

Foreword

Modern biotechnologies are applied to plants species (crops, flowers, trees), animals and micro-organisms. The safety of the resulting transgenic organisms when released in the environment for their use in agriculture, forestry, the food and feed industry or for other applications represents a challenging issue. Genetically engineered products are rigorously assessed by their developers during their elaboration, and by governments when ready for release, to ensure high safety standards. This remains essential with new biotechnology developments using insects to fight against disease outbreaks: engineered mosquitoes need to be evaluated through a scientifically sound approach to risk/safety assessment that will inform biosafety regulators and support the decision concerning the release of these novel organisms in the environment.

The OECD offers a long-standing recognised expertise in biosafety and contributes to facilitating an harmonised approach. The OECD's Working Group on Harmonisation of Regulatory Oversight in Biotechnology (WG-HROB) was established in 1995. The WG-HROB gathers national authorities responsible for the environmental risk/safety assessment of products of modern biotechnology in OECD countries and other economies. International organisations and experts involved in biosafety activities are associated with this programme.

The primary goals of the WG-HROB are to promote international regulatory harmonisation, to ensure that methods used in the risk/safety assessment of genetically engineered products are as similar as possible. This may open the way to possible recognition and even acceptance of information from the assessments of other countries. The benefits of harmonisation are multiple: it strengthens mutual understanding among countries, avoids duplication, saves resources and increases the efficiency of the risk assessment process. Overall, it improves safety while reducing unnecessary barriers to trade.

The environmental risk/safety assessment of transgenic organisms (biosafety assessment) is usually based on the information collected on the characteristics of the host organism, the introduced traits, the environment into which the organism will be released, the interaction between these, and the intended use of the organism for agriculture, forestry, food and feed industry, health improvement or other purposes. Since its establishment, the WG-HROB decided to focus its work on identifying parts of this information which could be commonly used among countries when conducting environmental risk/safety assessment, aiming to encourage information sharing and prevent duplication of effort among countries. Biosafety consensus documents are one of the major outputs of its work.

The OECD Biosafety consensus documents are intended to be a “snapshot” of current information on a specific host organism or trait, for use during regulatory assessments of organisms considered for their release in the environment. These publications are not designed to be a comprehensive source of information on everything that is known about

a specific host or trait, but they do address the key elements and core set of science-based issues that member countries believe are relevant to biosafety assessment. This information is said to be mutually acceptable among OECD Members and other economies associated with the work. The Biosafety consensus documents offer practical tools which compile science-based information useful for environmental risk/safety evaluation process. Because these documents are publicly available, they can also benefit other countries around the world wishing to use these tools along the same principles.

To date, a total of 57 consensus and guidance documents have been published by the WG-HROB. They mainly address the biology of crops, trees and micro-organisms, as well as specific traits introduced in engineered plants. Their scope is currently enlarging, in line with the new biotechnological developments and wider applications to new fields. The first document related to an animal species was published in 2017 on Atlantic salmon, a fish reared for food production but also occurring in the wild in undomesticated populations.

A further step has been taken in 2018 with this document on the mosquito *Aedes aegypti*, addressing for the first time the biology and ecology of an insect species. It is also the first OECD Biosafety consensus document to focus on an organism for which biotechnological applications are not aimed at an increase in production or the quality enhancement of the product (which are usual targets of crop variety improvement for instance) but are driven here by health considerations. In the case of mosquitoes, the objective of some current biotechnological developments is to fight against disease outbreaks by reducing the insect population or limiting its capacity to transmit diseases.

The mosquito *Ae. aegypti* is the main vector of viruses responsible for severe diseases such as yellow fever, dengue fever, Zika fever and chikungunya. This insect is currently subject to biotechnological research and applications (including genetic engineering), aiming to contribute to the control its population, reduce its capacity to spread diseases and thus limit its drastic impact on human health.

Over recent years, the epidemics brought by the mosquito have drastically spread in many tropical and sub-tropical regions of the world. The countries involved are developing strategic programmes which are specifically designed to control the *Ae. aegypti* population at local or regional level. These programmes often combine a range of chemical, biological and genetic control means, in addition to environmental management aiming to prevent the propagation of mosquito populations. The integrated vector management (IVM) is the approach promoted by the World Health Organization in support of these initiatives. More details on *Ae. aegypti* control is collated under Annex A to this document, while information regarding human and animal health affected by the mosquito is available in Annex B.

