

Chapter 4: Israel

DAVID FRIEDMAN

This chapter examines recent activities in Israel to promote awareness and action in relation to biosecurity. 'Biosecurity' here refers to the sum total of measures aimed at preventing deliberate attempts to obtain dangerous biological agents or technologies and information that will grant the capability to make biological weapons. In other words, all the steps that must be taken to deny access by unauthorised actors to dangerous biological agents, information and technology that can be used to manufacture bioweapons.

Israel is an important country for examination in this regard. As the 2006 Lemon-Relman Committee Report by the US National Research Council¹ noted, almost 60 per cent of Israeli-authored scientific publications are in the life sciences, including medicine and the agricultural sciences. This report also indicated that the impact of citation of scientific research to the gross national product (GNP) scores highly in Israel compared to life-science industries in some 30 other global competitive countries. This means that scientific research is a key feature of Israel's GNP and 60 per cent of that research is related to the life sciences.

Much of this chapter focuses on the activities associated with the recently formed Steering Committee on Biotechnology Research in an Age of Terrorism (COBRAT). However, prior to that it is important to detail the context of attention to biological weapons in Israel along with its research system.

Background: Combating the Threat from Biological Weapons

To combat the bioterror threat effectively, a multi-system strategy is essential. Such a comprehensive plan must address prevention, defence, and consequence management. The objective of prevention is to stop or limit hostile forces from obtaining, developing, producing or using biological weapons. To prevent

¹ Institute of Medicine and National Research Council 2006, *Globalization, biosecurity, and the future of the life sciences*, Washington, DC: National Academies Press.

states with developed scientific and technological infrastructures from attaining and manufacturing bioweapons if they choose to is almost impossible, although sometimes they can be deterred from using them. On the other hand, although it is difficult, it should be possible to prevent terrorist organisations from acquiring bioweapons, especially the more sophisticated, advanced and dangerous ones. However, this would require global cooperation, something not forthcoming when the terrorist organisation has a national sponsor or purveyor.

Traditionally, the majority of resources have been invested in defence, a strategy composed of protection, detection and early warning. When the main threats were from hostile states, this was justified. In order to design, develop and acquire an effective defence system, it was necessary to have accurate intelligence data concerning the enemy's plans, which was possible, albeit difficult. In contrast, it is almost impossible to predict the exact scenario of a bioterror attack. Therefore, defence systems may not give an optimal response when a strike occurs.

The aim of consequence management is to treat and save the lives of mass casualties. The basic building blocks of this goal are mainly medical measures, decontamination procedures, quarantine and evacuation. The source of an attack (terrorist or hostile state) is irrelevant. The only significant parameters are the number of casualties and the nature of the disease. Therefore, a country that is well prepared for a state-based biological threat will also be prepared for a bioterror attack. Moreover, since there is a great similarity between a bioattack and a natural epidemic, the most cost-effective approach is a 'dual-use' medical system, where the national medical setup is prepared for both cases.

Israel has had 50 years of experience in fighting conventional terrorism of various kinds. For most of that time, it also has been living under the shadow of a very real chemical and biothreat from many of its neighbours (for example, Syria, Iraq and Iran).² Over the years, Israel has developed very good defence and public-health (consequence-management) systems. It should be emphasised that the chemical and bioweapon threats are not only military ones; they are also a concrete threat to the Israeli civilian population.

When the biothreat re-emerged as an issue at the end of the 1990s, Israel recruited all its know-how and resources to modify its existing defence systems to include the new scenario. More recently, Israel has also begun to increase its emphasis on, and activity in, prevention.

2 Tucker, J. B. 2006, *War of nerves: chemical warfare from World War I to Al-Qaeda*, New York: Pantheon Books; Ali, J. 2001, 'Chemical weapons and the Iran-Iraq war: a case study in non-compliance', *Nonproliferation Review, CNS*, vol. 8(1).

Recent years have seen a revolution in the biological sciences. New molecular biological approaches and related technologies promise great benefits, but could also create more virulent micro-organisms that are resistant to antibiotics and vaccines, or that have other characteristics of effective biological weapons.³ Initially, such new technologies may only be available to a select few, but the rapid dissemination of information through modern communications makes it possible for hostile forces to access them. Such forces can use them to develop and produce sophisticated, dangerous biological weaponry that would be very difficult to counter.⁴ Thus, it is imperative to prevent organisms, knowledge and materials relevant to the production of bioweapons from reaching hostile hands.

