

RESEARCH ARTICLE

Screening novel antiviral compounds to treat *Clostridioides difficile* infectionsBrice J. Stoltz^{1,2}, Ahmed A. Abouelkhair^{1,2}, Mohamed N. Seleem^{1,2*}

1 Department of Biomedical Sciences and Pathobiology, Virginia-Maryland College of Veterinary Medicine, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, United States of America, **2** Center for One Health Research, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, United States of America

* mseleem@vt.edu

OPEN ACCESS

Citation: Stoltz BJ, Abouelkhair AA, Seleem MN (2024) Screening novel antiviral compounds to treat *Clostridioides difficile* infections. *PLOS ONE* 19(12): e0309624. <https://doi.org/10.1371/journal.pone.0309624>

Editor: Baochuan Lin, Defense Threat Reduction Agency, UNITED STATES OF AMERICA

Received: August 14, 2024

Accepted: November 27, 2024

Published: December 13, 2024

Copyright: © 2024 Stoltz et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: All relevant data are within the manuscript and its [Supporting Information files](#).

Funding: This work was funded by the National Institutes of Health (grant R01AI130186). Link: https://reporter.nih.gov/search/v5_bjCQoL80mmCvC38ybmd3Mg/project-details/10165470/similar-projects This funding was received by: M. N. Seleem. The funders played no role in the study of design, data collection, analysis, decision to publish, or preparation of this manuscript and its work.

Abstract

Clostridioides difficile is a major cause of nosocomial infections, often associated with individuals who have gut dysbiosis from previous antibiotic therapies. *C. difficile* infections (CDI) have a high recurrence rate and impose significant financial and mortality burdens on the healthcare system. Therefore, novel anti-*C. difficile* drugs are urgently needed to treat and reduce the severity and recurrence of infection. In this study, we screened a library of 618 antiviral drugs to identify a potential candidate for repurposing as novel anti-*C. difficile* therapeutics. Following our preliminary screening, we identified 9 novel compounds that inhibited *C. difficile* at a concentration of 16 μ M or lower. Among these, 4 antiviral compounds demonstrated the most potent anti-*C. difficile* activity against a panel of 15 *C. difficile* isolates, with minimum inhibitory concentrations (MICs) comparable to the drug of choice, vancomycin. These include rottlerin (MIC₅₀ = 0.25 μ g/mL), α -mangostin (MIC₅₀ = 1 μ g/mL), dryocrassin ABBA (MIC₅₀ = 1 μ g/mL), and obelazimod (MIC₅₀ = 4 μ g/mL). All exhibited minimal to no activity against representative members of the human gut microbiota. Interestingly, α -mangostin, a natural xanthone derived from the mangosteen fruit, exhibited strong bactericidal action, clearing a high inoculum of *C. difficile* in less than an hour. All other drugs exhibited bacteriostatic activity. Given their characteristics, these compounds show great promise as novel treatments for CDI.

Introduction

Healthcare-associated infections are one of the greatest burdens on healthcare systems. Most bacteria responsible for a part of this burden are associated with antimicrobial resistance, with one notable exception: *C. difficile*. Despite lacking a significant antimicrobial resistance profile, *C. difficile* is still considered an urgent threat and one of the deadliest bacterial infections responsible for approximately 30,000 deaths annually, primarily affecting older populations [1–5]. The incidence of *C. difficile* infections (CDI) in the United States has increased over the last two decades and has remained relatively stable from 2021 to 2022, with the COVID-19 pandemic seeing a drop in cases due to improved strategies preventing the spread of

Screening The Novel

Keith Selby, Robert Giddings



Screening The Novel:

