Review

Chewable Tablets and Mouth-Dissolving Films Revolutionizing Drug Administration

Ashutosh Sengar *

Posted Date: 25 March 2025

doi: 10.20944/preprints202503.1852.v1

Keywords: chewable tablets; mouth-dissolving films; nanotechnology; targeted drug delivery; oral bioavailability

 doi:10.20944/preprints202503.1852.v1

Review

Chewable Tablets and Mouth-Dissolving Films Revolutionizing Drug Administration

Ashutosh Sengar

Assistant Professor, Dept. of Pharmaceutics, Smt. Vidyawati College of Pharmacy, Smt. Vidyawati Group of Institutions, Jhansi (U.P.); ashutoshsengar26567@gmail.com

Abstract: Oral drug delivery has evolved a lot in terms of patient compliance, bioavailability, and therapeutic action. The present review integrates advancements in chew tablets and mouth-dissolving films according to their formulation strategy, merits, and application in pediatric and geriatric patients. They improve patient compliance due to good solubility and quick action. Nanotechnology has been a central force in drug delivery system transformation. Liposomal drug carriers, polymer therapeutic carriers, and nanoparticle formulations have enabled the increase in solubility, controlled release, and site-specificity of drugs. These strategies maximize pharmacokinetics and minimize systemic side effects. Furthermore, utilization of the enhanced permeability and retention (EPR) effect has enabled targeted drug delivery with maximum therapeutic efficacy and minimum toxicity. Overcoming the biologic barrier continues to pose a challenge in oral drug delivery. Transdermal and mucosal delivery systems have made rapid onset of drug action possible by circumventing enzymatic degradation in the gastrointestinal tract. All such innovations support each other in serving in the direction of greater patient benefit and drug efficacy. This review systematically discusses the current advances in oral drug delivery with special focus on the use of chewable tablets, mouth-dissolving films, and nanotechnology-based strategies. The emergence of these novel technologies is the key to an electrifying future of optimized drug delivery and therapeutic effect.

Keywords: chewable tablets; mouth-dissolving films; nanotechnology; targeted drug delivery; oral bioavailability

1. Introduction

1.1. Evolution of Oral Drug Delivery Systems

Ora drug delivery has evolved from traditional tablets and capsules to modern drugs like chewable tablets and mouth dissolving films. All of these are towards improving the bioavailability as well as patient compliance of the drug [1]. Earlier, oral drug formulations were limited to immediate release products, but with time and advancements in technology, controlled and site-specific drug delivery systems have come into focus, providing more effective therapeutic action [2]. Nanocarrier oral delivery such as liposomes has also revolutionized drug absorption and stability with potential optimal release profiles for improved efficacy [3]. Ongoing innovations in target method technology in drug delivery have also enabled more efficacious site-specific action with diminished systemic side effects and optimum therapeutic effect [4].

1.2. Need for Patient-Friendly Dosage Forms

Patient-friendly drug delivery systems have gained popularity with the development of improved medication compliance, especially in dysphagia, geriatric, and pediatric patients [5]. Nanoparticles and mucosal drug delivery systems have helped to deliver improved solubility and bioavailability, thus facilitating improved drug delivery [5]. Naso-pulmonary drug delivery is also

 doi:10.20944/preprints202503.1852.v1

trendy as an alternative to conventional oral formulations, with additional therapeutic advantages and reduced first-pass metabolism effects [6].

Table 1. Need for Patient-Friendly Dosage Forms.

Aspect	Description	Reference
Patient Population	Pediatric, geriatric, and dysphagic patients benefit from easier-to-administer formulations	[5]
Key Innovations	- Nanoparticles enhance solubility and bioavailability - Mucosal drug delivery systems improve absorption and ease of use	[5]
Alternative Delivery Routes	- Naso-pulmonary delivery: Bypasses first-pass metabolism, improves efficacy	[6]
Advantages of Patient-Friendly Forms	Enhanced medication adherence, better therapeutic outcomes, reduced side effects	[6]

2. Chewable Tablets: An Overview

2.1. Composition and Formulation Strategies

Dissolving quickly in the mouth, chewable tablets provide comfort of administration without water. Chewable tablets may contain excipients such as fillers, binders, and sweeteners to enhance taste without compromising mechanical strength [7]. Recent drug delivery technologies have allowed using bioenhancers and controlled-release polymers to achieve a maximum release and absorption of drugs [8]. Nanocarrier-based formulations have also improved the solubility and stability of active pharmaceutical ingredients and hence the therapeutic effect [8].