Israel conducts world-class biomedical research. This is done in a number of sectors — at universities, research institutes, hospitals and government laboratories. A 2003 Israel National Security Council (INSC) survey performed by the Center for Technological Analysis and Forecasting (ICTAF, Tel Aviv University) identified close to 500 Israeli focal points of biological research, development, and manufacture of potential relevance to biological weapons. The analysis includes academic and non-academic research institutions, government organisations (for example, the Ministries of Health, Agriculture, and Science), and industry.

Work on micro-organisms, often virulent ones, takes place in about 50–100 laboratories. Most use advanced biological methods and technologies, and possess considerable manufacturing expertise and knowledge that is potentially relevant to developing bioweapons.

Israel's Biomedical Research and Development System

Organisationally and functionally, the system is extremely decentralised, with no single national authority having comprehensive responsibility for these laboratories and focal points. Instead, accountability is divided between a number of government ministries, authorities and academic institutions. No sole centralised authority deals formally with professional issues relevant to the

3 Chyba, C. F. and Greminger, A. L. 2004, 'Biotechnology and bioterrorism: an unprecedented world', *Survival*, vol. 46(2), pp. 143–62.

4 The proliferation of chemical and biological weapons, materials and technologies to state and sub-state actors 2001, testimony by Jonathon B. Tucker, before the Senate Subcommittee on International Security, Proliferation and Federal Service, available: <http://cns.miiis.edu/research/cbw/cbwol.html>; Pate, J. and Ackerman, G. 2001, 'Assessing the threat of mass-casualty bioterrorism', Nuclear Threat Initiative, available: www.NTI.org/e_research/e3_1b.html.

proper performance of this system, and neither does any national organisation possess complete information about the system's scientific personnel, their research interests and their laboratory's research.

Ministry of Industry, Trade and Labour (MITL)

De jure, the primary legislated responsibility for worker and workplace safety, and hence laboratory biosafety, rests with the MITL. *De facto*, oversight and supervision of Israel's biomedical laboratories is considerably more complicated. The MITL tends not to focus its attention, expertise and inspections in the science sector. In contrast, the Ministry of Health (MOH) has major, expanding interest, expertise and, increasingly, activity in the field, which falls under the rubric of its general mandate to promote national health (see later in chapter).

The MITL's Laboratory Accreditation Authority (LAA) was established by law to accredit and inspect laboratories and ensure their compliance with international quality and safety standards. Observance of each measure is judged separately; there is no evaluation of the laboratory as a whole. Israeli law requires LAA accreditation only in specific sectors; for example, cement standards. In all non-specified areas, it is voluntary. This can lead to some unevenness. For example, the MOH's water and food laboratories must be certified, but the same ministry's medical laboratories are exempt. A few Israeli medical laboratories do seek voluntary endorsement for commercial reasons; but the lack of a comprehensive accreditation requirement for all biomedical laboratories prevents their effective central regulation.

Ministry of Health (MOH)

The MOH's responsibilities vary for Israeli biomedical laboratories in different sectors. Most conduct research and undertake routine diagnoses, are situated in hospitals, and many work with virulent bacteria or viruses. Laboratories in state-owned hospitals are under full MOH supervision. Other hospitals and laboratories belong to one of Israel's Kupot Holim (private health plans [HMOs]). These are not under MOH supervision, direct or indirect. The country's medical schools enjoy absolute independence and are not supervised by the MOH; rather, each medical school/university has its own safety committee.

The MOH's own Department for Laboratories, part of the Public Health Service, is directly and fully responsible for the operation of the ministry's six internal public-health laboratories. It also provides varying amounts of administrative oversight for hospitals, public- and private-sector medical laboratories and LAA-accredited environmental-health laboratories.

The MOH must approve medical laboratories in hospitals and HMOs and their professional staff. However, the ministry's Department of Laboratories does not possess information about, much less oversee, the research actually carried out in such environments. A dwindling number of private medical laboratories (only 13 are still operating today) are, in principle, supervised by the MOH.

