
Ireland

Report by Ireland in accordance with the Final Declaration of the Third Review Conference of the Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction

2013

Measure A, Part 1:
Exchange of Information on Research Centres and Laboratories

Current Status:

Ireland does not currently have maximum containment Biosafety Level 4 (BL4) or P4-equivalent laboratories.

There are approximately 36 (BL3) laboratories distributed among the universities and biotechnology companies in Ireland. These predominantly handle up to Category 3 pathogens; however, some of the laboratories also conduct contained-use genetic manipulations under regulations implemented by the Irish Environmental Protection Agency.

Both environmental and clinical specimens from suspected cases of deliberate release of *B. anthracis* are investigated in a Category 3 containment laboratory at Cherry Orchard Hospital, Dublin. This establishment can also test clinical samples for *Yersinia pestis* and is currently introducing techniques to detect the *Clostridium botulinum* toxin.

One high containment Class 3 (+) laboratory has been commissioned at the National Virus Reference Laboratory, University College Dublin (NVRL UCD). The NVRL BL3 + details are viewable on the Web at: <http://NVRL.ie>

A training programme for this laboratory in High Containment Laboratory procedures, organised by the Special Pathogens Reference Unit, UK Health Protection Agency (Porton Down), was originally completed in November 2004. There is an ongoing program of continuous training for senior staff responsible for the BL3+ laboratory in association with the UK HPA and the EU funded (European Training in Infectious Disease Emergencies) ETIDE training programme. The NVRL is also a member of the EU funded European Network for Diagnostics of “Imported” Viral Diseases (ENIVD) which provides “best practice” diagnostic assays and supply of Quality Control material.

Molecular assays have been validated at the NVRL for the detection of a wide range of viral agents whose investigation requires BL3 containment. These include Orthopox, Lassa virus, Ebola, Marburg and emerging novel influenza strains such as Influenza A (H5N1) or Swine lineage Influenza A (H1N1). A testing protocol to investigate suspected smallpox infection utilising electron microscopy is also in place. At the NVRL there is an ongoing programme to introduce “best practice” molecular methods to investigate the viral agents potentially associated with biological weapons such as the viral haemorrhagic fevers.

Laboratory details:

Location

University College Dublin
National Virus Reference Laboratory
Belfield
Dublin 4

Laboratory Details and functions

BL 3(+) Laboratory facilities (floor area of 28.3m² and a room volume of 85m³)
Core technology
Phylogenetic analysis
Molecular methodologies
Serological investigations

Public Health Laboratory
Cherry Orchard Hospital
Dublin

Cat 3 laboratory
Bacillus anthracis; *Cl.botulinum toxin*.

Responsibility for control of communicable diseases rests with Ireland's eight Directors of Public Health (Medical Officers of Health). There are over 50 clinical laboratories providing diagnostic microbiological services for humans. Seven of these are public health laboratories, which provide specialist microbiological services for food and veterinary analyses in Ireland.

The Health Protection Surveillance Centre (HPSC), formerly known as the National Disease Surveillance Centre, is Ireland's leading specialist centre for surveillance of communicable diseases. The Director of the HPSC together with the National Director of Health Protection in the Irish Health Service Executive (HSE) form the National Focal Point for Ireland in respect of the International Health Regulations and is the National Contact Point for The European Commission's Early Warning and response System for Communicable Diseases. The HPSC provides expert assistance as required in the investigation and management of outbreaks or incidents of communicable disease. The HPSC was established jointly by Ireland's eight Health Boards and with the approval of the Minister for Health and Children in 1998. The HPSC works in partnership with health service providers and sister organisations in other countries to ensure that up-to-date information is available to contribute to the effective control of infectious diseases. Since July 2000 the HPSC is statutorily responsible for the collation, analysis and dissemination of notifiable diseases in Ireland. A report on all notifiable pathogens is produced weekly and sent to key partners. This information is also published on the HPSC website and in Epi-insight, the monthly bulletin from the HPSC. In addition a report of all outbreaks of infectious diseases is produced on the HPSC website at <http://www.hpsc.ie/hpsc/NotifiableDiseases/WeeklyOutbreakReport/>

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The National Salmonella Reference Laboratory (INSL), located at the National University of Ireland, Galway, collects isolates of salmonella and associated data from all positive human faecal and blood samples, food samples and veterinary isolates in Ireland. Galway University Hospital has a Category 3 facility used for clinical diagnostics. This is the only CL3 facility in the Galway/Mayo/Roscommon/Sligo/Leitrim/Donegal region.

