of the programme (CBM Form A2ii) states also have to declare detailed information on facilities that have *"a substantial proportion of [their] resources devoted to the national biological defence research and development programme"* (CBM Form A2iii).

During the period 1992 (when CBM A2 came into existence) until 2003, 23 states declared biodefence programmes. The first and last year of declaration as well as the number of

biodefence facilities, the number of biodefence personnel and the level of funding declared in the most current CBM submission are summarized in Table 1.

The number of biodefence programmes declared per year is shown in figure 3. There is a visible trend towards the establishment of new biodefence programmes. Australia, Belarus, Belgium, Italy, Japan, Poland, South Africa, Spain, Switzerland and Ukraine declared initiating a biodefence programme during the period under review. With the exception of Czechoslovakia and Ukraine no country declared an end of their biodefence programme. When a country did not declare a stop to their programme, it is assumed that the declared programme is continuing, even if the country in question did not provide data during the last few years. Some countries provided information for the first time long after 1992, when information on biodefence programmes was required for the first time. India, for instance, participated only once, in 1997; their biodefence programme is counted in 1997 for the first time, even if it could be older, having been initiated much earlier.

Figure 3: Number of declared biodefence programmes per year



3.3. Information on BL4 facilities

CBM form A1 asks for information on *"research centres and laboratories that meet very high national or international safety standards"* or specialize in *"permitted biological activities directly related to the Convention"*.

A huge number of facilities was declared under CBM A1. Most of these facilities were neither funded by Ministries of Defence nor equipped with BL4 containment. During the 10-year period 1994 to 2003, 22 states declared 57 BL4 facilities. 43 of these facilities were declared in existence in 1994, 36 in 1998, and 32 in 2003. Four of the 57 declared facilities were partly, one was fully funded by Ministries of Defence. The 22 states and the years their BL4 facilities were declared are summarized in Table 2.

Table 1: Information on biodefence programmes

State	First and last year of declaration	Level of annual funding for the biodefence programme declared last	Number, name(s) and location(s) of biodefence facilities declared last	Number of biodefence personnel declared last
Australia	1995 / 2003	AUD 1.65 million (2003) (EUR 0.90 million)[A]	1 (2003) Chemical Biological Radiological and Nuclear (CBRN) Defence Centre (Melbourne/Maribyrnong, Victoria)	16 staff years, 20 personnel (2003)
Belarus	1995 / 2003	BYR 272 million (2003) (EUR 0.14 million)[C]	0 (2003)[1]	n.a.
Belgium	1999 / 2002	BEF 24.9 million (2002) (EUR 6.16 million)[A]	2 (2002) Laboratory of Applied Molecular Technologies. University Hospitals Saint-Luc (Brussels) Laboratory of Physiology. Unite FYSP. VUB (Brussels)	9 (2002)
Canada	1992 / 2003	CAD 1.77 million (EUR 1.09 million)[A] plus an unidentified portion of CAD 30 million (EUR 18.47 million)[A] for the *"Chemical, Biological, Radiological and Nuclear Research and Technology Initiative"* (2003)	1 (2003) Defence R&D Canada - Suffield. Chemical Biological Defence Section (Medicine Hat/Ralston, Alberta)	31 (2003)
China	1992 / 2003	CNY 2 million (1993)[2] (EUR 291,200)[D]	1 (2003) Institute of Microbiology and Epidemiology (Beijing)	173 (2003)
Czechoslovakia[3]	1992 / 1992	*no data provided*	3 (1992) Military Institute of Hygiene, Epidemiology and Microbiology (VUHEM) (Prague) Institute of Biochemistry. Medical Faculty. Charles University (Hradec Kralove) Institute of Biochemistry and Biotechnology. Faculty of Natural Sciences. Comenius University (Bratislava)	127 (1992)
Finland	1992 / 2003	EUR 70,000 (2003)	2 (2003) Finish Defence Forces Technical Research Centre (Lakiala/Tampere) University of Kuopio. Department of Biochemistry and Biotechnology (Kuopio)	2 (2003)
France	1992 / 2002	EUR 8 million (2002)	1 (2002) Centre d'Etudes du Bouchet (Vert-le-Petit)	31 (2002)

State	First and last year of declaration	Level of annual funding for the biodefence programme declared last	Number, name(s) and location(s) of biodefence facilities declared last	Number of biodefence personnel declared last
Germany	1992 / 2003	EUR 5.2 million (2003)	3 (2003) Bundeswehr Institute of Microbiology (Munich) Federal Armed Forces Scientific Institute for Protection Technologies and NBC Protection (Munster/Oertze) Central Institute of the Medical Service of the Federal Armed Forces. Medical B-Defence Laboratory (Munster/Oertze)	65 (2003)
India	1997 / 1997[4]	INR 2 million (1997) (EUR 0.04 million)[D]	1 (1997) Microbiology and Virology Division. Defence Research and Development Establishment (Gwalior)	25 (1997)
Italy	1997 / 2003	*no data provided*	1 (2003) Chemical-Physical-Biological Military Technical Centre (Civitavecchia/Rome)	6 (2003)
Japan	2002 / 2003	JPY 2.7 million (2003) (EUR 0.02 million)[A]	1 (2003) Japan Ground Self-Defence Force. Test and Evaluation Command. Military Medicine Research Unit (Setagaya-ku/Tokyo)	6 (2003)
Netherlands	1992 / 2003	EUR 0.47 million and USD 3 million (EUR 2.88 million)[A] (2003)	2 (2003) TNO Prevention and Health (Leiden/The Hague) TNO Prins Maurits Laboratory (Rijswijk/The Hague)	21 (2003)
Norway	1992 / 2003	USD 0.3 million (2003) (EUR 0.29 million)[A]	1 (2003) Institute of Microbiology. Armed Forces Medical Services (Oslo)	10 (2003)
Poland	1998 / 2003	*no data provided*	3 (2003) Diagnostic and Countering of Biological Threats Centre (Pulawy) Interdepartmental Division for Protection against Bioterrorism (Warsaw) Department of Microbiology and Epidemiology (Warsaw)	53 (2003)
Russia	1992 / 2003	RUB 165 million (2003) (EUR 4.95 million)[C]	3 (2003) Scientific Research Institute of Microbiology (Kirov) Virology Centre (Sergiev-Posad) Military-Technical Centre for Biological Protection (Ekaterinburg)	2978 (2003)
South Africa	2000 / 2003	USD 10,000 (2003) (EUR 9600)[A]	1 (2003) Protechnik Laboratories (Centurion/Pretoria)	1 (2003)
Spain	1996 / 2003	EUR 721,214 (2003)	4 (2003) Research Centre of Animal Health (Valdeolmos/Madrid) Laboratory of Analysis and Testing Adirondack (Vizcaya) Faculty of Veterinary Medicine. University Complutense Madrid (Madrid) Institute of Health Carlos III (Majadahonda/Madrid)	13 personnel, (12 part-time, 1 full-time) (2003)

State	First and last year of declaration	Level of annual funding for the biodefence programme declared last	Number, name(s) and location(s) of biodefence facilities declared last	Number of biodefence personnel declared last
Sweden	1992 / 2001	SEK 14.05 million (2001) (EUR 1.58 million)[A]	1 (2001) National Defence Research Establishment. Department of NBC Defence (Umeå)	24 (2001)
Switzerland	1996 / 2003	CHF 1 million (2003) (EUR 0.69 million)[A]	1 (2003) Spiez Laboratory. Swiss NBC Defence Establishment (Spiez)	8 (2003)
Ukraine	1996 / 1996	UAK 160 million (1996) (EUR <1000)[A B]	0 (1996)[5]	n.a.
United Kingdom	1992 / 2003	GBP 24 million (2003) (EUR 36.92 million)[A]	1 (2003) Defence Science and Technology Laboratory (Porton Down/Salisbury)	241 (2003)
USA	1992 / 2003	USD 114.29 million (EUR 109.89 million)[A] plus an unidentified portion of USD 85 million (EUR 81.73 million)[A] for the *"Chemical and Biological National Security Program"* (2003)	20 (2003) US Army Medical Research Institute of Chemical Defense (Aberdeen Proving Ground, Maryland) Walter Reed Army Institute of Research (Silver Spring, Maryland) US Army Medical Research Institute of Infectious Diseases (Ft. Detrick/Frederick, Maryland) US Army Edgewood Chemical and Biological Center (Aberdeen Proving Ground, Maryland) Lothar Salomon Test Facility (Dugway Proving Ground, Utah) US Army Corps of Engineers. Engineer Research and Development Center. Geotechnical and Structures Laboratory. Structural Engineering Branch (Vicksburg, Mississippi) Naval Medical Research Center. Biological Defense Research Directorate (Silver Spring, Maryland) Naval Research Laboratory. Chemistry Division, Center for Biomolecular Science and Engineering, Optical Sciences Division (Washington, D.C.) Naval Surface Warfare Center. Dahlgren Division. Chemical Biological Systems Technology Division (Dahlgren, Virginia) Armed Forces Institute of Pathology (Washington, D.C.) White Sands Missile Range (White Sands, New Mexico) Brookhaven National Laboratory (Upton, New York) Lawrence Livermore National Laboratory (Livermore, California) Los Alamos National Laboratory (Los Alamos, New Mexico) Oak Ridge National Laboratory (Oak Ridge, Tennessee) Sandia National Laboratories (Albuquerque, New Mexico, and Livermore, California)	1683 (2003)
USA ctd.			Air Force Research Laboratory. Directed Energy Bioeffects Division	

State	First and last year of declaration	Level of annual funding for the biodefence programme declared last	Number, name(s) and location(s) of biodefence facilities declared last	Number of biodefence personnel declared last
			(Brooks City Base/San Antonio, Texas) Air Force Research Laboratory. Materials and Manufacturing Directorate. Weapons Logistics Laboratory (Tandall Air Force Base/Panama City, Florida) Idaho National Engineering and Environmental Laboratory Research Center (Idaho Falls, Idaho) E. O. Lawrence Berkeley National Laboratory (Berkeley, California)	

1 Belarus declared the Scientific Research Institute for Epidemiology and Microbiology (Minsk) as the facility where the biodefence programme was carried out; it did not provide a detailed declaration for this facility under CBM Form A2iii.

2 China did not provide information on the overall programme after 1993. Information on a biodefence facility has been provided annually until 2003, however. The amount of funding declared in 2003 for the biodefence facility was Yuan 10.89 million (EUR 1.27 million)[D].

3 Both the Czech and the Slovak Republic declared from 1994 on that they do not have a biodefence programme.

4 India submitted a CBM declaration only once, in 1997.

5 Ukraine declared the Ukraine Institute of Medico-Biological Problems (Kiev), the Institute of Bioorganic Chemistry and Oil Chemistry (Kiev) and the Institute of Organic Chemistry (Kiev) as the facilities where the biodefence programme was carried out; it did not provide a detailed declaration for these facilities under CBM Form A2iii. Ukraine declared from 1997 on that they do not have a biodefence programme.

