Understanding the Current Threat of Bioterrorism: A study of Violent Non-State Actors' Online Instruction Manuals

July 2021

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Presented in partial fulfilment of the requirements for the Degree of

International Master in Security, Intelligence and Strategic Studies

Word Count: 23 525

Supervisor: Dr Luca Anceschi

Date of Submission: 21 July 2021

Acknowledgements

First and foremost, I would like to extend my deepest gratitude to my brilliant mentor Dr Truls Hallberg Tønnessen for reading all my rough drafts (there has been an excessive amount) and for his invaluable guidance throughout the process. I also want to express my sincere appreciation to my other colleagues at TERRA (FFI) for giving me the inspiration and opportunity to conduct this project. It has been a privilege to work with such distinguished terrorism scholars and colleagues. Their academic and moral support has made this process considerably more educational, inspiring and fun – and substantially less scary, stressful and lonely – than I could have dreamt of when I started the dissertation in the midst of a pandemic. Indeed, coffee breaks with good colleagues has been indispensable for the completion of my dissertation, academically and mentally. Special thanks also to the prominent CBRN scientists at FFI for patiently answering all my ignorant questions about gases, explosives and plants. Next, I want to give thanks to my supervisor Dr Luca Anceschi for his helpful contributions and advice. I am also extremely grateful to all my friends who have generously given of their time to read over drafts and provided valuable feedback. Last but not least, thanks to my amazing and supportive family for making my life easy and reminding me that there is a world outside the dissertation bubble.

Abstract

Against the backdrop of a pandemic that has overwhelmed and caused great damage to nations across the world, the issue of bioterrorism has received renewed attention. There is increasing concern that ill-intentioned actors' interest in bioterrorism might revive as Violent Non-State Actors (VNSAs) are witnessing the devastating effect of biological threat agents and national authorities' inability to control the COVID virus and its consequences.

Simultaneously, technological developments are decreasing the economical, practical, and intellectual barriers for VNSAs to enact advanced mass destruction bioterrorist attacks. The crux then, lies in the fact that bioterrorism-related incidents, thus far, have been scarce and limited in scope despite increasing technological opportunities. Indeed, the world has yet to witness a successful mass casualty bioterrorist attack. The divergence between the room of opportunity available to VNSAs and the seeming lack of efforts to exploit these opportunities to advance their bioterrorism capabilities, instigates further research on the issue to improve our understanding of the current and future bioterrorism threat.

This paper aims to improve our understanding of the bioterrorism threat by conducting an empirically grounded qualitative evaluation of VNSAs' current competency related to biological threat agents. The evaluation will be based on a cross-ideological study of a number of original English and Arabic language instruction manuals distributed online by jihadists and extreme right-wing actors. Subsequently, the study seeks to answer the following question: *What is the current level of competency demonstrated in Violent Non-State Actors' online instruction manuals concerned with biological threat agents?*

The paper will approach this question by considering the level of innovation, technical quality and sophistication demonstrated in these manuals. The findings from this analysis imply that VNSAs' competency to enact advanced and large-scale bioterrorist attacks remains low. These manuals have not previously been qualitatively evaluated and the study, thereby, seeks to contribute to the field by broadening the empirical foundation on which to assess the bioterrorism threat. The empirical insight provided in these manuals can add value to counterterrorism and security practitioners' foundation to assess the current, and predict the future, threat of bioterrorism.

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List of abbreviations

AM	Additive manufacturing
AQ	Al-Qaida
CBRN	Chemical, Biological, Radiological, Nuclear
CDCT	The Council of Europe's Committee on Counter-Terrorism
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CTC	Countering Terrorism Center
DHS	The United States Department of Homeland Security
DMSO	Dimethyl sulfoxide
FFI	Norwegian Defence Research Establishment
GTD	Global Terrorism Index
IS	The Islamic State
ISD	Institute for Strategic Dialogue
ITMC	Ibn Taymiyya Media Center
JAD	Jamaah Ansharut Daulah
LD50	Median lethal dose (a measure of acute toxicity)
Kg	Kilogram
Mg	Milligram
MSC	Mujahideen Shura in the Environs of Jerusalem
SITE	Search for International Terrorist Entities
POICN	Profiles of Incidents involving CBRN and Non-State Actors
PST	Norwegian Police Security Service
Ug	Microgram
VNSA	Violent Non-State Actor
WMD	Weapons of Mass Destruction
WRM	White Resistance Manual

A note on transliteration

Arabic phrases and words in the paper are transliterated according to the transliteration system of the International Journal of Middle East Studies (IJMES).[1]

[1] For more details, see: International Journal of Middle East Studies, 'IJMES Translation and Transliteration Guide', Cambridge University Press, accessed 1 June 2021, https://www.cambridge.org/core/journals/international-journal-of-middle-east-studies/information/author-resources/ijmes-translation-and-transliteration-guide.

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Chapter 1: Introduction

1.1 Bioterrorism

Bioterrorism continues to be an issue causing great concern and fear among government and counterterrorism practitioners. The United States Department of Homeland Security's (DHS) threat assessment for 2021 concludes that the risk of intentional incidents involving Chemical, Biological, Radiological and Nuclear (CBRN) material will continue to increase in the time ahead. Especially due to the pandemic, the DHS is concerned that the world may see 'a resurgence of state and non-state biological weapon pursuits.'[2] The Council of Europe's Committee on Counter-Terrorism (CDCT) is expressing similar concerns, stressing that 'the deliberate use of disease-causing agents as an act of terrorism "could prove to be extremely effective."'[3] This fear is further heightened by accounts reporting of neo-Nazis advocating for the weaponisation of COVID-19, and online distributions of instructions for how to use COVID-19 as a 'bioweapon'.[4] The rising interest in biological material among VNSAs combined with the increasing socio-economic hardship accompanying the pandemic, has led observers to warn that more disenfranchised groups may resort to violence.[5]

A number bioterrorism plots taking place in recent years have also contributed in prompting awareness surrounding the threat of biological agents in terrorism. A prominent case in Europe took place in 2018, when the Tunisian jihadist, Sief Allah Hammami, was arrested in Germany accused of plotting to conduct a bioterrorist attack with the lethal biological toxin, ricin. This was the first time a jihadist had been successful in producing ricin in a Western country.[6] A year later, in October 2019, Indonesian authorities arrested a cell of the largest pro-Islamic State (IS) network in Indonesia, Jamaah Ansharut Daulah (JAD), who planned to use

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[2] US Department of Homeland Security, 'Homeland Threat Assessment', Threat assessment (US: US Department of Homeland Security, October 2020), 19–20, https://www.dhs.gov/sites/default/files/publications/2020_10_06_homeland-threat-assessment.pdf.

[3] Alexandra Brzozowski, 'Has COVID-19 Increased the Threat of Bioterrorism in Europe?', *Euractive*, June 2020, https://www.euractiv.com/section/defence-and-security/news/has-covid-19-increased-the-threat-of-bioterrorism-in-europe/.

[4] Site Intelligence Group Enterprise, 'Minorities Targeted with Genetically Engineered Bioweapons', SITE [Bioterrorism and Public Health], May 2020, https://ent.siteintelgroup.com/Bioterrorism-and-Public-Health/genetically-modified-biological-weapons-to-kill-minorities-explored.html; Site Intelligence Group Enterprise, 'Neo-Nazi Channel Advocates Weaponization of COVID-19, Shares Instructions for Biological Weapon', SITE [Guide Tracker], July 2020, https://ent.siteintelgroup.com/Guide-Tracker/neo-nazi-channel-advocates-weaponization-of-covid-19-shares-instructions-for-biological-weapon.html.

[5] Ely Karmon, 'The Radical Right's Obsession with Bioterrorism', *International Institute for Counter-Terrorism [ICT]*, June 2020, 33, https://www.ict.org.il/Article/2566/The_Radical_Right_and_the_Obsession_with_Bioterrorism#gsc.tab=0.

[6] Florian Flade, 'The June 2018 Cologne Ricin Plot: A New Threshold in Jihadi Bio Terror', *Combating Terrorism Center at West Point [CTC Sentinel]* 11, no. 7 (August 2018): 1–4, https://ctc.usma.edu/june-2018-cologne-ricin-plot-new-threshold-jihadi-bio-terror/.

the biological toxin, abrin, in a suicide bomb attack. This was the first recorded terror plot using abrin.[7] In early 2021, the Norwegian Police Security Service (PST) arrested a 16-year-old boy allegedly planning a terror plot involving the use of nicotine poison.[8]

In addition to a surge in interest in biological toxins among VNSAs, several observers are emphasising that the emergence of new technologies are making the production and delivery of biological agents easier and cheaper for VNSAs. Examples of such technologies are biotechnology 'kits', Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) technology and 3-D printing.[9] The dual-use nature of various biological substances and equipment makes the necessary material relatively easy to obtain for non-state actors.[10] Particularly, the growing industry of e-commerce and communication technologies makes procurement of material, advanced equipment and scientific information increasingly accessible.[11] More so, the commercialisation of these technologies are lowering the costs, and are making new advanced technology available to a much wider audience.[12] The combination of decreasing economical, practical, and intellectual barriers for developing biological weapons enable VNSAs to achieve a 'higher damage at lower costs with fewer knowledge prerequisites'.[13] Thus, it becomes more feasible for VNSAs to develop and utilise advanced biological material capable of causing mass destruction.[14]

Nevertheless, the world has yet to witness a successful mass casualty bioterrorist attack.[15] Data shows that incidents of biological terrorism have indeed been scarce and had limited impact. Between 1970 and 2019, The Global Terrorism Database (GTD) registered 38

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[7] Vidia Arianti, 'Biological Terrorism in Indonesia', *The Diplomat*, accessed 20 November 2019, https://thediplomat.com/2019/11/biological-terrorism-in-indonesia/.
[8] Farid Ighoubah, 'PST Mener Nettsøk På Nattklubber Og Folkemasser i Norge Var Terrorplanlegging', *Nettavisen*, April 2021, https://www.nettavisen.no/nyheter/pst-mener-nettsok-pa-nattklubber-og-folkemasser-i-norge-var-terrorplanlegging/s/12-95-3424121733.
[9] Gary Ackerman and Michelle Jacome, 'WMD Terrorism: The Once and Future Threat', *PRISM* 7, no. 3 (2018): 32, http://www.jstor.org/stable/26470532.
[10] Ian Anthony and Fei Su, 'Reassessing CBRN Threats in a Changing Global Environment' (Stockholm: Stockholm International Peace Research Institute [SIPRI], June 2019), chap. 3, https://www.sipri.org/sites/default/files/2019-06/1906_cbrn_threats_su_anthony_0.pdf.
[11] Europol, 'EU Terrorism Situation & Trend Report 2019', Annual trend report (Europol, June 2019), 20, https://www.europol.europa.eu/activities-services/main-reports/terrorism-situation-and-trend-report-2019-te-sat; Anthony and Su, 'Reassessing CBRN Threats in a Changing Global Environment'.
[12] Ackerman and Jacome, 'WMD Terrorism', 32.
[13] Anthony and Su, 'Reassessing CBRN Threats in a Changing Global Environment', 9.
[14] Stephen Hummel and F. John Burpo, 'Small Groups, Big Weapons: The Nexus of Emerging Technologies and Weapons of Mass Destruction Terrorism' (West Point (US): Combating Terrorism Center (CTC), 2020), https://ctc.usma.edu/small-groups-big-weapons-the-nexus-of-emerging-technologies-and-weapons-of-mass-destruction-terrorism/; Europol, 'TE-SAT', June 2019.
[15] Amrit Acharya and Arabinda Acharya, 'Cyberterrorism and Biotechnology: When ISIS Meets CRISPR', *Foreign Affairs*, June 2017, https://www.foreignaffairs.com/articles/world/2017-06-01/cyberterrorism-and-biotechnology.

terrorist attacks involving biological material. This is a relatively small number compared to the 417 terrorism incidents involving chemical substances in the same period, for instance. More so, these bio-related incidents has led to a total number of nine fatalities, of which seven were related to one case involving anthrax-laced letters in the US in 2001.[16] The most extensive biological attack occurred in 1984 when a religious cult, the Rajneeshees, poisoned a number of salad bars in Dallas (US) with salmonella. 751 people were poisoned in the attack but no fatalities occurred.[17] Looking beyond executed attacks, the database for Profiles of Incidents involving CBRN and Non-State Actors (POICN) registered 517 CBRN terrorism-related incidents between 1990 and 2017 when including plots and activities prior to an attack. Of these, the clear majority involved chemical agents (77.37 percent), while biological agents were present in 107 events (20.7 percent).[18]

In spite of the limited impact of bioterrorist events thus far, security practitioners have persistently warned of the threat accompanying the proliferation of biotechnology since the 1990s. This discrepancy continue to serve as a crux in the field.[19] Most CBRN terrorism scholars contend that it is a question of when, not if, technological developments and commercialisation of technology will lead to a dramatic shift in the threat perception of Weapons of Mass Destruction (WMD) terrorism.[20]

The literature is divided on the question of why we are not seeing more and increasingly advanced biological terror plots and attacks buttressing the technological developments. Some observers argue that the absence of a successful mass casualty CBRN attack is due to VNSAs' lack of interest.[21] Their argument is supported by empirical studies testifying that most terrorists prefer conventional weapons and do not 'operate at the cutting edge of science'.[22] The other camp holds that VNSAs lack the capability to produce and use WMDs.[23] Plot data

[16] National Consortium for the Study of Terrorism and Responses to Terrorism [START], 'Global Terrorism Database [GTD]', START, June 2021, https://www.start.umd.edu/gtd/search/Results.aspx?expanded=no&casualties_type=b&casualties_max=&dtp2=all&success=yes&weapon=1&ob=GTDID&od=desc&page=1&count=100#results-table.
[17] Terrorism Research & Analysis Consortium [TRAC], 'Rajneeshees', trackingterrorism.org, accessed 12 May 2021, https://www.trackingterrorism.org/group/rajneeshees.
[18] Markus K. Binder and Gary A. Ackerman, 'Pick Your POICN: Introducing the Profiles of Incidents Involving CBRN and Non-State Actors (POICN) Database', *Studies in Conflict & Terrorism*, March 2019, 1–25, doi:10.1080/1057610X.2019.1577541.
[19] Margaret E. Kosal, 'Emerging Life Sciences and Possible Threats to International Security', *Orbis* 64, no. 4 (2020): 599–614, doi:10.1016/j.orbis.2020.08.008.
[20] Ackerman and Jacome, 'WMD Terrorism', 23.
[21] Acharya and Acharya, 'Cyberterrorism and Biotechnology'.
[22] Ackerman and Jacome, 'WMD Terrorism', 31–32.
[23] Acharya and Acharya, 'Cyberterrorism and Biotechnology'.

can seem to support this argument. POICN shows that 275 of the 517 (53.2 percent) CBRN plots registered never progressed into an attack.[24] Notably, the clear majority of these plots, allegedly, 'failed to materialize due to the perpetrators' lack of capability in relation to the pursued agents' complexity in manufacturing and weaponization.'[25] This study seeks to improve our understanding of this discrepancy by analysing primary documents distributed by VNSAs.

1.2 The practical role of online instruction manuals

Online instructional material, or 'how-to-guides', have provided *modus operandi* knowledge and inspiration for terror attacks dating back to the late 1800s.[26] Manuals can provide VNSAs with practical knowledge on how to execute attacks and enhance their skills. Additionally, it may serve as a source of inspiration and justification of terror tactics.[27] In recent years, Europol has continued to observe a surge in CBRN-related manuals being distributed online. Consequently, this leads to decreasing barriers for gaining knowledge on the use of CBRN agents in terrorism.[28] This way, some observers argue that the Internet has replaced some of the practical and ideological function that training camps used to provide for VNSAs.[29]

Several terror-related incidents in recent years testify to the use and practical implications of these online instruction manuals. For instance, manuals reportedly played a central role in the preparation of both the plots mentioned earlier in Cologne and Norway. Additionally, the perpetrators behind the terror attacks in London, Stockholm and New York in 2017, all utilised online instruction manuals in their preparations.[30]

In recent years, several individuals have also been faced with terrorist-related charges for, amongst other things, possessing and sharing instructional manuals. A British right-wing

[24] Binder and Ackerman, 'Pick Your POICN', 12.
[25] Daniel Koehler and Peter Popella, 'Mapping Far-Right Chemical, Biological, Radiological, and Nuclear (CBRN) Terrorism Efforts in the West: Characteristics of Plots and Perpetrators for Future Threat Assessment', *Terrorism and Political Violence*, August 2018, 1684, doi:10.1080/09546553.2018.1500365.
[26] Alastair G. Reed and Haroro J. Ingram, 'Exploring the Role of Instructional Material in AQAP's Inspire and ISIS'Rumiyah', Europol (Hague: Europol, May 2017), 3, https://icct.nl/publication/exploring-the-role-of-instructional-material-in-aqaps-inspire-and-isis-rumiyah/.
[27] Gary Ackerman and Jeremy Tamsett, eds., *Jihadists and Weapons of Mass Destruction* (Boca Raton: CRC Press, 2009), 106–107, https://ebookcentral.proquest.com/lib/gla/detail.action?docID=427024; Reed and Ingram, 'Exploring the Role of Instructional Material in AQAP's Inspire and ISIS'Rumiyah', 3.
[28] Europol, 'TE-SAT', June 2019, 19–20.
[29] Adam M. Segal, *The Hacked World Order: How Nations Fight, Trade, Maneuver, and Manipulate in the Digital Age*, First edition (New York: PublicAffairs, 2016), 186–187; Reed and Ingram, 'Exploring the Role of Instructional Material in AQAP's Inspire and ISIS'Rumiyah', 4–5.
[30] Reed and Ingram, 'Exploring the Role of Instructional Material in AQAP's Inspire and ISIS'Rumiyah', 2; Tom Winter, Jonathan Dienst, and Tracy Connor, 'NYC Blast Suspect Akayed Ullah Aimed to Avenge Muslim Deaths, Sources Say', *NBC News*, December 2017, https://www.nbcnews.com/news/us-news/akayed-ullah-nyc-explosion-suspect-identified-27-year-old-brooklyn-n828361.

extremist, Nicholas Brock (53), was convicted of terror offences in 2021 for possessing banned electronic documents, including an al-Qaida manual and a collection of bomb-making guides.[31] In February 2020, a 16-year-old boy became the United Kingdom's youngest convict sentenced on terrorist charges for, amongst other things, downloading a manual instructing how to build a bomb.[32] The emphasis on the role of manuals in these charges arguably highlights their significance and problematic content. The cases above also illustrate the apprehension of law enforcement and security practitioners towards the influence that these manuals can have on potential VNSAs.

