



Mahidol University
Faculty of Science

Stang Mongkolsuk Library
and Information Division

Stang Library Training

EndNote 21 for Macintosh



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Stang Mongkolsuk Library & Information Division

9 October 2024

Introduction

- **What is EndNote?**
- **How EndNote works**
- **Compatibility and System Requirements**
- **Download Endnote Software**

What is EndNote?

Reference management software

- Developed by [Clarivate Analytics](#)

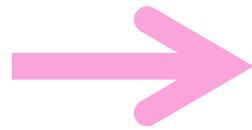
Personal Reference database

- Storing, managing, and searching for bibliographic references in your private reference library

Bibliography and manuscript maker

- Formats citations in Microsoft Word with the [Cite While You Write™](#) feature

How EndNote Works



Books, Journals,
Research Articles, E-
database, etc

Create bibliography

Report, Manuscript,
Thesis, etc.

Compatibility and System Requirements

Operating System	Version	Word processor software
Windows	<ul style="list-style-type: none">• Windows 10• Windows 11	Microsoft Word [CWYW] : <ul style="list-style-type: none">• 2010• 2013• 2016• 2019• Office 365 (locally installed desktop version only)
Macintosh	<ul style="list-style-type: none">• macOS 10.14• macOS 10.15• macOS 11• macOS 12• macOS 13	Microsoft Word [CWYW] : <ul style="list-style-type: none">• 2016• 2019• Office 365 (locally installed desktop version only)

Download Endnote Software (1)

1. Go to <https://softwaredownload.mahidol.ac.th/> (Access through MU-WiFi or VPN).
2. Login with the MU Internet account.



Mahidol University
Wisdom of the Land

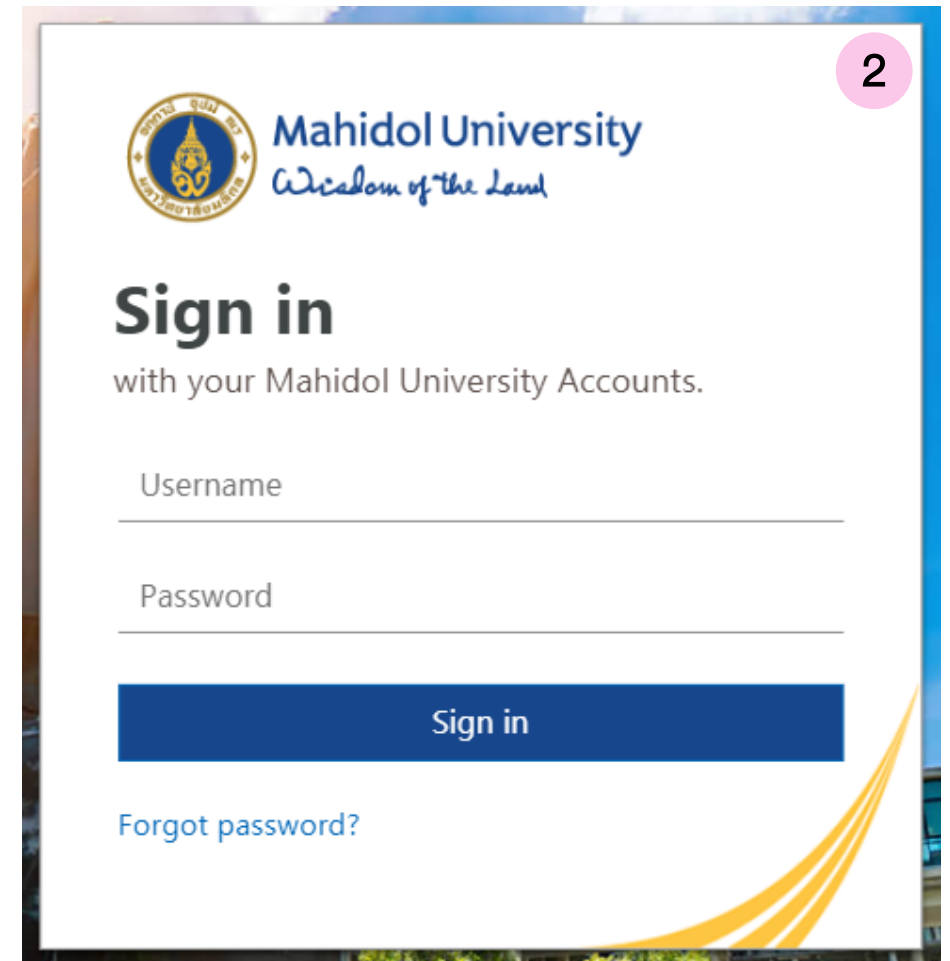
Software Download

มีดีใหม่แห่งการใช้ IT ในมหาวิทยาลัยมหิดล

มหาวิทยาลัยมหิดล มีความมุ่งมั่นที่จะส่งเสริมระบบงานด้าน IT และสมรรถนะทาง IT ให้แก่ประชาคมชาวมหิดลได้ใช้ประโยชน์อย่างทั่วถึง และมีมาตรฐานทัดเทียมกับองค์กรชั้นนำของโลก โดยได้จัดเตรียมสิทธิสำหรับ Software มาตรฐานให้บุคลากรของมหาวิทยาลัยได้ใช้งาน

Login

1



Mahidol University
Wisdom of the Land

Sign in

with your Mahidol University Accounts.

Username

Password

Sign in

[Forgot password?](#)

2

Download Endnote Software (2)

3. Download an installer compatible with your operating system. (Windows or Mac).
4. Download the EndNote key license.

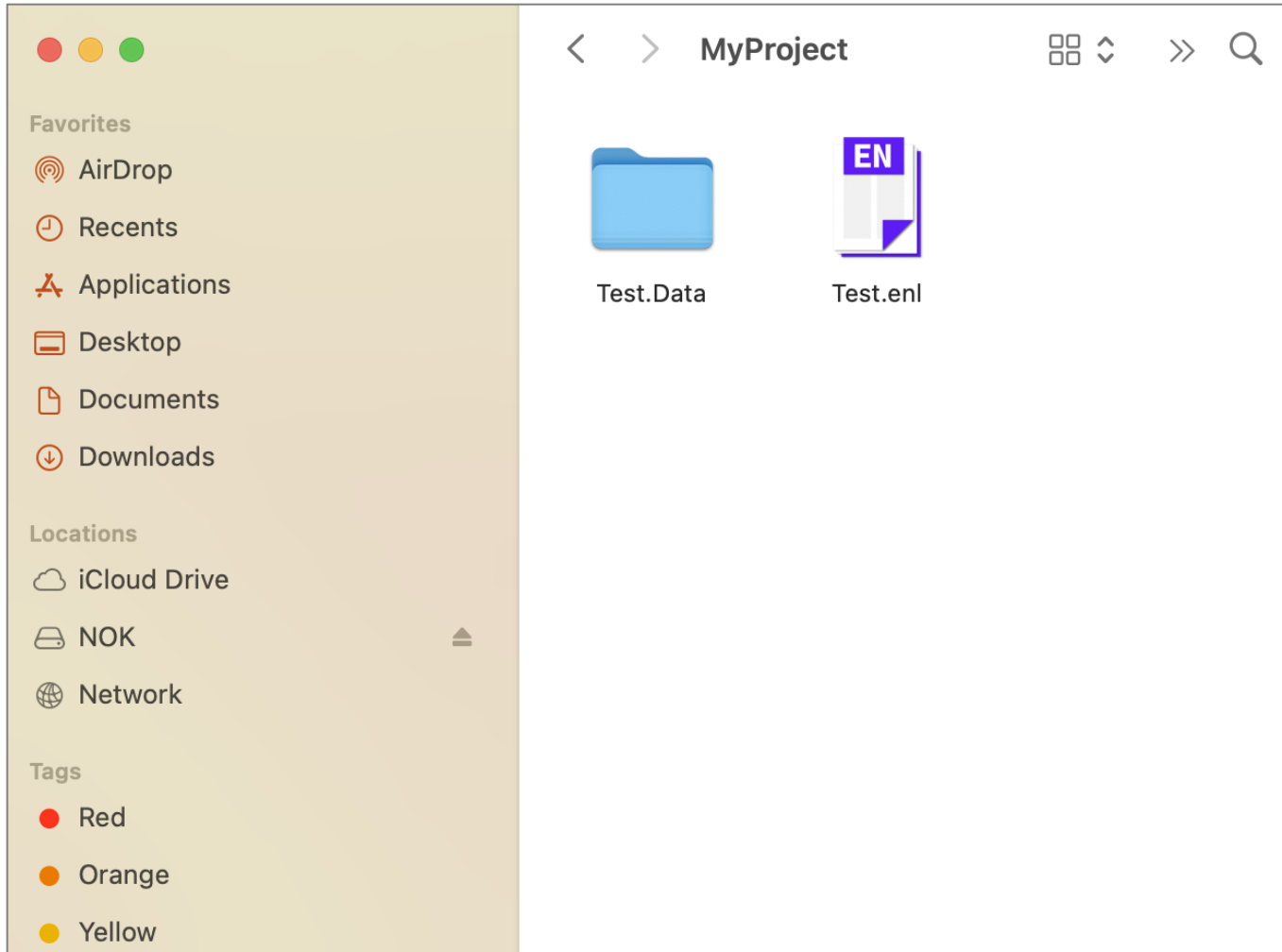
The screenshot shows the Mahidol Software License portal. The page title is "Mahidol Software License". It features several software categories with icons and labels: Microsoft Windows, Microsoft Office, Application (highlighted with a pink box and number 3), Key License (highlighted with a pink box and number 4), VPN, and Antivirus. To the right, there are three download options for EndNote 21: "EndNote 21 for Windows", "EndNote 21 for Mac", and "Key License EndNote 21". Each option has a "คู่มือ" (Manual) button and a "DOWNLOAD" button. Pink arrows point from the "Application" and "Key License" categories to their respective download options.