At the initiative of Central and South American countries involved in the OECD biosafety activities, the WG-HROB decided a few years ago to develop this document on the biology of the *Ae. aegypti* mosquito species. The objective was to provide a tool which could help authorities in charge of performing biosafety assessment relating to this insect. To cope with the new challenge, a team of regulators, assessors and scientists was established. The project was co-led by Mexico, Brazil and the ILSI Research Foundation, with additional expertise from Australia, France, India, Kenya, the United States and the industry sector. Other countries and observer organisations involved in the WG-HROB activities also contributed to the preparation of the document. In a workshop hosted by Mexico in May 2014 for launching the project, the experts elaborated the detailed outline of the document and agreed on an action plan. Successive drafts were prepared

through electronic exchange and reviewed by the whole WG-HROB at its annual meetings at each stage of the project development.

To conduct biosafety assessment of *Aedes aegypti*, a deep knowledge of the mosquito species is required to get a comprehensive view of its development, behaviour, and fully consider its potential interaction with the environment where it is to be released. This publication contains information relating to the mosquito taxonomy, morphology, reproductive biology, genetics, ecology and other aspects. Experts have summarised in this single document key elements from a vast range of solid scientific publications, selected for their potential interest during biosafety assessment, and carefully referenced at the end of the document. This information is intended to benefit risk assessors that may need to consider potential effects on the environment when releasing engineered *Ae. aegypti* in the context of mosquito control programmes and therefore may contribute to facilitating the decision-making process.

The set of science-based information and data contained in this document, previously agreed by consensus and published by the OECD, constitute a solid reference recognised internationally, a tool for use during the biosafety assessment process. It is not intended to be a substitute for nationally-required information for risk/safety assessment, because they address only a part of the necessary elements. Nevertheless, they should make an important contribution to environmental risk/safety assessment. As such, this publication should be of value to applicants for commercial and public uses of engineered *Ae. aegypti* mosquitoes, to risk assessors and regulators from national authorities responsible for granting approvals to their release in the environment, as well as the wider scientific community.

The OECD Biosafety consensus documents are compiled in the successive volumes constituting the Series on Harmonisation of Regulatory Oversight in Biotechnology. The list shown at the end of the publication summarises the extent of the species covered, and indicates how they are grouped in their respective volumes. This Volume 8, however, contains a single document which differentiates by dealing with a novel topic (the biology of an insect species) and is large enough to constitute a specific publication.

Along with the previous seven volumes, Volume 8 includes the ‘Introduction to the biosafety consensus documents’ which explains in detail the purpose of these documents and how they are relevant to risk/safety assessment. It also describes the process by which the consensus documents are drafted, using a ‘lead country(ies)’ approach (two co-lead countries and one observer organisation in the case of the *Ae. aegypti* document).

The consensus documents published in the Volumes 1 to 8 of the Series are also available individually free of charge on the OECD BioTrack website www.oecd.org/biotrack.

In reading the OECD Biosafety consensus documents, it may be useful to also consult the “*Points to Consider for Consensus Documents on the Biology of Cultivated Plants*”. Although this additional text is specifically for cultivated plants (crops and trees), it contains a structured checklist of “points to consider” relevant to risk/safety assessment that can also be considered by authors when drafting or reviewing a consensus document on the biology of animals used in agriculture or in health-related programmes.

Another document on the “*Environmental Considerations for Risk/Safety Assessment for the Release of Transgenic Plants*” is under preparation by the WG-HROB and will be published in the near future.

This biosafety work is complementary to the activities of the OECD programme on the safety of novel foods and feeds, in particular to the consensus documents developed on the composition of foods and feeds derived from transgenic organisms. These documents describe the key nutrients, anti-nutrients, toxicants and other constituents that can be used in a comparative approach. More information on this programme can be found in the introduction to this volume.

Another mosquito, *Anopheles gambiae*, is currently being considered by the WG-HROB for developing a similar biology document. This insect is causing a major public health concern at the global level, as the *A. gambiae* complex of species includes the most important vectors of malaria disease. A range of biotechnological solutions for its control is being explored. The future publication will constitute a useful complement to this publication by enlarging the range of insects covered by the OECD Biosafety consensus documents.

Acknowledgements

This book, containing the consensus document on the biology of mosquito *Aedes aegypti*, is the result of the common effort of the participants of the OECD's Working Group on Harmonisation of Regulatory Oversight in Biotechnology, with Mexico, Brazil and the ILSI Research Foundation having served as co-leads for the project and established their teams of specialists on the subject. In addition, experts from other delegations involved in the Ad hoc drafting group, namely Australia, France, India, Kenya, the United States and the industry sector, provided valuable contributions. During the preparation of the successive draft versions of the document, useful inputs and suggestions were also provided by a number of delegates and experts from the Working Group, whether from OECD member countries, non-member economies or observer organisations.