Screening the Novel Robert Giddings, Keith Selby, Chris Wensley, 1990 Screening The Novel Keith Selby, Robert Giddings, 2016-07-27 The book takes as its theme the relationship between literature and the contemporary means of production and distribution collectively termed the media in particular film and television The intention of the book is to explore and evaluate the mutual opportunities and restrictions in this relationship In the grammar of our culture there seems to be an accepted opinion that print is superior in terms of cultural production to film radio or television that to read a book is somehow a higher cultural activity than seeing a play on television or seeing a film By the same token a novel is a superior work of art to film or television The longer perspective reveals that traditionally there always is a greater respect paid to the previous mode of literary production poetry was superior to drama poetic drama was superior to the novel and film attained cult and classic status initially over television **Screening Novel Women** Liora Brosh, 2015-12-04 From Hollywood classics like Jane Eyre or Wuthering Heights to the 1990s wave of Jane Austen films adaptations of the British Nineteenth century novel have been sensationally popular This book examines how British and American filmmakers used the domestic novels of the past to construct stable gender ideals for the present Private Screening Richard North Patterson, 1985 The nation is stunned silent when presidential hopeful James Kilcannon is shot dead point blank while sharing the stage at a benefit concert with his rock star girlfriend Stacy Tarrant Fiercely independent attorney Tony Lord defends the assassin in a sensational trial that erupts into the media event of the decade But the most shocking gambit ever witnessed in the history of television has yet to unfold As America watches a mysterious and ruthless figure known only as Phoenix takes to the airwaves in the ultimate act of high tech terror Holding the wife of a wealthy newspaper mogul and Stacy s manager hostage Phoenix mounts a televised trial of his own in which Stacy Tarrant and Tony Lord are helpless defendants millions of viewers are jurors and unless his chilling demands are met Phoenix is the unstoppable executioner Copyright Libri GmbH All rights reserved **Keighley & Williams' Surgery of the Anus, Rectum and Colon, Fourth Edition** Michael R.B. Keighley, Norman S. Williams, 2018-11-06 This fourth edition of Surgery of the Anus Rectum and Colon continues to redefine the field with its comprehensive coverage of common and rare colorectal conditions advances in the molecular biology and genetics of colorectal diseases and new laparoscopic techniques Contributions from international experts on specialized topics and various new illustrations ensure that the extensive text is not only current and authoritative but easy to understand No other book provides the expertise of a world class editorial team with the cutting edge knowledge you need to master colorectal surgery **Photosynthesis Research for Food, Fuel and Future** Tingyun Kuang, Congming Lu, Lixin Zhang, 2013-08-31 Photosynthesis is the process by which plants algae and certain species of bacteria transform solar energy into chemical energy in the form of organic molecules In fact all life on the planet ultimately depends on photosynthetic energy conversion The book provides a compressive and state of the art of very recent progress on photosynthesis research

The topics span from atom to intact plants from femtosecond reactions to season long production from physics to agronomy. The book is to offer advanced undergraduate students, graduate students and research specialists the most recent advances in the all aspects of photosynthesis research. The book is intended to offer researchers detailed information on the most recent advances in all aspects of photosynthesis research. Tingyun Kuang is a professor at Institute of Botany the Chinese Academy of Sciences CAS and the Academician of CAS. Congming Lu is a professor at Institute of Botany CAS. Lixin Zhang is a professor at Institute of Botany CAS and the Chief Scientist in the National Basic Research Program of China on photosynthesis.

G Protein-Coupled Receptors Xinfeng Zhao, Qian Li, Jing Wang, Qi Liang, Jia Quan, 2023-02-20. This book summarizes the progress made to functional immobilize G protein coupled receptors (GPCRs) through site specific or orientated recognition in both non covalent and covalent manners. The last decade is the dawn of the post structural biology era for G protein coupled receptor research. As an emerging approach for state of the art immobilization, this book discusses efforts to explore the elegance of naturally occurring biochemical reactions by using their high specificity and robust reactivity in the complex system such as site specific conjugation by covalent recognition between enzymes and their substrates. With the perspective of protein drug interactions, this book also reviews the applications of protein immobilization with an emphasis on G protein coupled receptors in drug discovery and protein ligand interaction analysis. In addition, the merits, opportunities and disadvantages are analyzed for different immobilization methods and a perspective for future directions is presented. Given its scope, this book appeals to a broad readership, particularly researchers engaged in the field of analytical chemistry, bioconjugate chemistry and chemical biology and other related field as well as teachers of relevant majors in colleges and universities.

Chemical & Metallurgical Engineering Eugene Franz Roeber, Howard Coon Parmelee, 1924.

Advanced Methods in Biomedical Signal Processing and Analysis Kunal Pal, Samit Ari, Arindam Bit, Saugat Bhattacharyya, 2022-09-07. Advanced Methods in Biomedical Signal Processing and Analysis presents state of the art methods in biosignal processing including recurrence quantification analysis, heart rate variability analysis of the RRI time series signals, joint time frequency analyses, wavelet transforms and wavelet packet decomposition, empirical mode decomposition, modeling of biosignals, Gabor Transform, empirical mode decomposition. The book also gives an understanding of feature extraction, feature ranking and feature selection methods while also demonstrating how to apply artificial intelligence and machine learning to biosignal techniques. Gives advanced methods in signal processing. Includes machine and deep learning methods. Presents experimental case studies.