Copyright © 2023 Mahidol University. All rights reserved. E-mail: consult@mahidol.ac.th Phone: 662-849-6022

Get Started with EndNote

- **EndNote Library components**
- **Creating a New Library**
- **Library Overview**
- **Journal Term Lists**

EndNote Library components

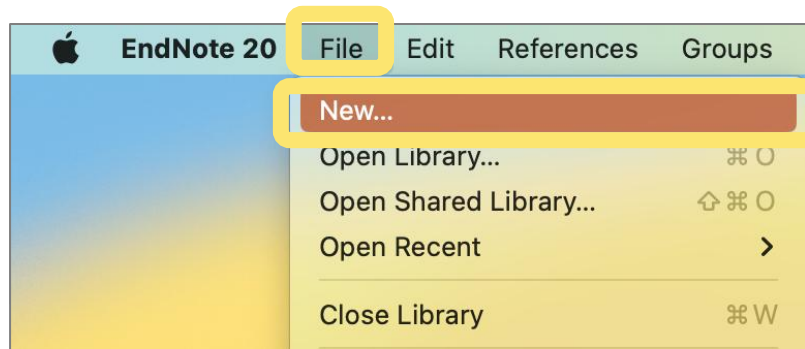


- EndNote libraries are made up of two parts:
 - EndNote Library file (*.enl)
 - Data folder (*.Data)These two parts must be kept together to work correctly.
- Keep EndNote libraries on your computer's local hard drive. Storing and editing libraries on a network drive can lead to corruption and performance issues.
- EndNote libraries should never be stored in cloud-syncing folders such as Google Drive, OneDrive, etc. Syncing folders corrupts EndNote libraries over time.

Creating a New Library

1. Go to **File > New...** or select **Creating a New Library** from Setup Endnote Library box
2. EndNote presents a dialog prompting you to enter a name for your new library.
3. Select the location where you will save the library.
4. Click **Save**, then the new Endnote library appears as an empty library.

1



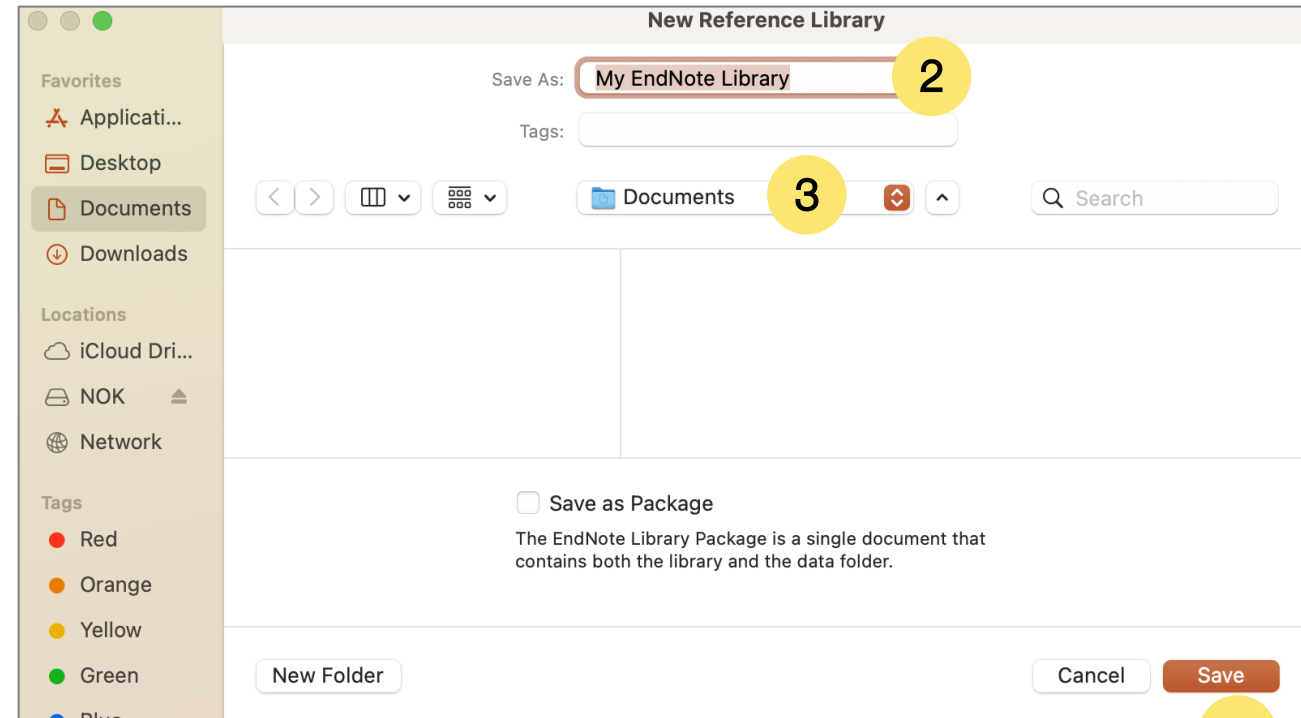
Set up EndNote Library

If you already have an EndNote library, please locate it and we'll get it set up.

[Open an existing library](#)

Alternatively, you can start from scratch with a new library.

[Create a new library](#)



4

Library Overview

The screenshot displays the EndNote 20 software interface. The title bar at the top reads "EndNote 20 - Test.enl". On the left is a dark blue sidebar with a navigation menu containing the following items: "Sync Configuration", "All References" (highlighted), "Recently Added", "Unfiled", "Trash", "MY GROUPS" (with a sub-item "My Groups"), "FIND FULL TEXT", "GROUPS SHARED BY OTHERS", and "ONLINE SEARCH" (with a sub-item "+"). Under "ONLINE SEARCH", there are four search options: "Jisc Library Hub Discover", "Library of Congress", "PubMed (NLM)", and "Web of Science Core Collectio...". At the bottom of the sidebar is a search bar labeled "Search for group".

The main window area is titled "All References" and contains a search bar with a "Search" button and an "Advanced Search" button. Below the search bar, the text "All References" is displayed, followed by "0 References". A row of icons for actions like quote, add, share, and search is visible. Below this is a table header with columns for "Author", "Year", and "Title".

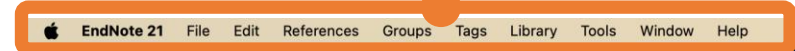
On the right side of the main window, a panel displays the message "No reference selected" with a close button (X).

Library Overview

Menu Bar

Search panel to find an item in your library or to query a remote database for new references to capture.

Groups panel shows you both default groups and groups or group sets you create for your research projects.



Sync Configuration

- All References 190
- Recently Added
- Unfiled 1
- Trash 2
- MY GROUPS
 - Avian Intelligence
 - Avian Cognition 33
 - Corvids 24
 - Corvids & Parrots 6
 - Parrots 28
 - Bats
 - Chiroptera 27
 - Echolocation 10
 - Echolocation OR... 13
 - Sonar 8
 - My Groups 155
- MY TAGS
 - Bats 27
 - Corvids 21
 - Parrots 63
- FIND FULL TEXT
- GROUPS SHARED BY O...
- ONLINE SEARCH
 - Jisc Library Hub Disco...
 - Library of Congress
 - PubMed (NLM)
 - Web of Science Core C...

Search for group

All References

Author Contains

Year Contains

Title Contains

Clear Search

Simple Search Search Options Search

Year	Title	Journal	Last Updated	Author
2011	New Data on the Brain and Cog...	Zoologi...	17/9/2563 BE	Zorina, Z. A.; Ob...
2012	New Caledonian crows reason a...	Procee...	17/9/2563 BE	Taylor, A. H.; Mil...
2003	Neurobiology of echolocation in...	Current...	17/9/2563 BE	Moss, C. F.; Sinf...
1988	NATURE NURTURE REFLUX	Behavio...	18/9/2563 BE	Pepperberg, I. M...
2018	Multi-state occupancy models o...	PLoS O...	18/9/2563 BE	Gorresen, P. M.;
1976	MOLECULAR-ORBITAL STUDY O...	Journal...	18/9/2563 BE	Pepperberg, I. M...
2005	A molecular phylogeny for bats i...	Science	17/9/2563 BE	Teeling, E. C.; S...
1995	MIRROR USE BY AFRICAN GRE...	Journal...	18/9/2563 BE	Pepperberg, I. M...
1996	Mechanisms of American Englis...	Auk	18/9/2563 BE	Warren, D. K.; P...
1998	Measurement of Grey parrot (Ps...	Journal...	18/9/2563 BE	Pepperberg, I. M...
2019	Logical reasoning by a Grey parr...	Behavio...	18/9/2563 BE	Pepperberg, I. M...
1999	Limited contextual vocal learnin...	Journal...	18/9/2563 BE	Pepperberg, I. M...
2009	Leaf-nosed bat	Encyclo...	21/8/2562 BE	
2011	Large-billed crows (Corvus mac...	Animal...	17/9/2563 BE	Goto, Kazuhiro;
1991	LANGUAGE-ACQUISITION AND F...	Ethology	18/9/2563 BE	Pepperberg, I. M...
1994	LANGUAGE AND COGNITION - T...	Behavio...	18/9/2563 BE	Pepperberg, I. M...
1983	INTERSPECIES COMMUNICATION...	Bulletin...	18/9/2563 BE	Pepperberg, I. M...
1988	AN INTERACTIVE MODELING TEC...	Applied...	18/9/2563 BE	Pepperberg, I. M...