The Irish Marine Institute, whose headquarters are in Oranmore, Galway and which has five regional fisheries laboratories, is the EU-designated National Reference laboratory for the monitoring of marine biotoxins (Council Decision 1999/312/EC) and co-ordinates the analysis of shellfish samples for the presence of marine biotoxins, as set out in Directive 91/492/EEC.

The Department of Agriculture, Fisheries and Food (DAFF) Laboratories are the primary diagnostic facility for agents causing diseases of animals in Ireland. Their BL3 laboratory facilities are located at Backweston, Celbridge, Co Kildare. A Cat 3 + / MAFF Class 4 facility is currently being commissioned.

The DAFF Laboratories act as the National Reference Laboratory for virus diseases such as Avian Influenzas, Newcastle Disease, Rabies, African Horse Sickness, Classical Swine Fever, African Swine Fever, Classical Swine Fever, Bluetongue, West Nile Fever, Aujeszky's disease, Equine Infectious Anaemia etc. and for bacterial diseases such as Salmonella, Campylobacter, Verotoxin *E.coli*, Bovine Tuberculosis, *M. paratuberculosis*, Bovine Brucellosis, Glanders, Dourine, Listeria, Staphylococci, Campylobacter etc. and also Transmissible Spongiform Encephalopathys.

A diagnostic capacity ranging from culture to molecular based techniques is maintained for a broader range of viruses and bacteria including *Bacillus anthracis*, *Clostridium botulinum* etc. Many of the protocols are accredited or undergoing accreditation procedures to the ISO 17025 Standard.

DAFF laboratories work with the above agents to provide testing facilities and comply with requirements of the EU Community Reference Laboratories (CRLs) relating to each particular agent. The CRLs provide regular training to staff in DAFF Laboratories.

Control and destruction of the above mentioned pathogens is carried out by internationally accepted norms.

The Environmental Protection Agency (EPA) is the Competent Authority in Ireland for the implementation of the Genetically Modified Organism (Contained Use) Regulations (2001 – 2010) on the contained use of GMOs. The EPA has issued consents for the following Class 3 GMM projects:

- Class 3 Genetically Modified Micro-organisms (GMMs), *Mycobacterium tuberculosis* complex organisms - *M. bovis* and *M. tuberculosis*; (Veterinary Sciences Centre in University College Dublin)
- Chimeric Hepatitis C virus (Institute for Molecular Medicine, Trinity College Centre for Health Sciences, St James' Hospital Dublin)
- Recombinant Hepatitis C virus, GM variants of the Human Immunodeficiency Virus (HIV), the causative agent of the Acquired Immune Deficiency Syndrome (AIDS). (School of Medicine and Medical Science Centre for Research in Infectious Diseases in University College Dublin.)

Laboratory details:

Location	Laboratory Details and functions
Backweston Celbridge Co Kildare	There are 556m ² of Cat 3 laboratories. 796m ² of Cat 3+ (MAFF 4) laboratories are currently being commissioned for the diagnosis of bacterial and viral agents

Science Foundation Ireland (SFI) contributes funding to support research activities in higher education institutes. Research centres funded by SFI are established within the higher education system. SFI mandates that all funded research bodies warrant that any funded Research Programme shall be conducted in compliance with Irish or other applicable laws; and that the Research Programme shall be conducted in accordance with such ethical guidelines as may be issued by the Foundation, or any relevant industry or other regulatory body, from time to time, including (without limitation) guidelines relating to the conduct of trials, clinical or otherwise, which involve members of the public or samples taken from them.

The Health Research Board funds a CL2 Sample Processing Laboratory within the Wellcome Trust-HRB Clinical Research Facility at St James' Hospital, Dublin. The Sample Processing Laboratory: 25m², opened in October 2013 is used for processing tissue (blood and urine) samples from human participants, and these may include tissues contaminated with infectious agents. Operates to the same standards as other hospital based CL2 laboratories.