Furthermore, it is interesting to note that VNSAs, such as Brock, seems to be unconcerned with the ideological orientation, if any, of the instructional content. This is also evident in Anders Behring Breivik's manifesto, where he argues for a cooperation with jihadists when discussing how to obtain WMDs.[33] A case from 2014 involving the Tunisian chemistry and physics student, Muhammed S., also testifies to the cross-ideological usage of instructional material. Despite pledging his allegiance to IS, the Tunisian student had downloaded several manuals published by non-jihadi groups, such as *The Terrorist's Handbook*, *The Anarchist Handbook*, the neo-Nazi *White Resistance Manual* and a ricin video published by the American survivalist, Kurt Saxon.[34] VNSAs' willingness to learn and adopt *modus operandi* from actors outside their ideological circle highlights the importance of a cross-ideological scope when studying CBRN terrorism. Yet, as will be demonstrated in the literature overview, an overly focus on jihadists in the CBRN terrorism literature thus far, has largely failed to consider this aspect of the CBRN terrorism threat.

1.3 Research focus

This research seeks to complement the current research field of bioterrorism by conducting a qualitative study of a selection of online instruction manuals concerned with biological material that VNSAs have published or distributed online after 2013. In this regard, the paper aims to answer the following research question: *What is the current level of competency demonstrated*

[31] Arab News, 'UK Man Found with "Al-Qaeda Manual" and Bomb-Making Guide Convicted of Terror Offenses', *Arab News*, March 2021, https://arab.news/r67dq.
[32] BBC News, 'UK's Youngest Terror Offender, Boy, 16, Sentenced', *BBC News*, February 2021, https://www.bbc.com/news/uk-england-cornwall-55951628.
[33] Breivik, Anders Behring [Pseudonym: Andrew Berwick], '2083 – A European Declaration of Independence', 2011, 967, Stored with the author, https://www.washingtonpost.com/r/2010-2019/WashingtonPost/2011/07/24/National-Politics/Graphics/2083+-+A+European+Declaration+of+Independence.pdf.
[34] Karmon, 'The Radical Right's Obsession with Bioterrorism', 17; Harald Doornbos and Jenan Moussa, 'Recipes From the Islamic State's Laptop of Doom', *Foreign Policy*, September 2014, https://foreignpolicy.com/2014/09/09/recipes-from-the-islamic-states-laptop-of-doom/.

in Violent Non-State Actors' online instruction manuals concerned with biological threat agents?

To answer this question, the study will evaluate the competency demonstrated in a selection of original Arabic and English language bio-manuals published by VNSAs after 2013, when the last research investigating the technical quality of such manuals was conducted. To do this, the research will first identify a selection of manuals concerned with biological threat agents distributed by VNSAs online after 2013. Secondly, the paper will conduct a qualitative document analysis evaluating three aspects of the identified manuals. These aspects are the suggested ingredients for the production of an agent, the method for producing the agent, and the method of delivering, or 'weaponising', the agent. Finally, the research will compare the new manuals identified in this study with older bio-manuals and evaluations of such manuals for the same toxins. This comparison enables us to look for indications of innovation or technical improvement in VNSAs' competency to enact advanced biological terrorist attacks.

Online instructional documents can provide governments and academics with valuable insight into the information and ideas that are exchanged and discussed among VNSAs in the online sphere. This research looks at a selection of manuals, and the findings will therefore be limited to the sources obtained by the author. A qualitative analysis of these manuals can, nevertheless, be indicative for the current level of competencies and aspirations that VNSAs possess with regards to biological agents. Encompassing both English and Arabic, as well as right-wing and jihadi manuals, the study provides new, up-to-date empirical insight into the competencies and aspirations of VNSAs.

Chapter 2: The research field

2.1 Introduction

This chapter will provide a brief introduction of the field of CBRN terrorism research. The section will first present and define some of the key concepts relevant for the paper. Thereafter, the paper looks at the CBRN terrorism literature and discusses some of the common approaches used by academics when studying the threat of CBRN terrorism. After identifying some of the challenges and limitations facing academics in the field, the paper will explain how instruction manuals can be used to complement the study of CBRN terrorism. The chapter is concluded with a presentation of the few studies previously

conducted on the quality of VNSAs' CBRN manuals, and demonstrates how this study will add to this knowledge.

2.2 Key concepts

The umbrella concept 'CBRN' encompass Chemical, Biological, Radiological and Nuclear material. Yet, these materials possess a diverse set of characteristics related to very different fields.[35] Therefore, the threat emanating from the various materials should be discussed separately to appreciate their unique features. Still, in the literature, CBRN is often discussed as a WMD. Consequently, we fail to distinguish between the unique features of the different threat agents, and to appreciate CBRN attacks below the WMD threshold. The latter is particularly important in the case of non-state actors, as they are much more likely to enact in smaller scale CBRN attacks.[36] Notably, small-scale attacks can still have extensive terrorising psychological and disruptive consequences for a society, and thus, should not be neglected in the threat assessment.[37]

The thesis at hand is concerned with the biological material (B) on the CBRN spectrum. In discussing biological agents in the context of terrorism, the following definition will be applied:

> *Biological agents are defined as microorganisms, or toxins, that are able to cause disease, damage or death to humans, animals, plants or materials. The terms "biological warfare agent" or "biological weapon" are also often associated with these types of agents. With respect to bioterrorism, the term "biological threat agent" should be used, as a biological weapon refers to a proven and tested delivery system containing an agent.*[38]

In turn, bioterrorism involves the use of biological threat agents for the purpose of terrorism. There is no universally agreed definition of 'terrorism', however, a definition usually emphasises terrorism's violent and political nature, and its significant psychological repercussions, spreading fear far beyond its immediate victims. Building on these elements,

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[35] Anne Stenersen and Brynjar Lia, 'Al-Qaida's Online CBRN Manuals: A Real Threat?', Exempt from public disclosure, FFI Report (Kjeller, Norway: Norwegian Defence Research Establishment (FFI), October 2007), 17.
[36] H.J. Jansen et al., 'Biological Warfare, Bioterrorism, and Biocrime', *Clinical Microbiology and Infection* 20, no. 6 (June 2014): 490, doi:10.1111/1469-0691.12699.
[37] Ackerman and Jacome, 'WMD Terrorism', 23.
[38] Janet Martha Blatny and Per Leines Lausund, 'The Threat of Bioterrorism: Identifying the Unknown', *Norwegian Defence Research Establishment*, April 2012, 2, https://issuu.com/ffi-/docs/ffi-fokus_nr2_2012_bio_web.

the paper will employ Hoffman's definition of terrorism, understood as the 'deliberate creation and exploitation of fear through violence or the threat of violence in the pursuit of political change.'[39] Bioterrorism, thereby, seeks to achieve this end through the deliberate release, or threat to release, biological agents to cause illness or death.[40]

A range of actors can engage in bioterrorism, increasingly so with the proliferating availability of knowledge and equipment via the Internet.[41] The paper will appreciate this spectre of non-state actors that can potentially seek to engage in bioterrorism by applying the term of 'Violent Non-State Actors'.[42] This term allows us to study the subject regardless of the ideological orientation and motivation of the actor(s), while appreciating the barriers and limitations facing all non-state actors in this endeavour. Indeed, any use of biological threat agents for harming others may have major disruptive consequences regardless of the motivation of the perpetrator. The term is therefore beneficial for the study's aim of evaluating the competency that any non-state actor with violent aspirations can acquire through instruction manuals published online.

The study has chosen to focus on two sub-groups of VNSAs. The first group is jihadists, here understood narrowly as a Muslim Sunni-Salafist movement that legitimises the use of violence through an Islamic doctrine of jihad.[43] Jihadists are included because they are the most active contributors of CBRN material online.[44] Right-wing extremists form the second group and has been included as they have emerged as a major terrorist threat in many countries, but in the realm CBRN terrorism these groups continue to represent an understudied actor.[45] Right-wing extremism encompass a broad web of neo-Nazi, neo-fascism and ultra-nationalist formations with a range of hateful sub-cultures opposing societal diversity and different minority groups. In common for these groups is usually an idea of supremacism, seeing their group as superior to the rest of the population.[46]

[39] Bruce Hoffman, *Inside Terrorism*, Reis and expand, Book, Whole (New York: Columbia University Press, 2006), 34–40, https://ebookcentral.proquest.com/lib/gla/detail.action?docID=908254.
[40] Hoffman, 40; Jansen et al., 'Biological Warfare, Bioterrorism, and Biocrime'.
[41] Kosal, 'Emerging Life Sciences and Possible Threats to International Security'.
[42] The term is applied by, amongst others, Gartenstein-Ross et al., and Ackerman.
[43] Europol, 'EU Terrorism Situation & Trend Report 2020', Annual trend report (Europol, June 2020), 35, https://www.europol.europa.eu/activities-services/main-reports/european-union-terrorism-situation-and-trend-report-te-sat-2020; Mark Sedgwick, 'Jihadism, Narrow and Wide: The Dangers of Loose Use of an Important Term', *Perspectives on Terrorism* 9, no. 2 (April 2015): 34–41, https://www.jstor.org/stable/26297358.
[44] Europol, 'TE-SAT', June 2019, 20.
[45] Koehler and Popella, 'Mapping Far-Right CBRN Terrorism Efforts in the West'.
[46] Europol, 'TE-SAT', June 2020, 65.

The term 'competency' serves as a final key concept in this study. Competency is here understood as the state of having sufficient knowledge and skills to perform a task. This should not be confused with 'capability', which is the ability to perform a set of actions or achieve an outcome. Accordingly, competencies constitute one of the factors that make up a group or an individual's capability. Advancing competencies can therefore increase the capability but capability is also dependent on retaining the required equipment for performing the task.[47]

2.3 Literature overview

The literature on CBRN, or WMD, terrorism is wide and complex, wherein the 'threat' of CBRN terrorism has received particular attention. Throughout the literature, threat is commonly understood as intent plus capability of terrorists.[48] A long-standing and prevailing argument in the WMD terrorism literature holds that terrorists' capability, and thereby the terror threat, increases with the development and commercialisation of new technology.[49] This hypothesis came to prominence already in the 1990s,[50] however, thirty years later the world has still to witness a successful CBRN attack causing mass casualty.[51] The lack of conformity between hypothesis and real-life events, thus, instigates an examination of the scholarly approaches studying the threat of CBRN terrorism.

Assessing the current, and predicting the future CBRN threat is difficult, because it is contingent on future technological developments, as well as VNSAs' ability and desire to take advantage of this. The body of knowledge has therefore come to rely heavily on two main approaches when studying the CBRN terrorist threat. The first group of scholarly work is based on non-empirical theorising on the subject, oftentimes falling short of taking the actors' actual interests and capabilities into consideration. The second approach largely relies on in-depth case studies of a few prominent cases, consequently failing to provide a representative understanding with a futuristic perspective on the issue of CBRN terrorism. Additionally, there

[47] Lanny Vincent, 'Differentiating Competence, Capability and Capacity', *Innovating Perspectives* 16, no. 3 (June 2008): 1–2, https://innovationsthatwork.com/images/pdf/June08newsltr.pdf.
[48] Ackerman and Tamsett, *Jihadists and Weapons of Mass Destruction*, 403.
[49] See for instance: Anthony and Su, 'Reassessing CBRN Threats in a Changing Global Environment'; Daniel Koehler and Peter Popella, 'Beware of CBRN Terrorism - From the Far-Right', *Small Wars Journal* (blog), September 2017, https://smallwarsjournal.com/jrnl/art/beware-of-cbrn-terrorism-from-the-far-right; Lasha Giorgidze and James Wither, 'Horror or Hype: The Challenge of Chemical, Biological, Radiological, and Nuclear Terrorism', *The George C. Marshall European Center for Security Studies* December 2019, no. 32 (December 2019), https://www.marshallcenter.org/en/publications/occasional-papers/horror-or-hype.
[50] Walter Laqueur, *The New Terrorism: Fanaticism and the Arms of Mass Destruction*, Book, Whole (New York: Oxford University Press, 1999), https://ebookcentral.proquest.com/lib/gla/detail.action?docID=273087.
[51] Acharya and Acharya, 'Cyberterrorism and Biotechnology'.

has been relatively few cases of terrorism involving CBRN agents, making the foundation for empirical research scarce.[52]

2.4 Common research approaches

As mentioned above, a significant amount of the literature discussing the capability of terrorists argue that there is an increased WMD threat buttressing rapid technological developments and commercialisation of technologies. Seeking to help national authorities preparing for future 'worst-case' scenarios, this literature tends to be techno-opportunistic and have an overly focus on hypothetical scenarios. Consequently, researchers have pointed out that this literature is often based on non-empirical theorising rather than historical cases.[53] Even though non-empirical research brings useful insight into the technologies and opportunities available to VNSAs, it fails to consider the actors' actual aspirations and competence to utilise such technology. Instead, a prevailing hypothesis in the assessment of terrorist tactics and strategies has been enshrined in, 'if they can, they will'.[54]

Even though empirics illustrate that VNSAs, thus far, seems to have had a disinterest in unconventional weapons or have failed in this endeavour, practitioners and scholars continue to contend that CBRN terrorism retains an increasingly disturbing threat. Ackerman and Jacome, for instance, argue that the current threat perception of WMD terrorism is overblown, but posit that 'changes in technology, however, could augur a dramatic shift in the WMD terrorism threat picture.'[55]

Despite the value added in terms of preparation of a 'worst-case' scenarios, hypothetical theory-based research may contribute in exaggerating the threat perception of CBRN terrorism. In turn, attributing VNSAs more CBRN capabilities than they possess 'serves no purpose but increasing fear and escalating public alarm.'[56] Additionally, such a technology opportunistic view may prevent authorities from preparing for the more likely small-scale CBRN scenarios, even though these may have major disruptive consequences.[57]

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[52] Binder and Ackerman, 'Pick Your POICN'.
[53] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 12; Binder and Ackerman, 'Pick Your POICN'.
[54] Mauro Lubrano, 'Navigating Terrorist Innovation: A Proposal for a Conceptual Framework on How Terrorists Innovate', *Terrorism and Political Violence*, April 2021, 2, doi:10.1080/09546553.2021.1903440.
[55] Ackerman and Jacome, 'WMD Terrorism', 23.
[56] Sammy Salama and Edith Bursac, 'Jihadist Capabilities and the Diffusion of Knowledge', in *Jihadists and Weapons of Mass Destruction*, Chapter 4 (Boca Raton: CRC Press, 2009), 124–125, https://ebookcentral.proquest.com/lib/gla/detail.action?docID=427024.
[57] Ackerman and Jacome, 'WMD Terrorism', 33.

Empirical case study research complements the technology-focused approach by considering the actors involved in CBRN terrorism. This research can, thereby, contribute to support or reject hypothesis brought forward by the non-empirical studies. Yet, a major obstacle to the empirical research in the realm of CBRN terrorism is the, fortunate, limited number of attacks. The lack of an adequate sample size of empirical evidence has led to an overreliance on a handful cases. Thus, to the degree that the hypotheses deriving from theoretically grounded CBRN research have been empirically tested, this has usually been limited to terrorist groups that are infamous for their CBRN efforts, such as Aum Shirikyo, the Rajneeshees, al-Qaida and IS.[58] Notably, these groups possess a number of features and resources that we cannot expect to see in autonomous cells and lone actors.[59] Consequently, as highlighted by Binder and Ackerman, an overreliance on such few cases can mislead analysts seeking to empirically prove or discard theories.[60]

In an attempt to address the scarce data on CBRN terrorism, Binder and Ackerman provide the plot database POICN. Here, they have identified 517 CBRN terrorism–related events in the time span between 1990 and 2017. POICN, thereby, adds significant value to the field, and arguably facilitates an improved assessment of the CBRN threat. For instance, it is interesting to note that out of the 517 plots registered within the given timeframe, a total of 275 never progressed into actual attacks.[61] Using the POICN database for further analysis of CBRN plots can therefore provide a useful and more representative picture of VNSAs' CBRN capabilities and intentions.

However, even when utilising a quantitatively larger plot database, looking at already ceased plots or accomplished attacks has limited value in preparing authorities for the future CBRN threat and new technologies pursued by VNSAs. Thus, due to its inherent retrospective nature, case study research alone arguably serves as an insufficient foundation for building a threat assessment that can benefit national authorities and counterterrorism practitioners seeking to prevent upcoming CBRN events.

[58] Binder and Ackerman, 'Pick Your POICN', 1–2.
[59] Gary A. Ackerman and Lauren E. Pinson, 'An Army of One: Assessing CBRN Pursuit and Use by Lone Wolves and Autonomous Cells', *Terrorism and Political Violence* 26, no. 1 (January 2014): 226–245, doi:10.1080/09546553.2014.849945; Binder and Ackerman, 'Pick Your POICN'.
[60] Binder and Ackerman, 'Pick Your POICN', 1–2.
[61] Binder and Ackerman, 12.

2.5 Studying VNSAs' instruction manuals

As demonstrated above, obtaining a representative, comprehensive and realistic understanding of the CBRN terrorism threat is highly challenging. Nevertheless, the next section suggests that our understanding of the current threat can be better informed with more qualitative research on CBRN instruction manuals that VNSAs are publishing and distributing online to their peers. This seems to be an under-studied research approach in the field, potentially due to the interdisciplinary nature of the endeavour. A comprehensive understanding of the CBRN terrorism threat requires cooperation between, amongst others, CBRN scientists and terrorism scholars.[62]

Nevertheless, instruction manuals can present valuable insight into the information, justification, encouragement and practical instructions that VNSAs are utilising for their benefit. Hence, qualitatively analysing these manuals can give an indication as to VNSAs' competence in CBRN material, which can inform our understanding of the bioterrorism threat. The next section will look at some of the scholarly debate concerning the role of online manuals in the context of terrorism to understand the merits and limitations of utilising such manuals as a research subject. Then, the paper will review the few qualitative studies conducted on the subject to highlight how this research contribute to the threat assessment by providing empirically grounded insights into the competency of VNSAs.

2.5.1 The role of online instruction manuals in academia

The role of instruction manuals is somewhat disputed in the terrorism literature. On the one hand, observers early noted that online instructional manuals served as an increasingly prevalent and important source of knowledge for VNSAs' tactics and *modus operandi*.[63] Salama and Bursac further argue that the Internet is imperative for terrorists' ability to attract, recruit, and instruct their supporters in how to plan and execute attacks, noting that 'The importance of these [operational] Web sites cannot be overemphasized'.[64] Despite constituting a mere fraction of jihadist content online, Salama and Bursac contend that such operational websites are the most menacing because they serve as a virtual training camp for aspiring terrorists, and can facilitate successful terrorist attacks around the world.[65]

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[62] Ackerman and Tamsett, *Jihadists and Weapons of Mass Destruction*.
[63] Brian A. Jackson et al., *Aptitude for Destruction, Volume 1 : Organizational Learning in Terrorist Groups and Its Implications for Combating Terrorism* (Santa Monica, UNITED STATES: RAND Corporation, The, 2005), 11–12, http://ebookcentral.proquest.com/lib/gla/detail.action?docID=784071.
[64] Salama and Bursac, 'Jihadist Capabilities and the Diffusion of Knowledge', 104.
[65] Salama and Bursac, 104–105.