Taylor, 2012 #2306

Attach file

New Caledonian crows reason about hidden causal agents

A. H. Taylor, R. Miller and R. D. Gray

Proceedings of the National Academy of Sciences of the United States of America 2012 Vol. 109 Issue 40 Pages 16389-16391

Accession Number: WOS:000309611400086 DOI: 10.1073/pnas.1208724109

The ability to make inferences about hidden causal mechanisms

Tab panel The Summary tab displays a detailed overview of a selected reference. Quickly alter reference metadata from the Edit tab.

APA 7th

Insert Copy

Taylor, A. H., Miller, R., & Gray, R. D. (2012). New Caledonian crows reason about hidden causal agents [Article]. *Proceedings of the National Academy of Sciences of the United States of America*, 109(40), 16389-16391. <https://doi.org/10.1073/pnas.1208724109>

Preview panel shows you how a reference would appear formatted with a specific output style.

Reference List panel shows you the individual references stored in your EndNote library, also known as library records.


Journal Term Lists

Journal Term Lists are lists of journal names in full and abbreviated form.

- These lists are used for making correct journal names in reference format.
- Help EndNote work correctly to find out the duplicate references.

Recently Added

2 References

	Author	Year	Title	Journal
	Li, Zhuo; Hirst, Jonathan D.	2020	Computed optical spectra of SARS-CoV-2 proteins	Chemical Physics Letters
	Li, Z.; Hirst, J. D.	2020	Computed optical spectra of SARS-CoV-2 proteins	Chem Phys Lett

*ScienceDirect**
give full journal name

*PubMed**
give abbreviated journal name

**Retrieving references from various sources may give the journal names in a different form.*

Before & After defining Journal Term Lists

Before

Vancouver

Insert Copy

1. Li Z, Hirst JD. Computed optical spectra of SARS-CoV-2 proteins. **Chemical Physics Letters.** 2020;758:137935.

After

Vancouver

Insert Copy

1. Li Z, Hirst JD. Computed optical spectra of SARS-CoV-2 proteins. **Chem Phys Lett.** 2020;758:137935.



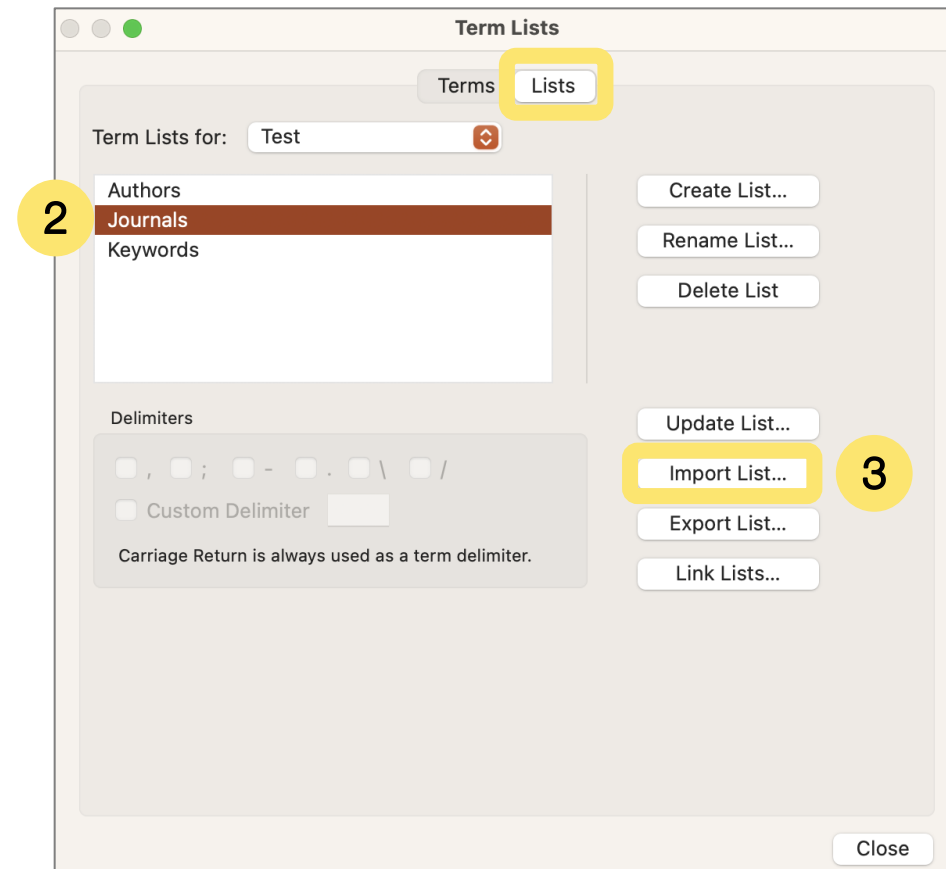
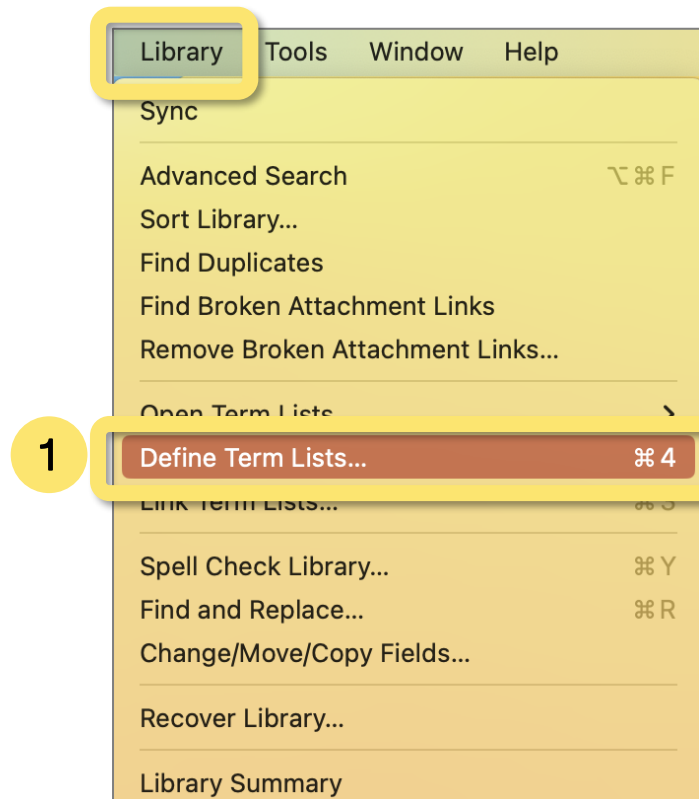
ScienceDirect