Conversion of currencies

Historical currency exchange rates as of 1 January of the year of the last declaration available were used. The sources for historical currency exchange rates were the following:

A: http://www.discount-currency-exchange.com/historical-rates/history_currency_search.cfm (8 September 2005)

B: http://www.bsi.si/html/eng/financial_data/arhiv/dte1996_01.html (8 September 2005)

C: http://fxtop.com/en/historates.php3 (8 September 2005)

D: http://www.x-rates.com/cgi-bin/hlookup.cgi (8 September 2005)

Table 2: Information on BL4 facilities

State	Number of BL4 facility	1994	1998	2003	Funding by Ministry of Defence?
Australia	1 Australian Animal Health Laboratoy (Geelong, Victoria)	x	x	x	no
	2 Commonwealth Serum Laboratories Limited (Parkville, Victoria)	x	x	x	no
	3 National High Security Quarantine Laboratory (Carlton South, Victoria)	x	x	x	no
	4 Australian Neuromuscular Research Institute (Nedlands, Western Australia)			x	no
	5 Queensland Health Scientific Services (Coopers Plains, Queensland)			x	no
Austria	1 Biomedical Research Centre. Immuno AG (Orth a. d. Donau / Wien)	x	x	x (2002)	no
Belarus	1 Government Scientific Research Institute of Epidemiology and Microbiology (Minsk)	x (1993)	x (1997)	x	no
Canada	1 Ontario Ministry of Health Laboratories. Central Public Health Laboratory (Etobicoke, Ontario)	x			no
	2 INRS. Institute Armand-Frappier (Laval, Quebec)			x	no
	3 BC Centre for Disease Control Laboratory Services. University of British Columbia. Division of Infectious Diseases (Vancouver, British Columbia)			x	no
	4 Canadian Science Centre for Human and Animal Health. National Microbiology Laboratory (Winnipeg, Manitoba)		x	x	no
	5 National Centre for Foreign Animal Disease (Winnipeg, Manitoba)		x	x	no
Cuba	1 Institute of Tropical Medicine "Pedro Kouri" (Havana)	x			no
Czech Republic	1 Dyntec (Terezin)	x	x	x	no
	2 Research Institute of Veterinary Medicine (Brno)	x			no
	3 State Veterinary Institute. FMD Diagnostic Laboratory (Prague)		x	x	no
Finland	1 Department of Virology. University of Helsinki (Helsinki)	x			no
	2 Animal Virus Laboratory. Department of Virology and Epidemiology. National Veterinary and Food Research Institute (Helsinki)	x			no
	3 Labsystems Oy (Helsinki)	x			no
France	1 Laboratory of Molecular Genetics of Eucaryotes (Strasbourg)	x			no
	2 Laboratory of Virology. Faculty of Medicine (Strasbourg)	x			no
	3 Unit for Research on Hepatitis and the Role of Hepatitis Virus for Oncogenesis and AIDS (Lyon)	x			no
	4 Laboratory of Veterinary Medicine (Fougeres)	x			no
	5 BL4 High Security Laboratory "Jean Merieux" (Lyon)			x (2002)	no
Germany	1 Federal Research Institute for Virus Diseases of Animals (Tübingen)	x	x	x	no
	2 Bernhard Nocht Institute for Tropical Medicine (Hamburg)	x	x	x	partly
	3 Institute of Virology. Philipps University Marburg (Marburg)			x	no
	4 Federal Health Agency (Berlin)	x	x		no
	5 State Medical, Food and Veterinary Inspection Agency North Hesse (Kassel)	x	x		no

State	Number of BL4 facility	1994	1998	2003	Funding by Ministry of Defence?
Italy	1 Laboratory of Cellular Biology. Biological Service (Rome)	x	x		no
Japan	1 Murayama Annex. National Institute of Infectious Diseases (Tokyo)	x	x	x	no
	2 RIKEN Tsukuba Institute (Ibaraki)	x	x	x	no
Mongolia	1 Institute for Naturally Occurring Diseases (Ulan Bator)	x	x (1995)	x (1995)	no
Netherlands	1 National Institute of Public Health and the Environment (Bilthoven)	x	x		no
	2 Central Institute for Animal Disease Control (Lelystad)	x	x	x	no
Russia	1 Government Scientific Centre for Virology and Biotechnology "Vector" (Kolzovo, Novosibirsk Rayon)		x	x	partly (1994) no (1998, 2003)
	2 Pharmaceutical Stock Company "Ferein" (Elektrogorsk, Moscow Oblast)		x		no
Slovakia	1 MEBAK (Nitra)	x			no
South Africa	1 Special Pathogens Unit (Sandringham)	x (1993)	x	x	no
Spain	1 National Centre for Animal Health (Valdeolmos/Madrid)	x	x		no
Sweden	1 Swedish Institute of Infectious Disease Control (Solna)	x	x	x (2001)	partly
Switzerland	1 Institute for Virus Diseases and Immune Prophylaxis (Mittelhäusern)	x	x	x	no
	2 Swiss Serum and Vaccine Institute (Thörishaus/Grafenried)	x	x		no
Ukraine	1 Ukrainian Scientific Research Anti-Plague Institute "I. Metschnikov" (Odessa)		x	x	no
United Kingdom	1 Centre for Applied Microbiology and Research (Porton Down, Salisbury)	x	x	x	no
	2 Virus Zoonosis Unit. Public Health Laboratory Service (London)	x	x		no
	3 Rabies High Security Unit. Veterinary Laboratories Agency (New Ham, Addlestone)	x	x		no
	4 National Institute for Biological Standards and Control (South Mimms, Potters Bar)	x	x		no
	5 High Security Laboratory. Ruchill Hospital (Glasgow)	x			no
	6 High Security Infectious Diseases Isolation Unit (Newcastle upon Tyne)	x	x		no
	7 Coppetts Wood High Security Infectious Diseases Unit (London)	x	x		no
USA	1 National Institutes of Health (Bethesda, Maryland)	x	x	x	no
	2 National Cancer Institute Frederick (Frederick, Maryland)	x			no
	3 Centers for Disease Control and Prevention (Atlanta, Georgia)	x	x	x	no
	4 US Army Medical Research Institute of Infectious Diseases (Fort Detrick/Frederick, Maryland)	x	x	x	wholly
	5 The Betty Slick and Lewis J. Moorman, Jr. Laboratory Complex. Department of Virology and Immunology (San Antonio, Texas)			x	partly
	6 National B Virus Resource Center. Viral Immunity Center. Georgia State University (Atlanta, Georgia)			x	
Sum	57	43	36	32	1 wholly, 4 partly

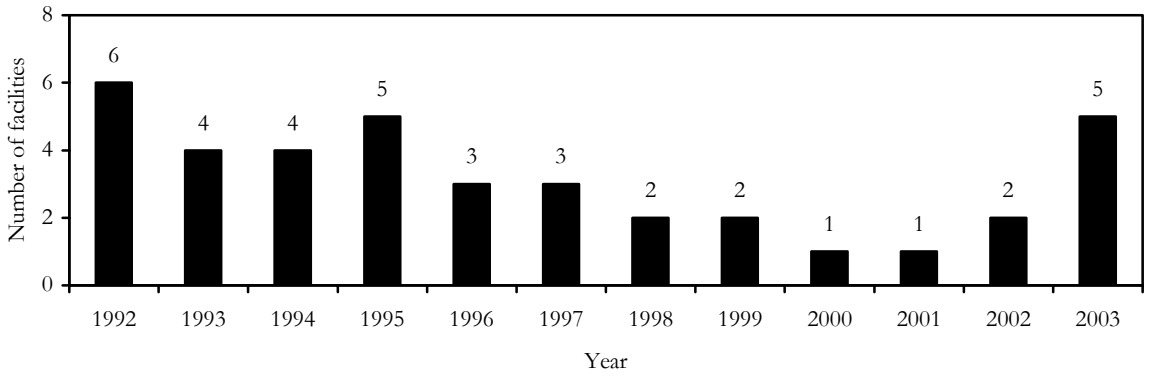
3.4. Information on vaccine production facilities

CBM form G asks for information on facilities *"producing vaccines licensed by the State party for the protection of humans"*.

Almost 300 vaccine production facilities have been declared during the period 1992 (when CBM G came into existence) until 2003. Not all of them are producing vaccines for human use; a number of states also declared veterinary vaccine production facilities. Of the many facilities producing vaccines for humans, most produce vaccines against "classic" diseases such as diphtheria, tetanus, pertussis, measles, mumps and rubella. More information on vaccine production facilities dealing with the following agents of high concern - smallpox, anthrax and plague - is given below.

Smallpox: Nine states declared a total of eleven smallpox vaccine production facilities between 1992 and 2003: Australia, Canada, Germany, Japan, Netherlands, Romania, Russia, Spain and USA. Five smallpox vaccine production facilities were declared active in 2003: one in Canada, one in Germany, one in Japan, one in the Netherlands and one in Russia. The number of smallpox vaccine production facilities declared active during the period 1992 until 2003 is shown in figure 4.

Figure 4: Number of smallpox vaccine production facilities declared active per year



Anthrax: Four states declared a total of six human anthrax vaccine production facilities over the years: China, Russia, United Kingdom and USA. Four human anthrax vaccine production facilities were declared active in 2003: one in China, one in Russia and two in the United Kingdom. More facilities were declared that were producing anthrax vaccine for veterinary use, among others facilities in the Czech Republic, Iran, Romania, South Africa and Turkey.

Plague: Four states declared a total of six plague vaccine production facilities over the years: Australia, China, Russia and the USA. Four plague vaccine production facilities were declared active in 2003: one in Australia, one in China and two in Russia.

4. INFORMATION ON PARTICULARLY IMPORTANT COUNTRIES

In the following, an in-depth account of information submitted through the CBMs per country is provided. This analysis is restricted to those countries that are particularly important for biological arms control.

4.1. What are particularly important countries?

Countries of particular importance for the BWC were selected based on the following four criteria, which are described in detail below:

- BWC depository countries;
- Countries which had BW programmes in the past;
- Countries which have officially been accused of BWC non-compliance; and
- Countries with a highly developed biotechnological capability.

Table 3 provides a list of the 27 countries whose activities and policies are of particular importance for the well-being of the BWC, and identifies the selection criteria applicable to each country.

BWC depositary countries

Three countries – Russia, United Kingdom and USA – are designated as depositaries of the BWC. They have special responsibilities, such as managing signatures, ratifications and accessions, but also calling and preparing consultative meetings. The three depositaries are charged with taking care of the BWC. They serve as role models. Therefore their activities and policies are particularly important for the well-being of the BWC.

The activities and policies of the three depositary countries – Russia, United Kingdom and USA – are of particular importance for the well-being of the BWC.

Countries which had BW programmes in the past

Countries that had BW programmes in the past are particularly relevant when it comes to assessing states compliance, because they (have) had BW expertise. Former BW states are looked at with varying degrees of suspicion; therefore their activities and policies as well as their performance in the CBMs is particularly important.

A number of countries had BW programmes of varying size and at different times in the past. Five states declared that they had BW programmes after 1946: Canada (until 1956), France (until 1973), Soviet Union/Russia (until 1992), United Kingdom (until 1957) and USA (until 1969). (Chevrier et. al. 2000: 32) All of these programmes began earlier, i.e. before or during World War II. (Geissler et. al. 1999)

Germany carried out limited BW efforts during the First and Second World War. (Geissler 1999) Japan conducted a major BW programme between 1932 and 1945. (Harris 1999) The United Nations Special Commission on Iraq (UNSCOM) uncovered a BW programme in Iraq that run from the 1970s at least until 1991. (S/1999/94) South Africa had a BW programme during the 1980s and early 1990s. (Truth and Reconciliation Commission of South Africa 1998: 509-523)

The activities and policies of countries which had BW programmes in the past – Canada, France, Germany, Iraq, Japan, Russia/Soviet Union, South Africa, United Kingdom and USA – are of particular importance for the well-being of the BWC.

Countries which have officially been accused of BWC non-compliance

A small number of allegations of BW development or use have been made in official BWC contexts.[10] During the Second Review Conference in 1986 the USA stated in the general debate that *"it believed that the Soviet Union had continued to maintain an offensive biological warfare programme"*. (BWC/CONF.II/SR.3: 4) In 1997, Cuba requested clarification from the USA under Article V of the BWC alleging the spread of an insect pest in Cuba by a US air plane. (Zilinskas 1999) During the Fifth Review Conference in 2001, the USA expressed their concerns about BW programmes in Iran, Iraq, Libya, North Korea, Sudan and Syria.[11] (Bolton 2001)

The activities and policies of countries which have officially been accused of BWC non-compliance – Iran, Iraq, Libya, North Korea, Russia/Soviet Union, Sudan, Syria and USA – are of particular importance for the well-being of the BWC.