2.2. Advantages Over Conventional Tablets

Some of the over traditional solid dosage forms are chewable tablets, e.g., the patient compliance and drug absorption are enhanced. Ease of first-pass metabolism results in rapid onset of action, hence best suited for drugs requiring immediate therapeutic action [9]. e.g., in addition, nanocarriers used in chewable products enhance drug targeting and bioavailability and reduce required dose and side effects [10]. All of these advancements are a better and patient-friendly drug delivery system, particularly in the elderly and children [9].

3. Mouth-Dissolving Films: Innovation in Drug Delivery

3.1. Formulation Techniques and Polymers Used

Mouth-dissolving films (MDFs) are thin, flexible films that easily dissolve very quickly when placed on saliva to deliver drugs painlessly. The MDFs are fabricated using water-soluble polymers such as hydroxypropyl methylcellulose (HPMC) and polyethylene glycol, which have quick dissolution with targeted delivery of the drug [13]. Transdermal and mucosal drug delivery technology has impacted MDF formulations with improved permeability and drug stability, contributing to improved therapeutic effectiveness [14].

3.2. Rapid Onset of Action and Bioavailability Enhancement

One of the most advantageous properties of MDFs is their capability to circumvent gastrointestinal metabolism, leading to rapid onset. Application of nanoparticle-based drug carriers in MDFs has significantly improved the drug solubility and absorption, leading to improved bioavailability [15]. Polymeric nanoparticles are also employed to prolong the circulation time of drugs, decrease the degradation of drugs, and increase systemic availability, making MDFs ideal for instant drug release [16].

 doi:10.20944/preprints202503.1852.v1

3.3. Applications in Pediatric and Geriatric Care

MDFs are particularly helpful in pediatric and geriatric patients who cannot swallow standard tablets. The rapid disintegration of such films without water increases drug compliance in such patients [17]. Furthermore, developments in drug delivery using nanoparticles have improved the safety and effectiveness of MDFs and reduced potential risk of dosing irregularity and drug release control [18].

Table 2. Key Aspects of Mouth-Dissolving Films (MDFs).

Aspect	Description	Reference
Composition & Formulation	- Made from hydrophilic polymers like HPMC and PEG - Designed for rapid disintegration and controlled drug release	[13]
Advantages Over Conventional Forms	- Bypasses gastrointestinal metabolism - Ensures faster drug absorption and higher bioavailability	[15]
Nanoparticle Integration	- Enhances solubility and drug stability - Prolongs circulation time and reduces degradation	[16]
Target Populations	- Ideal for pediatric and geriatric patients with swallowing difficulties - Eliminates need for water, improving adherence	[17]
Clinical Significance	- Reduces dose inconsistencies - Ensures controlled and precise drug release for effective therapy	[18]

4. Role of Nanotechnology in Oral Drug Delivery

4.1. Nanoparticles Improving Drug Solubility and Stability

Nanoparticles have revolutionized drug delivery by oral route in the form of enhanced drug solubility and stability for water-poor soluble drugs. Augmentation of surface area and alteration of drug release kinetics by their ability are responsible for maximum absorption and drug action [19]. Moreover, the EPR effect also renders significant contributions to the targeted delivery of drugs with nanoparticles by ensuring that there is increased bioavailability and diminished systemic toxicity [20].