Give full journal name

Vancouver Style uses the abbreviated journal names

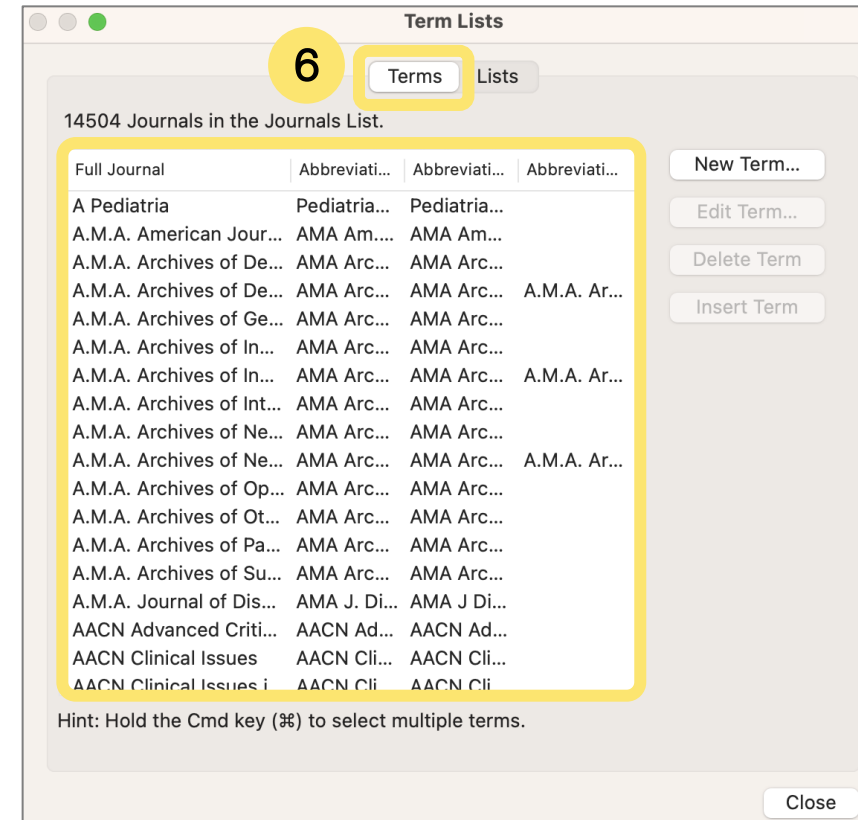
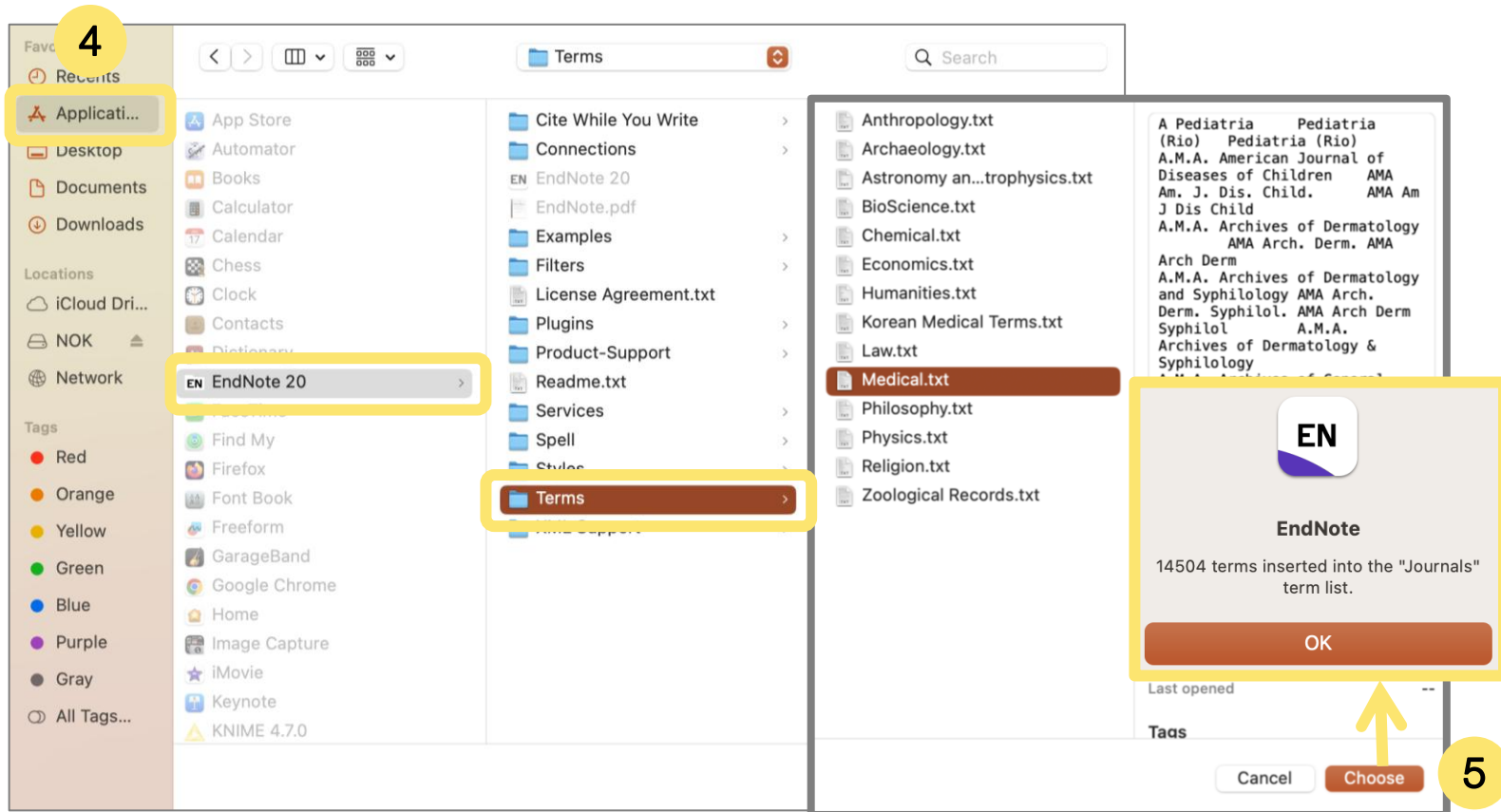
Define Journal Term Lists (1)

1. Go to **Library > Define Term Lists...**
2. In Term Lists box, select tab **Lists**, then select **Journals**
3. Click at **Import List...**



Define Journal Term Lists (2)

4. Browse to **Application > EndNote 21 > Terms**
5. Choose the appropriated term lists files (e.g. Medical.txt), then click **Choose** to completed.
6. Select tab **Terms** to view the imported journal lists, then close.



Input Data

- **Direct Export**
- **Import PDF**
- **Manual Typing**

Direct Export

Import PDF

Manual Typing



ScienceDirect



Scopus®

Google Scholar



New Reference

Journal Article

Author

Year

Title

Journal

Volume

Part/Supplement

Issue

Pages

Start Page

Errata

Epub Date

Date

Type of Article


Short Title

Alternate Journal


ISSN

DOI

Mahidol eJournal Access (EZproxy)



Mahidol University
Library and Knowledge Center
Mahidol eJournal Access

I'm not a robot 
reCAPTCHA
Privacy - Terms

firstname.sur (for staff) or u61xxx or g61xxx

type your password

028002680-9 ext.4262,4265 [Manual](#)
liwww@mahidol.ac.th

- URL: <https://ejournal.mahidol.ac.th>
- Login with MU Internet account to access subscribed e-resources
- Support all devices with all operating systems (Windows, MacIntosh, and Linux), smartphones and tablets with iOS (iPhone / iPad) and Android

***** Limitation *****

Must follow the links given on the library's website

Mahidol eJournal Access (EZproxy)

The screenshot shows the website <https://stang.sc.mahidol.ac.th/> with the following elements:

- 1**: The "E-Resources" menu is highlighted, and its dropdown is open, showing options like "E-DATABASES", "E-JOURNALS", and "E-BOOKS".
- 2**: A red banner contains the URL <https://ejournal.mahidol.ac.th>.
- 3**: The "eJournal Access" button, represented by a key icon, is highlighted in the footer.
- 4**: A grid of database logos is highlighted, including Scopus, ScienceDirect, SciVal, SJR, Journal Citation Reports, EBSCO, SCIFINDER, ACS Publications, PubMed.gov, nature, WILEY, Springer Link, AMERICAN SOCIETY FOR MICROBIOLOGY, BMC, zbmATH, Ovid, DOAJ, Google Scholar, turnitin, and EndNote.

You can access it by

1. Select menu E-Resources to find appropriated E-Databases, E-Journals, or E-Books
2. Click the URL from the top of the webpage
3. Click eJournal Access button
4. Select appropriated E-databases from the bottom of the webpages

Direct export: ScienceDirect



ScienceDirect

Journals & Books



Register

Sign in

Search for peer-reviewed journal articles and book chapters (including [open access content](#))

Keywords

Author name

Journal/book title

Volume

Issue

Pa



Advanced search



The most relevant research on Novel Coronavirus (SARS-CoV-2) and related viruses is [available for free on ScienceDirect](#), and can be downloaded in a machine-readable format for text mining.

Alternatively, visit the Elsevier Novel Coronavirus Information Center for general health information and advice.

[Visit the Information Center >](#)



1. Select the records you need.
2. Click **Export** at the top of the search results.
3. Click **Export citation to RIS** to download data to your library.

Find articles with these terms

Coronavirus



Advanced search

1



Download 25 articles

2

Export

Export



25 citations selected

> Save to RefWorks

> Export citation to RIS

3

> Export citation to BibTeX

> Export citation to text

45,746 results

Set search alert

Refine by:

Subscribed journals

Years

2022 (10)

2021 (12,137)

2020 (19,913)

Show more



Short communication

Prior and novel coronaviruses, **Coronavirus** Disease 2019: what is known?

Fertility and Sterility, 16 April 2020, ...

James Segars, Quinton Katler, ... Jennifer F. Kawwass

Abstract Extracts Export



Research article Full text access

In-hospital cardiac arrest in patients with **coronavirus** 2019

Resuscitation, 27 January 2021, ...

Oscar J. L. Mitchell, Eugene Yuriditsky, ... Benjamin S. Abella

Download PDF Abstract Extracts Export

Direct export: PubMed



National Library of Medicine
National Center for Biotechnology Information

Log in

PubMed.gov

Search PubMed

Search

Advanced

PubMed® comprises more than 32 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full text content from PubMed Central and publisher web sites.

coronavirus

Advanced Create alert Create RSS

2

Save Email Send to

Sorted by: Best match Display options

1. Select the records you need.
2. Click **Send to** at the top of search results, then select **Citation manager**.
3. Select the options.
4. Click the **Create file** to download data to your library.

MY NCBI FILTERS

RESULTS BY YEAR



TEXT AVAILABILITY

- Abstract
- Free full text
- Full text

97 records

1

- Clipboard
- My Bibliography
- Collections
- Citation manager

2

Create a file for external citation management software

Selection: Selection (2)

3

Create file 4 Cancel

Selection (2)

All results on this page

All results

Selection (2)

Broad-spectrum coronavirus antiviral drug discovery.