Countries with a highly developed biotechnological capability

Countries with a highly developed biotechnological infrastructure inevitably also have the capability to produce BW. Their activities and policies are therefore also particularly important for the well-being of the BWC. Biotechnological capabilities comprise research, development and production capabilities. While abundant data exist on these capabilities for individual countries or regions, a global comparative overview does not exist. For the purposes of this report, countries were ranked according to their biotechnological capabilities based on their research capabilities as measured by their output of biomedical publications, their development capabilities as measured by their output of biotechnology patents, and their production capabilities as measured by the number of their biotech companies. The detailed methodology for the ranking as well as the global top 60 biotech countries are presented in Annex III.

Based on the described methodology, the global top ten biotech countries are Australia, Canada, China, France, Germany, Italy, Japan, Sweden, United Kingdom and USA. In addition, to add geographical balance to the selection, and because these countries serve as role models in their regions, the top biotech country from each of the 22 geographical sub-regions[12] is also considered particularly important.[13] These regionally leading biotech countries are Australia, Brazil, China, Cuba, Egypt, Germany, India, Israel, Italy, Kenya, Mexico, Nigeria, Russia, Singapore, South Africa, United Kingdom and USA.

The activities and policies of the globally and regionally leading countries in terms of biotechnological capability – Australia, Brazil, Canada, China, Cuba, Egypt, France, Germany, India, Israel, Italy, Japan, Kenya, Mexico, Nigeria, Russia, Singapore, South Africa, Sweden, United Kingdom and USA – are of particular importance for the well-being of the BWC.

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10 There have been many more allegations of BW development and use, that were not voiced in official forums of the BWC member states. For a list of such allegations see Leitenberg 1997.

11 Syria is a signatory of the BWC but has not yet ratified it. Sudan acceded to the BWC in 2003.

12 According to the United Nations Statistics Division: Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings, accessible at http://unstats.un.org/unsd/methods/m49/m49regin.htm (8 August 2005).

13 The regional top biotech state is included in the following analysis only if it appears in the list of global top 60 biotech countries provided in Annex III. Excluded are thereby the geographical sub-regions Central Asia, Melanesia, Micronesia, Middle Africa and Polynesia.

Table 3: List of particularly important countries and selection criteria applicable to each country

Country	Depository	Past BW programme	Alleged past or current BW programme	Highly developed biotechnological infrastructure	
				Top ten globally	Top one regionally
Australia				8	Australia and New Zealand
Brazil					South America
Canada		x		7	
China				6	Eastern Asia
Cuba					Caribbean
Egypt					Northern Africa
France		x		4	
Germany		x		2	Western Europe
India					Southern Asia
Iran			x		
Iraq		x	x		
Israel					Western Asia
Italy				9	Southern Europe
Japan		x		5	
Kenya					Eastern Africa
Libya			x		
Mexico					Central America
Nigeria					Western Africa
North Korea			x		
Russia	x	x	x		Eastern Europe
Singapore					South-Eastern Asia
South Africa		x			Southern Africa
Sudan			x		
Sweden				9	
Syria			x		
United Kingdom	x	x		3	Northern Europe
USA	x	x	x	1	Northern America

In the following the CBM data declared by these 27 countries between 1987 and 2003 are presented. In addition to information on the submission of CBMs the following data will be provided for each country:

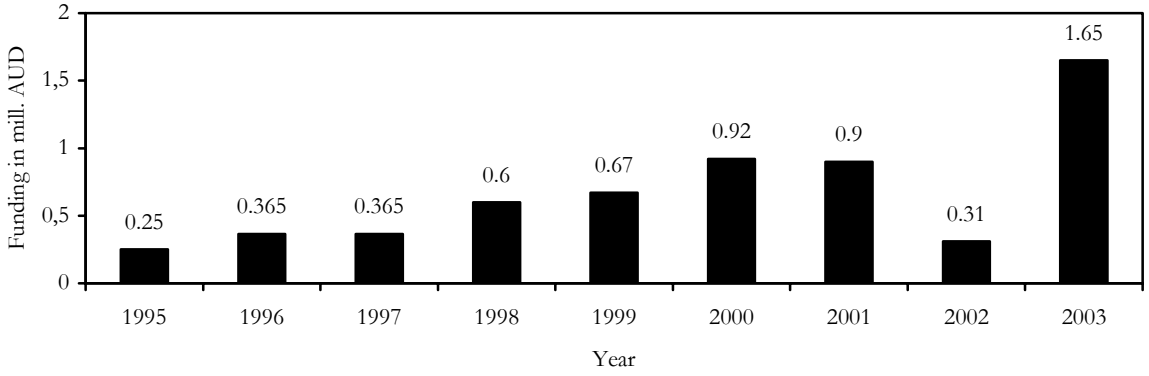
- The overall number of BL4 facilities declared and the number of BL4 facilities active in 2003 as well as an indication whether activities in those facilities were funded by the Ministry of Defence;
- The existence of a biodefence programme and the development of biodefence funding as well as information on biodefence facilities and staff; and
- The overall number of human vaccine production facilities declared and the number of human vaccine production facilities active in 2003 as well as an indication whether these facilities produced human vaccines against anthrax, plague and/or smallpox.

4.2. Australia

Australia signed the BWC in 1972 and ratified it in 1977.[14] It submitted CBM declarations regularly, in 14 of the 17 years under review, namely in 1987, 1990 and then annually from 1992 on. Australia made their 2002, 2004 and 2005 CBM declarations available on the internet.[15]

Australia declared five BL4 facilities (see table 2). All of these were active in 2003. Until 1994 Australia declared that they had no special biodefence programme. In 1995, a modest biodefence programme was declared for the first time. The development of funding for this programme is shown in figure 5. Australia declared one biodefence facility, the Chemical Biological Radiological and Nuclear (CBRN) Defence Centre in Melbourne/Maribyrnong, Victoria. Staff years in this facility increased from three in 1995 to 16 in 2003.

Figure 5: Declared funding for Australian biodefence programme per year



Australia declared one human vaccine production facility, CSL Limited in Parkville, Victoria. This facility was active in 2003. It produced smallpox vaccine in 1994, 1995 and 1996, and plague vaccine until 1993 and again from 1997 onwards.

4.3. Brazil

Brazil signed the BWC in 1972 and ratified it in 1973. It submitted CBM declarations irregularly, in nine of the 17 years under review, namely in 1991, annually from 1993 to 1997, and in 1999, 2001 and 2002.

Brazil did neither declare BL4 facilities nor a biodefence programme. However, it declared the Army Biology Institute in Rio de Janeiro as a biodefence facility in 2001 and 2002. This facility employed 249 staff in 2002.

Brazil declared ten vaccine production facilities, seven of which were active in 2003. None of the declared facilities produced human vaccines against anthrax, plague or smallpox.

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[14] Years of signature, ratification and/or accession here and in the following are according to the United Nations Department for Disarmament Affairs, accessible at http://disarmament.un.org:8080/TreatyStatus.nsf (8 August 2005).

[15] See http://www.opbw.org (8 August 2005).

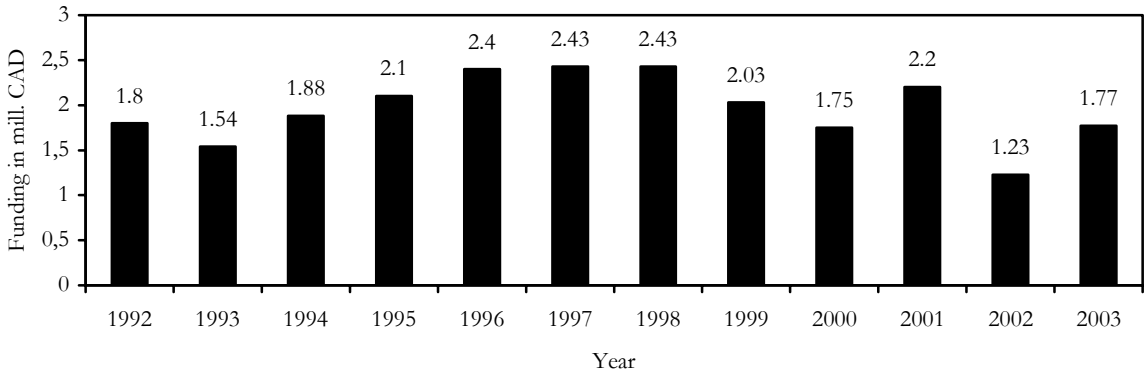
4.4. Canada

Canada signed and ratified the BWC in 1972. It submitted CBM declarations regularly, being one of the eight states that submitted CBM declarations in all of the 17 years under review.

Canada declared ten BL4 facilities. Four of these ceased to be BL4 facilities before 1990. One – the Quebec Public Health Laboratory in Saint-Anne de Bellevue, Quebec – was declared exclusively in 2000. The other five BL4 facilities are listed in table 2. Four of these were active in 2003.

Canada declared having a biodefence programme from 1992 onwards, when this information was required for the first time. The development of funding for this programme is shown in figure 6. Canada declared one biodefence facility, the Defence R&D Canada - Suffield, Chemical Biological Defence Section, located at the Canadian Forces Base Suffield in Medicine Hat, near Ralston, Alberta. Declared numbers of staff in this facility were between 23 and 33.

Figure 6: Declared funding for Canadian biodefence programme per year[16]



Canada declared three human vaccine production facilities, all of which were active in 2003. In addition they provided a list of veterinary vaccine producers in 2002 and 2003. One of the human vaccine production facilities – Aventis Pasteur in Toronto, Ontario – produced smallpox vaccine in 1992 and 1993.

4.5. China

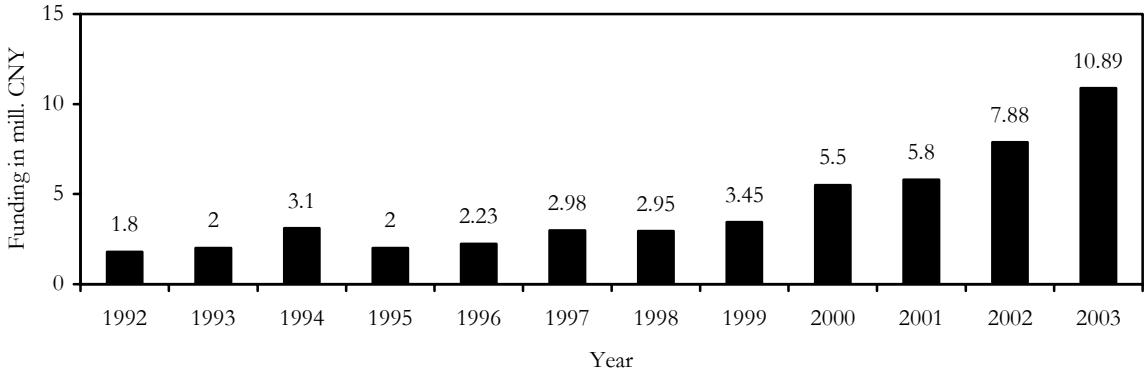
China acceded to the BWC in 1984. It submitted CBM declarations regularly, in 15 of the 17 years under review, namely annually from 1989 on.

China did not declare BL4 facilities. China declared having a biodefence programme from 1992 onwards, when this information was required for the first time. Funding for the biodefence programme was declared at CNY 1.8 million in 1992 and CNY 2 million in 1993; thereafter China had nothing new to declare in this respect. However, China declared one biodefence facility, the Institute for Microbiology and Epidemiology in Beijing, whose budget rose steadily

[16] In 2003, there was an additional unidentified portion of CAD 30 million out of the *"Chemical, Biological, Radiological and Nuclear Research and Technology Initiative"* expanded for the biodefence programme.

between 1992 and 2003. The development of funding for China's biodefence facility is shown in figure 7. The number of staff in this facility decreased from 246 in 1992 to 173 in 2003.