4.2. Liposomal Carriers for Controlled Drug Release

Liposomal drug carriers are a therapeutic tool in showing potential in delivering controlled release of the drug in oral systems. Vesicular drug delivery systems encapsulate active pharmaceutical moieties within them, shielding them from enzymatic degradation and sustained release of the drug [21]. Liposomes also maintain drug residence in the circulatory system, providing localized biodistribution and extended action and are, therefore, the ideal candidates for chronic disease treatment [22].

4.3. Polymer Therapeutics for Enhanced Oral Bioavailability

Polymer drug delivery has been the most prevalent method of enhancing drug bioavailability upon oral administration. Polymeric carriers enable the regulation of drug release profiles, mucosal adhesion, and prolonged therapeutic action [23]. Additionally, sophisticated nanoparticle design facilitates drugs to penetrate biological barriers, resulting in increased absorption and site-specificity in oral drug delivery [24].

5. Overcoming Biological Barriers

 doi:10.20944/preprints202503.1852.v1

5.1. EPR Effect and Targeted Drug Delivery Through Oral Routes

The EPR effect is widely employed to enhance oral bioavailability in drug delivery using nanoparticles. Nanoparticles target the diseased tissue preferentially, thereby enhancing therapeutic efficacy with less off-target effects. Advanced drug carriers use this effect for biological barrier crossing and enhancing targeted drug delivery and extended systemic circulation [24].

5.2. Transdermal and Mucosal Absorption Aiding Fast Action

Novel drug delivery concepts such as transdermal and mucosal absorption have greatly enhanced rates and efficiencies of drug action. They administer drugs past usual digestive barriers to create direct systemic uptake, with an increase in the bioavailability and a decrease in drug degradation. Nanotechnology platforms such as lipid-based carriers and polymeric nanoparticles enable passive as well as active targeting to offer enhanced therapeutic outcome [25].

6. Conclusions

Drugs have seen dramatic advancements through buccal delivery, beyond the confines of traditional dosage forms. Chewable tablets and mouth dissolving films are user-friendly drugs that enhance compliance in children and geriatric patients. They have formulation design with fast disintegration, high bioavailability, and simple swallowing, thereby being extremely effective.

Nanotechnology has also revolutionized the field of drug delivery by increasing solubility, stability, and specificity. Polymeric therapeutics and liposomes have given controlled release systems that maximize therapeutic efficacy with decreased systemic toxicity. Incorporation of nanoparticles has greatly improved the solubility and permeation of drugs and enabled better absorption with site-specific activity.

Biological barriers are still a major issue in drug delivery through the oral route. The EPR effect has contributed enhanced pharmacokinetics and therapeutic effect to site-directed drug delivery. Transdermal and mucosal absorption routes have also contributed quicker action, circumventing conventional gastrointestinal barriers.

In nomenclature, incorporation of nanotechnology-based innovations, new mechanism of formulation, and target-specific delivery strategies redefined the oral drug delivery paradigm. The future researches should make such systems simplified for maximum drug action and compliance in patients along with safety and stability on usage.

References

1. Sengar, A., Vashisth, H., Chatekar, V. K., Gupta, B., Thange, A. R., & Jillella, M. S. R. S. N. (2024). From concept to consumption: A comprehensive review of chewable tablets. World Journal of Pharmaceutical Research, 13(16), 176-189.
2. Sengar, A., Yadav, S., & Niranjan, S. K. (2024). Formulation and evaluation of mouth-dissolving films of propranolol hydrochloride. World Journal of Pharmaceutical Research, 13(16), 850-861.
3. Jagrati, K. M., & Sengar, A. (2024). Liposomal vesicular delivery system: An innovative nano carrier. World Journal of Pharmaceutical Research, 13(13), 1155-1169. https://doi.org/10.20959/wjpr202413-32990
4. Sengar, A. (2023). Targeting methods: A short review including rationale, goal, causes, strategies for targeting. International Journal of Research Publication and Reviews, 4(8), 1379-1384.
5. Prajapati, R. N., Jagrati, K., Sengar, A., & Prajapati, S. K. (2024). Nanoparticles: Pioneering the future of drug delivery and beyond. World Journal of Pharmaceutical Research, 13(13), 1243-1262.
6. Sengar, A., Jagrati, K., & Khatri, S. (2024). Enhancing therapeutics: A comprehensive review on naso-pulmonary drug delivery systems for respiratory health management. World Journal of Pharmaceutical Research, 13(13), 1112-1140.
7. Langer, R. (1998). Drug delivery and targeting. Nature, 392(6679), 5–10.
8. Allen, T. M., & Cullis, P. R. (2004). Drug delivery systems: Entering the mainstream. Science, 303(5665), 1818–1822.