Totura AL, Bavari S.
Expert Opin Drug Discov. 2019 Apr;14(4):397-412. doi: 10.1080/17460441.2019.1608808.
PMID: 30849247 Free PMC article. Review.

The highly pathogenic coronaviruses severe acute respiratory syndrome coronavirus (SARS-CoV) and

Direct export: Scopus



Scopus

[Search](#) [Sources](#) [Lists](#) [SciVal](#) ↗



[Create account](#)

[Sign in](#)

Start exploring

Discover the most reliable, relevant, up-to-date research. All in one place.

[Documents](#) [Authors](#) [Affiliations](#)

[Search tips](#) ⓘ

Search within

Article title, Abstract, Keywords



Search documents *

[+ Add search field](#) [Add date range](#) [Advanced document search](#) >

[Search](#) 🔍

[Search History](#)

[Saved Searches](#)



Start searching and your history will appear here. If you need help to start searching check out our [search tips](#).



196,547 document results

TITLE-ABS-KEY (coronavirus) AND (LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020))

Edit Save Set alert

Search within results...

Refine results

Limit to Exclude

Open Access

- All Open Access (162,607) >
- Gold (62,710) >
- Hybrid Gold (13,105) >
- Bronze (74,979) >
- Green (127,362) >

Learn more

Year

- 2022 (17,226) >

Documents Secondary documents

Analyze search results

Export

Document title

1 Patient-related outcomes in patients re-visited in a primary care clinic with persisting symptoms following COVID-19
Open Access

View abstract View at Publisher Related documents

2 Negative pressure protective barrier device used in dental emergencies during the COVID-19 pandemic | [Dispositivo de barrera protectora con presión negativa utilizado en urgencias odontológicas durante la pandemia de COVID-19]

Mendivelso, F., Guevara, C., Bernal, L., López, L., Low, E.

2022 *Iatreia* 35(1), pp. 29-39

0

1. Select the records you need.

2. Click **Export** at the top of search results, then it will present an **Export document setting** Box

Export document settings

You have chosen to export 196547 documents

Select your method of export

MENDELEY
 ExLibris RelWorks
 SciVal
 RIS Format EndNote, Reference Manager
 CSV Excel
 BibTeX
 Plain Text ASCII in HTML

What information do you want to export?

<input checked="" type="checkbox"/> Citation information	<input checked="" type="checkbox"/> Bibliographical information	<input type="checkbox"/> Abstract & keywords	<input type="checkbox"/> Funding details	<input type="checkbox"/> Other information
<input checked="" type="checkbox"/> Author(s) <input checked="" type="checkbox"/> Author(s) ID <input checked="" type="checkbox"/> Document title <input checked="" type="checkbox"/> Year <input checked="" type="checkbox"/> EID <input checked="" type="checkbox"/> Source title <input checked="" type="checkbox"/> volume, issue, pages <input checked="" type="checkbox"/> Citation count <input checked="" type="checkbox"/> Source & document type <input checked="" type="checkbox"/> Publication Stage <input checked="" type="checkbox"/> DOI <input checked="" type="checkbox"/> Open Access	<input checked="" type="checkbox"/> Affiliations <input checked="" type="checkbox"/> Serial identifiers (e.g. ISSN) <input checked="" type="checkbox"/> PubMed ID <input checked="" type="checkbox"/> Publisher <input checked="" type="checkbox"/> Editor(s) <input checked="" type="checkbox"/> Language of original document <input checked="" type="checkbox"/> Correspondence address <input checked="" type="checkbox"/> Abbreviated source title	<input type="checkbox"/> Abstract <input type="checkbox"/> Author keywords <input type="checkbox"/> Index keywords	<input type="checkbox"/> Number <input type="checkbox"/> Acronym <input type="checkbox"/> Sponsor <input type="checkbox"/> Funding text	<input type="checkbox"/> Tradenames & manufacturers <input type="checkbox"/> Accession numbers & chemicals <input type="checkbox"/> Conference information <input checked="" type="checkbox"/> Include references

Cancel **Export**

Export document settings [?](#)

You have chosen to export 196547 documents

Select your method of export

- MENDELEY
- ExLibris RefWorks
- SciVal [i](#)
- RIS Format
EndNote, Reference Manager
- CSV
Excel
- BibTeX
- ASCII in HTML

3

4

3. Select the record's information you need.
(recommended at least *citation information*)

4. Select the method of export as **RIS Format**

5. Click the **Export** to download data to your library.


What information do you want to export?


- | | | | | |
|--|--|--|--|--|
| <input checked="" type="checkbox"/> Citation information | <input checked="" type="checkbox"/> Bibliographical information | <input type="checkbox"/> Abstract & keywords | <input type="checkbox"/> Funding details | <input type="checkbox"/> Other information |
| <input checked="" type="checkbox"/> Author(s) | <input checked="" type="checkbox"/> Affiliations | <input type="checkbox"/> Abstract | <input type="checkbox"/> Number | <input type="checkbox"/> Tradenames & manufacturers |
| <input checked="" type="checkbox"/> Author(s) ID | <input checked="" type="checkbox"/> Serial identifiers (e.g. ISSN) | <input type="checkbox"/> Author keywords | <input type="checkbox"/> Acronym | <input type="checkbox"/> Accession numbers & chemicals |
| <input checked="" type="checkbox"/> Document title | <input checked="" type="checkbox"/> PubMed ID | <input type="checkbox"/> Index keywords | <input type="checkbox"/> Sponsor | <input type="checkbox"/> Conference information |
| <input checked="" type="checkbox"/> Year | <input checked="" type="checkbox"/> Publisher | | <input type="checkbox"/> Funding text | <input type="checkbox"/> Include references |
| <input checked="" type="checkbox"/> EID | <input checked="" type="checkbox"/> Editor(s) | | | |
| <input checked="" type="checkbox"/> Source title | <input checked="" type="checkbox"/> Language of original document | | | |
| <input checked="" type="checkbox"/> volume, issue, pages | <input checked="" type="checkbox"/> Correspondence address | | | |
| <input checked="" type="checkbox"/> Citation count | <input checked="" type="checkbox"/> Abbreviated source title | | | |
| <input checked="" type="checkbox"/> Source & document type | | | | |
| <input checked="" type="checkbox"/> Publication Stage | | | | |
| <input checked="" type="checkbox"/> DOI | | | | |
| <input checked="" type="checkbox"/> Open Access | | | | |

5

Direct export: Google Scholar



 My profile

 My library

SIGN IN

Google Scholar



Articles Case law

New! Track and manage your public access mandates

Articles about COVID-19

CDC

NEJM

JAMA

Lancet

Cell

BMJ

Nature

Science

Elsevier

Oxford

Wiley

medRxiv

Stand on the shoulders of giants

1. Click the **Cite** sign at the bottom of the record you need.
2. Click the **EndNote** to download data to your library.

Articles

About 1,450,000 results (0.03 sec)

Any time

Since 2021

Since 2020

Since 2017

Custom range...

Sort by relevance

Sort by date

include patents

include citations

Create alert

Coronavirus

World Health Organization - 2020 - pesquisa.bvsalud.org

Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). A novel coronavirus (nCoV) is

☆ Cited by 5108

[HTML] Another decade

S. Perlman - 2020 - Mass M

For the third time in as many years, a new coronavirus has emerged in human populations. This virus, which was first identified in Wuhan, China, in persons with

☆ Cited by 742

Coronavirus disease

F He, Y Deng, W Li - Journ

In late December 2019, a coronavirus was first identified in Wuhan, China. A few days later, it was identified as a novel coronavirus

☆ Cited by 556

Cite

<p>MLA</p> <p>APA</p> <p>Chicago</p> <p>Harvard</p> <p>Vancouver</p>	<p>Perlman, Stanley. "Another decade, another coronavirus." (2020): 760-762.</p> <p>Perlman, S. (2020). Another decade, another coronavirus.</p> <p>Perlman, Stanley. "Another decade, another coronavirus." (2020): 760-762.</p> <p>Perlman, S., 2020. Another decade, another coronavirus.</p> <p>Perlman S. Another decade, another coronavirus.</p>
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[BibTeX](#)
EndNote
[RefMan](#)
[RefWorks](#)