Other scholars, however, scholars express scepticism towards the significance of such manuals. Marone calls such instructional content available to VNSAs online for introductory and generic. He attributes the deficient nature of their content to VNSAs' awareness surrounding the monitoring of online platforms by intelligence and law enforcement. Marone also posits that online instructions cannot convey practical knowledge in a way that replaces the value of physical training and practice.[66] In this same realm, Reed and Ingram argue that 'instructional material is of little value unless they can convince supporters to adopt their "competitive system of meaning" (i.e. their way of perceiving the world, its actors and events).'[67] Therefore, they contend that the justification and inspiration provided in these manuals are just as important as the practical instructions.[68]

2.5.2 Previous research on manuals

Despite the somewhat disputed role of online instruction manuals, they certainly offer some insight into the general state of knowledge VNSAs possess. The few studies conducted on such manuals have added value to an interdisciplinary research field that has proven inherently difficult to comprehensively research.[69] A notable contribution in this realm remains a study conducted at the Norwegian Defence Research Establishment (FFI) in 2007. Here, Stenersen and Lia examine al-Qaida's intentions and capabilities to execute CBRN attacks by studying online jihadi CBRN manuals. Supported by CBRN scientists at FFI, they conduct a comprehensive technical evaluation of these manuals. This way, the study makes an important addition to the field, benefiting from primary sources that were largely unexplored at the time.[70]

In cooperation with CBRN experts at FFI, Stenersen and Lia performed a theoretical evaluation of the technical quality of the instructions provided in a selection of jihadi CBRN manuals. Based on a qualitative analysis of a number of manuals, the authors conclude that there is 'an apparent lack of knowledge and innovative ability regarding CBRN-related means and methods on the part of the jihadis.'[71] Suggestive of this conclusion, they find that several of the manuals distributed in 2007 actually originated from the 1990s. It is arguably indicative for the competence and innovative ability of al-Qaida sympathisers that they were still reading

[66] Francesco Marone, ed., *Digital Jihad* (IT: Ledizioni, 2019), 15, https://doi.org/10.14672/55261357.
[67] Reed and Ingram, 'Exploring the Role of Instructional Material in AQAP's Inspire and ISIS'Rumiyah', 3.
[68] Reed and Ingram, 'Exploring the Role of Instructional Material in AQAP's Inspire and ISIS'Rumiyah'.
[69] Ackerman and Tamsett, *Jihadists and Weapons of Mass Destruction*.
[70] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 11.
[71] Stenersen and Lia, 84.

and redistributing manuals reflective of the technological sophistication of the 1990s, almost two decades later.[72]

Following the research in 2007, Stenersen published a similar study in 2013 where she compared the manuals found in 2007 with manuals identified in 2012. During this time period, Stenersen finds that jihadists' interest in CBRN material has remained low. The tendency was still that CBRN manuals were being redistributed without innovation or improvements. In conclusion, Stenersen assesses that the threat of al-Qaida executing a successful CBRN attack had seemingly not increased since 2007.[73]

Salama and Bursac conducted a similar empirical study evaluating the technical competency demonstrated in jihadi CBRN manuals in 2009. They identify multiple recipes for eight selected CBRN agents and make a technical evaluation of the general level of competency demonstrated in the identified manuals for each agent. Echoing Stenersen and Lia's conclusion, the authors similarly find that 'the technical sophistication required to produce a working WMD is [not] widespread among jihadists.'[74] Rather, the instructions identified would, according to their evaluation, produce crude weapons suitable for poisoning a limited group or, at most, enacting disruptive attacks. The authors conclude that as of 2009, the jihadist community contains 'few groups or individuals with the requisite combination of both tactical competence and strategic freedom to actually benefit from investing the time, money, manpower and effort into a WMD attack.'[75]

The empirical studies of CBRN manuals provided by Salama and Bursac, and Stenersen and Lia, provide valuable insight into VNSAs' interest and level of technical competence in CBRN material. Importantly, these studies arrive at many of the same conclusions. First, jihadists are most likely to employ crude CBRN material using low-tech delivery methods. Second, the improvised crude devices typically described in these manuals are suitable for small-scale attacks and assassinations, rather than as means of mass destruction. Third, even though the technical sophistication demonstrated in jihadi CBRN manuals is subpar, the

[72] Stenersen and Lia, 11.
[73] Anne Stenersen, 'Al-Qaidas CBRN-oppskrifter på nett, 2007-2012 - innovasjon eller status quo?', Exempt from public disclosure, FFI report (Kjeller, Norway: Norwegian Defence Research Establishment (FFI), March 2013).
[74] Salama and Bursac, 'Jihadist Capabilities and the Diffusion of Knowledge', 405.
[75] Salama and Bursac, 405.

authors emphasise that a small-scale crude CBRN attack can have major psychological and disruptive impact on society.[76]

The lack of technical sophistication and innovation identified in the manuals indicates that VNSA manuals have, thus far, not been reflective of the technological developments taking place. Evidently then, these empirical studies do not support the hypothesis that VNSAs' CBRN capabilities necessarily improves in line with the technological developments. This finding illustrates the value of examining CBRN manuals as part of monitoring and understanding the CBRN threat.

2.5.3 Limitations of the previous research

Technology is constantly evolving, and similar research is therefore regularly needed in order to detect potential technology- and knowledge adoption by VNSAs that can improve the quality of CBRN agents and delivery devices. The field of biotechnology is one of the areas that has profoundly capitalised on the continuous technological developments.[77] Especially the last decade, concerns about the disruptive developments within the field has generated substantial concern among security practitioners.[78] Introduced in 2013, CRISPR technology was has developed rapidly, resulting in the first gene-edited baby being born in China already in 2018.[79] In 2016, bioengineers were able to print a complete 'heart on a chip' using a 3-D-printer. This invention was followed by printed stem cells the next year.[80] The rapid development and commercialisation of such disruptive technologies expose the urgency of an up-to-date study on VNSAs' competencies in the realm of biotechnology.

Yet, the author has not found similar empirical research studying the quality of CBRN manuals after 2013 to see whether the recent years' technological developments are reflected in VNSAs' current CBRN manuals. The absence of any qualitative studies of VNSA manuals

[76] Salama and Bursac, 'Jihadist Capabilities and the Diffusion of Knowledge'; Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals'; Stenersen, 'Al-Qaidas CBRN-oppskrifter på nett, 2007-2012 - innovasjon eller status quo?'
[77] Christian Mills, 'Biotech Innovation: 6 Exciting Developments in the Biotech Industry', *Hult International Business School* (blog), 2019, https://www.hult.edu/blog/biotech-innovation-6-exciting-developments/.
[78] Kosal, 'Emerging Life Sciences and Possible Threats to International Security'.
[79] Brian Colwell, 'Biotechnology Timeline: Humans Have Manipulated Genes since the "Dawn of Civilization"', Genetic Literacy Project, September 2020, https://geneticliteracyproject.org/2020/09/08/biotechnology-timeline-humans-manipulating-genes-since-dawn-civilization/; BBC News, 'Gene-Edited Babies: Current Techniques Not Safe, Say Experts', *BBC News*, September 2020, https://www.bbc.com/news/health-54014969.
[80] Colwell, 'Biotechnology Timeline: Humans Have Manipulated Genes since the "Dawn of Civilization"'.

after 2013 arguably serves as a shortcoming in our understanding of the current threat of CBRN terrorism.

Another limitation of the previous studies conducted on CBRN manuals is their exclusive focus on jihadists. There has been a general tendency in the CBRN terrorism literature to have an overly focus on jihadists after the 11 September attacks on the United States in 2001.[81] However, online CBRN manuals are in most instances available to everyone using the Internet, and a CBRN attack can be have major consequences for a society regardless of ideology of the actor. Indeed, a study by Clifford found that 'Channel administrators distribute whichever manuals they believe can be of aid to aspiring operatives, regardless of its ideological background.'[82] Consequently, some of the more recent CBRN literature has made efforts to investigate the threat posed by other non-jihadist extreme actors.[83]

In this regard, the prevalent presence of extreme right-wing violence recent years calls for particular attention. The Institute for Economics and Peace reported an increase of 320 percent in right-wing terror incidents between 2014 and 2018.[84] The prominence of right-wing terrorism has led Auger to argue that we are seeing a fifth wave of terrorism approaching, characterised by right-wing extremists.[85] The increasing focus on right-wing extremists, both in the online and physical sphere, highlights the importance of devoting more attention to this group in the terrorism research moving forward.

In the CBRN terrorism literature, limited attention has been devoted to extreme right-wing actors. Moreover, of the scarce research discussing this issue, a scenario involving CBRN

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[81] See for instance: Hoffman, *Inside Terrorism*; Steven Simon and Daniel Benjamin, 'America and the New Terrorism', *Survival* 42, no. 1 (January 2000): 59–75, doi:10.1093/survival/42.1.59; Peter Neumann, *Old and New Terrorism: Late Modernity, Globalization and the Transformation of Political Violence* (Cambridge: Polity Press, 2009); Ersun N. Kurtulus, 'The "New Terrorism" and Its Critics', *Studies in Conflict & Terrorism* 34, no. 6 (June 2011): 476–500, doi:10.1080/1057610X.2011.571194; Ackerman and Tamsett, *Jihadists and Weapons of Mass Destruction*.

[82] Gary Ackerman et al., 'On the Horizon: Security Challenges at the Nexus of State and Non-State Actors and Emerging/Disruptive Technologies', A Strategic Multilayer Assessment (SMA) Periodic Publication (NSI Boston United States, April 2019), https://www.hsdl.org/?view&did=824615.

[83] See for instance: Zachary Kallenborn and Philipp C. Bleek, 'Avatars of the Earth: Radical Environmentalism and Chemical, Biological, Radiological, and Nuclear (CBRN) Weapons', *Studies in Conflict & Terrorism* 43, no. 5 (May 2020): 351–381, doi:10.1080/1057610X.2018.1471972; Thomas R. Guarrieri and Collin J. Meisel, 'Extremists and Unconventional Weapons: Examining the Pursuit of Chemical and Biological Agents', *Behavioral Sciences of Terrorism and Political Aggression* 13, no. 1 (January 2021): 23–42, doi:10.1080/19434472.2019.1698633; BreAnne K. Fleer, 'Radiological-Weapons Threats: Case Studies from the Extreme Right', *The Nonproliferation Review*, June 2020, 1–18, doi:10.1080/10736700.2020.1775987.

[84] Institute for Economics & Peace, 'Global Terrorism Index 2019: Measuring the Impact of Terrorism' (Sydney, November 2019), 46, https://www.economicsandpeace.org/wp-content/uploads/2020/08/GTI-2019web.pdf.

[85] Vincent A. Auger, 'Right-Wing Terror: A Fifth Global Wave?', *Perspectives on Terrorism* 14, no. 3 (June 2020): 87–97, https://www.jstor.org/stable/10.2307/26918302.

attacks from the extreme right is usually considered very unlikely.[86] A common assumption in the literature has maintained that, 'CBRN terrorism is usually a tactic used by groups based on a religious ideology.'[87] Consequently, scholars have argued that using CBRN 'weapons' does not align with the goals and ideology of extreme right-wing groups.

Koehler and Popella have made a notable contribution to approach this gap in the field by researching what they argue is the under-studied issue of far-right CBRN terrorism.[88] Advocating the need for more research on right-wing actors in the CBRN literature, they highlight several factors that illustrate right-wing actors' CBRN aspirations and capabilities. The authors contend that in terms of CBRN aspirations, right-wing ideology 'is not more or less dangerous than jihadi or left-wing extremism'.[89] Right-wing actors possess the same access to necessary material and equipment to produce CBRN agents. Notably, Popella and Koehler also argue that right-wing actors' motivation for using CBRN weapons is increasing as they are competing for the public's attention and recognition with jihadi groups.[90]

Following Koehler and Popella, other scholarly work considering the CBRN threat from right-wing actors highlights that right-wing literature has been encouraging the use of CBRN material.[91] Fleer, for instance, illustrate that staple right-wing literature, such as Anders B. Breivik´s manifesto and *The Turner Diaries*, discusses and promotes the use of several CBRN agents. Fleer therefore argues that using such weapons are strategically aligned with the motives of right-wing extremists.[92]

Right-wing extremists' interest in CBRN terrorism is also illustrated looking at historical cases demonstrating that right-wing actors have employed, or attempted to employ, CBRN agents for decades.[93] Presenting the first quantitative study describing the characteristics of right-wing CBRN terrorism, Koehler and Popella identify 31 CBRN incidents related to right-wing terrorists in Western countries since 1970.[94] Based on this data, the authors find that right-wing extremists tend to target victims indiscriminately and that they have a preference for agents that are easy to obtain and 'require low technical knowledge for

[86] Koehler and Popella, 'Mapping Far-Right CBRN Terrorism Efforts in the West', 1679.
[87] Koehler and Popella, 1667.
[88] Koehler and Popella, 1685.
[89] Koehler and Popella, 'Beware of CBRN Terrorism - From the Far-Right'.
[90] Koehler and Popella.
[91] See for instance: Giorgidze and Wither, 'Horror or Hype: The Challenge of Chemical, Biological, Radiological, and Nuclear Terrorism'; Fleer, 'Radiological-Weapons Threats'.
[92] Fleer, 'Radiological-Weapons Threats', 6.
[93] Koehler and Popella, 'Beware of CBRN Terrorism - From the Far-Right'.
[94] Koehler and Popella, 'Mapping Far-Right CBRN Terrorism Efforts in the West'.

production.'[95] Nevertheless, plots involving the actual use of an agent only occurred in three of the 31 incidents. Moreover, even if more plots had been successful, Koehler and Popella argue that the low level of technical complexity and sophistication of the plots made it unlikely that they could have caused mass casualty. These findings are interesting because they demonstrate clear similarities between the jihadi- and right-wing community in their pursuit and use of CBRN agents.

Karmon's study from 2020 demonstrates, what he argues, is a particular interest in biological threat agents among right-wing actors. By analysing prominent right-wing staple literature and right-wing-related incidents and individuals involved in bioterrorism, Karmon presents 'a first evaluation of the future radical right bioterrorism threat'.[96] Notably, he finds that the covid-19 pandemic has triggered a renewed interest in bioterrorism in the right-wing community.[97] This surge prompts the importance of monitoring right-wing extremists' competency to engage in bioterrorism.

The author has not identified any former research studying the technical quality of instructional manuals published or distributed by right-wing actors. This study therefore represents a timely contribution to the threat assessment of right-wing actors in the realm of bioterrorism.

2.6 Summary and contribution

While techno-opportunists fail to appreciate the actual interests of VNSAs, empirical case studies fail to consider potentially alarming up- and coming technologies that can be utilised in terrorist attacks. As seen in the studies conducted by Stenersen and Lia, and Salama and Bursac, researching online CBRN instructions published and distributed by the VNSAs themselves is one way of approaching this research issue. Thus, by monitoring and evaluating their technical sophistication and innovation, we can form a foundation for assessing VNSAs' competency to enact CBRN attacks. Subsequently, this empirical insight can add to our understanding of the current threat of CBRN terrorism in general, and bioterrorism more specifically.

The research proposed by the author will add to the CBRN terrorism literature through an up-to-date assessment of VNSA manuals concerned with biological threat agents that are

[95] Koehler and Popella, 1680–1684.
[96] Karmon, 'The Radical Right's Obsession with Bioterrorism', 32.
[97] Karmon, 'The Radical Right's Obsession with Bioterrorism'.

published or distributed by jihadist or extreme right-wing actors between 2013 and 2021. This study will thereby approach two main gaps in the literature on CBRN terrorism. First, the lack of qualitative empirical research on VNSAs' CBRN manuals since 2013. Second, the lack of any empirical qualitative research of the CBRN manuals published and distributed by right-wing extremists. The study is supported by CBRN scientists at FFI, which will add important value to the technical evaluation of the manuals. Such interdisciplinary cooperation is a necessity but also a common shortcoming in the CBRN terrorism literature.

Chapter 3: Design and methodology

3.1 Introduction

With the aim of exploring VNSAs' current competency to engage in bioterrorism, this study will collect, evaluate and compare instructional manuals published and distributed online by jihadists and right-wing extremists. As seen in the previous chapter, an important contribution of this study involves identifying and collecting bio-manuals that have been posted by VNSAs after 2013. An evaluation and comparison of these will then provide insight into their current competency to enact bioterrorist attacks. A comparison with older bio-manuals will also enable us to identify whether current VNSA manuals have adopted or benefited from technological developments, which can have important implications for their competency.

This chapter presents the chosen research strategy and data collection techniques employed in this study. The author will then explain the case selection process and how the data is extracted from each manual using qualitative textual analysis. The next section will establish the comparative framework applied for analysing this data. The merits and limitations intrinsic in the study will be discussed appropriately throughout the chapter, but a section is also devoted to discuss some final considerations related to merits, challenges and ethical issues. Finally, the chapter will give a brief overview the main actors and manuals that will be considered in the paper.

3.2 Research strategy

The paper at hand will conduct an empirically grounded study, applying an exploratory strategy to implement the empirical research. An exploratory approach is particularly appropriate for the purpose of this study because there are very few similar studies previously conducted. As demonstrated in the literature overview, the author has only identified three other studies that have investigated the technical quality of VNSAs' manuals, and both of these were conducted before 2013 and were limited to jihadists. The scarce number of similar research makes an

exploratory design suitable because of the limited foundation we can rely on to predict the outcome of this study. Even though the nature of an exploratory study inherently restrains us from drawing generalised conclusions about the findings, it does provide valuable insight into an understudied research issue. It also allows us to generate tentative hypotheses and to build a foundation for further research on the issue.[98]

3.3 Data collection

This study has collected primary documents that are published in the online sphere by, or on behalf of, groups or networks related to jihadi or extreme right views. Due to the nature of the Internet and efforts to remove extreme content from the wider public, the relevant data was widely dispersed across a range of different online platforms. This study has used a limited number of platforms as starting points for the data collection. The author also received access to some of the manuals through the archive of FFI's terrorism research group, TERRA. All primary sources are stored with the author.

In order to make the research practically possible to conduct within the given timeframe, the study has employed a convenience sampling technique in the data collection. Convenience sampling is a non-probability technique where data is selected based on its convenience for the researcher. The selection is, therefore, not random and cannot be considered representative for the quality of all bio-manuals published by VNSAs online.[99] However, the data collected will still provide insight into the current ideas and technical competencies of VNSAs, which is the aim of this exploratory study. The next section will outline from where and how the data was collected, while elaborating the specific inclusion criteria used.

The first gateway used to collect data was the website of the private intelligence agency Search for International Terrorist Entities (SITE). SITE is a US-based, non-governmental intelligence group reporting on terrorist and extremist groups and their online activity. They are a for-profit company providing subscription-based and customised intelligence gathering

[98] Univeristy of Southern California [USC], 'Organizing Your Social Sciences Research Paper', *USC Libraries*, Research Guides (USC, March 2021), https://libguides.usc.edu/writingguide/researchdesigns.
[99] 'Convenience Sampling', in *Encyclopedia of Survey Research Methods*, by Paul Lavrakas (2455 Teller Road, Thousand Oaks California 91320 United States of America: Sage Publications, Inc., 2008), doi:10.4135/9781412963947.n105.

and analysis.[100] SITE has, thereby, provided a time-efficient way for the author to get an overview of the relevant information distributed in extreme online communities.