Recently, the MOH has begun to expand its oversight of medical laboratories in hospitals and health-service organisations, including the tracking of biological agents, the registration of workers, and, for the last few years, a regime of regular inspections. The Ministry's six public-health laboratories follow orderly safety procedures, including registration and documentation. However, the MITL biosafety regulations provide oversight and supervision of all other medical-laboratory work. The MITL regulations assign broader responsibility for these issues to the laboratory director, who must also appoint a safety supervisor.

Other (often industrial) private laboratories are not classified as 'medical laboratories', but as 'biological laboratories', although they do work with dangerous biological agents. The MOH does not oversee these laboratories in any way. Such laboratories just need a MITL business licence and are subject only to the usual MITL biological-safety oversight. This potentially serious problem should be tackled within some appropriate framework.

Institutions of Higher Education

The lion's share of Israeli life-sciences and medical research and development is conducted at the country's universities and academic-research institutions: the Hebrew University, Tel Aviv University, Ben-Gurion University, Bar-Ilan University, the University of Haifa, the Technion, and the Weizmann Institute of Science.

Israel's universities are not formally subordinate to any government or public body, although they retain strong links to the Council for Higher Education and its Planning and Budget Committee that divides the government's total budget for higher education among them. All Israeli institutions of higher education share a similar organisational structure — a president, who usually appoints a vice-president for research and development, heads each.

Individual university scientists usually enjoy considerable scientific freedom with no institutional reporting, oversight or supervision. Their work is only reviewed once every few years in the framework of institutional promotion committees. Only a few special activities are regulated by national or organisational procedures. For example, an Animal Experimentation Law establishes standards for the use of research animals; and Helsinki Committees oversee experiments on humans. Work with dangerous biological agents and

poisons are regulated under Israel's extensive biosafety legal infrastructure, and academic establishments have appropriate procedures and organisations to ensure compliance (dangerous biological agents, defined as micro-organisms and toxins that cause disease in humans, are listed in the law).

The awareness of biosafety and its legal requirements is increasing. Since international research funding bodies (for example, the US National Institutes of Health and the US military) are demanding more effective biosafety supervision and oversight in the foreign laboratories they support, Israel's academic biosafety procedures are continuously improving. All educational research institutions have safety units, a full-time safety director, and safety committees. Each safety system complies with the relevant laws and directives of the MITL Workplace Inspection Division. Appropriate laws include the Workplace Safety Order (1970), the Workplace Inspection Organisation Law (1945), and the Safety Oversight Order for Medical, Biological and Chemical Laboratories (2001).

An institution's safety officials oversee work with dangerous biological agents as listed in the law, with human blood and tissue samples, DNA manipulation, toxic materials, and pathogenic organisms. Workplace regulations and guidelines are constantly updated, and laboratories are inspected regularly to ensure compliance. Record-keeping and periodic reporting regarding high-risk materials are required, and automated systems are being created to track the purchase of dangerous strains and special biological materials.

Biosafety oversight in academia takes place at two loci: first, when research proposals are submitted, and second, during its progress. In addition, safety authorities conduct instructional workshops for scientists, laboratory workers and students in safety procedures. In some institutions, when a research project requires safety certification, it is given only after the safety division has confirmed that the laboratory's work conditions meet legal requirements.

Biosecurity in Israel

Israel, the US and Western Europe share common views concerning the threat of bioweapons, bioterror and the creation of weapons of mass destruction (WMD) among rogue states and terror organisations.⁵ Israel has repeatedly stated that its national policy is to prevent such proliferation, and has taken concrete steps in this direction, some in the framework of internal legislation and some as part of international initiatives, including those of the UN.

⁵ Danzig, R. 2003, *Catastrophic bioterrorism: what is to be done?* Center for Technology and National Security Policy, National Defense University, Washington, DC.

Although Israel has not formally joined the Biological and Toxin Weapons Convention (BTWC), regarding it as an inseparable part of a general and comprehensive regional political arrangement, it wholeheartedly adheres to the US, EU and UN initiatives combating bioterror and WMD proliferation. It adheres to and coordinates its activities with the AG regime and fully supports UN Resolution 1540. Israel also has consistently supported the policy of the US in its war against international terror of all kinds.