Once finalised and agreed on declassification in June 2018, the document was published by the OECD Environment, Health and Safety (EHS) Division in the Series on Harmonisation of Regulatory Oversight in Biotechnology. This volume was prepared by Ryudai Oshima and Bertrand Dagallier, with the editing contribution of Eleonore Morena, under the supervision of Peter Kearns at the EHS Division, OECD Environment Directorate.

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Table of contents

Abbreviations and acronyms.....	13
Executive summary	15
Introduction to the biosafety consensus documents	17
About the OECD’s working group for biosafety	17
Regulatory harmonisation.....	17
The need for harmonisation activities at the OECD	18
Key background concepts and principles	18
A common approach to risk/safety assessment.....	18
The emergence of the concept of consensus documents.....	19
The purpose of consensus documents.....	19
The process through which consensus documents are initiated and brought to publication.....	20
Current and future trends in the Working Group on Harmonisation of Regulatory Oversight in Biotechnology	21
The OECD Working Group for the Safety of Novel Foods and Feeds	22
Notes	23
References.....	25
Annex to the Introduction: OECD biosafety principles and concepts developed prior to the Working Group on Harmonisation of Regulatory Oversight in Biotechnology (1986-94)	27
BIOLOGY OF MOSQUITO <i>Aedes aegypti</i>	31
Chapter 1. Taxonomy, description and distribution of the mosquito <i>Ae. aegypti</i>	33
Classification and nomenclature of <i>Aedes aegypti</i>	34
Morphology	36
Origin and current geographic distribution.....	42
Notes	43
References.....	45
Chapter 2. Reproductive biology of the mosquito <i>Ae. aegypti</i>	49
Life cycle	50
Reproduction.....	53
Life table analysis, under natural (and laboratory) conditions.....	59
Interspecific breeding	59
Effect of <i>Wolbachia</i> on reproduction.....	60
Notes	61
References.....	62

Chapter 3. Genetics of the mosquito <i>Ae. aegypti</i>	69
Linkage map organisation of <i>Ae. aegypti</i>	70
Population genetics and phylogeography of <i>Ae. aegypti</i>	71
Genetics of insecticide susceptibility and development of insecticide resistance	73
Genetics of vector competence in <i>Ae. aegypti</i>	76
Notes	81
References.....	82
Chapter 4. Ecology of the mosquito <i>Ae. aegypti</i>	91
Ecological niche/species distribution modelling of <i>Ae. aegypti</i>	92
<i>Ae. aegypti</i> niche and trophic interactions	92
Anthropic habitats.....	93
Abiotic requirements and tolerance	94
Biotic interactions in the landscape	95
Life history traits and fitness.....	96
Notes	99
References.....	100
Annex A. Control of the mosquito <i>Ae. aegypti</i>	107
Current control strategies.....	108
Integrated control management.....	114
Prevention and management of insecticide resistance	115
References.....	116
Annex B. Human and animal health affected by mosquitoes	121
Pathogens and diseases	122
Virus infection vectored by mosquitoes	122
<i>Ae. Aegypti</i> other characteristics	128
References.....	129
List of OECD consensus documents on environmental safety assessment, 1996-2018	131

Tables

Table 1.1. Standardised taxonomic hierarchy and nomenclature for <i>Ae. aegypti</i> (Linnaeus, 1762)	34
Table A A.1. Summary of control tools/strategies available for <i>Ae. aegypti</i>	109
Table A B.1. Some important arbovirus infections of humans in geographic regions of the world ...	124

Figures

Figure 1.1. Dorsal view of <i>Ae. aegypti</i> larva.....	37
Figure 1.2. Comparison of the adults, eggs, larvae and pupae of mosquito genera <i>Anopheles</i> , <i>Aedes</i> , <i>Culex</i> and <i>Mansonia</i>	38
Figure 1.3. Comb scales of <i>Ae. aegypti</i> exhibiting a medial spine with stout, subapical spines and of <i>Ae. albopictus</i> without subapical spines	39

Figure 1.4. Anal segments of <i>Ae. aegypti</i> pupae - ventral view, showing dimorphism characters between females and males.....	40
Figure 1.5. Dorsal view of the female mosquito <i>Ae. aegypti</i>	40
Figure 1.6. Comparative dorsal view of thoracic scutum of <i>Ae. aegypti</i> and <i>Ae. albopictus</i>	42
Figure 1.7. Global map of the predicted distribution of <i>Ae. aegypti</i>	44
Figure 2.1. Life cycle of <i>Ae. aegypti</i>	50
Figure 2.2. <i>Ae. aegypti</i> gonotrophic cycle, taking into account the factors that can cause host-seeking behaviour to return after an initial blood meal.....	54
Figure 3.1. A physical map of the <i>Ae. aegypti</i> genome	71
Figure A B.1. Number of suspected or laboratory-confirmed dengue cases notified to WHO, 1990-2015	126



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