Nevertheless, SITE's characteristics create unavoidable biases and limitations. First of all, we need to consider SITE's objectivity. As they are a private entity, we should assume that they are largely gathering their intelligence based on their subscribers' interests and preference. This is a bias accounted for in this study by utilising additional platforms in the data collection. Secondly, there is no guarantee that SITE is able to identify and monitor all relevant information available on the Internet. Nevertheless, SITE is a well-known enterprise specialised in online monitoring, and used, among others, by the US government.[101] It is, therefore, reasonable to assume that they have the resources to monitor and provide a relatively exhaustive reporting on the topic.

The author began the data collection process by searching broadly for all CBRN content related to VNSAs to map the available data. Based on SITE's reporting after 2013, the author assembled all relevant CBRN matters reported in an excel sheet. Publications indicating that manuals, information or recipes on CBRN material had been published, gathered or redistributed by extremist groups online were considered relevant in this case.

In the period between January 2013 and January 2021, SITE reported of 44 instances where CBRN manuals had been published or shared online among VNSAs. Of these, no relevant publications were reported on radiological or nuclear agents. There were reports of both chemical and biological manuals, but the author chose to exclusively look at content related to biological substances due to its timely relevance in a pandemic and the urgency prompted by important technological developments within biotechnology. Instructions for biological material were included in 31 of the 44 reports. The large majority of these were related to jihadists, who distributed 21 of 31 manuals. Five reports were affiliated with right-wing ideology, and five were published by unspecified actors.

The author does not retain a subscription to SITE's service, and a considerable time has therefore been devoted to attempting to identify the original CBRN manuals referred to by SITE. To do this, the author has derived information from the headlines and pictures of the

[100] James Vincent, 'Who Are the SITE Intelligence Group That Distributed the Sotloff Video before the Jihadis?', *Independent*, September 2014, https://www.independent.co.uk/news/world/who-are-the-site-intelligence-group-that-distributed-the-sotloff-video-before-the-jihadis-9710732.html; Site Intelligence Group Enterprise, 'About Site', Site Intelligence Group Enterprise, accessed 13 July 2020, https://ent.siteintelgroup.com/Corporate/about-site.html.
[101] Vincent, 'Who Are the SITE Intelligence Group That Distributed the Sotloff Video before the Jihadis?'

manuals they reference and conducted open online searches with key-words from these. Most of the searches were done in Arabic as the majority of the manuals were written in Arabic, but also different compositions of English and Arabic key-words were used to find the manuals. This process also led the author to find other relevant manuals than those reported by SITE. For instance, could one manual be part of an archive of similar manuals collected by an account on *Archive.org*.

The disproportionate reporting on jihadist actors compared to right-wing actors by SITE, raised the question of whether they had an excessive focus on jihadist communities, or if CBRN continues to be a much more popular topic among jihadists. The author, therefore, conducted targeted searches on the encrypted messaging platform, Telegram, and an online archive of the /pol/ ('politically incorrect') board on 4chan.[102] Both of these platforms are popular among many extreme right-wing users, and thereby allowed the author to investigate the interest and potential distribution of CBRN manuals in the right-wing community specifically.[103]

The 4chan archive contained a simple search function that made it easy to find material by searching for relevant phrases or words. In order to find relevant material on Telegram, on the other hand, the author first had to identify channels frequented by right-wing actors. In this regard, the study employed a research approach inspired by the Institute for Strategic Dialogue (ISD), that conducted a study to unpack white supremacist Telegram channels. In accordance with their study, the author first used keywords and phrases associated with the extreme right to search for public Telegram groups frequented by extreme right actors. These Telegram channels are highly networked, with a lot of material being shared between ideologically similar communities. This enabled a so-called 'snowball' methodology, where associated channels were identified by tracking the source of the forwarded material from other channels.[104]

Using this approach on Telegram, the research identified 29 Telegram channels associated with extreme right-wing views. Of these, only four channels contained references to relevant keywords such as 'chemical' and 'biological', or had relevant files in its

[102] 4plebs, '4plebs Archive', Archive, archive.4plebs.org, June 2021, https://archive.4plebs.org/pol/.
[103] Jakob Guhl and Jacob Davey, 'A Safe Space to Hate: White Supremacist Mobilisation on Telegram', *Institute for Strategic Dialogue*, June 2020, 1–20, https://www.isdglobal.org/wp-content/uploads/2020/06/A-Safe-Space-to-Hate2.pdf; Stephane J. Baele, Lewys Brace, and Travis G. Coan, 'Variations on a Theme? Comparing 4chan, 8kun, and Other Chans' Far-Right "/Pol" Boards', *Perspectives on Terrorism* 15, no. 1 (2021): 65–80, https://www.jstor.org/stable/26984798.
[104] Guhl and Davey, 'A Safe Space to Hate'.

repositories. Especially interesting for this research were two channels named after the term 'boogaloo'. The term refers to a future civil war and is closely associated with the extreme right community.[105] These channels, 'Boogaloo Intel Drop' and 'Bruce's Boogaloo Library', seemed to function as 'content banks', serving as one-to-many repositories of material.[106] A substantial amount of training- and tactical manuals were found in these content banks.

After collecting data using Telegram, 4chan and SITE as starting points as elaborated above, the final data sample consisted of nine instruction manuals on biological agents that had been published or distributed by VNSAs after 2013. It was challenging to verify the origin of some of the manuals, especially those circulating on extreme right-wing platforms. Of the right-wing manuals collected, most could seemingly be traced back to the late 1900s or early 2000s. Despite being old, the author still found it important to include these manuals because there has previously not been conducted any studies researching the quality of bio-manuals published by right-wing actors. Additionally, seeing that they are still frequently distributed among VNSAs today, these three right-wing manuals, arguably, continuous to be relevant for considering VNSAs' current competency on the subject matter. See appendices 1 and 2 for overview of the manuals considered in the thesis.

3.4 Framework for analysis

To examine the research material collected, the paper employed a qualitative document analysis to extract the data. All nine manuals were subject to a textual analysis on the basis of three predetermined aspects. These involved the ingredients suggested for producing the agent, the method for producing the agent, and the method for delivering the agent. After the data was extracted, examples derived from this process were selectively used to exemplify observations made in the exploration of the manuals. Based on their content and relevance, some manuals have been used more actively than others in the analysis, but findings encountered throughout the data collection process have informed the final analysis. The Arabic language manuals were translated by the author before the content of the manuals could be explored.

The paper adopted a comparative framework for analysis of the data, using examples from the data collection to demonstrate certain findings. By using these examples in a comparative framework with older manuals and evaluations of these, the author was able to

[105] Karmon, 'The Radical Right's Obsession with Bioterrorism', 28.
[106] Guhl and Davey, 'A Safe Space to Hate', 1–3.

identify potential indicators of innovation with regards to the three aspects. Based on this analysis and with support from FFI's biologists, the thesis reached some tentative conclusions regarding the degree of innovation and technical quality in the identified manuals. In turn, the findings from this analysis were used to inform a discussion regarding VNSAs' current competency to enact bioterrorist attacks.

3.5 Merits, limitations and ethical considerations

The Internet served as a useful source for studying VNSAs because it allowed the research to capture the transnational nature of extreme milieus today by omitting the creation of artificial boundaries based on the researcher's geographical restraints.[107] However, there has also been a number of challenges and limitations in using the Internet for this research.

Firstly, the myriad of information available on the Internet made it a challenging and time-consuming project to identify relevant primary sources. Additionally, content published by VNSAs is increasingly being removed from the online sphere by social media platforms and law enforcement. Such efforts have pushed several VNSA groups to use closed and member-only forums.[108] This has naturally limited the author's access to parts of the empirical data material.

Secondly, accompanying the transnational nature of online communities is necessarily a broader range of languages used in the primary sources. However, this served as a minor limitation in this study as most of the instruction manuals identified were written in English or Arabic, making most of the material available to the author with competency in both of these languages.

A third limitation was related to the anonymous nature of the Internet, which made it challenging to verify some of the primary sources and its origin. This is an unavoidable challenge in all Internet-mediated research. To the extent possible, the author has verified the information through means of secondary sources. Moreover, the focal point of this study relates to the competency that any actor can acquire through online manuals. The issue of verification, therefore, does not have major implications for the findings of this study.

[107] Patricia Leavy, ed., *The Oxford Handbook of Qualitative Research*, 2nd ed. (Oxford University Press, 2020), 443, doi:10.1093/oxfordhb/9780190847388.001.0001.
[108] Europol, 'TE-SAT', June 2019, 20.

As with all Internet-mediated research, we need to consider ethical issues, amongst others, related to privacy concerns.[109] The data material in this study includes documents published for the purpose of making their publications available to third parties. Additionally, the manuals are published by or on behalf of ideologically extreme groups. In cases where communication platforms have been used to find this data, the platforms have been public and the identity of all participants is anonymous. The author has retained a passive stance when collecting the manuals, and has not engaged in any interaction on the social media platforms. Consideration has, accordingly, been taken to avoid potential ethical issues.

Other merits and limitations related to the study have been discussed throughout the chapter, and I do not foresee other issues related to the research. Thus, with an awareness surrounding the limitations and ethical considerations of the research, the study is valid and can provide useful insight into the subject.

3.6 Selected manuals

The next section will briefly introduce the main actors and manuals that has been considered in the paper.

Al-Ṣaqrī

Al-Ṣaqrī Foundation for Military Sciences (*Mūʾassasat al-Ṣaqrī lil-ʿUlūm al- Ḥarbiyya*) is an unofficial pro-IS media outlet. According to Europol, al-Ṣaqrī has been an important contributor in IS-supporters' propaganda efforts to promote the idea of unity within the IS-community.[110] Additionally, they played an important role in the 'media jihad' promoted in response to the intensified efforts by law enforcements and social media platforms to take down pro-IS content in recent years. Al-Ṣaqrī has been among the three most active contributors providing instructions on cyber and operational security.[111] The majority of al-Ṣaqrī's manuals are on explosives, but they also provide manuals on cyber, surveillance, espionage, and chemical and biological agents. Al-Ṣaqrī have published a few manuals with recipes for biological toxins as part of a series of manuals titled 'Toxic Warfare, Kill them Silently', that was published over a time span of around seven months in 2018.[112]

Ibn Taymiyya Media Center

[109] Leavy, *The Oxford Handbook of Qualitative Research*, 444–445.
[110] Europol, 'TE-SAT', June 2019, 36.
[111] Europol, 39.
[112] Site Intelligence Group Enterprise, 'SITE Guide Tracker', July 2021, https://ent.siteintelgroup.com/Articles/Guide-Tracker/.

Ibn Taymiyya Media Center (ITMC) is the official online media unit of the Mujahideen Shura Council in the Environs of Jerusalem (MSC) (*Majlis Shūra al-Mujāhidīn*). The group is a Salafi-jihadist group located in Gaza. Its terrorist attacks seek to target Israel, but the group has also pledged its support to IS and is designated a foreign terrorist group by the US.[113] In 2016, ITMC published video instructions on how to produce and deliver ricin toxin.[114] Their ricin video is interesting because it was allegedly used to prepare the ricin plot in Cologne in 2018, as well as a plot by two Egyptian brothers in France the same year.[115]

Al-Anfāl

Al-Anfāl translates to 'the spoils of war' and is an Arabic language, informal magazine produced by an IS' media network called al-Darʿ al-Sunnī (*Mūʾassasat al-Daraʿ al-Sunnī)*. The magazine was first published in late 2017, and was then issued every ten days until June 2018.[116] Al-Anfāl presented a ricin recipe in the sixth edition of their magazine published in January 2018 that will be used in our analysis.

The White Resistance Manual

The 'White Resistance Manual' (WRM) is a 310 pages long neo-Nazi tactical manual providing in-depth instructions for manufacturing and employment of numerous weapons and explosives. The author of the document is not known but the it contains clear expressions of anti-Jewish and racist ideology, and provides ideological legitimisation to target 'enemies of the white race'. The document contains a section on poisons, which includes a number of biological substances such as nicotine, ricin, abrin, oleander and poison hemlock. The document is originally from the early 2000s but it started resurfacing in the online sphere in 2019.[117]

4chan /pol/ board

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[113] Tom Keatinge, David Carlisle, and Florence Keen, 'Virtual Currencies and Terrorist Financing: Assessing the Risks and Evaluating Responses: Counter-Terrorism', Counter-Terrorism (European Parliament, May 2018), 29, https://www.europarl.europa.eu/RegData/etudes/STUD/2018/604970/IPOL_STU(2018)604970_EN.pdf.
[114] Site Intelligence Group Enterprise, 'ITMC Video Shows How to Make Ricin-Laced Cream, Explosives' (Site Intelligence Group Enterprise, May 2016), https://ent.siteintelgroup.com/Guide-Tracker/itmc-video-shows-how-to-make-ricin-laced-cream-explosives.html.
[115] Flade, 'The June 2018 Cologne Ricin Plot: A New Threshold in Jihadi Bio Terror'.
[116] The Meir Amit Intelligence and Terrorism Information Center (ITIC), 'ISIS's Media Network: Developments in 2018 and Future Courses of Action' (The Israeli Intelligence Heritage and Commemoration Center, February 2019), 37, https://www.terrorism-info.org.il/app/uploads/2019/02/E_285_18.pdf; The Meir Amit Intelligence and Terrorism Information Center (ITIC), 'ISIS's Media Network in the Era after the Fall of the Islamic State' (The Israeli Intelligence Heritage and Commemoration Center, January 2018), 24–25, https://www.terrorism-info.org.il/app/uploads/2018/01/E_264_17fv.pdf.
[117] Karmon, 'The Radical Right's Obsession with Bioterrorism'.

4chan is an Internet platform and image-board that, in recent years, has become an infamous breeding ground for extreme political ideologies. One of 4chan's discussion boards called /pol/ ('politically incorrect') is particularly known in this regard.[118] The research identified a ricin recipe that was being distributed in several threads on the /pol/ board. This JPEG file, from now referred to as the '4chan recipe', seems to be widely available online. There exist two almost identical variations of this recipe. The only difference seems to be that one version seemingly includes the author of the recipe in the sub-heading, written 'By Koslo'. However, the author has not been able to identify who the alleged 'Koslo' is, and the versions distributed on 4chan does not contain this reference. It is also difficult to confirm the original publication of this recipe. Still, the apparent interest in the recipe among /pol/ board's members, expressing encouragements to use it to poison 'children and families of [military] officers',[119] makes it interesting to include in the further analysis.

SS Paladin

The document titled 'SS Paladin', is a collection of combat instructions, supposedly complied by a man called Vernon Itas. The handbook comprises, ironically, of 666 pages and contains clear anti-Semitic sentiments, proclaiming Jews as their main enemy.[120] The author has not been able to identify and confirm who Itas is. However, the document is allegedly based on 'SS Werwolf Combat Manual', which was originally a German book published by the SS management in 1945. An English version of this book was translated by Michael C. Fagnon in 1982.[121] The full 169 pages of the SS Werwolf is compiled in the newer SS Paladin.

Chapter 4: Presentation and analysis of data

4.1 Introduction

The analysis will be divided into three sub-sections, each presenting findings from the empirical research that can serve as an indication of VNSAs' competency. The first sub-section examines the various types of knowledge sources that are being distributed online to inform

[118] Emilija Jokubauskaitė and Stijn Peeters, 'Generally Curious: Thematically Distinct Datasets of General Threads on 4chan/Pol', in *Proceedings of the International AAAI Conference on Web and Social Media*, vol. 14 (International AAAI Conference on Web and Social Media (ICWSM 2020), Association for the Advancement of Artificial Intelli-gence, 2020), 863–867, https://ojs.aaai.org/index.php/ICWSM/article/view/7351/7205.
[119] Anonymous 4chan account, '"Man Beaten in Hospital by US Police"', 4chan, *No.209202074*, April 2019, https://archive.4plebs.org/pol/thread/209195707/#209202074.
[120] Vernon Itas, ed., 'SS Paladin: Combat Instruction Manual' (Paladin Press, July 2020), Telegram channel: Boogaloo Intel Drop, Stored with the author.
[121] Charles D. Melson, 'German Counter-Insurgency Revisited', *Journal of Military and Strategic Studies* 14, no. 1 (2011): 2, https://ciaotest.cc.columbia.edu/journals/jomass/v14i1/f_0025242_20621.pdf.

VNSA operational and tactical knowledge. This section looks at general trends for instructional material distributed on different online platforms, and is, therefore, not exclusive to biological threat agents. The second sub-chapter proceeds to analyse a selection of the bio-manuals identified post-2013 that have not been evaluated previously. Here, the author examines the level of innovation and technical quality demonstrated in these manuals. The third sub-section continues the examination of post-2013 manuals, and discusses the general sophistication demonstrated in these manuals. Each section will conclude with a discussion on what the findings might imply for VNSAs' current level of competency in biological agents.

4.2 Different sources of knowledge

The research has found that jihadi and extreme right online communities today are frequently redistributing old instructional material, or are obtaining operational and tactical knowledge from sources that are related to any VNSA. The different knowledge sources naturally provide VNSAs with various competencies and skills to enact terrorist attacks. The next section will, therefore, display and discuss some of the general trends seen in the instructional material distributed on the Internet platforms examined in this study. First, we will look at some of the identified knowledge sources that are seemingly not related to any VNSA but originates from a non-related third party. Then, the paper will investigate the trend of redistributing old VNSA instruction manuals. In turn, these observations will inform a discussion concerning the quality and innovation of the instructional material that is circulating among VNSAs today.

4.2.1 Instructional material from third party sources

The research has not identified any references to scientific literature to inform VNSAs' competencies or skills. This is interesting because scientific material arguably presents the source of highest quality, and academic papers containing useful information about CBRN agents in particular, are widely available online. However, utilising scientific sources usually requires more 'advanced laboratory facilities and skills' than crude low-tech recipes.[122] Thus, despite the technical sophistication of such information, and the increasing availability of biotechnology 'kits' and laboratory equipment,[123] VNSAs still seem to prefer the more simplistic, crude manuals. The same preference was noticeable among VNSAs in the early 2000s.[124]

[122] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 66–67.
[123] Ackerman and Jacome, 'WMD Terrorism'.
[124] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 69.

Old field manuals written and used by US governmental military forces on the other hand, are seemingly popular content in both right-wing and jihadist online communities. For instance, the right-wing document titled SS Paladin contains a bibliography referencing around twenty US Army field manuals that they are recommending to their readers. These include information about the 'Tactical Employment of Mortars', soldier skills and special forces operations, to mention some. Another example is the right-wing Telegram channel, 'Boogaloo Intel Drop', that has distributed several explosive- and weapon manuals from the US Army and DHS.[125] Also jihadists are showing interest in learning from tactics and knowledge presented in US field manuals. Evidently, the Tunisian jihadist and IS member, Muhammed S., had collected and downloaded 51 US Army manuals when he was detected in 2014.[126]

The information provided in official US Army manuals should be considered as reliable and of good technical quality, as they are written by and for US authorities. However, their target audience is presumably individuals with pre-existing knowledge and access to advanced equipment. Thus, it may require a certain level of pre-existing competency and access from the side of the perpetrator in order to beneficially utilise the instructions provided in these manuals. Consequently, if US field manuals are successfully utilised by a VNSA, there is reason to believe that this actor possess a certain level of competency.