However, unlike the US, Western Europe and other countries, Israel has yet to adopt legislation directly aimed at preventing or minimising the spread from its own laboratories, of non-conventional weaponry and its components, including dangerous biological agents.

While, as outlined in the previous section, Israel has a well-developed system of civilian biosafety (as distinct from biosecurity) laws and regulations, these can make only a limited and indirect contribution to oversight and inspection aimed at preventing the seepage of dangerous agents or information into hostile hands. There is also an executive order issued by the MITL in 2004 which mandates the oversight of chemical, biological and nuclear exports 'to help prevent the spread of non-conventional weaponry... [by] forbidding the export from Israel of products, technologies and services that can be used to develop and manufacture chemical, biological or nuclear weapons'. It is important to note that to minimise any harm to basic and clinical biomedical research this MITL order specifically exempts the export of chemical and biological agents used for medical and veterinary diagnosis, treatment or research, and information related to such agents.

The prevention of biological terror remains of supreme importance at national level. A preliminary study at the INSC in 2003 produced the following findings:

- There is virtually no awareness of the need for biosecurity within Israel's civilian life-sciences research community.
- Israel has no legal and/or regulatory infrastructure directed specifically towards biosecurity. Existing biosafety laws and regulations provide only indirect and partial means for dealing with biosecurity.
- Institutions where biomedical research and development and other work (diagnosis, production, and so on) is performed are not subject to inspection or supervision by any single Israeli authority or ministry. Instead, this responsibility is shared between a number of ministries, where division of responsibility is often not clear.
- As a result, neither at national or ministerial level is there a system of control or supervision of biomedical research laboratories, nor is there sufficient

information about any dangerous biological agents used, the types of research performed, or the technologies employed.

The COBRAT Report and its Recommendations

The big challenge now is to incorporate biosecurity concerns into the system, in particular, to upgrade measures to prevent the leakage of dangerous organisms, information and technologies to terror organisations. To this end, the INSC and the Israel Academy of Sciences and Humanities (IASH) initiated a national project called 'Biotechnology Research in an Age of Terrorism', and formed a special Steering Committee on Biotechnology Research in an Age of Terrorism (COBRAT) to analyse and report on the current situation and recommend future action.⁶ The committee was composed of well-known scientists and biologists from Israeli academia and industry and experts in regulatory and legislative law, similar to the Fink Committee in the US.⁷

COBRAT took the situation in which authorities and the scientific community are oblivious to biosecurity issues as its starting point in seeking more effective and systematic ways to meet biosecurity concerns without compromising academic freedom and creativity. In its final report the Committee formulated specific recommendations to address:

- the changes required in Israel's existing legislative infrastructure
- the compilation of an updatable list of biological agents and research topics requiring inspection and supervision
- the establishment of a regime for tracking, supervising and enforcing all areas of biosecurity
- the need for a national inter-ministerial body or professional committee to guide, monitor and maintain biosecurity.

In pursuing these goals, COBRAT was confronted by several daunting but not atypical facts: (1) no biosecurity legislation exists in Israel; (2) the legislative process, as practiced by the Israeli parliament (Knesset), is long, complicated and uncertain; (3) a response to the bioterror threat cannot wait for long-term solutions. COBRAT's innovative yet practical interim solution to these problems may also serve as a useful model for others. COBRAT recommended modifying Israel's biosafety committees and empowering them, by executive order, to undertake responsibility for biosecurity concerns as well. In addition to reducing duplication, disruption and delay, this scheme avoids many of the

⁶ Steering Committee on Issues in Biotechnological Research in an Age of Terrorism 2008, Report by the Israeli Academy of Sciences and Humanities and the Israeli National Security Council.

⁷ National Research Council 2004, *Biotechnology research in an age of terrorism*, Washington, DC: National Academies Press.

sensitivities, suspicions and conflicts inherent in the regulation of dual-use research. The existing biosafety committees are of long standing, sensitive to scientific concerns (and those of the individual scientist), well-tolerated by the scientific and academic communities, and unlikely to trigger the hostility and 'graft rejection' typical of introducing a 'foreign body' into academia. Trust and comfort are indefinable, but their effects are all too real.