In mid 2014, a Research Pharmacy CL2 clean room will become operational. 25m², will be used for compounding cytotoxic therapies and gene therapies that use viral vectors in hazard groups 1 and 2. Activities will be regulated by IMB and/or HSE/HIQA

All biohazardous wastes (GM or pathogenic) arising from healthcare, research or industry at or above CL3 or BL3 are finally disposed of via licenced carriers and an industrial batch sterilisation facility SRCL, Kylemore Road Dublin. This process is regulated and inspected by the Environmental Protection Agency.

Measure A, Part 2:

Exchange of Information on National Biological Defence Research and Development Programmes

Ireland does not have a national biological defence R&D programme.

However, there have been and continue to be many small programmes in Ireland aimed at combating infectious diseases in humans, animals and plants. These programmes include research on the mechanisms of pathogenicity, their natural incidence and the possibilities for boosting host defences against them. These programmes are mainly funded by the Health Research Board, Enterprise Ireland, Teagasc (the Irish Agriculture and Food Development Authority), BioResearch Ireland, the Department of Agriculture, Fisheries and Food, the Wellcome Trust, the EU and a range of commercial interests.

The Irish Defence Forces undertakes training in protection from bioweapons. All personnel on induction and on career level courses undergo basic CBRN (Chemical, Biological, Radiological and Nuclear) defence training. This includes a basic understanding of the characteristics and effects of biological agents. To counter the threat, personnel are taught drills to enable them to operate for periods of time in a contaminated environment. A small number of specialists, typically with university qualifications are trained in identification techniques.

The Defence Forces, including Explosive Ordnance Disposal (EOD) teams, deploy a number of systems to detect a limited range of bacteria and toxins, including Anthrax and Ricin.

No known research on biocidal or plant protection active substances or products which could be construed as having a dual purpose was undertaken in Ireland during 2013.

A biological control efficacy trial against large pine weevil (*Hylobius abietis*) activity on pine stumps in a coniferous forest in Co Laois & at NUI Maynooth Co Kildare in 2013. This was undertaken under Trial Permit TA 003.

The trial used one nematode species (*Steinernema carpocapsae*) and three fungal species (*Beauveria bassiana*, *Metarhizium anisopliae* & *Beauveria caledonica*) applied to the soil around the tree stumps.

Ireland does not have aerosol testing facilities or biocide/pesticide spray testing facilities.

Measure B:
Exchange of Information on Outbreaks of Infectious Diseases and Similar Occurrences caused by Toxins

Current status

Ireland has had no unusual outbreaks of infectious diseases or similar occurrence caused by toxins that deviate from the normal.

Data regarding human diseases and zoonoses have been collected and co-ordinated methodically since 1998 under the auspices of the Health Protection Surveillance Centre. This is reported to the World Health Organisation (WHO), Geneva, via the Department of Health and Children.

The State Veterinary Services/Department of Agriculture, Fisheries and Food reports animal diseases to the OIE (International des Épizooties). Plant diseases are monitored nationally but are not systematically reported in the same way.

There is no R & D programme in Ireland aimed specifically at defence against biological and toxin weapons. The aim instead is to strengthen existing public health and laboratory capacity to identify possible clusters of disease that deviate from the norm or suspected deliberate release events (either in Ireland or in travellers from another jurisdiction). The intention is for early identification to minimise human health effects through effective public health controls and early clinical interventions. Thus, Ireland has concentrated its efforts on raising awareness of possible threats among first responders, clinicians and public health personnel, strengthening surveillance of communicable disease and in expanding laboratory capacity to deal with potential threats, should they appear.

Outbreak investigations are performed by public health professionals along with microbiology professionals, environmental health professionals, infection control staff and clinicians, depending on the disease, using laboratory results generated by the UCD NVRL or other microbiology laboratories. Research teams based at the UCD NVRL with expertise in phylogenetic analysis of viral sequences will be used to determine the source of any deliberate release agent by comparing the sequence of the agent to known sequences.

A single national data repository for rapid central electronic reporting of clinical and laboratory information on infectious disease (CIDR) has been established, but has not yet been fully rolled out nationally

The Health Protection Surveillance Centre (HPSC) has a close and productive interaction with the Health Protection Agency (CDSC), Colindale, London, UK and the Centres for Disease Control and Prevention (CDC), Atlanta.

