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Corresponding author:
Catarina Possidónio

catarina.possidonio@ulusofona.pt

Author Affiliation:
HEI-Lab: Digital Human-
Environment Interaction Lab,
Universidade Lusófona.

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None declared.

Exploring supply-side barriers for commercialization of new biopolymer production technologies: A systematic review

Possidónio, C¹; Farias, AR²; Domingos, S³; Cruz, B⁴; Luís, S⁵;
Loureiro, A⁶.

Review question / Objective: What are the multi-level supply-side barriers to the commercialization of new biopolymer production technologies?

Condition being studied: Biopolymers are sustainable and environmentally friendly alternatives to traditional petroleum-based polymers, and their use is becoming increasingly important for reducing the negative impact of plastic waste on the environment.

Despite the potential benefits of biopolymers, their commercialization might face several supply-side barriers. This systematic review aims the identification and characterization of these barriers. The focus is on understanding the challenges involved in the commercialization of new biopolymer production technologies, which may include technological, economic, regulatory, and social factors that can affect the adoption and use of biopolymers in various industries.

The question studied in this systematic review is relevant to a broad range of stakeholders, including researchers, policymakers, and industry professionals involved in the development, production, and commercialization of new biopolymer technologies. By providing a comprehensive synthesis of the existing literature on the multi-level supply-side barriers that can hinder the commercialization of new biopolymer production technologies, this systematic review aims to inform future research, policy, and practice to facilitate the successful implementation of these technologies.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 19 May 2023 and was last updated on 11 September 2023 (registration number INPLASY202350076).

INTRODUCTION

Review question / Objective: What are the multi-level supply-side barriers to the

commercialization of new biopolymer production technologies?

Rationale: The rationale for this systematic review is to identify and characterize the

multi-level supply-side barriers that can hinder the commercialization of new biopolymer production technologies. This systematic review aims to provide a comprehensive synthesis of the existing literature on the multi-level supply-side barriers on this regard, such as technological barriers, regulatory barriers (including pre-market approval but also related to e.g., environmental protection), financial barriers, supply-stability barriers & other barriers (e.g., a lack of education or available information on rearing/farming techniques). By identifying and characterizing these barriers, this review will help researchers, policymakers, and industry professionals to better understand the challenges involved in developing and commercializing new biopolymer production technologies. The findings of this systematic review will provide evidence-based information for the development of strategies to address these barriers and facilitate the successful implementation of new biopolymer production technologies.

Overall, this systematic review is necessary to advance our understanding of the supply-side barriers to the commercialization of new biopolymer production technologies and to inform future research, policy making, and interventions in this area.

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The question studied in this systematic review is relevant to a broad range of stakeholders, including researchers, policymakers, and industry professionals involved in the development, production, and commercialization of new biopolymer technologies. By providing a comprehensive synthesis of the existing literature on the multi-level supply-side barriers that can hinder the commercialization of new biopolymer production technologies, this systematic review aims to inform future research, policy, and practice to facilitate the successful implementation of these technologies.

METHODS

Search strategy: Terms: Supply-side, Supply-chain, Supply, Stakeholder*, Shareholder*, Producer*, Manufacturer*, Industry Biopolymer*, Bioplastic*, Biobased polymer*, Biodegradable polymer*, Sustainable polymer*, Renewable polymer*, Green polymer*, Biomaterial*, Bioproduct*, Bio-based material*, Biodegradable material*, Sustainable material*, Green material*, Commercial* Market, Entry, Market penetration, Industry, Business, Barrier*, Obstacle*, Challenge*, Difficult*, Problem*, Impediment*, Limitation*, Constraint* Electronic databases: Web of Science, SCOPUS, PubMed, IEEE Xplore.

Participant or population: Researchers, policymakers, industry professionals and any stakeholders involved in the development and commercialization of biopolymer production technologies. No restrictions will be introduced concerning the studies samples/participants individual/group characteristics.

Intervention: Studies will include questionnaires, interviews and data in which the samples/participants were asked about the main barriers to the commercialization of (new) biopolymer production technologies.

Comparator: There is no specific comparison group for this question.

Study designs to be included: Articles and reviews will be included, ensuring the selection of high-quality, peer-reviewed sources that contribute directly to the body of knowledge in the field. The first ones accessing original research studies, primary data and analyses; and the second ones offering a comprehensive synthesis of existing research, allowing for a broader understanding of the current state of knowledge on the topic. Proceedings papers will also be included to provide early access to emerging research on the topic, accessing the current research trends and the cutting-edge developments in the field.

Eligibility criteria: Publications between 2019-2023 will be considered in this systematic review, considering the European Green Deal, first presented on 11 December 2019 - a package of policy initiatives, which aims to set the EU on the path to a green transition. The European Green Deal has 11 policy areas, whereas two are particularly relevant for biopolymers, the substances from which they are produced, are used in, or the waste they generate: 1. Transition to a circular economy 2. Zero pollution.

Information sources: Electronic databases, industry reports.

Main outcome(s): By identifying and characterizing the multi-level supply-side barriers for commercialization of new biopolymer production technologies, this systematic review will help inform the development of strategies to address these barriers and facilitate the successful implementation of new biopolymer production technologies. Qualitative and quantitative insights on supply-side barriers to the commercialization of new biopolymer production technologies, and on recommendations for best practice, and lessons learned to overcome such barriers.

Data management: 1. First, three independent reviewers will apply an initial set of criteria to 10% of articles obtained from the database search, for training and definition of screening criteria. This screening will focus at title and abstract

level. Similar to the search string, the initial set of criteria will reflect each of the PICO elements previously defined. Cohens kappa will be used as a measure of interrater agreement.

2. After this training and criteria refining process, the remaining papers will be screened by the three team members at title and abstract level.

3. Lasty, three team members will screen the selected articles at full text level and perform the critical appraisal. At each stage, inconsistencies will be solved through discussion between the members. Any discrepancies between the reviewers will be resolved through discussion and consensus, and the third reviewer will be consulted if necessary.

Quality assessment / Risk of bias analysis:

We will perform a critical appraisal regarding both internal as well as external validity of studies. We will assess internal validity by examining sample size, methodological rigor, and suitability of data and statistics reported. We will assess external validity by examining the type of samples studied in each study, as well as how far the studies reflect actual supply-side barriers for commercialization of new biopolymer production technologies. Critical appraisal will be first performed by three team members on a subset of randomly selected studies (10%). This will serve for training and refining the initial set of critical appraisal criteria. After this, two raters will critically appraise the remaining studies.

Strategy of data synthesis: Papers content will be coded by three team members. This will follow a PICO (like) structure and include quantitative and qualitative information on topics such as sample, country, business area, identified barriers, recommendations to overcome barriers. The results will be reported following the PRISMA checklist (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.

pmed100097; <http://prisma-statement.org/>).

Subgroup analysis: n/a.

Sensitivity analysis: n/a.

Language restriction: English.

Country(ies) involved: Portugal.

Keywords: supply-side, barriers, commercialization, biopolymers.

Contributions of each author:

Author 1 - Catarina Possidónio.

Email: catarina.possidonio@ulusofona.pt

Author 2 - Ana Rita Farias.

Email: ana.rita.farias@ulusofona.pt

Author 3 - Samuel Domingos.

Email: samuel.domingos@ulusofona.pt

Author 4 - Bernardo Cruz.

Email: a221057812@alunos.ulht.pt

Author 5 - Sílvia Luís.

Email: silvia.luis@ulusofona.pt

Author 6 - Ana Loureiro.

Email: ana.loureiro@ulusofona.pt

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