Figure 7: Declared funding for China's biodefence facility per year



China declared seven human vaccine production facilities. All seven facilities were active in 2003. One of those facilities, the Lanzhou Institute of Biological Products in Lanzhou, has been producing vaccines against anthrax and plague.

4.6. Cuba

Cuba signed the BWC in 1972 and ratified it in 1976. It submitted CBM declarations regularly, in 13 of the 17 years under review, namely annually from 1991 on.

Cuba declared one BL4 facility (see table 2). This facility was not active in 2003. Cuba did not declare a biodefence programme. Cuba declared three human vaccine production facilities, one of which was active in 2003. None of the declared facilities produced human vaccines against anthrax, plague or smallpox.

4.7. Egypt

Egypt signed the BWC in 1972 but has not yet ratified it. It did not submit CBM declarations in any of the 17 years under review.[17]

4.8. France

France acceded to the BWC in 1984. It submitted CBM declarations regularly, in 13 of the 17 years under review, namely in 1989 and then annually from 1991 to 2002.

France declared five BL4 facilities (see table 2). One of these facilities was active in 2003. France declared having a biodefence programme from 1992 onwards, when this information was required for the first time. The following annual funding levels for this programme were declared: FRF 14 million from 1992 to 1999, FRF 50 million in 2000, FRF 3.5 million in 2001 and EUR 8

[17] While there is no obligation for a signatory state to submit CBM declarations, such declarations could be provided voluntarily, as done by Mali - also a BWC signatory state by that time - in 1998.

million in 2002. France declared two biodefence facilities. The Bouchet Research Centre in Vert-le-Petit had a declared staff of 20 in 1992 and 31 in 2002. The Department for the Biology of Transmissible Agents of the Research Centre of the Health Service of the French Armed Forces (CRSSA) in La Tronche was declared exclusively in 2001 with a staff of 36 persons.

France did not declare human vaccine production facilities until 1996 but provided instead a list of human vaccines produced. After 1996, France declared three human vaccine production facilities on French territory. Two of these were active in 2003. None of the facilities produced vaccines against anthrax, plague or smallpox.

The Sunshine Project recently published a report on France's biodefence activities that is based on open sources and provides comprehensive additional information on the size, type and location of BW-related activities in France.[18]

4.9. Germany

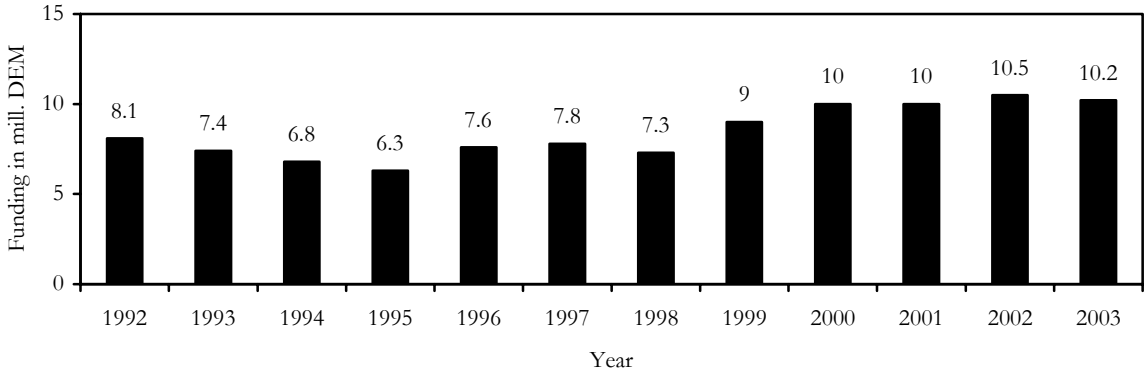
Germany signed the BWC in 1972 and ratified it in 1983. It submitted CBM declarations regularly, being one of the eight states that submitted CBM declarations in all of the 17 years under review.

Germany declared five BL4 facilities (see table 2). Three of these facilities were active in 2003. One of the facilities, the Bernhard Nocht Institute for Tropical Medicine in Hamburg, received funding from the Ministry of Defence 1988-1992 and from 2000 onwards.

Germany declared having a biodefence programme from 1992 onwards, when this information was required for the first time. The development of funding for this programme is shown in figure 8. Germany declared three biodefence facilities. The Federal Armed Forces Institute for Microbiology in Munich was declared over the whole period under review and employed around 20 staff (between 19 in 1996 and 25 in 2003). The Federal Armed Forces Scientific Institute for Protection Technologies and NBC Protection in Munster was also declared over the whole period under review and employed around 30 staff (between 29 in 1996 and 37 in 1992, 1993 and 2003). The Medical B-Defence Laboratory of the Federal Armed Forces Central Institute of the Medical Service in Munster has been declared since 1999 and employed two or three staff during those years.

[18] Available at http://www.sunshine-project.de/infos/Laenderstudien/France_BW_Report.pdf (8 August 2005).

Figure 8: Declared funding for German biodefence programme per year[19]



Germany declared five human vaccine production facilities. Three of these were active in 2003. The Vaccine Plant Dessau Tornau in Rosslau was declared in 2003 for the first time and produces exclusively smallpox vaccine.

The Sunshine Project recently published a report on Germany's biodefence activities that is based on open sources and provides comprehensive additional information on the size, type and location of BW-related activities in Germany.[20]

4.10. India

India signed the BWC in 1973 and ratified it in 1974. It submitted a CBM declaration only once during the 17 years under review, namely in 1997.

India did not declare BL4 facilities. India declared having a biodefence programme with INR 2 million funding annually. India declared one biodefence facility, the Microbiology and Virology Division of the Defence Research and Development Establishment in Gwalior, with a declared staff of 25. India declared 15 public sector and four private human vaccine production facilities, none of which produced vaccines against anthrax, plague or smallpox.

4.11. Iran

Iran signed the BWC in 1972 and ratified it in 1973. It submitted CBM declarations irregularly, in three of the 17 years under review, namely in 1998, 1999 and 2002.

Iran did neither declare BL4 facilities nor a biodefence programme. In their 2002 CBM submission the country declared: *"Iran did not and does not have any national, subnational or individual programs/activities and/or facilities related to biological offensive purposes ... Iran did not and does not have any 'National Biological Defensive Program'. However the state has carried out some defensive studies on identification, decontamination, protection and treatment against some agents and toxins."* Iran declared two

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[19] In 2003, declared funding for the German biodefence programme was EUR 5.2 million, which has been converted into DEM in this figure.

[20] Available at http://www.sunshine-project.de/infos/Laenderstudien/German_BW_Report.pdf (8 August 2005).

human vaccine production facilities which were both active in 2003. None of these facilities produced human vaccines against anthrax, plague or smallpox.

4.12. Iraq

Iraq signed the BWC in 1972 and ratified it in 1991. It submitted CBM declarations irregularly, in four of the 17 years under review, namely in 1993 and then annually from 1995 to 1997.

Iraq did neither declare BL4 facilities nor a biodefence programme. Iraq declared one human and two animal vaccine production facilities. None of these facilities produced human vaccines against anthrax, plague or smallpox.

4.13. Israel

Israel is neither a state party nor a signatory of the BWC. It did not submit CBM declarations in any of the 17 years under review.[21]

4.14. Italy

Italy signed the BWC in 1972 and ratified it in 1975. It submitted CBM declarations regularly, in 14 of the 17 years under review, namely annually from 1989 to 1991 and then annually from 1993 onwards.

Italy declared one BL4 facility (see table 2), which did not have maximum containment facilities any longer in 2003. Italy declared a biodefence programme in 1997 for the first time. They did not provide information on funding. One biodefence facility was declared, the Chemical-Physical-Biological Military Technical Centre in Civitavecchia, Rome, with a declared staff of between seven and nine persons. Italy declared 21 vaccine production facilities, 14 of which were active in 2003. Since 1997 Italy has not been providing information on the diseases covered by the vaccines produced.

4.15. Japan

Japan signed the BWC in 1972 and ratified it in 1982. It submitted CBM declarations regularly, in 14 of the 17 years under review, namely in 1988 and then annually from 1991 on. The Japanese CBM declarations for 1994 and 1996 were submitted retrospectively in 1998.

Japan declared two BL4 facilities (see table 2). Both were active in 2003. Japan declared a biodefence programme in 2002 for the first time. Funding for this programme was JPY 42 million in 2002 and JPY 2.7 million in 2003. Japan declared one biodefence facility, the Military Medicine Research Unit of the Test and Evaluation Command of the Japan Ground Self-Defence Force in Setagaya-Ku, Tokyo, with a declared staff of six people.

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[21] While there is naturally no obligation for a non-State party to submit CBM declarations, such declarations could be provided voluntarily, as done by Kyrgyzstan - also a BWC non-State Party - in 1993.

Japan declared 13 human vaccine production facilities, eight of which were active in 2003. None of these facilities produced vaccines against anthrax or plague. One facility, the Chemo Sero Therapeutic Research Institute in Kumamoto City began to produce smallpox vaccine in 2003.

4.16. Kenya

Kenya acceded to the BWC in 1976. It did not submit even a single CBM declaration in the 17 years under review.

4.17. Libya

Libya acceded to the BWC in 1982. It did not submit even a single CBM declaration in the 17 years under review.

4.18. Mexico

Mexico signed the BWC in 1972 and ratified it in 1974. It submitted CBM declarations irregularly, in three of the 17 years under review, namely in 1990, 1992 and 1994. Mexico did neither declare BL4 facilities nor a biodefence programme. They also did not declare vaccine production facilities.

4.19. Nigeria

Nigeria signed the BWC in 1972 and ratified it in 1973. It did not submit even a single CBM declaration in the 17 years under review.

4.20. North Korea

North Korea acceded to the BWC in 1987. It submitted a CBM declaration only once in the 17 years under review, namely in 1990. North Korea did neither declare BL4 facilities nor a biodefence programme. They also did not declare vaccine production facilities.

4.21. Russia

The Soviet Union signed the BWC in 1972 and ratified it in 1975. In December 1991 Russia took over the Soviet Union's rights and commitments. The Soviet Union/Russia submitted CBM declarations regularly, being one of the eight states that submitted CBM declarations in all of the 17 years under review.

Russia declared eight BL4 facilities. Six of these ceased to be BL4 facilities before 1993:

1) The Government Scientific Centre of Applied Microbiology in Obolensk,
2) The Scientific Research Institute for Virology "D. I. Ivanovski" in Moscow,
3) The Scientific Research Institute for Epidemiology and Microbiology "N. F. Gamalei" in Moscow,

4) The Anti-Plague Scientific Research Institute for Siberia and the Far East in Irkutsk,

5) The Scientific Research Institute for Virus Preparations in Moscow, and

6) The Scientific Research Institute for Poliomyelitis and Virus Encephalitis in the Moscow Region.

The other two facilities are listed in table 2. One facility, the Government Scientific Centre for Virology and Biotechnology "Vector" in Kolzovo, was active in 2003. It had received funding from the Ministry of Defence between 1993 and 1997.

Russia declared having a biodefence programme from 1992 onwards, when this information was required for the first time. The development of funding for this programme is shown in figure 9. Russia declared ten biodefence facilities:

1) The Government Scientific Research Testing Institute of Military Medicine in St. Petersburg was declared until 2001 and employed 131 people in 1992 and 75 in 2001.

2) The Government Scientific Centre for Applied Microbiology in Obolensk was declared until 1997 and employed 250 people in 1992 and 60 in 1997.

3) The Government Scientific Centre for Virology and Biotechnology "Vector" in Koltsovo was declared until 1997 and employed 192 people in 1994 and 129 in 1997.[22]

4) The Scientific Research Institute for Epidemiology and Microbiology "N. F. Gamalei" in Moscow was declared from 1993 until 1998 and employed 10 people in 1998.[23]

5) The Government Scientific Research Institute for Ultrapure Biologicals in St. Petersburg was declared in 1996 and employed 29 people.