With this introduction let us proceed to the Committee's (edited) recommendations given in Table 1.⁸

Table 1: COBRAT's Recommendations

Recommendation 1: awareness, consciousness and education

An ongoing effort should be carried out to raise awareness and understanding of the risks associated with the biological threat in general, and with dual-use biological research in particular, within Israel's life and medical research and development community.

Recommendation 2: existing and new legislation

Legislative solutions must be addressed on two levels:

Since the creation of totally new legislation, under Israeli conditions, can be a long, slow and uncertain process, the Committee recommends that existing Israeli secondary legislation on biosafety should immediately be used as a model for ministerial executive orders and institutional (for example, university) procedures designed to prevent the potential seepage of organisms, materials and information to hostile elements.

In parallel, specific longer-term legislation should be formulated. This legislation must be comprehensive and cover all aspects of biosecurity.

Recommendation 3: oversight and supervision mechanisms

The fastest, most efficient and least disruptive way to enforce a regime ensuring biosecurity is to upgrade and adapt existing institutional biosafety oversight procedures to also assure biosecurity.

⁸ Friedman, D., Rager-Zisman, B., Bibi, E. and Keinan, A. 2008, 'The bioterrorism threat and dual-use biotechnological research: an Israeli perspective', *Science and Engineering Ethics* vol. 16(1), pp. 85–97.

Local responsibility for the enforcement should be delegated to existing institutional biosafety committees (renamed “biosafety and biosecurity committees”) for the academic sector and special Central Biosafety and Biosecurity Committees for biomedical laboratories affiliated with government ministries. National biosecurity policy, procedures and enforcement should be overseen by a National Biosecurity Council (NBC) to be appointed by the Ministry of Health (MOH).

Recommendation 4: list of dangerous agents

There should be an itemized core list of dangerous agents. Not all biological agents should be placed in this category. The list of agents issued by the US Department of Health and Human Services was adopted as the initial core list. The list should be reviewed and updated annually, as required, by the NBC. The Committee emphasises, however, that sensitive dual-use data and information are not limited to research connected with these agents, but also can stem from work with other, in themselves harmless, strains.

Recommendation 5: publication of information generated by dual-use research

This sensitive subject must be an essential part of Israel’s biosecurity policy. Given the risks involved, it is recommended to establish a system to oversee and approve the publication of the results of dual-use research projects. This should be undertaken by an internal mechanism based on the judgment of the academic community itself. Professionalism, balance and lack of undue delay will be essential to ensuring acceptance.

Recommendation 6: consideration of biosecurity issues by funding agencies

It is recommended that the Israel Science Foundation (ISF) and government research foundations require, as part of their approval process, biosecurity approval from the applicant’s institution. This would ensure that these issues are considered by applicant institutions and that proper safety and security measures are enforced. In the case of non-academic laboratory research, similar certification should come from the chairman of the Central Safety and Security Committee in the relevant ministry.

Recommendation 7: supervision of importation and sale of dual-use biological equipment and agents

In addition to existing export regulations, the Committee believes that it is necessary to establish a system to oversee the Israeli import of dual-use biological laboratory equipment and biological agents, as defined by the (export) risk list maintained by the MITL Export Authority, as well as the sale of these items in the local market (in particular, the sale of used equipment).

Recommendation 8: national responsibility for biosecurity

The establishment of a biosecurity regime and its enforcement should be assigned to the Ministry of Health (MOH), which has both primary responsibility for public health and the requisite scientific knowledge and professional experience. MOH should establish a National Biosecurity Council (NBC). The Chairman and members of the Council should be appointed by the Minister of Health in consultation with the head of the National Security Council and the president of the Israel Academy of Sciences and Humanities.

The New Legislation Process

In its work the Committee has sought to clarify the extent to which Israeli law contains normative instructions to deal with bioterror threats that could result from scientific research conducted in Israel's biological and medical laboratories. The Committee found that Israel lacks legislation specifically addressing this goal, although there are many relevant existing statutes. In particular, there is a clear link between the need to protect the safety and health of laboratory workers handling dangerous biological agents and the public at large. Thus the Committee carefully examined existing biosafety laws that address inspection, work safety, hygiene and public health as they relate to biological laboratories.