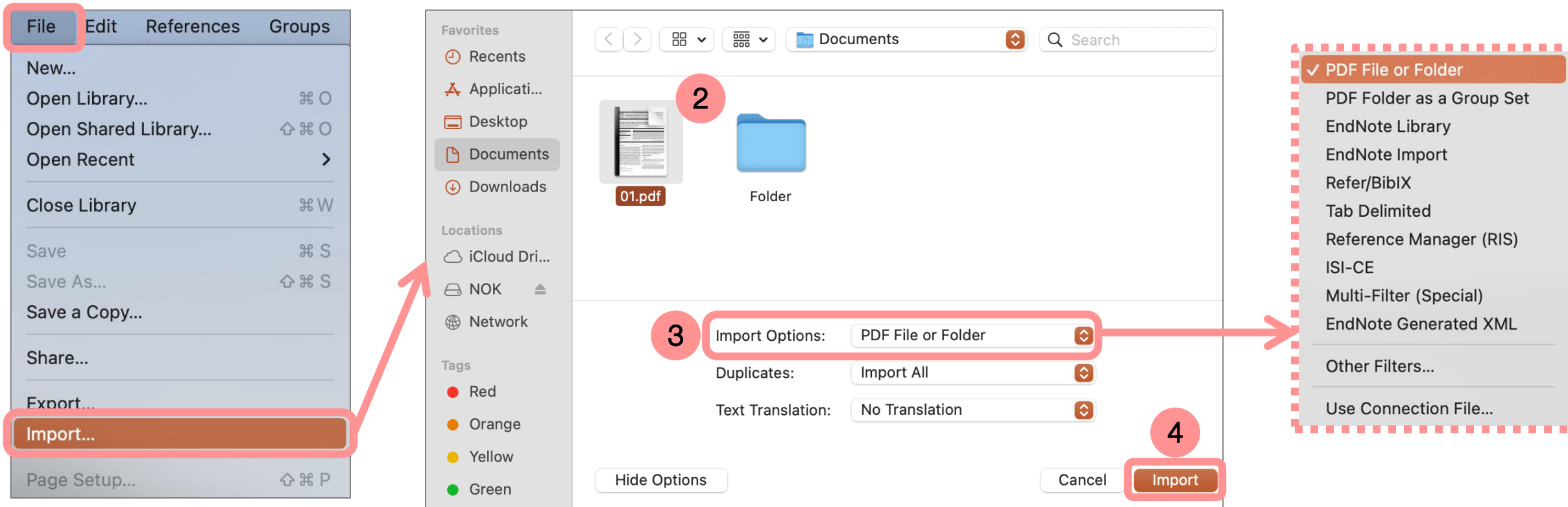
1

Cite

2

Import PDF File (1)

1. Go to **File > Import...** EndNote presents a dialog to find the location where you keep a PDF file.
2. Select a PDF file or folder from your hard drive.
3. Set Import Option as **PDF File or Folder**
4. Click **Import** to import a PDF file or folder into your library.



Import PDF File (2)

EndNote 20 - Library_6500001.enl

Imported References

Search Advanced Search

Imported References

1 References

Author	Year	Title
Kamboj, K.; Jana, S...	2019	Mechanisms of protein kinas

Kamboj, 2019 #10

Summary Edit PDF

01.pdf

453

454

455

456

457

458

Biochemical and Biophysical Research Communications 520 (2019) 453–458

Contents lists available at ScienceDirect

Biochemical and Biophysical Research Communications

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Mechanisms of protein kinase C-induced sustained activation of extracellular signal-regulated kinase in the hippocampus

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ARTICLE INFO

ABSTRACT

1. Introduction

2. Materials and methods

2.1. Animals

2.2. Hippocampal slice preparation and treatments

hippocampal slices [1]. Blocking ERK activity inhibits LTP [14]. Furthermore, ERK activity is required for memory formation [15,16].

Previous studies have shown that activation of protein kinase C by phorbol 12,13-dibutyrate (PDBu) activates ERK in the hippocampal slices [17,18]. However, the activation profile of PDBu-induced ERK activation is not well understood. In this study, we show that activation of PKC by PDBu leads to a sustained ERK activation in the hippocampus. Further, we have examined the processes that are important for PDBu-induced sustained ERK activation.

The methods used in this study have been described previously [19–21]. Briefly, the animals were killed in accordance with the procedure approved by the Animal Ethics Committee of National Brain Research Centre. After anesthetizing with halothane (Pranal Healthcare), the animals were killed and their hippocampi were removed. After preparing hippocampal slices (350 μ m), pooling and recovery, the slices were randomly divided into experimental groups, with 3–4 slices in each group. To examine PDBu-induced ERK activation, the slices were treated with 3 μ M PDBu [1] for 25 min in artificial cerebrospinal fluid (aCSF). The composition of aCSF was 25 mM glucose, 1.25 mM NaH₂PO₄, 25 mM NaHCO₃, 125 mM NaCl, 2.5 mM KCl, 1 mM MgCl₂, 2 mM CaCl₂. A stock solution of PDBu (Stem Cell Sciences) was prepared at 3 mM in dimethyl sulfoxide (DMSO). ERK activation was assessed immediately after PDBu treatment (immediate) or 1 h after PDBu treatment (sustained). For analysis of immediate ERK activation, the slices were washed using aCSF before harvesting in sodium dodecyl sulfate containing lysis buffer (SDS-LB) within 1–2 min after treatment. For analysis of sustained ERK activation, the slices were washed with aCSF after PDBu treatment, incubated in aCSF for 1 h, and harvested in SDS-LB.

The effect of pharmacological agents on ERK activation was examined at immediate and sustained time points. A stock solution of protein synthesis inhibitor (cycloheximide, Cyclohex), transcriptional inhibitor (actinomycin D, ActD), mammalian target of rapamycin (mTOR) inhibitor (rapamycin, Rap), and ERK inhibitor (SCH777604, SCH) were prepared in DMSO. Similarly, ERK, and ERK2 bands were quantified together. ERK activation was estimated by dividing phospho-ERK α signal by ERK α signal in each sample, then normalizing with the control sample. Likewise, for each sample, ERK α /tubulin signal ratio was obtained and normalized by the control sample. ERK activation or ERK levels at the immediate and sustained time points were assessed simultaneously in slices from the same animal. The samples were separated on the same gel. However, for clarity reasons, they are presented separately.

2.4. Data analysis

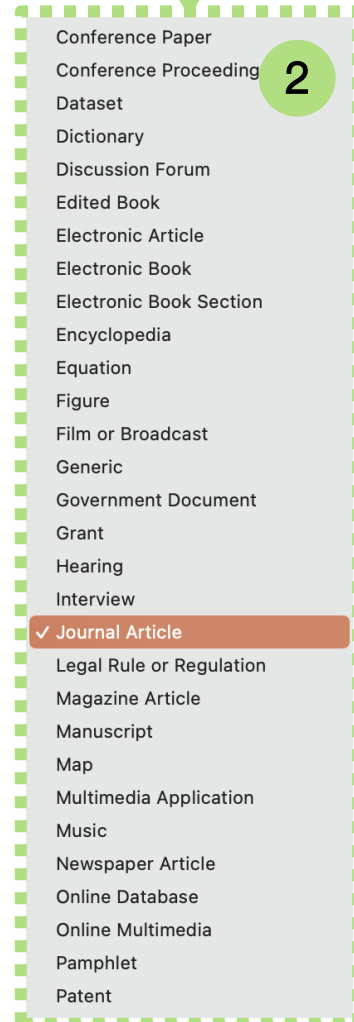
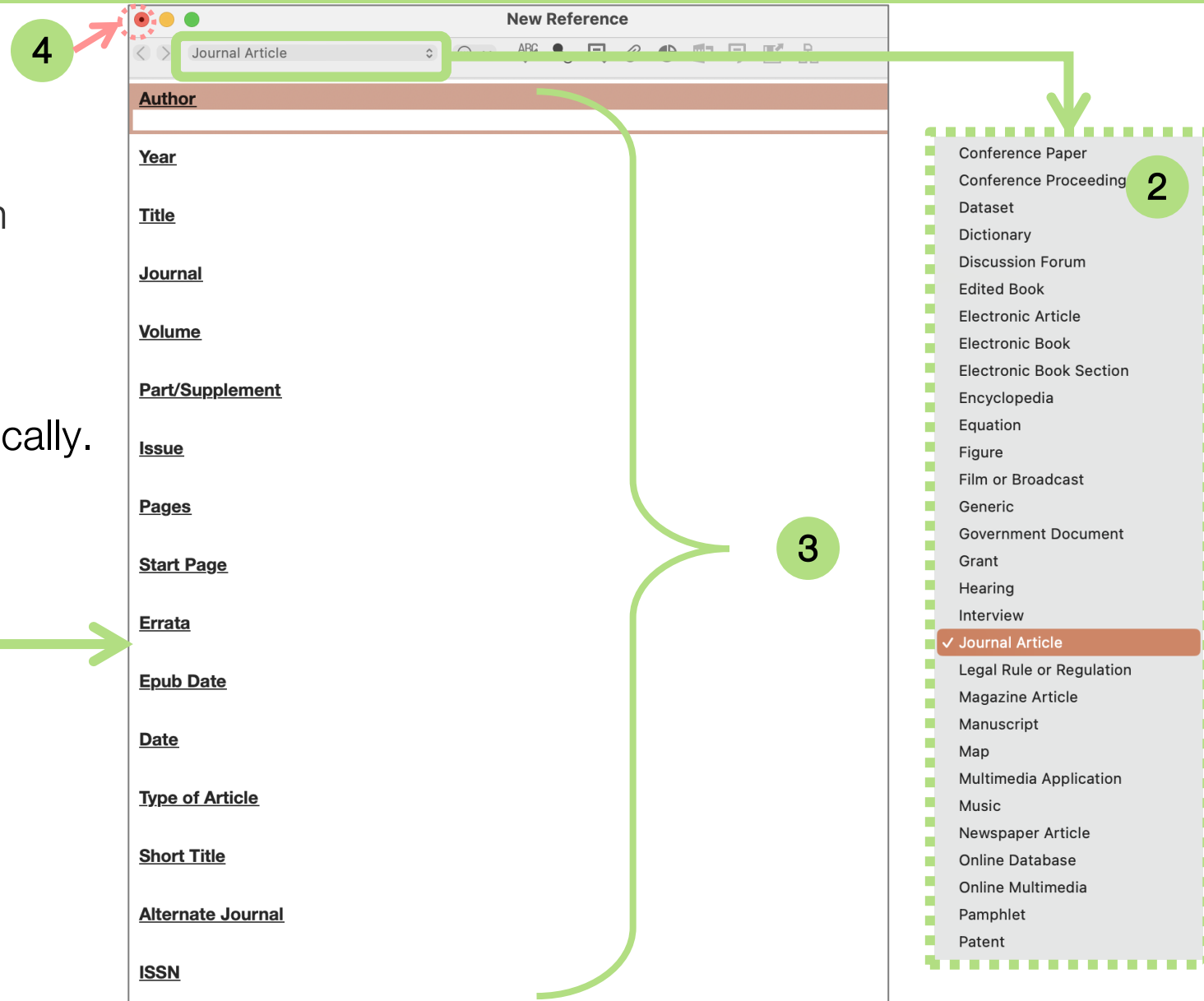
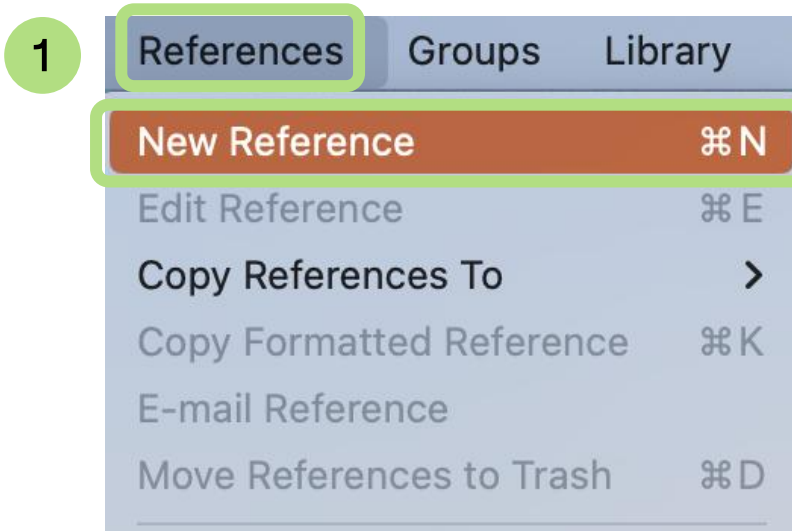
In Fig. 1, data were analyzed using paired Student's t-test (two-tailed). In Fig. 2, data were analyzed using one-way analysis of variance (ANOVA), which showed significant difference ($p < 0.05$). Thus, individual comparisons were assessed using paired Student's t-test (two-tailed). The difference between groups were considered significant when the p -value was less than 0.05. Data are expressed as mean \pm SEM.