Yet, it is important to note that the field manuals currently circulating among VNSAs online originates from the late 1900s, and the technological level demonstrated is necessarily reflective of its time. Nevertheless, the interest in these manuals among VNSAs should urge governments to be mindful as to the content they release to the public, knowing that it can serve as a source of inspiration and useful knowledge for actors with harmful intentions.

Today's VNSAs also show considerable interest in underground literature, such as paramilitary and survivalist handbooks. The current study has identified several paramilitary and survivalist books published after 2013 that are being distributed in online VNSA forums. The Telegram channel, 'Boogaloo Intel Drop', has for instance distributed a book titled, *Prepper's Armed Defense* by Jim Cobb, and *Ragnar's Urban Survival* by Ragnar Benson. It is also interesting to note that Kurt Saxon's infamous survivalist book, *The Poor Man's James Bond* published in the 1980s, is still being frequently distributed among VNSAs today.

[125] Examples are: Homeland Security 'Introduction to Explosives', Department of the Army Technical Manual (TM 31-210) 'Improvised Munitions Handbook' (original 1969, current volum 3.0 from 2007).
[126] Doornbos and Moussa, 'Recipes From the Islamic State's Laptop of Doom'.

Even though the technical quality of this literature naturally depends on the competencies of the authors, such content can potentially provide useful knowledge for VNSAs. An illustrative example of VNSAs' use of underground literature as a source of knowledge is Maxwell Hutchkinson's book titled, *The Poisoner's Handbook*. Several jihadist manuals, such as *The Mujahideen Poisons Handbook*, *The Manual of Afghan Jihad* and *The Encyclopaedia of Jihad*, are more or less direct translations of *The Poisoner's Handbook*.[127]

Moreover, regardless of the quality of the practical instructions provided, underground literature can also provide inspiration and justification for violence. The infamous book, *The Turner Diaries* written by William Luther Pierce under the pseudonym 'Andrew MacDonald' in 1978, serves as a dreadful evidence of the possible influence that underground literature may have on VNSAs. Europol assert that this book has, 'inspired attacks resulting in over two hundred deaths'.[128] Numerous Turner wannabes have also been arrested for, amongst other things, stockpiling biological weapons.[129]

Going through the 'Boogaloo Intel Drop' channel, the study finds distribution of literature that, despite not comprising of instructional content, can serve as a source of inspiration for its readers. One example is the novel titled *The Brigade*, written by the American neo-Nazi, Harold Covington, in 2007. This book is one of Covington's fictional novels, where a group of Americans living in a 'devastated 21st century America', join the Brigade and revolt.[130] *The Brigade* was distributed in a Telegram post together with *The Turner Diaries* and an English translation of *Mein Kampf* by Adolf Hitler, and is seemingly a part of the right-wing literature that promotes racist neo-Nazi ideology and can inspire violence.

The newer survivalist and underground literature identified in this study has yet to be traced back to CBRN manuals published by VNSAs such as Hutchkinson's book. Nevertheless, VNSAs' use of *The Turner Diaries* and *The Poisoner's Handbook* for inspiration and knowledge arguably gives reason to be aware of the content published in such literature.

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[127] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 63; Karmon, 'The Radical Right's Obsession with Bioterrorism', 17.
[128] Reed and Ingram, 'Exploring the Role of Instructional Material in AQAP's Inspire and ISIS'Rumiyah', 3.
[129] Camille Jackson, 'The Turner Diaries, Other Racist Novels, Inspire Extremists Violence', *Southern Poverty Law Center*, October 2004, https://www.splcenter.org/fighting-hate/intelligence-report/2004/turner-diaries-other-racist-novels-inspire-extremist-violence.
[130] Goodreads.com, 'The Brigade', accessed 10 May 2021, https://www.goodreads.com/book/show/4377158-the-brigade; Ryan Lenz, 'Harold Covington, Founder of White Separatist Group, Dies at 64', *Southern Poverty Law Center*, July 2018, https://www.splcenter.org/hatewatch/2018/07/25/harold-covington-founder-white-separatist-group-dies-64.

4.2.2 Redistribution of old VNSA manuals

Looking at CBRN instruction manuals seemingly written for the purpose of terrorism, VNSAs today seemingly prefers to redistribute old manuals rather than writing and publishing new manuals.

The right-wing Telegram channel, 'Boogaloo Intel Drop', demonstrates the frequent redistribution of instructional material and training manuals that was originally published by VNSAs several decades ago. Only the past year, the channel distributed *The IRA Handbook* issued in 1956,[131] *The Anarchist Cookbook* first published in 1971,[132] *The Mujahideen Explosives Handbook* from 1996,[133] The White Resistance Manual published in the early 2000s,[134] *The Turner Diaries* from 1978,[135] and *The Poor Man's James Bond* issued in 1991.[136]

The White Resistance Manual is one of the manuals that continuous to be redistributed in VNSAs' online communities. The document was originally published in the early 2000s, but this study found that the WRM is still being redistributed at the time of writing. The manual was, for instance, uploaded to the Telegram channel 'Boogaloo Intel Drop' in early January 2021. In addition to Telegram, the WRM has been widely distributed on platforms such as the white supremacist forums Stormfront, Gab and Bitchute in recent years.[137] Thus, despite presenting instructions based on the knowledge and technology available two decades ago, the WRM seemingly still informs the competency of VNSAs today.

4.3 Quality and innovation in post-2013 manuals

The current study has also identified a number of manuals concerned with biological threat agents that are seemingly not redistributions of other VNSAs' work, and are published after 2013. As explained in Chapter 3, however, some of the right-wing manuals were published before 2013 but are still included because they are considered relevant for the purpose of this research.

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[131] Irish republican Army General Headquarters, 'Handbook for Volunteers of the Irish Republican Army: Notes on Guerrilla Warfare', 1956, Telegram channel: Boogaloo Intel Drop, Stored with the author.
[132] William Powell, *The Anarchist Cookbook*, ed. P.M Bergman (New York: Barricade Books, Inc., 1971), https://cdn.preterhuman.net/texts/terrorism_and_pyrotechnics/explosives/MISC/Anarchist%20Cookbook%20-%20William%20Powell.pdf.
[133] Abdel Aziz, 'The Mujahideen Explosives Handbook', February 1996, FFI's archive of jihadi training manuals.
[134] White Resistance Manual, author unknown, 'White Resistance Manual', accessed 26 January 2021, https://usermanual.wiki/Document/WhiteResistanceManual.86687255/view.
[135] William Pierce Luther, *The Turner Diaries*, 1978.
[136] Kurt Saxon, *The Poor Man's James Bond*, vol. 1 (Alpena: Atlan Formularies, 1991).
[137] Karmon, 'The Radical Right's Obsession with Bioterrorism', 16–17.

The next section will look into a selection of these manuals and apply a comparative framework to evaluate the technical quality and look for indicators of innovation in the realm of VNSAs' biological threat agent competence. This part of the analysis will largely build on a comparison with a selection of the jihadist manuals studied by Stenersen and Lia, and Salama and Bursac, and their evaluation of these. The section will examine recipes for the biological agents; ricin, botulinum and oleander. Each section begins with a brief introduction of the relevant toxin and the manual in question, before the manual is thoroughly analysed in light of former VNSA manuals on the same toxin.

4.3.1 Ricin toxin

An instruction video for ricin published by Ibn Taymiyya Media Center in 2016 serves as the first subject of analysis. Ricin is the biological agent most frequently used in terror incidents, and serves as an attractive biological agent for VNSAs for several reasons.[138] First, ricin is found in castor beans, which is a cheap and easily available plant. Second, ricin is highly toxic and there is no antidote for treating intoxication.[139] Ricin has an estimated median lethal dose (LD50) of 1-20 milligram per kilo bodyweight (mg/kg) by oral ingestion, and 5.8 microgram per kilo bodyweight (ug/kg) through inhalation, making it a highly poisonous toxin.[140] It usually takes two hours for it to be absorbed into the body, and after 4-6 hours the intoxication is usually apparent.[141] A final factor which is important for VNSAs' preference for ricin, is the relative ease of producing the agent at a low price. Production is made easy because of the accessibility of the source plant, as well as the abundance of online instruction manuals explaining the production of ricin.[142]

ITMC' video serves as a highly relevant illustration of the current competency of VNSAs as these instructions allegedly were used to prepare the Cologne plot in 2018. The perpetrator, Sief Allah Hammami, planned to execute an attack using ricin. When the police raided his apartment, they found 3,150 castor beans in addition to 84.3 milligram of already extracted ricin. In preparing this attack, sources close to the investigation reported that

[138] Binder and Ackerman, 'Pick Your POICN'.
[139] P. Gopalakrishnakone and Mahdi Balali-Mood, eds., *Biological Toxins and Bioterrorism*, Toxinology, P. Gopalakrishnakone Ed.-in-chief ; 1 (New York, NY: Springer, 2015), 79–102, https://link-springer-com.ezproxy.lib.gla.ac.uk/referencework/10.1007/978-94-007-5869-8.
[140] Hsiao Ying Chen, Ling Yann Foo, and Weng Keong Loke, 'Abrin and Ricin: Understanding Their Toxicity, Diagnosis, and Treatment', in *Biological Toxins and Bioterrorism*, ed. P. Gopalakrishnakone et al., Toxinology (Dordrecht: Springer Netherlands, 2015), 79–102, doi:10.1007/978-94-007-5869-8_1.
[141] Gopalakrishnakone and Balali-Mood, *Biological Toxins and Bioterrorism*, 48–50.
[142] Koehler and Popella, 'Mapping Far-Right CBRN Terrorism Efforts in the West', 17.

Hammami was most likely following instructions from an online jihadist video from 2016.[143] Even though it is not stated which video they refer to, there is reason to believe that the video in question is ITMC' video that was reported by SITE May 11, 2016.[144]

The video produced and published by ITMC is almost nine minutes long. The instructions are presented in Arabic and Islamic '*nashīd*' is playing in the background throughout the video. The largest part of the video displays a set of hands that are performing the instructions, which are also written in subtitles at the bottom of the screen and simultaneously read by a technologically-manipulated dark voice.[145]

The instructions presented constitute a variation of the so-called 'acetone method' for extracting ricin. The acetone method is not new or innovative. Rather, this extraction method was introduced already in the 1980s by the American survivalist, Kurt Saxon. He presented two methods for extracting ricin, the acetone method and the 'salting out method'. These recipes were first introduced in one of Saxon's many paramilitary manuals and survivalist handbooks, called *The Poor Man's James Bond*. He later made a 20 minutes long video in English where he demonstrates the acetone approach.[146] Stenersen and Lia found in 2007 that all the ricin manuals they explored in their report described variations of the acetone method presented by Saxon.[147] Accordingly, the ricin video is not innovative in its content, nor in its format.

There are only minor differences in ITMC' video compared to the ricin recipes presented by former jihadist groups. Comparing ITMC' recipe with *The Poisons Encyclopaedia*,[148] ITMC seem to provide less detailed and concrete instructions to their audience. For instance, the video does not inform how many beans are being used in the recipe. In turn, when the viewer is instructed to add four times the amount of acetone as the amount of grounded beans, ITMC is leaving the preparer guessing what amounts are required. Also different is that ITMC suggest grinding the beans first and adding acetone afterwards, instead of grinding the two components together as suggested in *The Encyclopaedia of Poisons*. Yet,

[143] Flade, 'The June 2018 Cologne Ricin Plot: A New Threshold in Jihadi Bio Terror', 3.
[144] Site Intelligence Group Enterprise, 'ITMC Video Shows How to Make Ricin-Laced Cream, Explosives'.
[145] Ibn Taymiyyah Media Center, *ITMC ricin video*, Video, 2018, Accessed through FFI's archive of jihadi training manuals.
[146] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 68.
[147] Stenersen and Lia, 68.
[148] There are two versions of this manual. This paper uses the 60-page HTML version entitled 'Encyclopedia of Poisons'. The second version is an identical 99-page PDF document titled 'Comprehensive Course in Poisons and Poisonous Gases'. The only difference is that the former does not include pictures.

the same quantity of acetone is reportedly used in both recipes, and the remaining instructions are more or less the same. The two recipes are also unison in that the poison is contained in the beans and not the acetone, which has been a discussion in earlier recipes.[149] Overall, ITMC present an acetone formulation of the ricin recipe with only minor, and presumably non-significant, variations from older formulations.

In terms of delivering the toxic agent, ITMC' ricin video makes two suggestions. First, they suggest filling a knife sheath with a cream mixed with the homemade ricin extraction. This way, they say, 'whenever you take the dagger out it will be loaded with poison [*sic*]'.[150] Using a knife to deliver the poison arguably indicates that the amount of ricin produced is suitable for assassinations, killing one or a few individuals, and not suitable for being dispersed to a larger audience causing mass casualty and destruction.

A second dispersal method suggested briefly at the end of the video is spreading ricin in a *Triacetone Triperoxide* (TATP) bomb, referred to as an 'acetone peroxide' bomb. ITMC write that, 'those who will not die from the explosion will die [from] poison with the permission of Allah'.[151] This statement may indicate that the group intend to use the poison as a means to increase the effect of an already lethal conventional weapon, rather than as a 'bioweapon' per se. A perpetrator may wish to add the toxin for the sake of being able to call it bioterrorism. As mentioned previously, the connotations of the term itself can incite an intrinsic terror effect.

According to German police authorities, Hammami was planning 'to combine the deadly toxin [ricin] with a bomb'.[152] The type of bomb is not specified, but two bottles of acetone nail polish remover together with 250 grams aluminium powder and substances from fireworks was found in his home.[153] These findings can imply that Hammami was aiming to use a TATP bomb to disperse the ricin in the planned attack. A ricin- filled TATP bomb may cause more harm than using a knife, but a substantial amount of this damage is likely due to the explosion and not the necessarily biological toxin. Moreover, using any sort of explosive to disperse the ricin may risk that the protein is partially or fully deactivated by the explosion.

[149] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 68.
[150] Ibn Taymiyyah Media Center, *ITMC ricin video*.
[151] Ibn Taymiyyah Media Center.
[152] Christian Jokinen, 'Foiled Ricin Plot Raises Specter of "More Sophisticated" IS-Inspired Attacks', *Jamestown Foundation: Terrorism Monitor* 16, no. 16 (August 2018), https://jamestown.org/program/foiled-ricin-plot-raises-specter-of-more-sophisticated-is-inspired-attacks/.
[153] Jokinen.

In the early 2000s, online manuals on ricin included few instructions on how to weaponise ricin. Nevertheless, among the methods that had been suggested was poisoning food and injecting the toxin.[154] Other suggestions have involved rubbing hand cream containing ricin on doorknobs and spreading ricin powder through ventilation systems and in perfume.[155] Hence, the suggestions of using a ricin- laced knife or a TATP explosive have seemingly not been suggested for dispersing ricin previously. However, both weapons constitute low-tech and common choices of weapon used in terror plots.[156] None of the delivery methods suggested by ITMC are innovative and none of them seem to enable ricin to cause mass casualty.[157]

The tremendous technological developments witnessed since the acetone method was first introduced in the 1980s is, thus, not reflected in ITMC' instructions for producing and delivering the ricin toxin. This in spite of a major interest in ricin among VNSAs and an abundance of relatively easy accessible ricin manuals online. Indeed, the analysis of ITMC' video from 2016 reveals that there does not seem to be significant changes or innovation in VNSAs' competency with regards to the production or delivery or ricin. Rather, the video instructions used to prepare the plot in 2016 are based on the same low-tech instructions as presented in the 1980s.

Evaluations of similar ricin recipes presented by VNSAs conclude that these instructions do not reflect the tedious process required to extract and purify ricin.[158] Furthermore, a Spanish study testing the two extraction methods suggested by Saxon found that the acetone method yields low amounts of ricin, and the salting out method yields no ricin at all.[159] Salama and Bursac calls the instructions they identify for ricin for amateurish, and conclude that these will generate small amounts of crude agent.[160] Stenersen and Lia reach the same conclusion, thus, agreeing that ricin produced and delivered according to these manuals is unsuitable as a WMD. Yet, despite its limited potential of causing mass casualty and

[154] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 71.
[155] Stenersen, 'Al-Qaidas CBRN-oppskrifter på nett, 2007-2012 - innovasjon eller status quo?', 24.
[156] Petter Nesser and Anne Stenersen, 'The Modus Operandi of Jihadi Terrorists in Europe', *Perspectives on Terrorism* 8, no. 6 (2014): 12, http://www.jstor.org/stable/26297290.
[157] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 70–72.
[158] Stenersen and Lia, 53.
[159] René Pita Pita et al., 'Extracción de Ricina Por Procedimientos Incluidos En Publicaciones Paramilitares y Manuales Relacionados Con La Red Terrorista Al Qaeda', *Med. Mil*, 2004, 172–175, cited in Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals: A Real Threat?', 68.
[160] Salama and Bursac, 'Jihadist Capabilities and the Diffusion of Knowledge', 114.

destruction, the instructions can still be used to target a limited number of people in poisoning or assassinations and provoke disruptive societal consequences in this endeavour.[161]

4.3.2 Botulinum toxin

A manual on botulinum toxin published by al-Ṣaqrī in 2018 serves as a second illustration of VNSAs' competency in biological material. Botulinum toxin is considered the most toxic substance known and is produced by a bacterium called *Clostridium Botulinum* (C. botulinum) under low-oxygen conditions.[162] Botulinum toxin is an attractive threat agent for several reasons. First, C. botulinum is the substance with the lowest LD50 known, making it a very lethal toxin.[163] The lethal dose for humans is not known, but estimates by extrapolation from primate studies indicate that the toxicity of botulinum in humans is 1 ug/kg when taken orally and 10 nanogram per kilo weight (ng/kg) by inhalation.[164] Second, botulinum toxin is widely and easily obtainable, as it materialises under low-oxygen conditions. Third, delivering the toxin for terrorism purposes is relatively easy as the substance is odourless, colourless, and tasteless. Botulinum toxins are neurotoxic and can block nerve functions, leading to respiratory and muscular paralysis. Intoxication can be treated if treatment is started at an early stage but since the symptoms of infection are difficult to identify in the initial phase, it makes treatment difficult.[165]

Yet, botulinum toxin has intrinsic characteristics that makes 'production, purification, storage, transportation, and dispersion' difficult for an actor with minimal or no scientific training, especially if working under sub-laboratory conditions. The toxin's high decay rate and risk of exposure also constitute a prevalent challenge when working with botulinum.[166]

Al-Ṣaqrī has dedicated one full manual to explain how to produce and deliver the botulinum toxin. The manual consists of almost seven pages of instructions, warnings and advice regarding the toxin. Nonetheless, searching for paraphrased excerpts of al-Ṣaqrī's botulinum recipe, the author found that large parts of the manual were identical to a recipe

[161] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 68; Salama and Bursac, 'Jihadist Capabilities and the Diffusion of Knowledge', 114.
[162] B. Zane Horowitz, 'Botulinum Toxin', *Critical Care Clinics* 21, no. 4 (October 2005): 825–839, doi:10.1016/j.ccc.2005.06.008.
[163] World Health Organization [WHO], 'Botulism', who.int, January 2018, https://www.who.int/news-room/fact-sheets/detail/botulism.
[164] Stephen S. Arnon et al., 'Botulinum Toxin as a Biological Weapon: Medical and Public Health Management', *JAMA* 285, no. 8 (February 2001): 1061, doi:10.1001/jama.285.8.1059.
[165] Orlando Cenciarelli, Paul William Riley, and Agoritsa Baka, 'Biosecurity Threat Posed by Botulinum Toxin', *Toxins* 11, no. 12 (November 2019): 4–7, doi:10.3390/toxins11120681.
[166] Cenciarelli, Riley, and Baka, 4–7.

posted on an Arabic webpage called *chem.alafdal.net.*[167] The website does not appear to have any ideological affiliation or violent intentions. The text on this website is dated to the 6 May 2010, while al-Ṣaqrī published its plant manual in 2018. Hence, it can seem like al-Ṣaqrī has copied the instructions presented on *chem.alafdal.net* and used it in their botulinum manual eight years later.