Screening the Novel Gabriel Miller, 2020. Some of the most memorable movies of Hollywood's Golden Age were based on novels that never received the acclaim they deserved. No one who saw Rod Steiger in *The Pawnbroker* could forget the actor's wrenching performance, but does anyone remember the author of the book on which the film was based? The same can be said of Jane Fonda in *They Shoot Horses, Don't They?* Greta Garbo in *Susan Lennox* and Humphrey Bogart in *The Treasure of the Sierra Madre*. This book retrieves these novels and re

evaluates the careers of the eight neglected novelists whose works inspired eight different directors among them Stanley Kubrick Sidney Lumet John Huston and Sidney Pollack Each chapter offers detailed analysis on both the original text and the resulting movie Taken together the double examination of novel and film raises some important questions about the nature and problems of cinematic adaptation

This book delves into Screening The Novel. Screening The Novel is a vital topic that must be grasped by everyone, from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Screening The Novel, encompassing both the fundamentals and more intricate discussions.

1. This book is structured into several chapters, namely:

- Chapter 1: Introduction to Screening The Novel
- Chapter 2: Essential Elements of Screening The Novel
- Chapter 3: Screening The Novel in Everyday Life
- Chapter 4: Screening The Novel in Specific Contexts
- Chapter 5: Conclusion

2. In chapter 1, this book will provide an overview of Screening The Novel. The first chapter will explore what Screening The Novel is, why Screening The Novel is vital, and how to effectively learn about Screening The Novel.
3. In chapter 2, the author will delve into the foundational concepts of Screening The Novel. The second chapter will elucidate the essential principles that need to be understood to grasp Screening The Novel in its entirety.
4. In chapter 3, the author will examine the practical applications of Screening The Novel in daily life. The third chapter will showcase real-world examples of how Screening The Novel can be effectively utilized in everyday scenarios.
5. In chapter 4, the author will scrutinize the relevance of Screening The Novel in specific contexts. The fourth chapter will explore how Screening The Novel is applied in specialized fields, such as education, business, and technology.
6. In chapter 5, this book will draw a conclusion about Screening The Novel. The final chapter will summarize the key points that have been discussed throughout the book.

The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Screening The Novel.

https://pinsupreme.com/book/publication/Download_PDFS/Recpk%20100%20Chu2%20Registratn%20Rec.pdf

Table of Contents Screening The Novel

1. Understanding the eBook Screening The Novel

- The Rise of Digital Reading Screening The Novel
- Advantages of eBooks Over Traditional Books
- 2. Identifying Screening The Novel
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
- 3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Screening The Novel
 - User-Friendly Interface
- 4. Exploring eBook Recommendations from Screening The Novel
 - Personalized Recommendations
 - Screening The Novel User Reviews and Ratings
 - Screening The Novel and Bestseller Lists
- 5. Accessing Screening The Novel Free and Paid eBooks
 - Screening The Novel Public Domain eBooks
 - Screening The Novel eBook Subscription Services
 - Screening The Novel Budget-Friendly Options
- 6. Navigating Screening The Novel eBook Formats
 - ePub, PDF, MOBI, and More
 - Screening The Novel Compatibility with Devices
 - Screening The Novel Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Screening The Novel
 - Highlighting and Note-Taking Screening The Novel
 - Interactive Elements Screening The Novel
- 8. Staying Engaged with Screening The Novel
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Screening The Novel

9. Balancing eBooks and Physical Books Screening The Novel
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Screening The Novel
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Screening The Novel
 - Setting Reading Goals Screening The Novel
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Screening The Novel
 - Fact-Checking eBook Content of Screening The Novel
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