The Committee has concluded that, although Israel has an effective legal framework for biosafety, it urgently needs a similar normative structure for biosecurity. A statutory list of dangerous biological agents and their forbidden uses must be drawn up and updated frequently. Relevant laboratories must be identified and certification procedures for using dangerous organisms legislated. Legislation must also provide for the adequate supervision of anti-theft, transfer and storage procedures. Clearly, existing biosafety provisions intended to protect people working with dangerous biological agents from laboratory accidents are also relevant for biosecurity.

Other efforts must include raising the awareness of laboratory directors, scientists and students regarding existing legal requirements, the current bioterror threat, and the vital need for biosecurity and biosafety procedures. An active concern for biosecurity plays an important role in establishing standards for working with dangerous biological agents. International initiatives followed by national legislation in many states focus on laboratories holding stores of dangerous biological agents, because these are prime targets for hostile forces.

‘Preventative caution’ requires rules that specify how to prevent hostile forces from acquiring bioweapons. The Committee believes that any framework must provide for the continued performance, publication and implementation of scientific research, as well as the defence, oversight and inspection mechanisms needed to prevent or minimise hostile use of ostensibly positive research results.

The committee assumed that introducing a new law would be a lengthy process and therefore recommended an interim step be taken. This step was to integrate biosecurity laws into the existing biosafety laws and regulations. Fortunately, and contrary to the committee’s expectations, a separate biosecurity law was put on fast track, thanks to the combined efforts of several members of parliament.

The Regulation of Research into Biological Disease Agents Act, 2008

In November 2008, the Israeli parliament passed legislation on a set of laws that cover biosecurity issues. Moreover, the main recommendations of the committee were made law thanks to their cooperation with the different government departments, mainly the MOH and Ministry of Justice.

The main points of the law are as follows:

- The law applies to all institutions and laboratories (universities, research labs, industry and hospitals), in all sectors, that have in their possession disease-causing biological agents as listed in the law or conduct research or diagnostics in said agents.
- The Minister of Health will be in charge of enforcing this law in all institutions.
- Possessing, conducting research or working with these biological agents requires an authorisation from the Ministry of Health.
- Possessing, conducting research or working with these biological agents must be performed so as not to impinge upon safety or security concerns.
- No one shall conduct research whose sole purpose is to cause or exacerbate a disease or illness or to impair the ability to prevent or treat it.
- A person or institution that has conducted a research study for which permission did not have to be obtained under the Act, but which has made

findings of a nature to increase the virulence or the contagiousness of disease agents not included in the list, or findings of a nature to alter the host range of the said disease agents, so that the disease can pass to humans, shall halt the research and submit a request to the 'institutional committee'.

- All institutions that possess disease-causing agents will establish an 'institutional committee' whose purpose is to supervise the research conducted in that institution. The committees will comprise scientists as well as security and safety personnel from the institution.
- A council for biological disease-agent research will be created to advise the Minister of Health and will comprise professionals and members of relevant government ministries. The council's responsibilities will be to advise the Minister of Health regarding research authorisation, to supervise the various institutions, and to promote training workshops and courses in institutions that work with biological agents.

Since the Act itself does not define what 'public information campaigns' and 'in-service training courses' are, it is understood that the Council has a duty to oversee those through to their implementation. Based on the Act, the Council can approve operating rules that are implemented by institutional committees (of a corporation or company conducting research, whether scientific, medical, industrial-commercial or educational, including hospitals and government organisations) to approve scientific research in Israel. Therefore, the Council can guide research establishments to adopt such campaigns or training courses as a part of their operating rules, notably so for educational institutions. Moreover, the Council also has the right to oversee the institutional committees' compliance with their operating rules based on the Act. Once certain educational programmes are set out, research establishments need to be compliant with them. Education of life scientists about dual use in Israel will be an important case where specific national legislation to deal with biosecurity is achieved alongside the establishment of specifically dedicated committees to address biosecurity issues.