The first three and a half pages of al-Ṣaqrī's manual is a verbatim copy of the *chem.alafdal.net* webpage. The information that al-Ṣaqrī has copied from *chem.alafdal.net* includes general information about the toxin, such as its lethal dose and time course until death. More importantly however, the production process presented in al-Ṣaqrī's manual is also copied from this webpage. The procedure presented comprises of step-by-step instructions explaining how to produce the botulinum toxin. It is also suggested to dispose of the equipment and clothing used during the production phase, recommending to soak it in gas and burning it.

The ingredients required in this recipe are corn, meat or fish slices, as well as horse or cattle faeces and water. The following instructions are a seemingly detailed procedure containing ten steps. The overall approach involves mixing meat with droppings or soil, then creating an anaerobic environment and leaving the substance for a number of days in a tempered place. This process will supposedly produce a brown substance that is described as the botulinum toxin.[168] Based on previous evaluations of this method from the early 2000s, there is reason to believe that al-Ṣaqrī's instructions present a variation of a crude and well-known extraction method for botulinum toxin.

Nevertheless, al-Ṣaqrī seemingly fail to provide their readers with possibly important information in their version of the botulinum recipe. The jihadi manual, *The Encyclopaedia of Poisons*, alleges that the botulinum poison 'will go bad 12 hours after exposure to the air'.[169] Seeing the toxin's high decay rate,[170] there is reason to believe that the toxin's effect decreases or disappears after come time in normal-oxygen conditions. If so, the lack of this information in al-Ṣaqrī's manual is an important limitation, and constitute a negative development, in the quality of botulinum manuals.

[167] Chem.alafdal.net, '"al-kīmīāʾ" (The chemistry)', chem.alafdal.net, May 2010, https://chem.alafdal.net/t8-topic.
[168] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 69.
[169] Islamic Media Center, 'Encyclopaedia of Poisons' (Islamic Media Center, December 2002), 8, FFI's archive of jihadi training manuals.
[170] Cenciarelli, Riley, and Baka, 'Biosecurity Threat Posed by Botulinum Toxin', 4–7.

A seemingly self-composed part of the manual, however, contains instructions for how to deliver the botulinum toxin. The first suggestion involves mixing the bacteria with a substance that can be applied to the skin. According to al-Ṣaqrī, this method is most efficient when mixed with a chemical substance. Specifically, they suggest mixing one milligram of the botulinum bacteria with two milligrams of *dimethyl sulfoxide* (DMSO). This chemical substance is known for its quality of quickly penetrating cell- and mucous membranes, making it a popular solvent.[171] Presumably, the idea is that mixing the botulinum toxin with DMSO will enable the skin to better absorb the substance, and thereby, increase the effect of the toxin.[172] Alternatively, they write that DMSO can be replaced with olive oil, which also has penetrative qualities.[173] The second suggestion involves poisoning food. Specifically, al-Ṣaqrī suggest that, 'if you work in a juice booth at the market and a kuffar comes to you, add a bit [poison] in it [the juice] through a very fine needle [*sic*]'.[174]

Al-Ṣaqrī's suggestions for delivering the poison through the skin using DMSO is based on an idea that is also presented in *The Encyclopaedia of Poisons*. Here, they allegedly experiment with poisoning a rabbit with botulinum using DMSO: 'We just rubbed the poison dissolved in "DMSO" on the back of rabbit's neck; he died after 42 hours after the symptoms were displayed.'[175] Both substances have been suggested as means to deliver biological toxins in several older VNSA manuals.[176] Poisoning of food is also a common suggestion for delivering biological toxins, for instance, suggested in *The Mujahideen Poisons Handbook.*[177] The botulinum manual from 2018, thus, does not demonstrate advancement or innovation in terms of delivering the biological material. Rather, al-Ṣaqrī suggest low-tech delivery methods that does not enable the toxin to cause mass casualty.

Evidently, al-Ṣaqrī's manual from 2018 does not present any significant changes or innovation in terms of production or delivery of botulinum. There are no indications of an increased competence among VNSAs related to the use of the toxin in bioterrorism. The recipe does not utilise new or advanced technology or knowledge to improve the quality or dispersal

[171] Martin Ystenes, 'Dimetylsulfoksid', *Store Norske Leksikon*, May 2018, https://snl.no/dimetylsulfoksid.
[172] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 71.
[173] Vytis Čižinauskas et al., 'Skin Penetration Enhancement by Natural Oils for Dihydroquercetin Delivery', *Molecules* 22, no. 9 (September 2017): 1536, doi:10.3390/molecules22091536.
[174] Al-Ṣaqrī Foundation for Military Sciences, 'Toxic Warfare, Kill Them Silently: Botulinum Poison' (Downloaded from archive.org, November 2019), 6, Stored with the author, https://archive.org/details/20191106_20191106_0410.
[175] Islamic Media Center, 'Encyclopaedia of Poisons', 8.
[176] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 64, 94, 101.
[177] Stenersen and Lia, 71.

of the product. Instead, this is a crude recipe that utilises low-tech methods for producing and delivering the botulinum toxin.

A theoretical evaluation made by CBRN scientists at FFI of the production approach explained for botulinum toxin above, conclude that these instructions do not reflect the necessary level of technical knowledge and competency to produce botulinum toxin. Indeed, it has been pointed out that, 'The process of isolating the correct strain of C. botulinum is in reality very complex.'[178] Similar evaluations of these botulinum recipes are seconded by Salama and Bursac. They find that the botulinum instructions circulating among VNSAs are valid but, nevertheless, that 'the process is very difficult to master'.[179] The quality of the produced agent is considered crude and possibly non-functioning.[180]

One example of the lack of competency in C. botulinum among VNSAs is the belief uttered in many of the manuals that the brown substance produced in the extraction process is the botulinum toxin. This is a myth according to Stenersen and Lia. Rather, the production process that continues to be spread today will most likely yield a host of different bacteria that may be lethal.[181] However, 'there is no guarantee that the toxin-producing strain of Clostridium botulinum will be among them.'[182] Yet, al-Ṣaqrī write that, 'these brown crystals are known as the poison'.[183] Thus, this myth seems to live on among VNSAs today, highlighting the lack of competency on the subject.

4.3.3 Oleander toxin

The only recipe identified in this study that is not among the biological toxins found and analysed in previous qualitative studies of VNSA manuals is al-Ṣaqrī's recipe for extraction of poison from the oleander plant. Nerium Oleander (N. oleander) is a toxic plant that has its habitat mainly in regions around the Mediterranean Sea in Africa and Europe, where it grows as bushes or small trees. However, the shrub is also commonly available in other countries as ornamental plants.[184] All parts of the plant are considered highly toxic, containing various toxins such as the cardiac glycosides, oleandrin and neriin. Thus, ingesting or being exposed

[178] Stenersen and Lia, 70.
[179] Ackerman and Tamsett, *Jihadists and Weapons of Mass Destruction*, 114.
[180] Ackerman and Tamsett, 114.
[181] Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 76.
[182] Stenersen and Lia, 69–70.
[183] Al-Ṣaqrī Foundation for Military Sciences, 'Al-ṣaqri botulinum manual', 4.
[184] Rania H. Abdou, Walaa A. Basha, and Waleed F. Khalil, 'Subacute Toxicity of Nerium Oleander Ethanolic Extract in Mice', *Toxicological Research* 35, no. 3 (July 2019): 233–239, doi:10.5487/TR.2019.35.3.233.

to any part of the plant in dried, smoked or fresh form may result in serious illness or death.[185] Depending on the extraction method, scientific studies of oleander's estimated LD50 ranges from 62.6 mg/kg to 1164.8 mg/kg in one study,[186] while other studies estimate LD50 to be 157 mg/kg[187] and 350 mg/kg.[188] Since it is difficult to know exactly which of the plant's toxins al-Ṣaqrī's recipe elicits, the various toxic properties in the oleander plant will be discussed under the umbrella term 'oleander toxin'.

The commonality of the plant in Southern and Mediterranean parts of the world has made oleander poisoning a common problem in certain societies.[189] In the early 2000s, for instance, the oleander seed became a popular method of suicide in Sri Lanka. For a time, there were thousands of such cases every year.[190] The lethal dose and time course reported has varied a great deal in each case, but incidents of suicide have proven that one oleander seed can be lethal for humans.[191] Despite the plant's well-known toxic qualities, there has not been any attempts at using the oleander toxin in relation to terrorism events thus far, according to the POICN database.[192]

The lack of concrete instructions for how to extract and use this toxic plant for terrorism purposes in previous studies, may suggest that this recipe serves as the most innovative contribution to VNSAs' competency on biological agents identified after 2013. The next section, therefore, includes a thorough analysis of the oleander recipe presented in al-Ṣaqrī's

[185] Renee Miller, 'How Toxic Is Oleander to Humans?', *SF Gate* (blog), December 2018, https://homeguides.sfgate.com/toxic-oleander-humans-82304.html; Ibraheem Khan et al., 'Acute Cardiac Toxicity of Nerium Oleander/Indicum Poisoning (Kaner) Poisoning', *Heart Views* 11, no. 3 (2010): 115–116, doi:10.4103/1995-705X.76803.
[186] Ali A Al-Khayyat, Lubna A Kafi, and Rana A Sailh, 'Study of Acute Toxicity of Different Preparation of Oleander Leaves in Mice', *Basrah Journal of Veterinary Research* 7, no. 2 (2008): 1–6, https://www.iasj.net/iasj/download/1ad0073a7ec24ed8.
[187] B. A. Al-Badrani, M. S. Rhaymah, and M. I. Al-Farwachi, 'Acute Toxicity of Nerium Oleander Aqueous Leaf Extract in Rabbits', *Iraqi Journal of Veterinary Sciences* 22, no. 1 (June 2008): 1–4, doi:10.33899/ijvs.2008.5665.
[188] Ali Aziz Alkhayyat, Lubna Ahmed Kafi, and Zena Ahmed Hatif, 'Acute Toxicity Study of Three Type of Nerium. Oleander Leaves of Hexane Extract in Mice', *The Iraqi Journal of Veterinary Medicine (ISSN-P: 1609-5693 ISSN-E: 2410-7409)* 34, no. 2 (2010): 194–201, https://iasj.net/iasj/download/52dcebbb56d77007.
[189] Abdou, Basha, and Khalil, 'Subacute Toxicity of Nerium Oleander Ethanolic Extract in Mice'.
[190] M. Eddleston et al., 'Epidemic of Self-Poisoning with Seeds of the Yellow Oleander Tree (Thevetia Peruviana) in Northern Sri Lanka', *Tropical Medicine & International Health* 4, no. 4 (1999): 266–273, doi:https://doi.org/10.1046/j.1365-3156.1999.00397.x.
[191] Eddleston et al.; Silje Bryne, 'Fikk ikke se på TV - begikk selvmord', April 2006, https://www.dagbladet.no/nyheter/fikk-ikke-se-pa-tv---begikk-selvmord/66205142.
[192] Markus K. Binder et al., 'Profiles of Incidents Involving CBRN and Non-State Actors (POICN) Database', START, accessed 20 November 2020, https://www.start.umd.edu/research-projects/profiles-incidents-involving-cbrn-and-non-state-actors-poicn-database.

plant manual. First, however, we will give a brief overview of the remaining parts of al-Ṣaqrī's plant manual.

Al-Ṣaqrī's plant poison manual is part of the Toxic Warfare series. The plant manual contains references to eleven plants but oleander is the only plant included with instructions on how to produce and use the plant to harm others. Moreover, the oleander instructions also seem to be the only part of the plant manual that is produced by al-Ṣaqrī. As seen in al-Ṣaqrī's botulinum manual, their plant manual also comprises of a combination of self-composed text and text directly copied from seemingly non-related sources.

A Google search manifests that the brief information provided about each of the other ten plants is identical to a text found on an Arabic-language, presumably non-jihadi webpage called *cloob.com*. *Cloob.com* is a Persian webpage launched in December 2004. According to its founders, it seeks to function as a platform for Iranians to exchange information and services, and promote Iranian public opinion and culture around the globe.[193] Despite being a Persian webpage with Iranians as their target audience, the relevant text is written in Arabic. The text it titled 'the ten most poisonous plants on the face of the earth', and the general information provided about each plant does not contain instructions or encouragements to use the toxic plants to harm or poison others.[194]

The text on *cloob.com* was reportedly posted 25th of August 1992. However, seeing that the website was established in 2004, this seems rather unlikely. Due to the lack of accurate information regarding the date of which the information was published on *cloob.com*, it is not possible to know where the information was published first. Thus, we cannot know whether extremists have adopted information that was originally intended for non-violent purposes, or vice versa. The fact that this ricin recipe is presented without suggesting any means of delivery can imply the former. Yet, there is also a chance that extremists are using non-associated forums to spread the instructions in order to decrease the risk of the content being detected and taken down from the Web.

Nevertheless, a large part of al-Ṣaqrī's plant manual is a verbatim copy of the content, including text and images of the plants, derived from *cloob.com*. This part of the plant manual, thereby, does not provide practical information for how to use the biological toxins in terrorism,

[193] Cloob.com, '"About Cloob.com"', Cloob.com, accessed 25 June 2021, https://www.cloob.com/about.
[194] Cloob.com, ''The ten most poisonous plants on the face of the earth'', Cloob.com, August 1992, https://www.cloob.com/c/mena_alhurea/89001504.

nor does it directly encourage or justify using biological material in terrorism. Yet, being a part of al-Ṣaqrī's Toxic Warfare series, there is arguably an intrinsic encouragement to utilise the material for violent purposes. Nevertheless, the lack of instructional information regarding how the plant toxins can be extracted and delivered in a terrorist attack, arguably makes it difficult for a VNSA without relevant pre-existing knowledge on the topic to benefit from this part of the plant manual.

The oleander recipe in the plant manual comprises of approximately six pages of instructions that, according to al-Ṣaqrī, 'no one has mentioned before'.[195] The recipe begins by informing the readers of where the plant can be obtained. Interestingly, al-Ṣaqrī specify that 'She [the oleander plant] is numerous in the streets of Saudi Arabia, Libya, Tunisia and Lebanon'.[196] This can be seen as an encouragement directed towards supporters in those specific countries, as the oleander plant indeed can be found in numerous other countries, as well as being purchased online.

The ingredients required for producing the toxin is, according to the recipe, distilled water and 200 grams of oleander root. Alternatively, they write, 'if there are no roots, it is possible to use 300 grams of the leaves and branches'.[197] The further instructions provided by al-Ṣaqrī constitute a detailed description of how, allegedly, to extract poison from the oleander plant. The procedure involves, first, that the plant is cleaned for dirt and grinded with a hammer or a flourmill. Subsequently, the recipe instructs adding half a litre of water together with the grinded plant in a vessel. The following process involves boiling this mixture on low heat to reduce the liquid in three rounds. The mixture is then taken off the heat and filtered through a sock or a piece of fabric so the water drips into a vessel. The vessel, now only containing filtered water, is then put back onto the heating source until there is left five to ten millilitres of liquid. This is supposedly the poison.

Al-Ṣaqrī also present another set of instructions that are modified, allegedly, to make it suitable for producing the poison in areas with high surveillance. According to al-Ṣaqrī, the process above produces an unpleasant, though not harmful, smell. This second version of the recipe seemingly seeks to avoid that 'the neighbourhood notices something weird [*sic*]',[198]

[195] Al-Ṣaqrī Foundation for Military Sciences, 'And Prepare Against Them' (Downloaded from archive.org, November 2019), 5, Stored with the author, https://archive.org/details/20191105_20191105_0308.
[196] Al-Ṣaqrī Foundation for Military Sciences, 'Toxic Warfare, Kill Them Silently: Plant Poisons' (Downloaded from archive.org, November 2019), 2, Stored with the author, https://archive.org/details/20191106_20191106_0410.
[197] Al-Ṣaqrī Foundation for Military Sciences, 3.
[198] Al-Ṣaqrī Foundation for Military Sciences, 5.

presumably referring to the smelly steam. For this reason, al-Ṣaqrī advise to use isopropyl alcohol instead of distilled water when producing the toxin. The remaining instructions are otherwise similar, using the same quantities of the plant, grinding it and adding the substance in a vessel together with half a litre of isopropyl alcohol. The vessel is then carefully closed and placed in a warm environment, for instance in the sun. They claim that this is 'not dangerous because the isopropyl alcohol boils at 80 degrees Celsius [*sic*]'.[199] Thus, the logic seems to be that applying isopropyl alcohol can replace the boiling process and, thereby, avoid the smelly steam produced during boiling. In turn, this is supposed to prevent the operation from being revealed. A third alternative that al-Ṣaqrī briefly mention is the possibility of using the original recipe with distilled water but in smaller quantities, and boiling it on a lower temperature. The final suggestion also seems to have the same aim, namely to avoid the smelly steam revealing the operation.

It is possible to get a certain understanding of the quality that these extraction methods present by comparing them with scientific research on the oleander plant. A study from 2008, for instance, experiments with three different methods of preparing dried oleander leaves and measures their respective LD50 for oral administration. The study finds that LD50 for hexane extract is 62.6 mg/kg, while for ethanol extract LD50 is 521 mg/kg and leave suspension has an estimated LD50 of 1164.8 mg/kg.[200] Thus, it is apparent that the process in which the toxin is prepared is important for the quality of the oleander extraction.

Based on the abovementioned study, it is evident that it is more efficient to extract toxins from the oleander plant using organic solvents such as hexane or alcohols, rather than water, which is used in the leave suspension. Hence, the main approach described in al-Ṣaqrī's recipe using distilled water seems to elicit the least toxic extraction. The second approach that is suggested to avoid detection, on the other hand, uses isopropyl alcohol to extract the toxins and can therefore seem to have a more lethal potential.