The Health Services Executive carries out surveillance and control of infectious diseases in Ireland. Notification data on infectious diseases and conditions are gathered and collated by the HPSC. Throughout Ireland specified infectious diseases diagnosed by clinicians and pathogens identified in clinical laboratories and outbreaks or suspected outbreaks of infectious disease are notified to regional Directors of Public Health. This information is in turn passed on to the HPSC on at least a weekly basis (immediately in the cases of certain serious diseases). Notification data are then published on a weekly basis by the HPSC. Subsets of the data are shared with a number of EU consortia and several other non-EU countries. Information on notifiable infectious disease is shared with the European Centre for Disease Prevention and Control (ECDC) in Stockholm. The HPSC also provides human health data to the EU Basic Surveillance Network. The main data sets are forwarded to the WHO in Geneva, via the Department of Health and Children.

The Department of Agriculture, Fisheries and Food (DAFF) and the Food Safety Authority of Ireland collect and collate zoonotic disease data. This information is collected under the EU Zoonoses Directive 2003/99/EEC and Regulation 2160/2003, and is passed on to the European Food Safety Authority. The data are available on the Internet. Legislation has been updated for control of plant diseases and for animal diseases in line with EU requirements e.g. S.I. 83 of 2009 - EC Control of organisms harmful to plants and Plant products (Amendment) (No. 2) Regulations 2009.

The Food Safety Authority of Ireland is involved in the coordination of the investigation of national, cross-border and international outbreaks where foods are implicated and is the Competent Authority for rapid food alerts. The Food Safety Promotion Board based in Co. Cork is an all-island public health body. Among its key functions is the surveillance of food-borne disease on an all-island basis.

Measure C:

Encouragement of Publication of Results and Promotion of the Use of Knowledge

Current status:

As no active programmes of research directly related to the Biological and Toxin Weapons Convention exist in Ireland, there is no publication in this area.

All non-commercial research regarding biological science and infectious diseases is published in national and international journals. In Ireland, Government policy is to promote transparency and dissemination of knowledge in the biological sciences, especially in the field of human epidemiology. Relevant data regarding epidemiology and zoonoses, as well as being available nationally, are fed into European and WHO networks. Science Foundation Ireland's (SFI) publication policy mandates that the Research Body and the Principal Investigator shall disseminate, as widely as reasonably practicable and in accordance with the Intellectual Property Guidelines, the products and results of the Research Programme in internationally peer-reviewed publications and the scientific press, and where appropriate, among the general public, except where such dissemination could undermine the Intellectual Property or other rights and entitlements of the Research Body or the Principal Investigator. In addition SFI supports the principle of open access to publicly funded research, whereby all funded researchers are required to lodge their publications resulting in whole or in part from SFI-funded research in an open access repository as soon as possible after publication.

The Health Research Board (HRB) actively encourages the dissemination of research results that arise from the projects and programmes that it funds. This expectation is clearly stated in the Grant Conditions of the HRB where Clause 14 states:

14 Publication

14.1 The Host Institution shall, and shall ensure that the Principal Investigator shall:-

14.1.1 Work in co-operation with the HRB to publicise any research studies included in the Grant Funded Activities and the findings of them as part of the wider responsibility to promote the value of health research to the public. This shall, if required by the HRB, include: (a) Up to two agreed days during each successive twelve month period of the Term when the Principal Investigator or a member of the Team will be available to promote and publicise its work; (b) Participation in communications/media training.

14.1.2.1 Disseminate any findings, results or products of the Grant Funded Activities in peer review publications through the media and among the general public as far as possible or practicable (unless this would undermine Intellectual Property or other rights/entitlements of the Host Institution, Principal Investigator or the Team.)

14.1.2.2 Subject to any copyright entitlement of third parties, deposit electronic copies of any research papers that have been accepted for publication in a peer-review journal, which are supported in whole or in part by the Grant Funded Activities, in UK PubMed Central (www.ukpmc.ac.uk) as soon as possible following the date of final publication.

14.1.2.3 Whenever possible, Grant licences in respect of research papers such that they can be freely copied and re-used for, amongst other things, text and data-mining purposes, provided that such uses are fully attributed.

In addition, the HRB takes the following measures to encourage dissemination of research results:

- Provides funding through its awards for dissemination activities (journal fees, publication of research briefs, attendance at national and international scientific conferences, public engagement events etc)
- Gathers information on dissemination activities in both its annual progress reports and end of grant reports and in detailed evaluation reports.
- Provides supplemental funding through a scheme, specifically targeted at innovative knowledge exchange and dissemination activities and events (KEDS)
- Requires funding applicants to provide a dissemination plan, as part of their application, and has made the quality of the dissemination plan a criteria for funding at evaluation stage

Measure D:
Promotion of Professional Contacts

Current Status

While no active programmes of research directly related to the BTWC Convention exist in Ireland, Ireland believes that international cooperation in the field of peaceful microbiological (biological) activities is important.