6) The Government Scientific Research Institute for Biological Instrument Making in Moscow was declared from 1996 until 2000 and employed 23 people in 2000.

7) The Institute for Virology "D. I. Ivanovski" in Moscow was declared in 1996 and 1997 and employed 25 people.

8), 9) and 10) The Scientific Research Institute of Microbiology in Kirov was declared together with the Virology Centre in Sergiev Posad and the Military Technical Centre for Biological Protection in Ekaterinburg. These three facilities were declared from 1992 onwards. The number of people employed in those three facilities over the years is shown in figure 10.

Russia declared 21 human vaccine production facilities. 16 of those were active in 2003. The Scientific Research Institute for Microbiology in Kirov has been producing vaccines against anthrax and plague. The Scientific Research Anti-Plague Institute in Stavropol has been producing vaccines against plague. The Government Company "Virion" in Tomsk has been producing vaccines against smallpox.

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[22] Data on personnel in 1992 and 1993 were for the whole facility, not just the biodefence programme as from 1994 onwards.

[23] Data on personnel from 1993 until 1997 were for the whole facility, not just the biodefence programme as in 1998.

Figure 9: Declared funding for Russian biodefence programme per year[24]

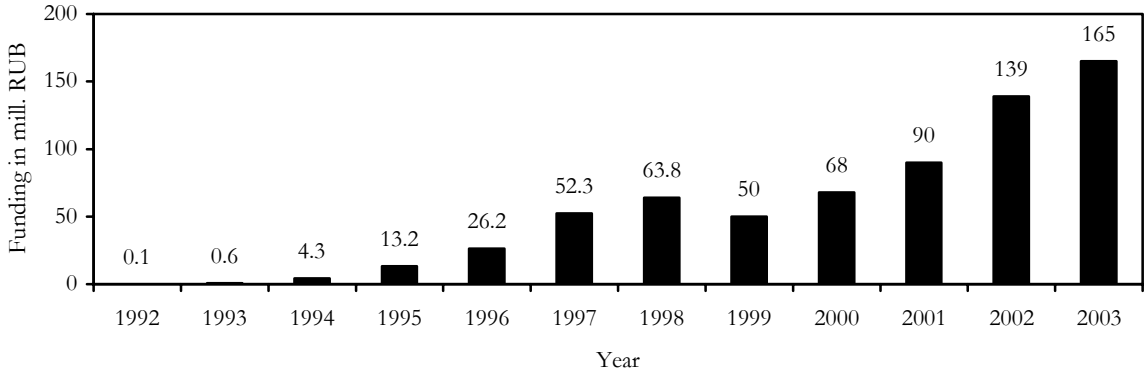
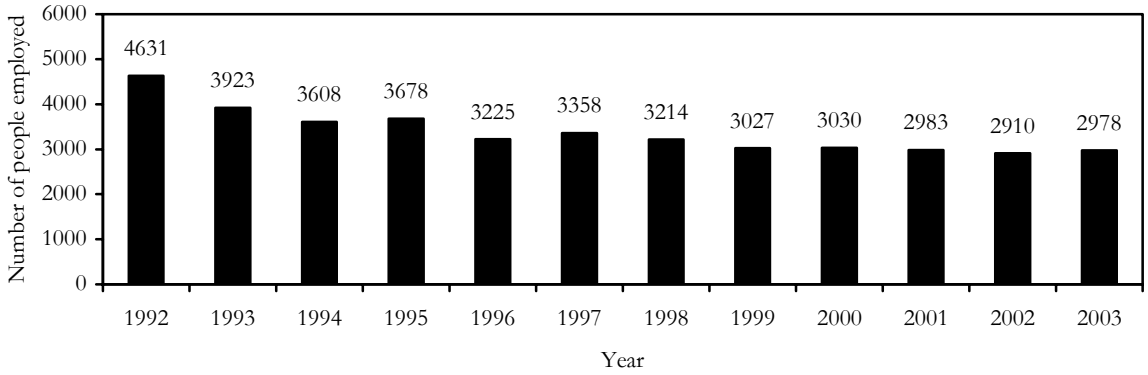


Figure 10: Declared number of people employed in the main Russian biodefence facilities[25]



4.22. Singapore

Singapore signed the BWC in 1972 and ratified it in 1975. It did not submit even a single CBM declaration in the 17 years under review.

4.23. South Africa

South Africa signed the BWC in 1972 and ratified it in 1975. It submitted CBM declarations irregularly, in nine of the 17 years under review, namely in 1993, annually from 1995 to 2000, and in 2002 and 2003.

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[24] In 1998 a monetary reform took place in Russia, during which the new ruble replaced the old one at a rate of 1:1000. In this figure all data are in new rubles.

[25] These are the Scientific Research Institute of Microbiology in Kirov, the Virology Centre in Sergiev Posad and the Military Technical Centre for Biological Protection in Ekaterinburg. In 1992 the Field Proving Laboratory in Aralsk, Kazakhstan, was declared together with the three main Russian biodefence facilities.

South Africa declared one BL4 facility, the Special Pathogens Unit at Sandringham, which was active in 2003. Since 2000, South Africa has been declaring a biodefence programme stating that the only activities conducted in biological defence were literature studies on specific biodefence aspects. Funding levels were as follows: USD 35,000 in 2000 and 2002, and USD 10,000 in 2003. South Africa declared one biodefence facility, the Protechnik Laboratories in Centurion, Pretoria, employing one person. South Africa declared three human vaccine and one animal vaccine production facilities. One of the human vaccine production facilities, the South African Vaccine Producers in Sandringham, were active in 2003. It did not produce vaccines against anthrax, plague or smallpox.

4.24. Sudan

Sudan acceded to the BWC in 2003. It did not submit CBM declarations in any of the 17 years under review.

4.25. Sweden

Sweden signed the BWC in 1975 and ratified it in 1976. It submitted CBM declarations regularly, in 15 of the 17 years under review, namely annually from 1987 to 2001. As one of the most consistent supporters of a strong BWC, it is surprising that Sweden did not submit CBM declarations in 2002 and 2003.

Sweden declared two BL4 facilities. The National Veterinary Institute in Uppsala was declared as a BL4 facility exclusively in 2000. The Swedish Institute of Infectious Disease Control in Solna was declared from 1990 onwards and was partly funded by the Ministry of Defence.

Sweden declared having a biodefence programme from 1992 onwards, when this information was required for the first time. Funding for this programme was SEK 14.05 million annually. Sweden declared one biodefence facility, the Department of NBC Defence of the National Defence Research Establishment in Umeå, employing 24 staff.

Sweden declared one human vaccine production facility, the SBL Vaccin in Stockholm, which was active in 2003. It did not produce vaccines against anthrax, plague or smallpox.

4.26. Syria

Syria signed the BWC in 1972 but has not yet ratified it. It did not submit CBM declarations in any of the 17 years under review.[26]

4.27. United Kingdom

The United Kingdom signed the BWC in 1972 and ratified it in 1975. It submitted CBM declarations regularly, in 16 of the 17 years under review, namely annually from 1987 to 2000 and in 2002 and 2003. It failed to submit a CBM return in 2001.

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[26] While there is no obligation for a signatory state to submit CBM declarations, such declarations could be provided voluntarily, as done by Mali - also a BWC signatory state by that time - in 1998.

The United Kingdom declared eight BL4 facilities. One of these facilities, the Unit R, Park Drive, of MFM Laboratories in Essex, was declared exclusively in 1992. The other seven facilities are listed in table 2. One of these facilities, the Centre for Applied Microbiology and Research in Porton Down, was active in 2003.

The United Kingdom declared having a biodefence programme from 1992 onwards, when this information was required for the first time. The development of funding for this programme is shown in figure 11. Great Britain declared one biodefence facility, the Defence Science and Technology Laboratory in Porton Down. The number of people employed in this facility over the years is shown in figure 12.

Great Britain declared eight human vaccine production facilities. Two of these facilities - the Powderjet Pharmaceuticals in Speke, Liverpool, and the Health Protection Agency of the Centre for Applied Microbiology and Research in Porton Down - were active in 2003. Both produced vaccines against anthrax, the facility in Speke until 1993 and again in 2002 and 2003, and the facility in Porton Down without interruption.

Figure 11: Declared funding for British biodefence programme per year

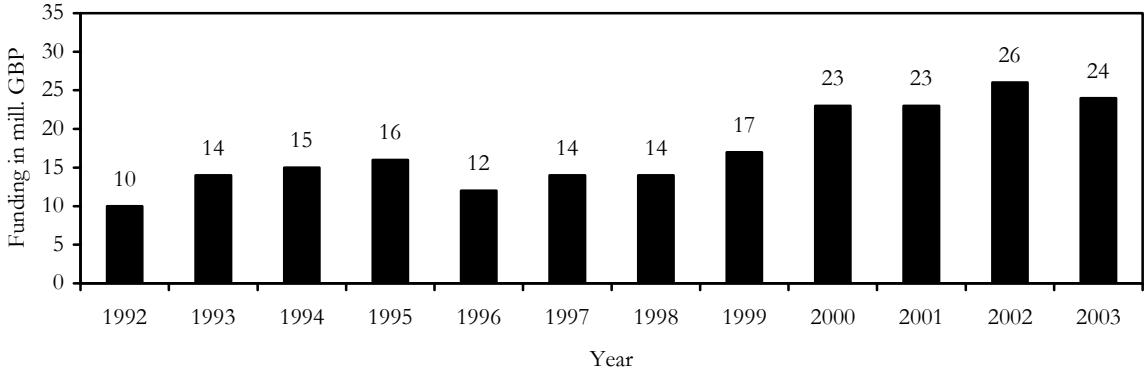
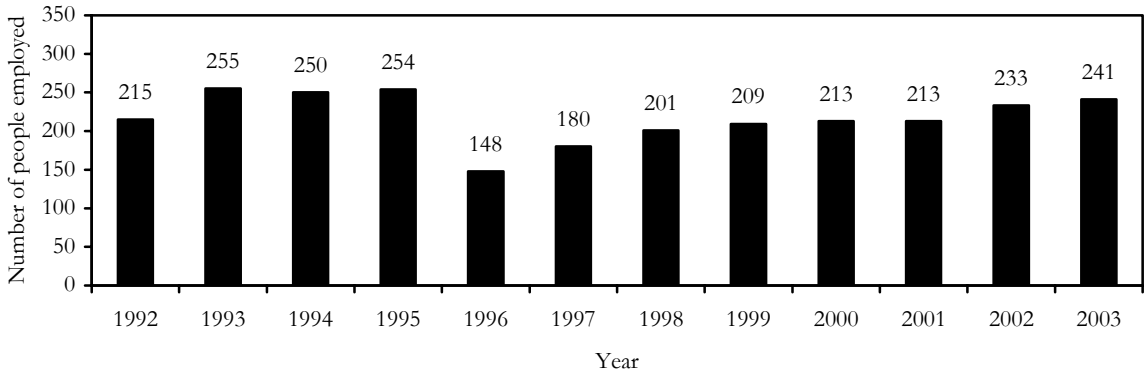


Figure 12: Declared number of people employed in the British biodefence facility per year