There have been numerous cases of oleander poisoning demonstrating the potentially lethal consequences of ingesting a part of the plant. A valid question is therefore, whether this extraction process is necessary for using the plant in bioterrorism, or if it would be just as effective to use crushed seeds or finely chopped leaves in its natural form. The WRM mentions the oleander plant briefly as part of its poison section. Interestingly, this manual does not

[199] Al-Ṣaqrī Foundation for Military Sciences, 6.
[200] Al-Khayyat, Kafi, and Sailh, 'Study of Acute Toxicity of Different Preparation of Oleander Leaves in Mice'.

suggest going through any process of extraction of the oleander toxin. Rather, the WRM suggests using the plant in its dried form: 'Dried leaves can be crushed into powder and applied by ingestion, dosage should be the powder of 3-4 leaves.'[201] Arguably then, the WRM is implying that the plant can be efficiently used for harmful purposes without the extraction process.

The purpose of an extraction process is to concentrate the toxic properties of the material. Thus, the LD50 will in theory remain the same as in the plant's natural form, but if an extraction process is successful, it will require smaller amounts of it to achieve a potentially lethal outcome. The WRM's suggestion to use dried oleander leaves can in theory be equally as lethal as the extraction, but whether three to four leaves are enough to intoxicate an adult human being is difficult to say. Still, although water seems to have a lower solubility for botulinum than an alcoholic solvent, there is reason to believe that the process will concentrate some of the plant's toxic properties. Subsequently, extracted oleander toxin will in theory require smaller dosages to make it lethal than the plant in its natural form. However, this will depend on how much of the toxin is soluble in the solvent used. It would necessitate testing of al-Ṣaqrī's recipe to know exactly how much oleander toxin will materialise in the liquid through the different extraction processes, and how will remain in the actual plant.

Furthermore, it is reasonable to question what level of innovation and competence this 'new' recipe actually constitutes. The process of boiling and filtering in order to extract a biological toxin is a relatively common and low-tech procedure. The same is for instance suggested in an old recipe for nicotine poison.[202] Therefore, it is difficult to ascertain whether al-Ṣaqrī's oleander recipe is actually original and innovative, based on testing and experimenting by al-Ṣaqrī, or if they have put together a recipe based on inspiration from earlier recipes on biological agents. Regardless, the recipe still presents a low-tech crude method for extracting the toxic agent.

A Youtube video by a gardening enthusiast serves as a final remark as to the level of innovation presented in al-Ṣaqrī's oleander recipe. A Google search quickly demonstrates that al-Ṣaqrī are not the only people discussing the production of oleander poison online. In September 2018, a video series in six parts was published on Youtube where an account called

[201] White Resistance Manual, author unknown, 'WRM', 255.
[202] See for instance translation of a nicotine recipe in: Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals', 94.

'Bayou Chic Gardening' demonstrates 'How to make Poison: Oleander'.[203] This Youtube series was posted a couple of months after SITE reported that al-Ṣaqrī had published their plant manual. Yet, Bayou Chic Gardening is seemingly a gardening enthusiast extracting oleander toxin for medical purposes, and thus, it is doubtful that she has used, or is familiar with al-Ṣaqrī's recipe. Despite having the opposite intention for publishing instructions for oleander extraction and presumably not having knowledge of each other, Bayou Chic Gardening and al-Ṣaqrī present very similar procedures for extracting the oleander poison.

In terms of delivering the poison, al-Ṣaqrī propose applying the mixture on the handle of a car or a door. However, this method is subsequently ruled out due to the dark colour of the substance, presumably making it easy to detect. Al-Ṣaqrī therefore encourage poisoning food or beverages by adding one spoon of the mixture in 'food, coffee or black soda'.[204] These are common and widespread ideas for weaponising biological agents.[205] Yet, oleander is known to have a strong bitter taste, which gives reason to be sceptical of the practicality of this delivery method for oleander.[206] Failure to accommodate for this consideration can arguably serve as an indication of al-Ṣaqrī's limited knowledge on the subject.

Naturally, poison in liquid form has its advantages in terms of delivering the toxin. Yet, despite its alleged new and innovative nature, al-Ṣaqrī's oleander recipe seems to constitute yet another crude and simplistic recipe for biological threat agents circulating among VNSAs. They continue to prefer using low-tech delivery mechanisms and easily available equipment and material, creating threat agents that are suitable for assassinations or poisoning of a limited group of individuals, rather than aiming to create a WMD.

4.4 General sophistication

Instances of typing errors and lack of relevant information in the manuals also serve to strengthen the theory of the VNSAs' low level of competence with regards to biological threat agents. For instance, al-Anfāl's numbered step-by-step instructions for 'Obtaining ricin poison' is missing step number four of their instructions.[207] The information missing is seemingly not

[203] 'Bayou Chic Gardening', *1/6 How To Make Poison : Oleander Step 1*, Video, vol. 1, How to Make Poison: Oleander, 2018, https://www.youtube.com/watch?v=Ko8MnLbhyAA.
[204] Al-Ṣaqrī Foundation for Military Sciences, 'Plant Poisons Manual', 7.
[205] Stenersen, 'Al-Qaidas CBRN-oppskrifter på nett, 2007-2012 - innovasjon eller status quo?', 24.
[206] Christeine Ariaranee Gnanathasan, 'Oleander Poisoning', in *Plant Toxins*, ed. P. Gopalakrishnakone, Célia R. Carlini, and Rodrigo Ligabue-Braun (Dordrecht: Springer Netherlands, 2016), 17, doi:10.1007/978-94-007-6728-7_22-1.
[207] Al-Dar' al-Sunnī Foundation, 'Obtaining Ricin Poison', *Al-Anfāl*, January 2018, Stored with the author, https://fliphtml5.com/keycu/fmoc/basic.

of significance for the quality of the final product and there is an abundance of ricin manuals easily available online that can compensate for this shortcoming. Nevertheless, it is interesting that al-Anfāl magazine, being a part of IS' media network, is missing an obvious part of the recipe. More so, the magazine is known to instigate lone wolf attacks.[208] Yet, their ricin recipe does not provide suggestions or encouragements for delivery of the toxin in an attack, arguably serving as a limitation of their attempt at enabling and encouraging attacks by their supporters.

The ricin recipe circulating on the infamous /pol/ board on 4chan is illustrative of the amateurish and unprofessional language seen in several manuals. First, the recipe seems to contain a typing error that can cause confusion for the reader, presumably writing 24 instead of 14. The reader is thereby instructed to repeat steps 12 to 24 of the recipe, even though the recipe only contains 15 steps. The 4chan recipe also utilises a language that seems amateurish and unprofessional. For instance, the author suggests to remove the skin of the castor beans by, 'using your fingernail or something'.[209] Another set of instructions informs the reader to blend the inside of the bean pulp with acetone 'until it looks like milk'.[210] These are examples of the amateurish and, indeed, non-scientific language and tone present in some manuals. In turn, these characterises can indicate that the recipe is written by an amateur and that the competency demonstrated may be correspondingly poor.

There are also instances of directly incorrect information presented in the manuals. In the 4chan recipe, for instance, the reader is informed that there is a cure for the ricin toxin, however, being 'rare and expensive'.[211] This contradicts the scientific literature, clearly agreeing that there does not exist an antidote for ricin.[212] Another such incorrect statement is found in the beginning of the recipe, writing that ricin is 'the deadliest poison known to man'.[213] Indeed, botulinum has a lower LD50 than ricin.[214] Despite not directly impacting the quality

[208] The Meir Amit Intelligence and Terrorism Information Center (ITIC), 'ISIS's Media Network: Developments in 2018 and Future Courses of Action', 37.
[209] 4chan ricin recipe (author unknown), 'Ricin: A Step by Step Process' (4chan (archived on 4plebs), April 2019), Stored with the author, archive.4plebs.org, https://i.4pcdn.org/pol/1541763147035.jpg.
[210] 4chan ricin recipe (author unknown).
[211] 4chan ricin recipe (author unknown).
[212] See for instance: Gopalakrishnakone and Balali-Mood, *Biological Toxins and Bioterrorism*; Gudrun Høiseth, 'Forgiftning med ricin', *Tidsskrift for den norske lægeforeningen* 125, no. 2449 (September 2005), https://tidsskriftet.no/2005/09/forsidebildet/forgiftning-med-ricin; Kerrie L. May, Qing Yan, and Nilgun E. Tumer, 'Targeting Ricin to the Ribosome', *Toxicon (Oxford)* 69, no. Journal Article (2013): 143–151, doi:10.1016/j.toxicon.2013.02.001.
[213] 4chan ricin recipe (author unknown), '4chan Recipe'.
[214] Horowitz, 'Botulinum Toxin', 825.

of the toxin produced, the incorrect information highlights the low competence of the author and thereby gives reason to doubt the quality of the recipe in general.

4.5 Conclusion

The chapter has found that a substantial part of the instructional material currently circulating in jihadi and extreme right-wing communities online originates from third party sources and is not written by any VNSA for the purpose of terrorism. Moreover, of the instructional material published by VNSAs, a considerable part of it originates from late 1900s or early 2000s. If these findings are representative for the competency of today's VNSAs, it might imply that they do not possess the necessary competency or interest to take advantage of the technological developments to improve their bioterrorism capability.

By conducting a comparative analysis looking at manuals described and evaluated approximately ten years ago and comparing them with manuals published after 2013, it is apparent that most of the manuals published today present recipes that are variations of the same recipes presented in older VNSA manuals. Based on the empirical evidence in this study, we find that the level of innovation and technical quality in the manuals published after 2013 is correspondingly low. In turn, the low level of innovation and technical quality may imply that VNSAs continue to possess limited competency on biological material in spite of the rapid technological developments and the increasing accessibility to equipment and sources of knowledge for VNSAs.

The chapter manifests that the current manuals published by ITMC and al-Ṣaqrī on ricin, botulinum and plant poisons respectively, comprise of production- and delivery instructions that are not new nor innovative. Combined with a general low level of sophistication and technical quality, there are no indication of an increased competency among VNSAs' competency on biological threat agents. The most innovative contribution to VNSAs' biological toxin competency the last ten years is seemingly al-Sari's oleander recipe. However, an assessment of the technical sophistication and innovation of these instructions reveal that the oleander recipe also uses well-known, low-tech methods for producing and delivering the toxin.

The continuous use of these old and low-tech methods, despite new technology and increasing access to information and equipment, would arguably be warranted if the instructions were of high quality. However, a technical assessment of the instructions has found

that they demonstrate a low level of technical sophistication, which further highlights a low level of competency.

Chapter 5: A discussion on the current and future threat of bioterrorism

5.1 Introduction

Based on the source material analysed in this study, there are no indicators implying that today's VNSAs possess an improved competency to engage in advanced bioterrorist attacks. In the broader CBRN terrorism literature, this is an interesting finding because it contradicts the argument supported by many terrorism scholars, saying that there will be an increased threat of CBRN terrorism buttressing the rapid technological developments.[215] Indeed, the empirical evidence in this study shows that there is not a necessary correlation between the room of opportunities enabled by new technology and VNSAs' competency or aspiration to utilise such technology. This chapter will discuss some aspects that potentially can explain why we are not seeing innovation and use of new technology reflected in VNSA current manuals. Finally, the paper will discuss the future prospect of the bioterrorism threat based on the findings of this research.

5.2 Online instruction manuals as a poor indicator of VNSAs' competency?

As mentioned before, this study covers a selection of manuals that has been attainable to the author. Accordingly, there may exist discussions and manuals circulating in the online sphere that could result in a different assessment of VNSAs' bioterrorism competency. Accentuating this explanation, Marone argues that VNSAs' fear of being monitored leads to an apprehension towards sharing certain material on open online platforms.[216] His argument seems to be supported in a thread from 4chan's /pol/ board, where an account distributing explosive- and ricin manuals is accused of being CIA: 'this users ID is CIA, gtfo [get the fuck out] [of] here glow nigger /pol/ is a board of peace'.[217] Such statements highlights the possibility that VNSAs may be distributing more technologically advanced and innovative bio-manuals through means of private communication.

The terror plot in Indonesia involving the biological agent, abrin, serves to reinforce this theory. In 2019, a cell of the pro-IS network, Jamaah Ansharut Daulah (JAD), planned to

[215] See for instance: Anthony and Su, 'Reassessing CBRN Threats in a Changing Global Environment'; Koehler and Popella, 'Beware of CBRN Terrorism - From the Far-Right'; Giorgidze and Wither, 'Horror or Hype: The Challenge of Chemical, Biological, Radiological, and Nuclear Terrorism'.
[216] Marone, *Digital Jihad*.
[217] Anonymous 4chan account, '"Man Beaten in Hospital by US Police"'.

use abrin in a suicide bomb attack. The attack was foiled, but the police found 310 grams of rosary pea seeds, which is the source plant of abrin. The police also seized a highly explosive bomb, indicating that they intended to disperse the toxin using a bomb.[218] This accentuates a limitation of the study and, accordingly, we need to acknowledge that the manuals identified for this research might represent a fraction of the relevant instruction material that exist in the online sphere.

In spite of the Indonesian terror plot, abrin is not extensively discussed in VNSA manuals published online. More so, manuals for abrin have been absent from the online sphere frequented by Indonesian militants.[219] Only two of the manuals identified in this study refer to abrin but these instructions are scarce. Al-Ṣaqrī briefly mention abrin in their plant manual, writing that, 'if you bite and swallow her [the seeds] you will be on you path to death after a very short period'.[220] The second manual mentioning abrin is the WRM, where a recipe for abrin is discussed as one and the same as for ricin: 'The [abrin] seeds should be processed in a similar fashion as the castor bean (Ricin).'[221] The instructions provided for ricin and abrin in the WRM are based on the acetone method. The assumption that the qualities of ricin and abrin are so similar that the same extraction method can be used for both agents is not new but was also seen in an older manual titled *Military Studies in the Jihad Against the Tyrants*, for example.[222]

Abrin, a toxic protein found in the *Abrus Precatorius* plant, does share numerous similarities with the more well-known ricin toxin.[223] Notably, although ricin is more known and commonly used in terrorism thus far, abrin has very similar qualities and is easily available at a low cost.[224] However, abrin is much more toxic than ricin. While abrin's LD50 for humans by oral ingestion is estimated to be 0.1-1 mg/kg, the same for ricin is 1-20 mg/kg.[225] If it is true that one can simply replace ricin with abrin and use the same recipe as suggested in the WRM,

[218] Arianti, 'Biological Terrorism in Indonesia'.
[219] Arianti.
[220] Al-Ṣaqrī Foundation for Military Sciences, 'Plant Poisons Manual', 9.
[221] White Resistance Manual, author unknown, 'WRM', 252.
[222] Jerrold M. Post, ed., 'Military Studies in the Jihad Against the Tyrants: The Al-Qaeda Training Manual', *USAF Counterproliferation Center, US Air Force*, 2004, 155, https://www.airuniversity.af.edu/Portals/10/CSDS/Books/alqaedatrainingmanual2.pdf; Stenersen and Lia, 'Al-Qaida's Online CBRN Manuals'.
[223] Kirsten J Dickers et al., 'Abrin Poisoning', *Toxicological Reviews* 22, no. 3 (2003): 137–142, doi:10.2165/00139709-200322030-00002.
[224] Arianti, 'Biological Terrorism in Indonesia'.
[225] Diana Pei, 'Are Rosary Peas Poisonous?', *National Capital Poison Center*, Poison Control, accessed 1 July 2020, https://www.poison.org/articles/are-rosary-peas-poisonous-194.

it is interesting that abrin has not been more used in terror plots seeing it has a much more lethal potential than ricin.

Observers have pointed out that the abrin plot in 2019 extensively resembled the ricin plot in Cologne in 2018, emphasising that both plots sought to use a bomb filled with abrin and ricin, respectively.[226] Hence, the abrin case might imply that there is a general consensus in the jihadi community surrounding the similarities between ricin and abrin, even though this is not clearly communicated in online instruction manuals. The lack of this information in newer manuals, if accurate, is arguably an important limitation and can illustrate a lack of knowledge and competence on the subject among VNSAs. On the other hand, the abrin plot can also be seen as an illustration of an inherent limitation of studying manuals, highlighting the possibility that VNSAs may possess knowledge and competency that is not reflected in online manuals.

It should be noted that the similarities between the two may also be a coincidence. This theory is supported by the fact that explosive devices are common weapons used by jihadists in terrorism.[227] Nevertheless, the case indicates at least that the idea of using abrin as an agent in terror attacks is an idea among some jihadists despite not being reflected in online instruction manuals.

5.3 VNSAs' adoption of emerging technologies

A second possible explanation that may elucidate the lack of innovation and improvement in the newer manuals analysed in this study, relates to the issue of technology adoption by VNSAs. Indeed, it is important to note that even though this study has not found manuals containing instructions or references to any new and emerging technologies, several intelligence reports manifest that there is an interest in new technologies among VNSAs online. For instance, SITE has reported that minorities have been targeted with 'genetically engineered bioweapons'.[228] The monitoring service has also reported that instructions explaining 3-D printing of an 'untraceable firearm' have been distributed by right-wing groups,[229] and that jihadists have distributed tutorials demonstrating drop mechanisms for drones.[230] These reports

[226] Arianti, 'Biological Terrorism in Indonesia'.
[227] Nesser and Stenersen, 'The Modus Operandi of Jihadi Terrorists in Europe', 6.
[228] Site Intelligence Group Enterprise, 'Minorities Targeted with Genetically Engineered Bioweapons'.
[229] Site Intelligence Group Enterprise, 'Far-Right Group Distributes Instructions for 3D Printing Untraceable Firearm', SITE [Guide Tracker], May 2020, https://ent.siteintelgroup.com/Guide-Tracker/far-right-group-distributes-instructions-for-3d-printing-untraceable-firearm.html.
[230] Site Intelligence Group Enterprise, 'Jihadist Distributes Tutorials on Drop Mechanisms for Drones', SITE [Guide Tracker], April 2019, https://ent.siteintelgroup.com/Guide-Tracker/jihadist-distributes-tutorials-on-drop-mechanisms-for-drones.html.

illustrate that there are VNSAs in the online sphere with an interest and, in worst case, competency to utilise newer technologies for violent purposes.

The 2019 terrorist attack in Halle, Germany, further accentuates VNSAs' interest and use of new technology. The perpetrator, Stephan Baillet, allegedly manufactured three weapons using, amongst other material, 3-D-printed plastic components. Even though his weapons jammed three times, presumably saving several lives and arguably highlighting the challenges related to technology adoption for VNSAs, the significance of this event should not be underestimated. As the following section will demonstrate, the Halle attack can be seen as an early warning of VNSAs' attempt at exploiting the 3-D technology for terrorist purposes.[231] Indeed, the terrorist attack in Halle and the intelligence reports manifesting VNSAs' interest in new technologies urge the question: How soon after the introduction of a new technology to the commercial market is it reasonable to expect to see the same technology adopted by VNSAs?