Most Irish microbiologists are members of international microbiology and immunology societies, which are in turn affiliated to the International Union of Microbiology Societies (IUMS). There is a National Committee for Microbiology that is part of the Royal Irish Academy, which arranges and facilitates international contacts. There are also many medical and general scientific exchanges between microbiology institutions in Ireland and abroad.

The UCD NVRL has a close collaboration with the Special Pathogens Reference Unit, HPA Porton Down and also the Centre for Infection, Colindale in the UK. Samples, either environmental or clinical, for which there are no diagnostic investigations currently available in Ireland, will be referred to one of the appropriate centres detailed above. The UCD NVRL is a member of the European Network for Diagnostics of “Imported” Viral Diseases (ENIVD) and this facilitates collaboration with member laboratories throughout Europe.

Ireland participates in a number of European organisations and programmes such as HELICS and HARMONY, which closely track infectious diseases and drug resistance patterns.

Zoonoses Committees have been established at regional and national level to provide formal contact points for professionals in the animal, human, food and environmental health areas.

The Defence Forces are associated with Bio defence networks in NATO/PfP and the European Defence Agency. Representatives attend meetings and use information/data gathered to inform risk assessment measures and to structure appropriate response measures in suspected bio attacks.

Measure E:
Declaration of Legislation, Regulations and Other measures

Current Status:

Ireland has implemented new national legislation, the Biological Weapons Act 2011, to ensure that Ireland's obligations under the Convention are being met. This contains provisions for appropriate and specific criminal offences to prohibit the manufacture, acquisition, possession, development, transport, transfer or use of biological weapons.

There are a number of pieces of national legislation previously in place in Ireland, which regulate the use of biological materials. This legislation includes the following: Control of Exports Act 2008; Control of Exports (Goods and Technology) Order 2009; Importation of Pathogenic Agents Order 1997; and the Safety, Health and Welfare at Work (Biological Agents) Regulations 1994, as amended 1998; Genetically Modified Organisms (Contained Use) Regulations 2001 and 2010, and the Genetically Modified Organisms (Deliberate Release) Regulations 2003. In addition, the export of pharmaceutically produced biological toxins is covered by European Community dual-use export legislation and domestic law, which controls the export of military goods.

Ireland collects its human infectious diseases data under the 1947 Health Act, amended by the 1983 Act. Furthermore, this is detailed in the Infectious Disease Regulations 1981, amended 1996.

The Department of Agriculture, Fisheries and Food (DAFF) is responsible for the enactment of legislation relating to zoonoses and for providing the necessary resources to ensure their monitoring and control. Under the powers of the Diseases of Animals Acts (1966-2001) and Regulations made under the European Communities Act, veterinary inspectors inspect farms where animals and poultry are kept. As part of its zoonoses control programmes, DAFF carries out surveillance programmes to test for the presence of such pathogens on a wide range of animals and animal products.

In relation to biocidal and plant protection chemicals (both old and new chemistry) provisions exist in the Biocidal Products Regulation 528/2012 (Article 56) and the Plant Protection Products Regulation 1107/2009 (Article 54), and as transposed in Ireland by SI 427 of 2013 and SI 159 of 2012, respectively, that allows for trial programmes/experiments for research and development purposes on biocides and plant protection products.

The Health and Safety Authority (HSA) is the national body in Ireland with responsibility for the Safety, Health and Welfare at Work (Biological Agents) Regulations, 1994 (Statutory Instrument No. 146 of 1994), as amended in 1998 by S.I. 248 of 1998. It is a state-sponsored body, established under the Safety, Health and Welfare at Work Act and it reports to the Minister for Enterprise, Trade and Innovation. The HSA's main function is to ensure that workers are not at risk from exposure or potential exposure to biological agents while at work and/or performing their work activities. This is achieved through

advice, proactive workplace inspections as set out in its annual Programme of Work and workplace inspections following complaints to its Workplace Contact Unit (WCU). Where there is intentional work with biological agents, e.g. research, teaching and diagnostic purposes and thus a potential for exposure to biological agents (in particular Group 3 or 4 organisms), those employers are obliged to notify the HSA 30 days in advance of work commencing. The HSA are currently revising and updating the Safety, Health and Welfare at Work (Biological Agents) Regulations 1994 (as amended).