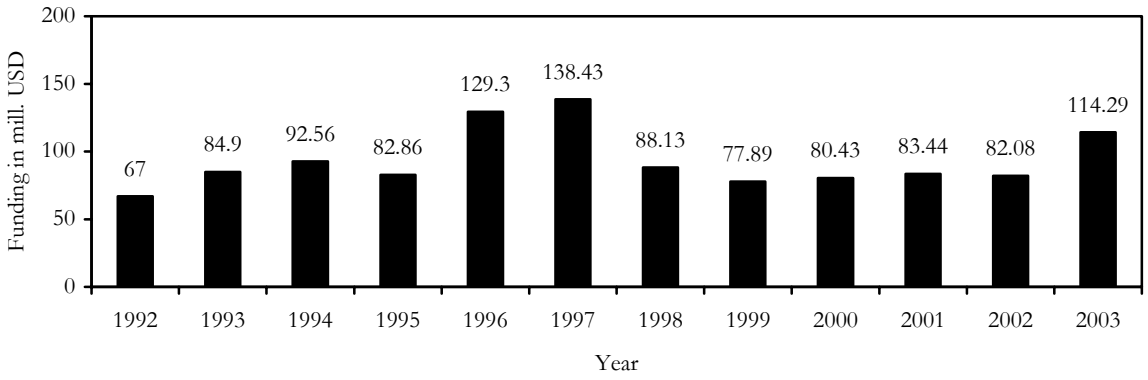
4.28. USA

The USA signed the BWC in 1972 and ratified it in 1975. It submitted CBM declarations regularly, being one of the eight states that submitted CBM declarations in all of the 17 years under review. The USA made their 2004 CBM declaration available on the internet.[27]

The USA declared six BL4 facilities (see table 2). With the exception of the National Cancer Institute in Frederick, all of these were active in 2003. The Centers for Disease Control and Prevention in Atlanta had a BL4 facility during all of the 17 years under review and received minimal funding from the Ministry of Defence from 1987 until 1989. The National Cancer Institute in Frederick had a BL4 facility until 1994 and received funding by the Ministry of Defence afterwards, in 2002 and 2003. The US Army Medical Research Institute of Infectious Diseases in Fort Detrick had a BL4 facility during all of the 17 years under review and was wholly funded by the Department of Defense. The Department of Virology and Immunology at the Betty Slick and Lewis J. Moorman Jr. Laboratory Complex in San Antonio was declared as a BL4 facility from 2001 onwards and was partly financed by the Ministry of Defence.

The USA declared having a biodefence programme from 1992 onwards, when this information was required for the first time. The USA declared several different biodefence programmes over the years. The development of the combined funding for these programmes is shown in figure 13.

Figure 13: Declared funding for the US biodefence programmes per year[28]



The USA declared 43 biodefence facilities over the years. They are listed, together with the number of staff employed according to the most current declaration, in table 4.

Table 4: Declared US biodefence facilities

	Current name of facility	Current location	Years declared	Most current number of staff employed
1	US Army Medical Research Institute of Chemical Defense	Aberdeen Proving Ground, Maryland	1992-2003	11

[27] See http://www.state.gov/documents/organization/32486.pdf (8 August 2005).

[28] The USA declared in 2002 and 2003 that an additional unidentified portion of about 85 million USD was spent on biological defence under the *"Chemical and Biological National Security Program"*.

	Current name of facility	Current location	Years declared	Most current number of staff employed
2	US Army Edgewood Chemical and Biological Center	Aberdeen Proving Ground, Maryland	1992-2003	303
3	USAF Armstrong Laboratory. Chemical-Biological Defense Division	Aberdeen Proving Ground, Maryland	1994-1995 1997	5
4	Air Force Research Laboratory. Human Effectiveness Directorate. Deployment and Sustainment Division. Operational Toxicology Branch. Chemical and Biological Defense Group	Aberdeen Proving Ground, Maryland	1998-2000	5
5	Sandia National Laboratories	Albuquerque, New Mexico Livermore, California	2002-2003	69
6	Argonne National Laboratory. Energy Systems Division. Biodetector Applications Section	Argonne, Illinois	2002	13
7	Arnold AFB. Hypervelocity Range. Track G	Arnold AFB, Nashville, Tennessee	1996-2000	28
8	E. O. Lawrence Berkeley National Laboratory	Berkeley, California	2003	6
9	Armed Forces Radiobiology Research Institute	Bethesda, Maryland	1994-1997	164**
10	Southern Research Institute	Birmingham, Alabama	1993-1995	14**
11	Air Force Research Laboratory. Directed Energy Bioeffects Division	Brooks City Base, San Antonio, Texas	2003	18
12	Illinois Institute of Technology Research	Chicago, Illinois	1993-1994	20**
13	ITT Advanced Engineering and Sciences. Garden of the Gods Facility	Colorado Springs, Colorado	1998-2000	17**
14	Battelle - Columbus Operations	Columbus, Ohio	1993-1997 2000	90
15	Battelle Memorial Institute	Columbus, Ohio	1999	7
16	Naval Surface Warfare Center. Dahlgren Division. Chemical Biological Systems Technology Division	Dahlgren, Virginia	1995-2003	112
17	Denver Research Institute. University of Denver	Denver, Colorado	1995-1998	7**
18	Lothar Salomon Test Facility	Dugway Proving Ground, Utah	1992-2003	53
19	AF Research Laboratory. Munitions Directorate	Eglin AFB, Florida	1995 1997-2000 2002	8
20	US Army Medical Research Institute of Infectious Diseases	Ft. Detrick, Frederick, Maryland	1992-1995 1997-2003	704
21	Holloman High Speed Test Track	Holloman AFB, Alamogordo, New Mexico	1993-1995 1997-1999	117
22	Battelle - Huntsville Operations	Huntsville, Alabama	1993-1995	7**
23	Aerophysics Research Centre. University of Alabama	Huntsville, Alabama	1993-1995	20**
24	Idaho National Engineering and Environmental Laboratory Research Center	Idaho Falls, Idaho	2003	4
25	Lovelace Respiratory Research Institute. Inhalation Toxicology Research Institute	Kirtland AFB East, Albuquerque, New Mexico	2001-2002	166
26	Lawrence Livermore National Laboratory	Livermore, California	2002-2003	88
27	Los Alamos National Laboratory	Los Alamos, New Mexico	2002-2003	50
28	Oak Ridge National Laboratory	Oak Ridge, Tennessee	2002-2003	14
29	Southwest Research Institute	San Antonio, Texas	1995-1996 1999	10**

	Current name of facility	Current location	Years declared	Most current number of staff employed
30	Science Applications International Corporation	San Diego, California	1998	3**
31	General Research Corporation	Santa Barbara, California	1993-1995 1997	12**
32	Walter Reed Army Institute of Research	Silver Spring, Maryland	1992-2003	78
33	Naval Medical Research Center. Biological Defense Research Directorate	Silver Spring, Maryland	1995-2003	40
34	Energetic Materials Research and Testing Center. New Mexico Institute of Mining and Technology	Socorro, New Mexico	1993	150**
35	The Salk Institute	Swiftwater, Pennsylvania	1992-1998	52
36	Air Force Research Laboratory. Materials and Manufacturing Directorate. Weapons Systems Logistics Laboratory	Tandall AFB, Panama City, Florida	2003	7
37	Brookhaven National Laboratory	Upton, New York	2002-2003	5
38	US Army Corps of Engineers. Engineer Research and Development Center. Geotechnical and Structures Laboratory. Structural Engineering Branch	Vicksburg, Mississippi	1994-1995 1997-2000 2002-2003	3
39	Naval Research Laboratory	Washington, D.C.	1995-2003	28
40	Armed Forces Institute of Pathology	Washington, D.C.	1996-2003	28
41	Battelle - West Jefferson. Hypervelocity Facility	West Jefferson, Ohio	1994-1995	90*
42	Battelle - West Jefferson. Medical Research and Evaluation Facility	West Jefferson, Ohio	1996	15
43	White Sands Missile Range	White Sands, New Mexico	2002-2003	62

* Numbers for Battelle Columbus Operations and Battelle West Jefferson were provided together; in addition, the personnel is not dedicated to the biodefence programme, the majority of their time is spent on other activities.

** The personnel is not dedicated to the biodefence programme, the majority of their time is spent on other activities.

The USA declared 17 human vaccine production facilities on US territory. Five of these were active in 2003: 1) Merck & Company in West Point, Pennsylvania, 2) Lederle Laboratories Division of the American Cyanamid Company in Pearl River, New York, 3) Aventis Pasteur in Swiftwater, Pennsylvania, which produced smallpox vaccine until 1996, 4) Organon Teknika Corporation in Durham, North Carolina, and 5) North American Vaccine in Columbia, Maryland.

In addition, the Wyeth Laboratories in Marietta, Pennsylvania, were declared until 2002 and produced smallpox vaccine until 1997. The Salk Institute in Swiftwater, Pennsylvania, was declared until 1996 and produced anthrax and smallpox vaccine. The Bioport Corporation in Lansing, Michigan, was declared until 2002 and produced anthrax vaccine. The Miles Inc. in Elkhart, Indiana, Berkeley, California, and Spokane, Washington, was declared until 1995 and produced plague vaccine until 1994. The Greer Laboratories in Lenoir, North Carolina, were declared until 2002 and produced vaccines against plague.

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ANNEX I

LIST OF DOCUMENTS CONTAINING THE CBM SUBMISSIONS 1987-2003

Document symbol	Containing CBM submissions of year
BWC/CONF.III/2 BWC/CONF.III/2/Add.1 BWC/CONF.III/2/Add.3	1987 – 1991
DDA/4-92/BWIII DDA/4-92/BWIII/Add.1 DDA/4-92/BWIII/Add.2 DDA/4-92/BWIII/Add.3 DDA/4-92/BWIII/Add.4 BWC/CONF.III/VEREX/NONE.26	1992
ODA/9-93/BWIII ODA/9-93/BWIII/Add.1 ODA/9-93/BWIII/Add.2	1993
CDA/16-94/BWIII CDA/16-94/BWIII/Add.1 CDA/16-94/BWIII/Add.2	1994
CDA/14-95/BW-III CDA/14-95/BWIII/Add.1 CDA/14-95/BW-III/Add.2 CDA/14-95/BW-III/Add.3	1995
CDA/11-96/BW-III CDA/11-96/BW-III/Add.1 11-96/CDA/BW-III/Add.II	1996
CDA/BWC/1997/CBM CDA/BWC/1997/CBM/Add.1	1997
DDA/BWC/1998/CBM DDA/BWC/1998/CBM/Add.1	1998
DDA/BWC/1999/CBM DDA/BWC/1999/CBM/Add.1 DDA/BWC/1999/CBM/Add.2 DDA/BWC/1999/CBM/Add.3	1999
DDA/BWC/2000/CBM DDA/BWC/2000/CBM/Add.1 DDA/BWC/2000/CBM/Add.2 DDA/BWC/2000/CBM/Add.3	2000
DDA/BWC/2001/CBM DDA/BWC/2001/CBM/Add.1 DDA/BWC/2001/CBM/Add.2 DDA/BWC/2001/CBM/Add.3	2001
DDA/BWC/2002/CBM DDA/BWC/2002/CBM/Add.1 DDA/BWC/2002/CBM/Add.2 DDA/BWC/2002/CBM/Add.3	2002
DDA/BWC/2003/CBM DDA/BWC/2003/CBM/Add.1 DDA/BWC/2003/CBM/Add.2	2003

ANNEX II

PARTICIPATION OF COUNTRIES IN THE CBM DATA EXCHANGE 1987-2003

1. BWC member states

"n.a." indicates that the country was not a BWC state party in a particular year.