 doi:10.20944/preprints202503.1852.v1

9. Torchilin, V. P. (2005). Recent advances with liposomes as pharmaceutical carriers. Nature Reviews Drug Discovery, 4(2), 145–160.
10. Peer, D., Karp, J. M., Hong, S., Farokhzad, O. C., Margalit, R., & Langer, R. (2007). Nanocarriers as an emerging platform for cancer therapy. Nature Nanotechnology, 2(12), 751–760.
11. Duncan, R. (2003). The dawning era of polymer therapeutics. Nature Reviews Drug Discovery, 2(5), 347–360.
12. Mitrogotri, S., Burke, P. A., & Langer, R. (2014). Overcoming the challenges in administering biopharmaceuticals: Formulation and delivery strategies. Nature Reviews Drug Discovery, 13(9), 655–672.
13. Maeda, H., Wu, J., Sawa, T., Matsumura, Y., & Hori, K. (2000). Tumor vascular permeability and the EPR effect in macromolecular therapeutics: A review. Journal of Controlled Release, 65(1–2), 271–284.
14. Mitrogotri, S., Anderson, W. A., & Nahata, M. (2002). The science of transdermal drug delivery. Journal of Controlled Release, 78(1), 3–14.
15. Zhang, L., Gu, F. X., Chan, J. M., Wang, A. Z., Langer, R., & Farokhzad, O. C. (2008). Nanoparticles in medicine: Therapeutic applications and developments. Clinical Pharmacology & Therapeutics, 83(5), 761–769.
16. Alexis, F., Pridgen, E., Molnar, L. K., & Farokhzad, O. C. (2008). Factors affecting the clearance and biodistribution of polymeric nanoparticles. Molecular Pharmaceutics, 5(4), 505–515.
17. Byrne, J. D., Betancourt, T., & Brannon-Peppas, L. (2008). Active targeting schemes for nanoparticle systems in cancer therapeutics. Advanced Drug Delivery Reviews, 60(15), 1615–1626.
18. De Jong, W. H., & Borm, P. J. (2008). Drug delivery and nanoparticles: Applications and hazards. International Journal of Nanomedicine, 3(2), 133–149.
19. Petros, R. A., & DeSimone, J. M. (2010). Strategies in the design of nanoparticles for therapeutic applications. Nature Reviews Drug Discovery, 9(8), 615–627.
20. Torchilin, V. P. (2011). Tumor delivery of macromolecular drugs based on the EPR effect. Advanced Drug Delivery Reviews, 63(3), 131–135.
21. Farokhzad, O. C., & Langer, R. (2009). Impact of nanotechnology on drug delivery. ACS Nano, 3(1), 16–20.
22. Li, S. D., & Huang, L. (2008). Pharmacokinetics and biodistribution of nanoparticles. Molecular Pharmaceutics, 5(4), 496–504.
23. Riehemann, K., Schneider, S. W., Luger, T. A., Godin, B., Ferrari, M., & Fuchs, H. (2009). Nanomedicine—Challenge and perspectives. Angewandte Chemie International Edition, 48(5), 872–897.
24. Blanco, E., Shen, H., & Ferrari, M. (2015). Principles of nanoparticle design for overcoming biological barriers to drug delivery. Nature Biotechnology, 33(9), 941–951.
25. Bertrand, N., Wu, J., Xu, X., Kamaly, N., & Farokhzad, O. C. (2014). Cancer nanotechnology: The impact of passive and active targeting in the era of modern cancer biology. Advanced Drug Delivery Reviews, 66, 2–25.