The authorisation process allowing institutions to possess and/or conduct research with biological-disease agents was launched in Israel in 2009 and organisations have begun establishing their own internal committees. Towards this end, a nationwide workshop is planned to take place at the end of February 2010. Participants will include members from the Council and institutional committees, plus other representatives from various establishments. The current legislation and regulations will be discussed and clarified and the participants will also hear lectures on biological threats, dual-use purpose research and more.

Awareness-raising and Education

The recent Regulation of Research into Biological Disease Agents Act is without a doubt a giant step forward in Israel's awareness and attitude towards biosecurity. Nevertheless, we should anticipate a long and gradual process that will require a great deal of effort and patience. The success of this legislation is largely dependent on researchers and their cooperation is crucial. For biosecurity regulation to succeed, researchers must first be well-informed about the topic. It is important that they recognise and understand the potential harm that can be caused by the technologies they are developing and the research they are conducting.

In this regard, it is important to note that raising awareness about biosecurity has already received some attention in Israel in recent years. Numerous programmes have been launched to assess the level of knowledge among different research communities, as well as offer ways of increasing awareness. Two major figures in this move are Malcolm Dando and Brian Rappert,⁹ who have been very active in launching programmes and publishing a large number of papers and books on the topic. Such a programme is currently running in Israel, with the support of the Sloan Foundation. The initial stage of this programme — which included a survey conducted by the author — investigated the relevance of courses in bioethics, biosecurity and biosafety within Israel's research universities.¹⁰

The survey examined the syllabi of 35 courses offered at the Faculty of Life Sciences of six research universities in Israel. Courses were sampled by focusing on those that provide specific educational modules on biosafety, biosecurity, and bioethics. The rationale for the survey was that we aimed to investigate the current state of awareness regarding these topics within the research communities of life sciences, as it manifests itself in the curricula.

In general, we found that very little biosecurity education is offered to researchers in the life sciences. Moreover, the results indicate there is currently no academic course at Israeli universities that is specifically designed to educate life scientists on the issue of biosecurity. Interestingly, comparable surveys conducted in different parts of the world have rendered very similar results (see the chapters in this volume by Minehata and Shinomiya, and Mancini and Revill).

9 Rappert, B. 2007, 'Education for the life sciences', in Rappert, B. and Mcleish, C. (eds), *A Web of prevention: Biological weapons, life sciences and the future governance of research*, London: Earthscan; Rappert, B., Chavrier, M. I. and Dando M. R. 2006, *In-depth Implementation of the BTWC: Education and Outreach*, Bradford Review Conference Papers, no. 18.

10 Minehata, M. and Friedman, D. 2010, *Biosecurity education in Israeli research universities: Survey report*, Bradford Disarmament Research Centre (BDRC) and Institute for National Security Studies (INSS).

Given these results, it would be reasonable to assume that insufficient education is a major contributing factor to the lack of awareness of biosecurity issues amongst life scientists. In a similar vein, the COBRAT Report also noted the lack of legal infrastructure for biosecurity and the fact that there is virtually no knowledge of the need for biosecurity amongst Israel's scientific-research community as well as within Israeli civilian life. What is more, this lack of awareness was concluded to be the likely reason for biosecurity education also being essentially non-existent in Europe and Japan.

Nonetheless, it is important to note that even universities that were informed about biosecurity issues, in Israel as well as Europe and Japan, still encounter difficulties when attempting to include biosecurity education in their curricula. These difficulties may include:

- insufficient time available in the existing curricula
- time constraints and insufficient resources required for the development of new curricula
- lack of expertise and available literature on biosecurity education
- lack of interest in biosecurity education.

With the results of the survey in mind, the second part of the Sloan Foundation-supported programme aims to raise awareness. In this part of the programme, 10 life-science faculties and/or departments at research universities in Israel (Tel Aviv University, Ben-Gurion University, the Technion, Bar-Ilan University and the Hebrew University) were targeted and an hour-long seminar was given in each on the subject of dual-use research and biosecurity. The audience comprised faculty members as well as graduate students. The seminar discussed the threat of bioterrorism, the potential dangers posed by advanced biotechnological research and the possible systems that can be implemented to stop or greatly hinder the transfer of biohazardous material and sensitive information into the hands of terrorists. In addition, the new Israeli legislation was presented and discussed. Following the lectures, a questionnaire was sent to all who had attended. These questionnaires will be analysed and used to determine the programme's next steps.