Gartenstein-Ross et al. provide further insight into this question, presenting a model of four steps that VNSAs usually go through when adopting a new technology. They find that in the first, 'early adaption' phase, the VNSA attempts to adopt a new technology but is usually unsuccessful. The second, 'iteration' phase, is where tech companies make improvements to the technology, which subsequently, benefits both the intended consumer and the VNSA. Due to the improvements made to the commercial technology, the VNSA has a 'breakthrough' in the third phase that significantly improves their use of this new technology. Finally, after the VNSA achieved success in the former phase, the VNSA enters a 'competition' phase where states and other stakeholders seek out countermeasures to mitigate the new threat. The VNSA and the state compete to stay one step ahead of the other but the uncharted territory makes the outcome of this phase uncertain.[232]

Recognising that a VNSA may divert from this exact pattern and, for instance, achieve success already in the first phase, this model should not be seen as deterministic. Moreover, the model is based on VNSAs seen in a group structure and is related to their ability to engage

[231] Daveed Gartenstein-Ross, Colin Clarke, and Matt Shear, 'Terrorists and Technological Innovation', *Valens Global*, February 2021, https://valensglobal.com/terrorists-and-technological-innovation/.
[232] Daveed Gartenstein-Ross, Matt Shear, and David Jones, 'Virtual Plotters. Drones. Weaponized AI?: Violent Non-State Actors as Deadly Early Adopters', *Valens Global*, November 2019, https://valensglobal.com/virtual-plotters-drones-weaponized-ai-violent-non-state-actors-as-deadly-early-adopters/; Gartenstein-Ross, Clarke, and Shear, 'Terrorists and Technological Innovation'.

in organisational learning.[233] For this reason, the pattern follows technology adoption as seen in organisations, with less emphasis on individual perpetrators. Yet, individual learning is relatively unambiguous and serves as an imperative prerequisite for organisational learning to occur. Furthermore, it is important to note that so-called 'lone wolf' terrorists are rarely operating in a vacuum. Rather, they are usually part of a network, albeit being loosely connected and online.[234] Arguably then, the model is valuable for understanding the process of technology adoption for all VNSAs, also when they are not part of a formal organisation. The model serves as a useful analytical tool providing practitioners with a point of reference that can aid them in assessing the future prospects when a VNSA has taken interest in a certain technology.[235]

Applying the adoption model presented by Gartenstein-Ross et al. to VNSAs' history with Unmanned Aerial Vehicles (UAVs), or drones, serves to illustrate the process of VNSA technology adoption.[236] UAVs have been employed by professional militaries to support combat operations since World War II. VNSAs' first engagement with UAVs is, however, traced back to a period between 1994 and 2005. One significant case in this early adoption phase is Aum Shinrikyo's failed attempt at deploying a remote-controlled helicopter as a dispersal mechanism for chemical and biological agents in 1994. In the early 2000s, drone technology began to serve dual-use purposes attaining additional commercial applications. This resulted in a rapid proliferation of the technology, where the quality of commercial drones increased and became widely available at a reduced cost. Consequently, a breakthrough occurred around 2014, accumulating in IS' first successful attack using weaponised UAVs in October 2016.[237]

According to the Combating Terrorism Center (CTC) at West Point, some of the emerging technologies considered as critical for boosting VNSAs' ability to produce weapons of mass destruction from biological agents are synthetic biology, additive manufacturing (AM),

[233] Gartenstein-Ross, Shear, and Jones, 'Virtual Plotters. Drones. Weaponized AI?: Violent Non-State Actors as Deadly Early Adopters'.
[234] David C. Hofmann, 'How "Alone" Are Lone-Actors? Exploring the Ideological, Signaling, and Support Networks of Lone-Actor Terrorists', *Studies in Conflict & Terrorism* 43, no. 7 (July 2020): 657–678, doi:10.1080/1057610X.2018.1493833.
[235] Michael Mayer et al., 'Ikke-statlige aktører og fremvoksende teknologi mot 2050-utviklingstrekk og konsekvenser for militære operasjoner' (Kjeller, Norway: Norwegian Defence Research Establishment (FFI), May 2021), 21–22, http://hdl.handle.net/20.500.12242/2892.
[236] Gartenstein-Ross, Shear, and Jones, 'Virtual Plotters. Drones. Weaponized AI?: Violent Non-State Actors as Deadly Early Adopters'.
[237] Gartenstein-Ross, Shear, and Jones, 42–56; Thomas Pledger, 'THE ROLE OF DRONES IN FUTURE TERRORIST ATTACKS', *Associsation of the United States Army*, February 2021, https://www.ausa.org/publications/role-drones-future-terrorist-attacks.

also known as 3-D printing, and Unmanned Aerial Systems (UAS). While AD and UAS have a major potential to advance the dissemination of biological agents, it is the commercialisation of synthetic biology that is pointed out as the biggest game-changer in the field.[238] Synthetic biology involves genetic engineering of biological organisms and can have extensive impact on the accessibility and delivery of biological weapons. CTC predict that within the next five to ten years, 'an undergraduate with minimal experience in a lab could purchase commercially available synthetic biology kits and materials to develop an agent or modify an existing agent to be more deadly or undetectable.'[239]

A new gene editing technique called CRISPR, is one of the emerging biotechnologies that is causing major concern in national and international security debates. Gene editing is not a new phenomenon, but CRISPR technology has made such manipulation of the genetic code of living organisms considerably easier, cheaper and more precise. This has led to an accelerating concern among security scholars over the last decade.[240] Scientists are concerned that such biotechnologies can allow VNSAs to manipulate naturally occurring pathogens to increase their transmissibility and elude known treatments and detection.[241] Naturally then, in the hands of VNSAs, biotechnology can accumulate massive and lethal consequences. In attempting to evaluate the future threat of bioterrorism, the next section will apply Gartenstein-Ross' model to discuss the prospects of CRISPR technology and VNSAs' possible appropriation and exploitation of this disruptive biotechnology to advance bioterrorist attacks.

Gene editing was introduced already in the 1970s and major advances were made through the 1980s. At this time, however, gene editing was expensive, time-consuming and required 'significant expertise and tacit knowledge, and access to advanced facilities and equipment.'[242] CRISPR technology, therefore, represented a major leap forward when it was

[238] Hummel and Burpo, 'Small Groups, Big Weapons'.
[239] Hummel and Burpo.
[240] Kosal, 'Emerging Life Sciences and Possible Threats to International Security'.
[241] Kosal; Hummel and Burpo, 'Small Groups, Big Weapons', 22.
[242] Kosal, 'Emerging Life Sciences and Possible Threats to International Security'.

discovered in 2013.[243] Currently, an increasing number of commercial applications are being identified and applied for the technology, for instance in the health sector.[244]

Meanwhile, proponents of do-it-yourself (DIY) engineering are making CRISPR technology available to anyone through mail-order online.[245] One of the DIY-ers at the forefront of this community is Josiah Zayner who has a Ph.D. in molecular biophysics and work experience from NASA. His company, the Odin, offers DIY biotechnology kits and tools, as well as tutorials, classes and t-shirts. The website advertises that for $349, one of the more expensive kits, the customer can get 'Bioengineering 101 Beginner Kit and Video Lectures', emphasising that no experience is needed.[246] Arguably, enterprises such as the Odin makes CRISPR technology accessible and attractive to a much larger and more disperse audience.

Still, however easy it may be to conduct experiments with synthetic biology using DIY kits and following clear instructions developed by a competent biophysicist, it necessitates more knowledge, materials, time and money to disruptively exploit CRISPR technology.[247] The DIY kits that are currently being sold online have seemingly noble purposes, at least on the open web. Thus, it arguably requires a certain level of capability and knowledge for a VNSA to exploit and repurpose this technology to serve their cause.

Nevertheless, the spread of biotechnology knowledge and equipment can cause harm intentionally or accidentally. The making the technology easily available to a large audience, companies such as the Odin are arguably increasing the risk of both. For actors seeking to deliberately exploit biotechnology, this commercialisation can lower the threshold and competency necessary for VNSAs to misuse the technology. Notably, the Odin is offering to custom-make special products, or quantities of products, per request from costumers. Such

[243] Thad Allen, Cathy Lanier, and Robert Rose, 'Final Report of the Emerging Technologies Subcommittee Biotechnology' (US Department of Homeland Security [DHS]: Homeland Security Advisory Council, August 2020), 13–15, https://www.dhs.gov/sites/default/files/publications/final_hsac_emerging_technologies_biotechnology_report_8_18_2020_-_508.pdf; Colwell, 'Biotechnology Timeline: Humans Have Manipulated Genes since the "Dawn of Civilization"'.
[244] Joseph Constance, 'CRISPR Technology Edges Closer to Commercial Use', *BioSpace*, October 2020, https://www.biospace.com/article/crispr-technology-edges-closer-to-commercial-use-/.
[245] Annie Sneed, 'Mail-Order CRISPR Kits Allow Absolutely Anyone to Hack DNA', *Scientific American*, November 2017, https://www.scientificamerican.com/article/mail-order-crispr-kits-allow-absolutely-anyone-to-hack-dna/.
[246] Josiah Zayner, 'The Odin', The Odin, accessed 10 June 2021, https://www.the-odin.com/.
[247] Sneed, 'Mail-Order CRISPR Kits Allow Absolutely Anyone to Hack DNA'.

services can be seen as particularly beneficial for VNSAs' exploitation of biotechnology for terrorism purposes.[248]

Considering the VNSA technology adoption curve and former experience with UAV technology, it seems reasonable to argue that CRISPR technology is still too nascent in the development process for it to be successfully exploited by VNSAs. Subsequently, it is arguably also too soon to expect to see such technology reflected in VNSAs' instruction manuals. However, as demonstrated previously in this paper, most VNSAs do not seem hesitant to use knowledge sources that are published by actors outside their ideological peers. Hence, there is reason to believe that content and tutorials provided online by DIY-ers in synthetic biology can boost VNSAs' ability to exploit CRISPR technology. In accordance with the technology adoption model, the first failed or successful attempt of a VNSA to exploit CRISPR technology for terrorist purposes should serve as an early warning sign to authorities and security practitioners that the threat is forthcoming.

The adoption model shows that an accelerating factor for the success of VNSA technology adoption is technological advancements and commercialisation of the technology. It is, therefore, worth noting that the process of adopting UAV technology for Hezbollah, the first VNSA to successfully conduct a drone attack in mid-2013,[249] took approximately seven years. In contrast, the Islamic State spent one year on the same endeavour when they sought to adopt drone technology around 2013. Even with Hezbollah's support from Iran, the advancements and commercialisation of drone technology in the mid-2010 versus the early 2000s, evidently had a major impact on IS' rapid success.[250]

Just a few years ago, CRISPR technology was a lab experiment. Today however, the technological developments of commercial CRISPR is advancing rapidly with big agriculture companies investing heavily in research on this technology.[251] Moreover, the knowledge of how to utilise CRISPR is also widely available. In 2017 alone, more than 17,000 studies on CRISPR technology were published. Additionally, online repositories containing information

[248] Josiah Zayner, 'About Us', The Odin, accessed 10 June 2021, https://www.the-odin.com/about-us/.
[249] Thomas Braun, 'Miniature Menace: The Threat of Weaponized Drone Use by Violent Non-State Actors', ed. Alexander Fleiss, *Air Univeristy*, September 2020, https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2344151/miniature-menace-the-threat-of-weaponized-drone-use-by-violent-non-state-actors/.
[250] Truls Hallberg Tønnessen, 'Islamic State and Technology – A Literature Review', *Perspectives on Terrorism* 11, no. 6 (2017): 103, https://www.jstor.org/stable/26295959; Don Rassler, 'Remotely Piloted Innovation: Terrorism, Drones and Supportive Technology' (US Military Academy-Combating Terrorism Center West Point United States, October 2016), https://css.ethz.ch/content/dam/ethz/special-interest/gess/cis/center-for-securities-studies/resources/docs/CTC%20Drones-Report.pdf.
[251] Acharya and Acharya, 'Cyberterrorism and Biotechnology'.

about the genetic sequences for diseases such smallpox, anthrax and the 1918 Spanish flu, are openly available.[252] With the Internet accelerating the distribution of knowledge and access to equipment via online markets, there may be reason to expect that the pace of VNSAs' technology adoption may occur accordingly – in an increasingly rapid pace.

Learning from VNSAs' adoption of drone technology, we can also observe other factors that may impact a VNSA's adoption of new technology. Observers have for instance noted the structural organisation and bureaucracy of IS as an important factor explaining their success with drones.[253] Additionally, all of the four VNSA groups possessing discernible drone programs have been in possession of some territorial control.[254] Tønnessen points out that VNSAs' success with technology is usually ingrained in the innovative and creative ways of using existing technology and simple *modi operandi.* Subsequently, he argues that this has also been IS' primary asset in their drone program.[255]

Considering the future threat of bioterrorism and VNSAs' ability to exploit new technological developments, a final factor that is worth noting is the 'insider threat'. In the case of bioterrorism, a VNSA possessing scientific or technical background and education can for instance have extensive significance for the technical sophistication of a bioterrorist attack.[256] There is also a concern that individuals with special access to, for instance, state-run biological weapons programs, can provide VNSAs with high quality agents and competencies.[257] Such factors are unlikely to be reflected in online manuals but, nevertheless, have the potential to seriously impact the competencies of VNSAs to enact advanced biological terrorist attacks.

Chapter 6: Summary and conclusion

The COVID-19 pandemic indeed accentuates the severe implications of a potential bioterrorist attack. This paper has approached the important issue of bioterrorism and attempted to evaluate VNSAs' current competency to enact bioterrorist attacks. By studying a number of online instruction manuals linked to jihadi- and right-wing extremist milieus, the paper has identified and discussed several indicators in these manuals that can be suggestive for the level of competency VNSAs possess with regards to biological threat agents.

[252] Hummel and Burpo, 'Small Groups, Big Weapons', 4.
[253] Gartenstein-Ross, Shear, and Jones, 'Virtual Plotters. Drones. Weaponized AI?: Violent Non-State Actors as Deadly Early Adopters'.
[254] Tønnessen, 'Islamic State and Technology – A Literature Review', 103.
[255] Tønnessen, 'Islamic State and Technology – A Literature Review'.
[256] Ackerman and Tamsett, *Jihadists and Weapons of Mass Destruction*, 405.
[257] Ackerman and Jacome, 'WMD Terrorism', 27.

Based on the empirical foundation provided in this study, there are no indicators implying that the current level of VNSAs' competency to execute bioterrorist attacks has increased since similar evaluations were conducted about a decade ago. VNSAs continue publish and distribute non-innovative manuals that utilise old, low-tech methods for producing and delivering biological threat agents in terror attacks. In terms of the technical quality of manuals published after 2013, a qualitative evaluation of a number of these conclude that they yield crude biological agents. Moreover, the delivery mechanisms suggested in these recipes are seemingly suitable for assassinations and small-scale poisonings but they are unlikely to enable the biological substance to function as a weapon of mass destruction. Compared to technical evaluations of former VNSA manuals, the study has found that there has been limited innovation and technical improvement in VNSAs' competency concerning biological threat agents in recent years. The findings thereby indicate that the competency of VNSAs to enact bioterrorist attacks has remained low.

The lack of innovation and technical improvement in the identified bio-manuals currently circulating among VNSAs in the online sphere can imply that VNSAs do not possess the necessary competency to exploit the advantages generated by the technological developments materialising in society today. It is noteworthy that several of the manuals circulating and utilised by VNSAs today applies methods that can be traced back to the late 1900s and early 2000s. Evidently then, new technological advancements, commercialisation of technology and the increasing availability of information, material and equipment enabled by the Internet, has yet to advance VNSAs' bioterrorism competency.

In spite of the limited effect and quality demonstrated in bio-manuals, it is interesting to note that VNSAs continue to show interest in biological threat agents. There are indeed weapons and *modi operandi* that have proven substantially more efficient and uncomplicated than the endeavour of bioterrorism, for instance, driving a truck into a crowd. VNSAs' continuous efforts of to use biological threat agents in terrorism then, arguably highlights the powerful propaganda effect entailed in this *modi operandi*. VNSAs' seeming interest in biological weapons give reason to believe that VNSAs will continue this endeavour in the years ahead.

Several scholars and security practitioners contend that it is a question of *when* VNSAs will take advantage of the technological advancements and commercialisation in biotechnology to enact bioterrorist attacks. However, by learning from previous experience with UAVs, as

well as the VNSA technology adoption model, the paper highlights several factors that can affect VNSAs' adoption of a technology. Accordingly, the paper finds that the CRISPR technology, for instance, seems to be too early in the development process to be successfully exploited in terrorism. Therefore, it is arguably also too early to expect this technology to be reflected in the current manuals. Even though the Internet and new technology may enable the technology adoption process to accelerate more swiftly than previously seen, the world has yet to witness a first attempt by a VNSA to utilise CRISPR technology. Thus, according to the adoption model, we can assume that it might still take some time until a VNSA is able to successfully employ CRISPR technology in an attack.

Nevertheless, VNSAs' enduring interest in biological agents combined with potential insider threats, DIY companies and an increasing availability of information and equipment, prompts the necessity of constantly monitoring VNSAs' competencies and aspirations to adopt new technologies to enhance bioterrorism attacks. This thesis serves as an example of how online instruction manuals can benefit this research venture, and hopes to encourage more qualitative research on the vast collection of primary instructional material available online.

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Appendices

Appendix 1: List of jihadi manuals and documents considered in this paper.

Title	**Original Arabic title**	**Year**	**Biological Threat Agent**	**Group affiliation**
Toxic Warfare, Kill Them Silently: Plant Poisons	*Salsalat ḥarb al-sumūm uqtuluhum bi-al-ṣamat sumūm al-ashjār*	2018	Oleander - Castor oil plant - Abrus precatorius - Aconitum -Acokanthera oppositifolia - Datura - Cicuta virosa Taxus baccata - Ageratina altissima - Strychnos nux-vomica - Menispermum[258]	Al-Ṣaqrī
Toxic Warfare, Kill Them Silently: Botulinum Poison	*Salsalat ḥarb al-sumūm uqtuluhum bi-al-ṣamat sam al-butālūmīniyūm*	2018	Botulinum	Al-Ṣaqrī
Toxic Warfare, Kill Them Silently: Animal Poisons	*Salsalat ḥarb al-sumūm uqtuluhum bi-al-ṣamat sumūm al-ḥiywānāt*	2018	Red scorpion Frog skin Tuna fish	Al-Ṣaqrī
Al-Anfāl Magazine: Obtaining Ricin Poison	*Al-ḥuṣūl ilā risīn*	2018	Ricin	Al-Darʿ al-Sunnī
Botulinum	*Al-butālūmīniyūm*	2018	Botulinum	Al-ʿAbd al-Faqīr
ITMC Ricin Video	No title	2016	Ricin	Ibn Taymiyyah Media Center (ITMC)

[258] The manual refers to a plant by the name 'Men's Premium'. This is presumably a spelling error, supposed to reference the plant, Menispermum.

Appendix 2: List of extreme right-wing manuals and documents considered in this paper.

Title	**Year**	**Biological Threat Agent**
SS Paladin: Combat Instruction Manual[259]	2020 (uploaded to Telegram)	Ricin
Ricin: A Step by Step Process	2019 (posted on 4chan)	Ricin
White Resistance Manual (WRM)	Early 2000s	Nicotine - Conium Alkaloids - Belladonna - Castor Bean – Roasary Pea (Abrus precatorius) - Polypeptide - Deadly Galernia - Aconitum Napellus - Oleander

[259] The manual is based on the 'SS Werwolfs' manual from 1945.