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<https://doi.org/10.1016/j.bbrc.2019.10.046>
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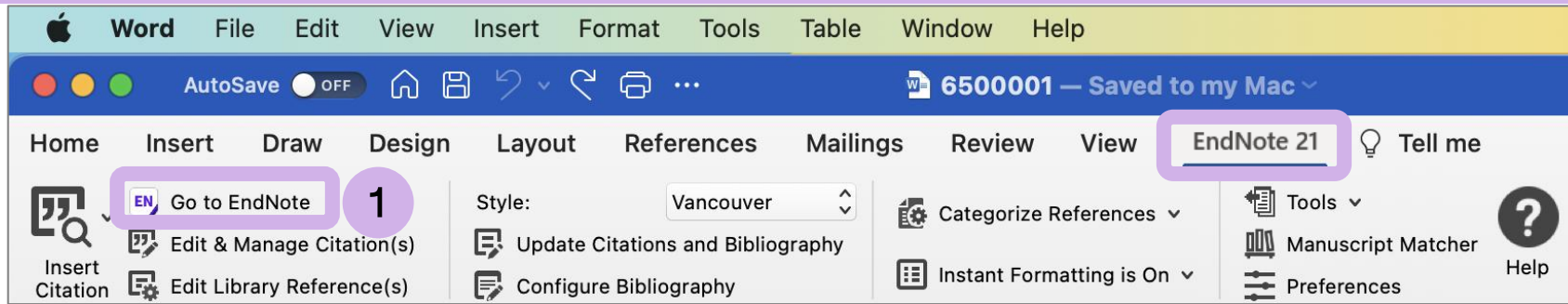
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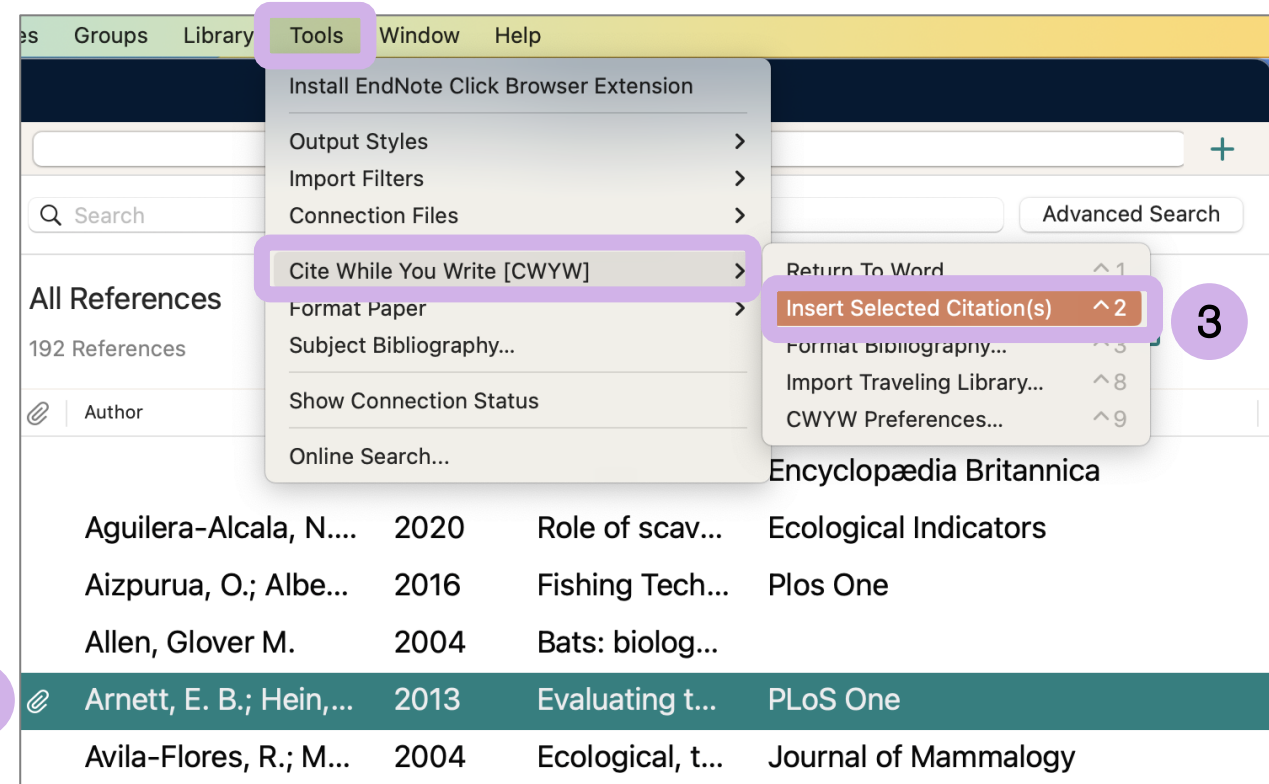
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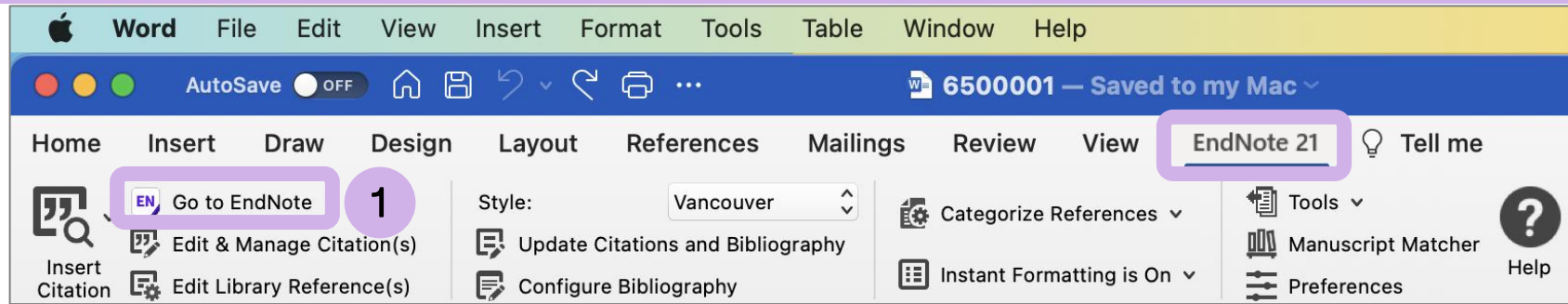