This series of seminars, limited as it may be, is nevertheless an important first step towards increasing awareness regarding biosecurity issues. Therefore, one of the main goals of the programme, which will be based on the analysis of the questionnaires, is to build a lesson plan or course syllabus on the subject. With the help of the Council for Biological Disease Agent Research and the MOH, we will encourage research institutions that deal with biological agents to incorporate such courses in their curriculum. With this, we hope to contribute considerably to biosecurity education and expect to see a significant rise in knowledge of biosecurity issues in Israel.

In the context of raising awareness, it is important to discuss the above-mentioned Regulation of Research into Biological Disease Agents Act, which was recently passed in Israel, as well as the Council for Biological Disease Agent Research, which was established under this Act. Although Israel is not a State Party to the BTWC, this legislation certainly conforms to the spirit of the treaty and puts Israel at the forefront of confronting the issues of biosecurity. In this sense, the education of life scientists about dual use in Israel will be an important test for examining the effects of national legislation on biosecurity and national committees specifically targeting biosecurity issues.

To sum up, based on the data presented above, this investigation indicates that there is a lack of biosecurity education and educational content on dual-use issues in Israel at the time of inquiry. However, this certainly does not mean that promoting biosecurity education in Israel cannot be done. In fact, we believe precisely the opposite is the case, perhaps most importantly as a result of the Regulation of Research into Biological Disease Agents Act and the establishment of the Council for Biological Disease Agent Research. The Council is responsible for outlining, recommending and overseeing the implementation of regulations enhancing biosecurity at research institutions in Israel alongside raising awareness of biosecurity issues amongst life scientists. Hence, the Israeli government's initiative to develop infrastructure for biosecurity policies is evident in this Act and, in this sense, is an example of a top-down approach to the promotion of biosecurity education whereby raising awareness begins with legislation, then trickles down to the level of educational institutions and, finally, reaches the public sphere.

Summary and Conclusion

Over the past 40 years, the state of Israel has been facing chemical and biological threats, not only to its military but also mainly to its civilian population. Until the late 1990s, the threat emanated primarily from hostile states that developed and stockpiled bioweapons and chemical weapons. However, from that time, and especially after the 11 September attacks and subsequent distribution of anthrax envelopes around the US, bioterror has become a global threat. Israel joined the international effort spearheaded by the US to curb this threat, investing much of its resources on building an effective biodefence system, as well as joining efforts to prevent bioweapons and their components from reaching hostile hands, and mostly stopping the leakage of dangerous biological agents and dual-use technologies and information to terrorists.

In order to assess and investigate the issues in Israel, the COBRAT was assembled. The committee's main recommendations were: 1) to initiate and

enhance education and awareness in the life-science community; 2) to promote legislation; and 3) to establish a regulation system regarding research with dangerous biological agents and dual-use technologies. These proposals were quickly implemented, as evidenced by the establishment of the Council for Dangerous Biological Agents as well as novel legislation, placing Israel at the forefront of countries confronting these issues successfully.

The following list summarises the most important and effective properties of the Israeli approach to the fight against bioterror:

- a top-down approach, whereby official agencies initiate assessment and research of the issues, leading to legislation, which is subsequently followed by structured education at university level, and finally, the launching of public campaigns
- the assessment and research is independent and conducted by senior scientists from the academic life-science community, rather than government officials
- cooperation between the INSC, which represents the interests of national security, and the Israeli Academy of Science, which stands for pure academic research
- the support of public officials, such as members of Parliament
- the establishment of a professional advisory council that is responsible for implementation and supervision of the law
- the legislation regulates not only research with specifically listed biological-disease agents but also dual-use research
- although research institutes are regulated by the Council for Dangerous Biological Agents they each have the mandate to work as an independent entity; a configuration which significantly reduces bureaucracy.

In conclusion, we strongly believe that the Israeli approach for addressing and confronting current biosecurity issues and, in particular, the top-down approach, is the optimal model and should be adopted by governments across the world.