	STATE (States that never submitted CBMs are indicated in *italics*)	**BWC IN FORCE SINCE**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
1	*Afghanistan*	1975																	
2	*Albania*	1992	n.a.	n.a.	n.a.	n.a.	n.a.												
3	*Algeria*	2001	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			
4	*Antigua and Barbuda*	2003	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
5	Argentina	1979					x	x	x	x	x	x	x	x	x	x	x	x	x
6	Armenia	1994	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.				x	x	x		x		x
7	Australia	1977	x			x		x	x	x	x	x	x	x	x	x	x	x	x
8	Austria	1975				x	x	x	x	x	x	x	x	x	x	x	x	x	
9	*Azerbaijan*	2004	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
10	*Bahamas*	1986																	
11	*Bahrain*	1988	n.a.																
12	Bangladesh	1985										x							
13	*Barbados*	1975																	
14	Belarus	1975	x[1]	x[1]	x[1]	x[1]	x[1]	x	x		x	x	x		x	x	x	x	x
15	Belgium	1979		x				x				x	x		x	x	x	x	
16	Belize	1986																	x
17	*Benin*	1975																	

	STATE (States that never submitted CBMs are indicated in *italics*)	BWC IN FORCE SINCE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
18	Bhutan	1978									x								
19	Bolivia	1975								x									
20	*Bosnia and Herzegovina*	1994	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.										
21	*Botswana*	1992	n.a.	n.a.	n.a.	n.a.	n.a.												
22	Brazil	1975					x		x	x	x	x	x		x		x	x	
23	*Brunei*	1991	n.a.	n.a.	n.a.	n.a.													
24	Bulgaria	1975		x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
25	*Burkina Faso*	1991	n.a.	n.a.	n.a.	n.a.													
26	*Cambodia*	1983																	
27	Canada	1975	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
28	*Cape Verde*	1977																	
29	Chile	1980				x	x					x	x	x		x	x	x	
30	China	1984			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
31	Columbia	1983												x					
32	*Congo*	1978																	
33	Costa Rica	1975														x	x		
34	Croatia	1993	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			x				x	x			
35	Cuba	1976					x	x	x	x	x	x	x	x	x	x	x	x	x
36	Cyprus	1975					x	x	x		x	x	x						
37	Czech Republic	1993	x[2]	x[2]	x[2]	x[2]	x[2]	x[2]		x		x	x	x	x	x	x	x	x
38	*Democratic Republic of the Congo*	1975																	
39	Denmark	1975	x	x	x	x	x	x	x	x	x	x	x						
40	*Dominica*	1978																	
41	*Dominican Republic*	1975																	
42	Ecuador	1975				x			x	x	x	x							
43	*El Salvador*	1991	n.a.	n.a.	n.a.	n.a.													

	STATE (States that never submitted CBMs are indicated in *italics*)	BWC IN FORCE SINCE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
44	*Equatorial Guinea*	1989	n.a.	n.a.															
45	Estonia	1993	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		x	x	x	x	x	x	x	x		x
46	*Ethiopia*	1975																	
47	Fiji	1975								x	x	x	x						
48	Finland	1975	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
49	France	1984			x		x	x	x	x	x	x	x	x	x	x	x	x	
50	*Gambia*	1991	n.a.	n.a.	n.a.	n.a.													
51	Georgia	1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.					x		x	x
52	Germany[3]	1983	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
53	*Ghana*	1975																	
54	Greece	1975				x	x			x	x								
55	*Grenada*	1986																	
56	*Guatemala*	1975																	
57	*Guinea-Bissau*	1976																	
58	*Holy See*	2002	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		
59	*Honduras*	1979																	
60	Hungary	1975	x				x	x	x	x	x	x	x	x	x	x	x		
61	Iceland	1975					x		x	x									
62	India	1975											x						
63	*Indonesia*	1992	n.a.	n.a.	n.a.	n.a.	n.a.												
64	Iran	1975												x	x			x	
65	Iraq	1991	n.a.	n.a.	n.a.	n.a.			x		x	x	x						
66	Ireland	1975		x		x	x		x		x	x	x					x	
67	Italy	1975			x	x	x		x	x	x	x	x	x	x	x	x	x	x
68	*Jamaica*	1975																	
69	Japan	1982		x			x	x	x	x[4]	x	x[5]	x	x	x	x	x	x	x

	STATE (States that never submitted CBMs are indicated in *italics*)	BWC IN FORCE SINCE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
70	Jordan	1975						x			x	x							
71	*Kenya*	1976																	
72	Kuwait	1975										x							
73	Laos	1975									x								
74	Latvia	1997	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.						x	
75	*Lebanon*	1975																	
76	*Lesotho*	1977																	
77	*Libya*	1982																	
78	Liechtenstein	1991	n.a.	n.a.	n.a.	n.a.											x	x	
79	Lithuania	1998	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			x	x	x	x
80	Luxembourg	1976								x		x	x	x					
81	*Macedonia*	1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.								
82	*Malaysia*	1991	n.a.	n.a.	n.a.	n.a.													
83	*Maldives*	1993	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.											
84	Mali	2002	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	x	n.a.	n.a.	n.a.		
85	Malta	1975						x		x	x	x		x		x			
86	*Mauritius*	1975																	
87	Mexico	1975				x		x		x									
88	*Monaco*	1999	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.					
89	Mongolia	1975				x		x	x	x	x								
90	*Morocco*	2002	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		
91	Netherlands	1975	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
92	New Zealand	1975	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x
93	Nicaragua	1975							x										
94	*Niger*	1975																	
95	*Nigeria*	1975																	

	STATE (States that never submitted CBMs are indicated in *italics*)	BWC IN FORCE SINCE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
96	North Korea	1987				x													
97	Norway	1975	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
98	*Oman*	1992	n.a.	n.a.	n.a.	n.a.	n.a.												
99	*Pakistan*	1975																	
100	*Palau*	2003	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
101	Panama	1975					x												
102	Papua-New Guinea	1980										x							
103	Paraguay	1976									x								
104	Peru	1985					x	x										x	
105	Philippines	1975					x												
106	Poland	1975	x	x			x			x	x	x	x	x	x		x	x	x
107	Portugal	1975				x	x			x	x	x							
108	Qatar	1975					x				x	x		x					
109	Romania	1979					x	x[6]	x	x	x	x	x	x	x	x	x	x	x
110	Russia	1975	x[1]	x[1]	x[1]	x[1]	x[1]	x	x	x	x	x	x	x	x	x	x	x	x
111	*Rwanda*	1975																	
112	*Saint Kitts and Nevis*	1991	n.a.	n.a.	n.a.	n.a.													
113	Saint Lucia	1986									x								
114	*Saint Vincent and the Grenadines*	1999	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.					
115	San Marino	1975									x	x	x			x	x		
116	*Sao Tome and Principe*	1979																	
117	Saudi Arabia	1975										x	x						
118	Senegal	1975					x												
119	Seychelles	1979								x									
120	*Sierra Leone*	1976																	
121	*Singapore*	1975																	

	STATE (States that never submitted CBMs are indicated in *italics*)	BWC IN FORCE SINCE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
122	Slovakia	1975	x[2]	x[2]	x[2]	x[2]	x[2]	x[2]		x	x	x	x	x	x	x	x	x	x
123	Slovenia	1992	n.a.	n.a.	n.a.	n.a.	n.a.		x	x	x	x	x	x	x	x		x	
124	*Solomon Islands*	1981																	
125	South Africa	1975							x		x	x	x	x	x	x		x	x
126	South Korea	1987						x	x	x	x	x	x	x	x	x	x	x	x
127	Spain	1979	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
128	Sri Lanka	1986								x									
129	*Sudan*	2003	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
130	*Suriname*	1993	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.											
131	*Swaziland*	1991	n.a.	n.a.	n.a.	n.a.													
132	Sweden	1976	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
133	Switzerland	1976		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
134	Thailand	1975				x		x											
135	*Timor-Leste*	2003	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
136	Togo	1976		x															
137	*Tonga*	1976																	
138	Tunisia	1975						x								x			
139	Turkey	1975					x		x	x	x	x	x	x	x	x	x	x	x
140	*Turkmenistan*	1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.								
141	Uganda	1992	n.a.	n.a.	n.a.	n.a.	n.a.					x							
142	Ukraine	1975	x[1]	x[1]	x[1]	x[1]	x[1]	x	x		x	x	x	x	x		x	x	x
143	United Kingdom	1975	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
144	*Uruguay*	1981																	
145	USA	1975	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
146	Uzbekistan	1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			x	x		x	x	x
147	*Vanuatu*	1990	n.a.	n.a.	n.a.														

	STATE (States that never submitted CBMs are indicated in *italics*)	**BWC IN FORCE SINCE**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
148	*Venezuela*	1978																	
149	*Viet Nam*	1980																	
150	*Yemen*	1979																	
151	Yugoslavia	1975					x	x											
152	*Zimbabwe*	1990	n.a.	n.a.	n.a.														
Sum			**19**	**23**	**21**	**31**	**41**	**38**	**38**	**43**	**51**	**53**	**46**	**41**	**38**	**40**	**39**	**41**	**33**

1 As Soviet Union.
2 As Czechoslovakia.
3 Until 1990 separate CBM submissions for German Democratic Republic and Federal Republic of Germany.
4 CBM for 1994 submitted in 1998.
5 CBM for 1996 submitted in 1998.
6 Romania submitted their 1992 CBMs during a session of the *Forum for Security Cooperation* in Vienna and published them during the second VEREX session in November/December 1992 as document BWC/CONF.III/VEREX/NONE.26. The CBMs were not forwarded to the proper place within the UN and therefore do not appear in the official CBM documents.

2. Other states

	STATE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	Kyrgyzstan							x										

ANNEX III

COUNTRIES AND THEIR BIOTECHNOLOGICAL CAPABILITIES[29]

When discussing arms control or non-proliferation efforts in the area of biological weapons (BW), a key question relates to the biotechnological capabilities of countries. Countries with a highly developed biotechnological infrastructure have a high capability to produce BW. Countries that do not have biotechnological capabilities are not able to develop and produce BW on a large scale. For arms control and non-proliferation efforts, countries with a highly developed infrastructure in the area of biotechnology are of greater interest than those that are most likely not capable to produce BW at all.

The problem is, however, that no global ranking of the biotechnological capabilities of countries exists. While abundant data are available on biotechnology research, development and production capabilities in individual countries, no global comparative overview based on a common methodology has been published so far. A major reason for this deficit may be the fact that "biotechnology" is not a clearly defined term, so that national data are hard to compare.

The term "biotechnology" may comprise only the high end of modern biotechnology in terms of state-of-the-art vaccine production or the use of genetically engineered microorganisms to produce pharmaceutical or nutritional compounds, but it may also include traditional biotechnologies such as beer brewing. Biotechnology may include agricultural, pharmaceutical and industrial applications, and the term may relate to research, development or application and production. From the perspective of biological arms control, all three levels – research, development and production – are relevant and not only modern biotechnology but also traditional techniques may inform or may be used in a BW programme.

The problem of identifying the leading countries in biotechnology was approached by combining three methods, each of which covers different aspects of biotechnology. Through a combination of three independent methods, systematic errors of any single method are minimized.

1. Research: Number of publications

In order to get an overview of the research activities in a given country, the PubMed-database was searched for articles containing the words "biotechnology", "fermenter" and/or "vaccine" or variations thereof. The number of articles for a particular country (as indicated by the first or corresponding author's affiliation) correlates with the amount of research activities conducted in this country. The search was restricted to the five-year period 1999 to 2003 in order to get a recent picture.[30] A number of systematic errors may occur using this methodology:

- Country names are searched for by looking at the first or corresponding author's affiliation. Some country names may be part of street names in another country. Random checks, however, indicated that this was a minor problem for most

[29] The author would like to thank Dr. Jan van Aken for substantial research and writing regarding this section.

[30] The exact query for the PubMed search was: Country[Affiliation] AND (biotechnol* OR ferment* OR vaccine*). Limits: publication date 1 January 1999 to 31 December 2003. The search was conducted on 3 September 2004.

countries, with the notable exception of Jamaica.[31] If researchers in several countries are involved in the published research, only the country where the first or corresponding author comes from is counted. In addition, some country names may be spelled differently, especially if work is published in a language other than English.[32]

- A more serious problem may be different cultures in using specific terms. While doing similar research work, scientists in one country may often use a term such as "biotechnology" to describe their activities, while scientists in another country may use a different term.
- A third problem may be a publication bias. Certain research results may not be published in PubMed indexed journals, either because the authors come from countries or research groups that lack the reputation to pass the peer review process, or because the authors prefer to publish in national journals which are often not PubMed indexed. This appears to be especially true for Eastern European countries which consistently rank very low in terms of PubMed indexed publications while they get much higher ranks in terms of patents.