Screening The Novel Introduction

Free PDF Books and Manuals for Download: Unlocking Knowledge at Your Fingertips In today's fast-paced digital age, obtaining valuable knowledge has become easier than ever. Thanks to the internet, a vast array of books and manuals are now available for free download in PDF format. Whether you are a student, professional, or simply an avid reader, this treasure trove of downloadable resources offers a wealth of information, conveniently accessible anytime, anywhere. The advent of online libraries and platforms dedicated to sharing knowledge has revolutionized the way we consume information. No longer confined to physical libraries or bookstores, readers can now access an extensive collection of digital books and manuals with just a few clicks. These resources, available in PDF, Microsoft Word, and PowerPoint formats, cater to a wide range of interests, including literature, technology, science, history, and much more. One notable platform where you can explore and download free Screening The Novel PDF books and manuals is the internet's largest free library. Hosted online,

this catalog compiles a vast assortment of documents, making it a veritable goldmine of knowledge. With its easy-to-use website interface and customizable PDF generator, this platform offers a user-friendly experience, allowing individuals to effortlessly navigate and access the information they seek. The availability of free PDF books and manuals on this platform demonstrates its commitment to democratizing education and empowering individuals with the tools needed to succeed in their chosen fields. It allows anyone, regardless of their background or financial limitations, to expand their horizons and gain insights from experts in various disciplines. One of the most significant advantages of downloading PDF books and manuals lies in their portability. Unlike physical copies, digital books can be stored and carried on a single device, such as a tablet or smartphone, saving valuable space and weight. This convenience makes it possible for readers to have their entire library at their fingertips, whether they are commuting, traveling, or simply enjoying a lazy afternoon at home. Additionally, digital files are easily searchable, enabling readers to locate specific information within seconds. With a few keystrokes, users can search for keywords, topics, or phrases, making research and finding relevant information a breeze. This efficiency saves time and effort, streamlining the learning process and allowing individuals to focus on extracting the information they need. Furthermore, the availability of free PDF books and manuals fosters a culture of continuous learning. By removing financial barriers, more people can access educational resources and pursue lifelong learning, contributing to personal growth and professional development. This democratization of knowledge promotes intellectual curiosity and empowers individuals to become lifelong learners, promoting progress and innovation in various fields. It is worth noting that while accessing free Screening The Novel PDF books and manuals is convenient and cost-effective, it is vital to respect copyright laws and intellectual property rights. Platforms offering free downloads often operate within legal boundaries, ensuring that the materials they provide are either in the public domain or authorized for distribution. By adhering to copyright laws, users can enjoy the benefits of free access to knowledge while supporting the authors and publishers who make these resources available. In conclusion, the availability of Screening The Novel free PDF books and manuals for download has revolutionized the way we access and consume knowledge. With just a few clicks, individuals can explore a vast collection of resources across different disciplines, all free of charge. This accessibility empowers individuals to become lifelong learners, contributing to personal growth, professional development, and the advancement of society as a whole. So why not unlock a world of knowledge today? Start exploring the vast sea of free PDF books and manuals waiting to be discovered right at your fingertips.

FAQs About Screening The Novel Books

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading

preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer web-based readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. Screening The Novel is one of the best book in our library for free trial. We provide copy of Screening The Novel in digital format, so the resources that you find are reliable. There are also many Ebooks of related with Screening The Novel. Where to download Screening The Novel online for free? Are you looking for Screening The Novel PDF? This is definitely going to save you time and cash in something you should think about.

Find Screening The Novel :

[recpk/100 chu2 registratn rec](#)

[reckless abandon the call for spiritual pioneers](#)

recreation aide career examination series c 1449

[recommended country hotels of britain 1995](#)

red hot monogamy in just 60 seconds a day

[red power](#)

[recon pilot project:](#)

recreation business

[recollections of a violinst](#)

[recovered memories of trauma transferring the present to the past](#)

recreating democracy breathing new life into american communities

reclaiming the spirit gay men and women come to terms with religion

[reconstructing proto-afroasiatic proto-afasian](#)

recueil des cours collected courses 271

red ginger blossom

Screening The Novel :