The Environmental Protection Agency is the “regulator” or Competent Authority in Ireland for the implementation of the Genetically Modified Organism (GMO) Regulations on the contained use and the deliberate release of GMOs into the environment. The Agency also has the remit for the Transboundary movement of GMOs. In practice what this means is that anyone planning to use a GMO in a laboratory (contained use) or in a field trial (deliberate release into the environment) must first obtain consent from the Agency. Genetically Modified Organisms are defined as bacteria, viruses, fungi, plant and animal cells, plants and animals capable of replication or of transferring genetic material in which the genetic material has been altered in a way that does not occur naturally by mating or natural recombination. There are a total of 533 registered users on the EPA register of GMO users in Ireland. 98% of these users work with Class 1/2 GMMs and GM animals. There are four (4) registered Class 3 GMM users and to date, the Agency has not received any Class 4 GMM notification.

There have been changes in Irish human infectious disease legislation. On 1 January 2004 an amendment to the existing infectious diseases Regulations established a revised list of notifiable diseases. The changes introduced are consistent with a European Commission Decision on the communicable diseases to be progressively covered by the European Community network (Decision No. 2000/96/EC, under Decision No. 2119/98/EC of the European Parliament and of the Council).

The key advances of the new legislation include:

- A greatly expanded list of conditions and diseases (increased from 35 to 68)
- A requirement for laboratory directors to report infectious diseases;
- Food- and water-borne illnesses are now specified (e.g. campylobacter infection, cryptosporidiosis, listeriosis), whereas previously there was merely a category of food poisoning (bacterial other than salmonella);
- The addition of potential biological threat agents, such as botulism and tularaemia;
- Hepatitis C is now specified;
- Several pathogens that are important in the monitoring of antimicrobial resistance became notifiable;
- The use of case definitions for infectious diseases has been introduced, a set of which has been drawn up, in line with standardised European case definitions; and

- Under the amended regulations, unusual clusters or changing patterns of illness (including outbreaks) that may be of public concern must also be reported. This was an important development, particularly in the context of any deliberate release of biological agents.

Furthermore, under the new legislation there are a number of diseases which require immediate preliminary notification by telephone, e.g. poliomyelitis, typhus, botulism, cholera, legionellosis, smallpox, paratyphoid, typhus, viral haemorrhagic fevers, SARS, and where there is a serious outbreak of any infectious disease. The web link for HPSC's 2009 Annual Report can be found here:

<http://www.hpsc.ie/hpsc/AboutHPSC/AnnualReports/>

And updated statistics at:

<http://www.hpsc.ie/hpsc/NotifiableDiseases/AnnualIDStatistics/>

Measure F:
Declaration of Past Activities in Offensive and/or Defensive Biological Research and Development Programmes

Current status:

No offensive or defensive biological R & D programmes have been undertaken in Ireland since 1 January 1946.

Measure G:
Declaration of vaccine production facilities

Current status:

All human vaccine manufacture is subject to authorisation by the Irish Medicines Board. At present, there are three human vaccine production facilities in Ireland.

- 1) Pfizer Ireland Pharmaceuticals operates a vaccine manufacturing plant located at Grange Castle in Co. Dublin. The facility also holds a Manufacturer's Authorisation for vaccine conjugation investigational medicinal products (IMP) for use in clinical trials
- 2) MSD International GmbH, trading as MSD Ireland (Carlow), began operations in 2013. The facility holds manufacturing authorisations for the formulation and fill finish of biological products, including human vaccines, for both commercial and clinical trial use.
- 3) Schering Plough (Ireland) Company, Brinny, Inishannon, Co. Cork, hold an IMP Authorisation for the PEGylation of vaccine conjugates.

There is also one veterinary vaccine Production Company in the biotechnology sector in Ireland. Elanco Laboratories in Co. Sligo have the capability to manufacture live vaccines. Manufacture of autogenous vaccines may be performed by a veterinarian based in Oldcastle, Co. Meath who may receive samples from flocks/herds in the Republic of Ireland and Northern Ireland for preparation of autogenous vaccines.

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