2. Development: Number of patents

In order to get an overview of the development activities in a given country, the number of biotechnology related patents was analysed. Several databases exist that allow detailed searches of patents. One is the database of the US Patent and Trademark Office (USPTO), which can be searched for key words, date ranges and, most importantly, the inventors or applicants affiliation. This database is, however, restricted to US patents and is thus not reflecting the global situation. Although inventors appear to file nearly always for patents in the USA, which is probably a key market for most products, this does not apply to all countries. Most notably Chinese inventors applied for a huge number of patents in China and elsewhere, but only very few in the USA, as indicated by a preliminary search on the USPTO database.[33] Hence the EspaceNet database and search engine of the European Patent Office was selected, which allows for global searches and, most importantly, for searches using the International Patent Classification (IPC) system.[34] This globally harmonized system assigns a specific code to a specific class of technologies. Class C12 includes all inventions related to *"Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or Genetic Engineering"*. By using this IPC code for the search, the problem of cultural differences in using specific terms is circumvented. It would be possible to restrict the search to specific sub-classes of C12, for example to only those sub-classes that are more related to

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31 Nearly 50 per cent of the search results for "Jamaica" came from US institutions with a "Jamaica" address; there is, for example, a research hospital in Jamaica, NY.

32 For the United Kingdom, a combined search query for "UK" and "United Kingdom" was used to overcome this problem.

33 The exact query for the USPTO search at www.uspto.gov was ACN/country AND ((biotechnol* OR ferment*) OR vaccin*)) AND ISD/19990101->20031231 (i.e. assignee country, issue date between 1 January 1999 and 31 December 2003). The search was conducted on 3 September 2004. While China ranked only 22nd on the USPTO database, it ranked 6th on the EspaceNet database.

34 The search on the advanced search site of EspaceNet at http://ep.espacenet.com/search97cgi/s97_cgi.exe?Action=FormGen&Template=ep/en/advanced.hts&REF=yes was performed on 8 September 2004. The exact query was: IPC = C12 and Priority Number = Two-digit country code.

"modern" types of biotechnology. But it appears that, from the perspective of biological arms control, a broader search makes more sense. In addition, preliminary results showed that the ranks of countries resulting from searches for C12 and from searches for a selection of sub-classes (C12M, C12N and C12P) were nearly identical.

The EspaceNet database has two major downsides. No date range can be selected, which means that the search could not be restricted to the past five years as was done for the publication search. A focus on current developments is therefore impossible. It can be assumed, however, that countries that were strong in biotechnology development 30 years ago are still relevant today from the perspective of biological arms control. The affiliation of the inventor or applicant can also not be searched for. This problem was solved by using the country in which the first patent for a specific invention – the so called "priority" patent – was filed as an indicator for the inventor's home country. Random checks indicated that this is indeed a very reliable method. Less than 5 per cent of the patents that were filed in a given country were not invented or applied for by a citizen or institution of this country. The notable exception is the USA, where both the inventor and the applicant are non-US citizens in about 20 per cent of the priority patents. Two other exceptions are the Philippines and Indonesia, were for some unknown reason the vast majority of the priority patents were developed and/or filed by foreigners. In addition to these shortcomings, the following systematic errors may be encountered with this method:

- Countries with small markets may be underrepresented, as their citizens may choose to file patents for new inventions immediately elsewhere. However, as the number of foreign-filed priority patents is rather low in most countries, this error may be neglected.
- Younger countries, for example many new Eastern European states, are underrepresented as the search was not restricted to the recent past.
- There are probably huge differences between countries in their "patent-culture". While even important new developments will never be patented in one country, everything that looks even remotely new may be immediately patented in another country.
- Countries with headquarters of international pharmaceutical or biotechnological companies may get higher results, even if inventions were made in a branch of the company located elsewhere in the world.

3. Application: Number of companies

In order to get an overview of the production activities in a given country, the number of biotechnology companies was analysed. A report from the international consultant company Ernst & Young (E&Y) presents such numbers at least for some countries.[35] The report includes both public and private companies. It should be noted that the report does not give any indication of the size of the companies, their technology potential, or their sales. So it might well be that a country with many small biotechnology start-up companies ranks higher than a country with only a few big, consolidated biotechnology companies. An example may be Canada which ranks second in number of companies, but according to the Ernst & Young report, most of these

[35] Ernst & Young (2004): On the Threshold. Global Biotechnology Report 2004, June 2004. This report contains diagrams indicating the most important biotech countries based on the number of public and private biotechnology companies in the country. The number of biotech companies was extrapolated from the diagrams.

companies are rather small.[36] The report covers only three regions – Asia-Pacific, Europe and the Americas – and lists only the top 12 or so companies for each region.

Ranking

Although all three approaches have their obvious downsides, it is assumed that a combination of all three approaches adds confidence to the analysis, as systematic errors or cultural differences are evened out to a satisfying extent.

The three methods were combined by first calculating the numerical rank of a country using each method alone, then adding the numerical ranks and dividing the result by three. If no ranking in terms of biotechnology companies from the Ernst & Young report was available, only the first two ranks were added and divided by two.

The resulting top 60 biotechnology countries world-wide are presented in table 5. The table also indicates the ranks of countries within geographical sub-regions. Countries whose names appear in bold text are leading biotechnology countries in their sub-region.[37]

Table 5: Top 60 biotechnology countries world-wide

Rank in sub-region	Rank	Country	Hits in PubMed	Ranking PubMed	Hits in EspaceNet	Ranking EspaceNet	E&Y	E&Y ranking	Combined ranking (1+2+3)/ 2 or 3
N. America 1	**1**	**USA**	17,553	1	100,000	1	1,473	1	1.0
W. Europe 1	**2**	**Germany**	3,450	4	44,136	3	350	3	3.3
N. Europe 1	**3**	**UK**	3,871	3	40,913	4	334	4	3.7
W. Europe 2	4	France	2,350	5	23,302	5	246	5	5.0
E. Asia 1	**5**	**Japan**	4,420	2	100,000	1	40	18	7.0
E. Asia 2	6	China	2,048	6	15,974	6	136	10	7.3
N. America 2	7	Canada	1,736	8	4,129	13	470	2	7.7
Australia/NZ 1	**8**	**Australia**	1,430	12	8,525	7	226	6	8.3
N. Europe 2	9	Sweden	939	15	4,299	12	177	7	11.3
S. Europe 1	**9**	**Italy**	1,942	7	5,239	11	50	16	11.3
E. Asia 3	11	Korea	1,713	9	6,886	9	41	17	11.7
W. Europe 3	12	Switzerland	906	17	3,940	14	138	9	13.3
N. Europe 3	13	Denmark	537	21	7,800	8	83	12	13.7
W. Europe 4	13	Netherlands	1,456	11	2,149	17	80	13	13.7
W. Asia 1	**15**	**Israel**	808	18	2,320	16	156	8	14.0
E. Europe 1	**16**	**Russia**	559	20	6,521	10			15.0

[36] Ernst & Young (2004): On the Threshold. Global Biotechnology Report 2004. The Americas, June 2004, p. 55.

[37] Countries were assigned to geographical sub-regions according to the United Nations Statistics Division: Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings, accessible at http://unstats.un.org/unsd/methods/m49/m49regin.htm (8 August 2005).

Rank in sub-region	Rank	Country	Hits in PubMed	Ranking PubMed	Hits in EspaceNet	Ranking EspaceNet	E&Y	E&Y ranking	Combined ranking (1+2+3)/ 2 or 3
S. Europe 2	17	Spain	1,112	14	1,964	18			16.0
S. Asia 1	**18**	**India**	1,644	10	467	30	96	11	17.0
N. Europe 4	19	Finland	922	16	1,584	19			17.5
W. Europe 5	20	Belgium	1,229	13	561	27	70	14	18.0
W. Europe 6	21	Austria	380	25	2,566	15			20.0
S. America 1	**22**	**Brazil**	641	19	965	23			21.0
E. Europe 2	23	Poland	449	23	967	22			22.5
N. Europe 5	24	Ireland	337	28	1,269	21	35	19	22.7
E. Asia 4	25	China (Taiwan)[38]	480	22	216	33	52	15	23.3
E. Europe 3	26	Hungary	219	33	1,520	20			26.5
N. Europe 6	27	Norway	366	26	532	29			27.5
S. Africa 1	**28**	**South Africa**	299	30	654	26			28.0
Australia/NZ 2	29	New Zealand	202	34	837	24			29.0
C. America 1	**30**	**Mexico**	345	27	104	37			32.0
E. Europe 4	31	Czech Republic	137	37	540	28			32.5
S. Europe 3	31	Greece	384	24	64	41			32.5
Caribbean 1	**33**	**Cuba**	192	35	260	32			33.5
S. America 2	34	Argentina	287	31	77	39			35.0
S. Europe 4	35	Portugal	142	36	111	36			36.0
W. Asia 2	36	Turkey	264	32	23	45			38.5
N. Europe 7	37	Lithuania	62	46	147	34			40.0
N. Africa 1	**38**	**Egypt**	120	38	29	43			40.5
SE. Asia 1	**38**	**Singapore**	115	39	58	42			40.5
SE. Asia 2	40	Thailand	314	29	3	54			41.5
E. Europe 5	41	Bulgaria	33	61	746	25			43.0
SE. Asia 3	42	Malaysia	81	42	16	47			44.5
S. Europe 5	43	Slovenia	45	52	72	40			46.0
E. Europe 6	44	Ukraine	73	44	8	49			46.5
S. America 3	45	Chile	86	41	5	53			47.0
E. Europe 7	46	Slovakia	37	57	92	38			47.5
S. Europe 6	46	Croatia	46	51	29	44			47.5
S. America 4	48	Colombia	78	43	2	57			50.0
SE. Asia 4	48	Philippines	44	54	17	46			50.0
W. Africa 1	**48**	**Nigeria**	90	40	1	60			50.0
S. Asia 2	51	Iran	52	48	3	54			51.0
E. Europe 8	52	Romania	17	76	437	31			53.5

[38] Taiwan is not a country officially recognized by the UN. They appear, however, as a separate entity in the databases used here. Taiwan is therefore listed separately.

Rank in sub-region	Rank	Country	Hits in PubMed	Ranking PubMed	Hits in EspaceNet	Ranking EspaceNet	E&Y	E&Y ranking	Combined ranking (1+2+3)/ 2 or 3
N. Europe 8	53	Latvia	18	73	123	35			54.0
E. Africa 1	**54**	**Kenya**	70	45	0	64			54.5
N. Africa 2	54	Tunisia	50	49	1	60			54.5
W. Asia 3	56	Saudi Arabia	53	47	0	64			55.5
S. America 5	57	Venezuela	45	52	1	60			56.0
S. Asia 3	58	Pakistan	50	49	0	64			56.5
N. Africa 3	59	Morocco	25	66	8	49			57.5
SE. Asia 5	59	Indonesia	35	58	2	57			57.5

Indonesia: The search query in EspaceNet yielded 33 patents, but only two of these were either invented or applied for by an Indonesian individual/institution.

Korea: The PubMed database does not distinguished between North and South Korea. The EspaceNet database covers only South Korea.

Philippines: The search query in EspaceNet yielded 77 patents, but the vast majority of these were neither invented nor applied for by Philippine citizens. From a total of 27 patents where the affiliation of the inventor and applicant was provided, only six were either invented or applied for by a Philippine individual/institution. Based on these numbers it was calculated that some 17 out of the 77 patents were indeed Philippine inventions.

USA and Japan: EspaceNet appears to have an upper limit of 100.000 search results. It is assumed that the actual number of patents for these two countries is higher than 100.000.