Parallel Myths by Bierlein, J.F. This is an extremely well-researched and well-organized volume comparing the mythological stories of past civilizations and showing similarities and trends ... Parallel Myths - Kindle edition by Bierlein, J.F.. Literature & ... This is an extremely well-researched and well-organized volume comparing the mythological stories of past civilizations and showing similarities and trends ... Parallel Myths by J.F. Bierlein: 9780345381460 About Parallel Myths Bierlein gathers the key myths from all of the world's major traditions and reveals their common themes, images, and meanings. Parallel Myths by J.F. Bierlein, Paperback This is a marvelous compilation of myths from around the world: western, non-western, and Native American. It is a great book for classes focusing on world ... Parallel Myths by J.F. Bierlein Juxtaposing the most potent stories and symbols from each tradition, Bierlein explores the parallels in such key topics as creation myths, flood myths, tales ... Parallel Myths Summary and Study Guide Parallel Myths by J. F. Bierlein, a scholarly study of cultural mythology and its extensive cross-cultural intersectionality, was originally published in ... Parallel Myths Parallel Myths. J. F. Bierlein. Ballantine Books, \$15.95 (368pp) ISBN 978-0-345-38146-0. A religious scholar and lifelong student of mythology, Bierlein (The ... Parallel Myths - J.F. Bierlein Jun 16, 2010 — The author of Parallel Myths and The Book of Ages, J. F. Bierlein teaches in the Washington Semester and World Capitals Program at American ... Parallel Myths Bierlein's thoughtfully arranged book is largely an anthology, and retells myths explaining the creation of the universe, the great flood, the nature of death ... j f bierlein - parallel myths - First Edition Parallel Myths by Bierlein, J. F. and a great selection of related books, art and collectibles available now at AbeBooks.com. The Political Economy of East Asia: Striving for Wealth and ... The Political Economy of East Asia: Striving for Wealth and Power · By: Ming Wan · Publisher: CQ Press · Publication year: 2008; Online pub date: December 20, 2013. The Political Economy of East Asia: Wealth and Power ... Offering a coherent overview of the historical and institutional context of enduring patterns in East Asian political economy, this updated and expanded ... The Political Economy of East Asia: Striving for Wealth and ... In his new text, Ming Wan illustrates the diverse ways that the domestic politics and policies of countries within East Asia affect the region's production, ... Ming Wan, ed. The Political Economy of East Asia: Striving for ... by P Thiers · 2010 — The Political Economy of East Asia: Striving for Wealth and Power: Washington, DC: CQ Press, 2008, 394p. \$39.95 paperback. Paul Thiers Show author details. The Political Economy of East Asia: Wealth and Power Offering a coherent overview of the historical and institutional context of enduring patterns in East Asian political economy, this updated and expanded ... The Political Economy of East Asia Offering a coherent overview of the historical and institutional context of enduring patterns in East Asian political economy, this updated and expanded ... Table of contents for The political economy of East Asia Table of Contents for The political economy of East Asia : striving for wealth and power / by Ming Wan, available from the Library of Congress. The Political Economy of East Asia - Ming Wan The Political Economy of East Asia: Striving for Wealth and Power. By Ming Wan. About this book · Get Textbooks on Google Play.

Rent and save from the world's ... Ming Wan, ed. The Political Economy of East Asia by P Thiers · 2010 — Ming Wan, ed. The Political Economy of East Asia: Striving for Wealth and Power. Washington, DC: CQ Press, 2008, 394p. \$39.95 paperback.

Paul ... The political economy of East Asia : striving for wealth and ... The political economy of East Asia : striving for wealth and power / Ming Wan. Request Order a copy. Bib ID: 4241862; Format: Book; Author: Wan, Ming, 1960 ... How to identify mammal skulls - BBC Wildlife How to identify mammal skulls - BBC Wildlife Identify animal skulls How to identify an animal skull! Found a bird skull or mammal bone in the UK? Take a look at our ID guide to work out what your animal bones might be. Animal Skull Identification Guide Our Comprehensive animal skull identification guide with over 100 animal skull photos will help you identify animal skulls from around the world. How to Identify a Skull The most effective means of identifying a skull to species is with the use of a dichotomous key. A dichotomous key allows a person, through a series of ... What Do We Have Here? | How To Identify Animal Skulls Jan 13, 2022 — You can tell whether the skull you're holding belonged to a predator species or a prey species just by looking at certain characteristics of the ... How to Identify a Skull | Skeleton Museum The most effective means of identifying a skull and determining the correct species is with the use of a dichotomous key. A dichotomous key allows a person, ... Become a Skull Detective, Alaska Department of Fish and Game If you are serious about learning more about skulls, you should consider this extensive skull guide: Animal Skulls, A Guide to North American Species by Mark ... Animal Skulls American beaver. (Castor canadensis). Page 2. American beaver top. Page 3. American beaver bottom. Page 4. American beaver front. Page 5. American beaver.