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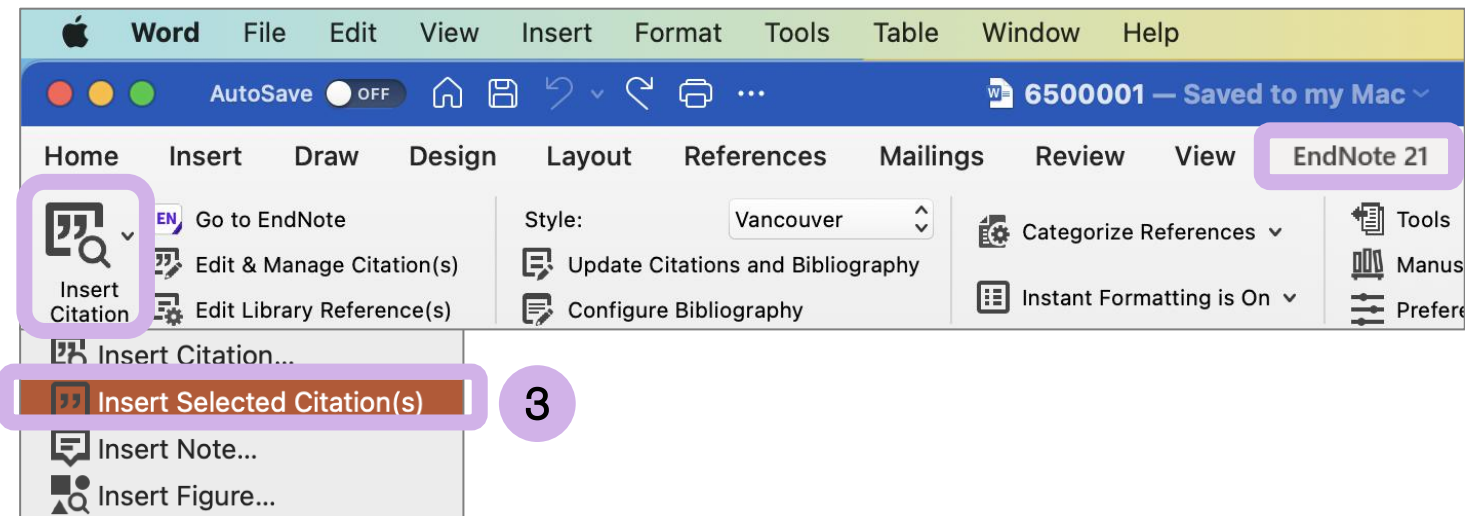
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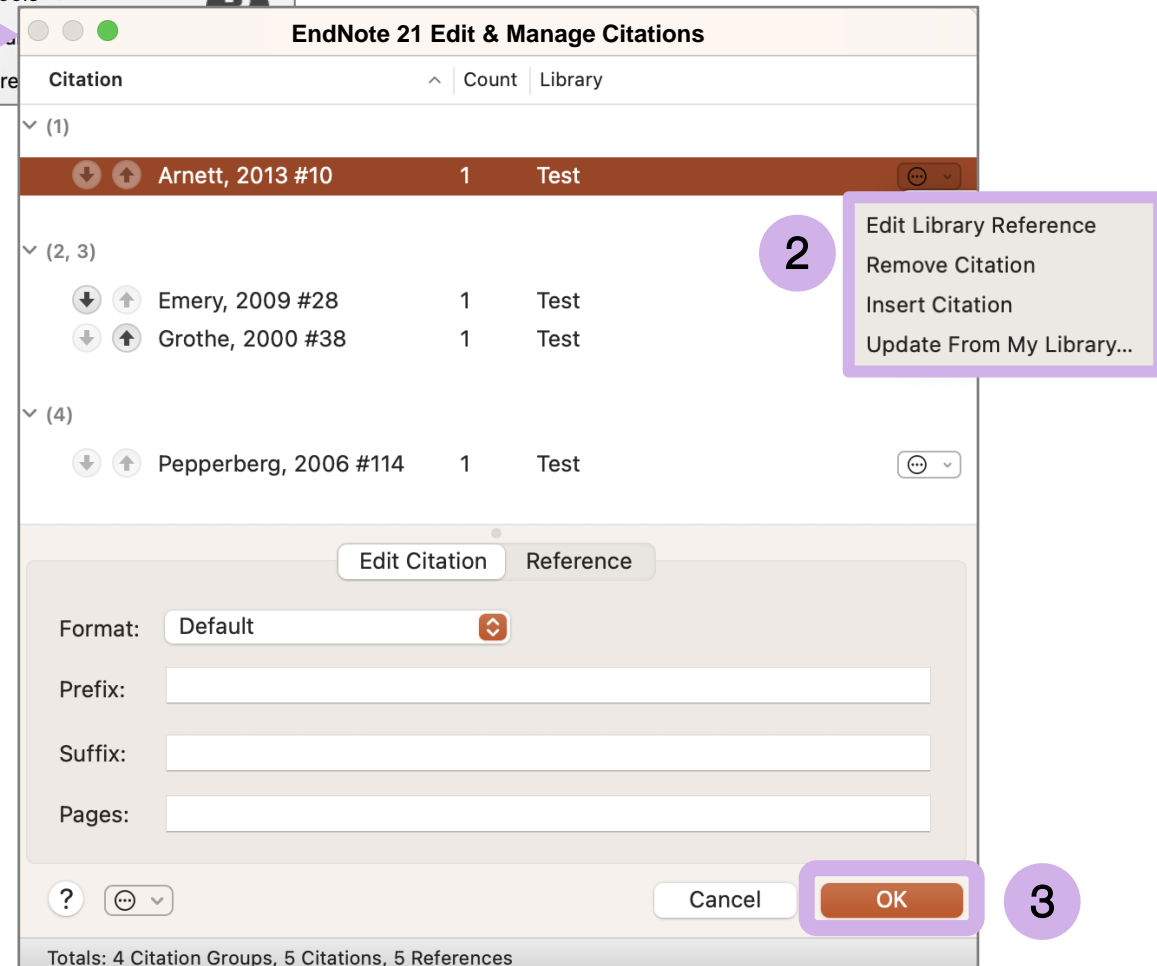
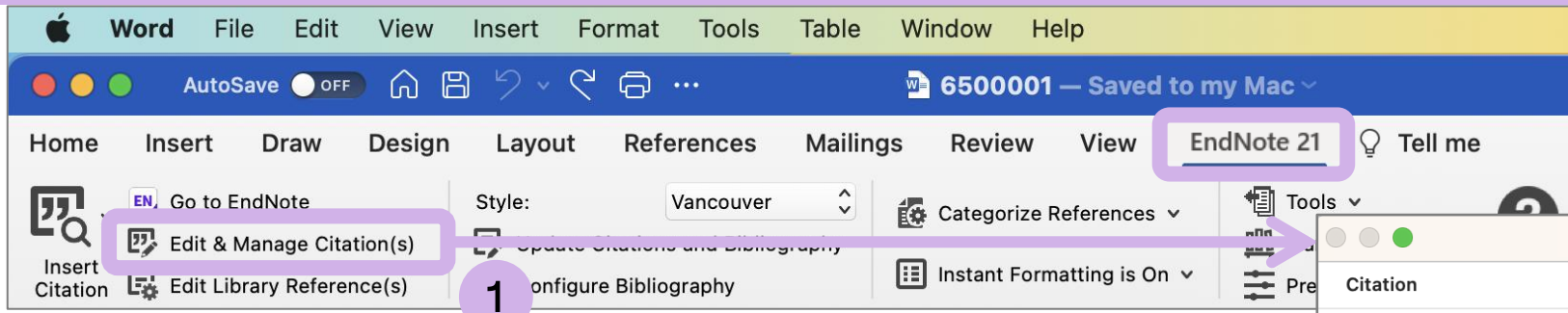
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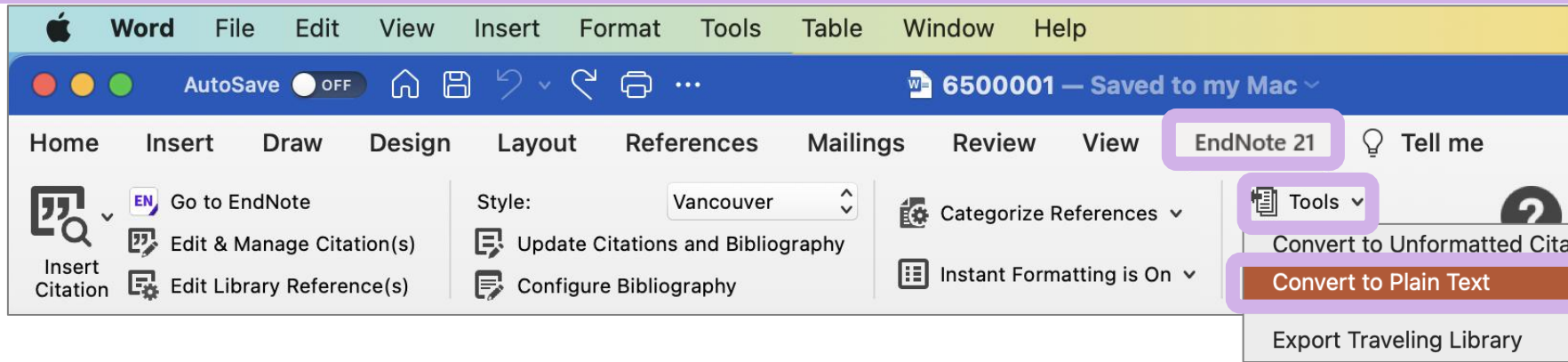
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