

Tablet-in-capsule formulations: enhancing patient compliance and therapeutic outcomes

As patient needs become a larger factor in pharma manufacturing, how can advancements in tableting formulations help pharma companies adapt to this increased consideration?

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The evolution of pharmaceutical formulations has traditionally prioritised efficacy and stability, but the industry is increasingly shifting towards a patient-centric approach. Vulnerable demographics, such as the elderly and paediatric patients, often struggle with conventional tablet and capsule formats, leading to medication non-compliance and compromised therapeutic outcomes.

Tablet-in-capsule formulations are emerging as a revolutionary solution, addressing these challenges by enhancing ease of administration, adherence and therapeutic efficacy. By integrating multiple active pharmaceutical ingredients (APIs) or mini-tablets within a single capsule, this innovation offers greater dosing flexibility, improved stability and optimised drug release profiles.

For geriatric patients, difficulties such as dysphagia (difficulty in swallowing), cognitive decline and polypharmacy can complicate medication adherence.

Tablet-in-capsule formulations simplify ingestion, reduce pill burden and ensure controlled drug release,

thereby improving compliance. Similarly, paediatric patients often resist medication due to taste aversion and swallowing challenges. Mini-tablets enclosed within capsules present a superior alternative to syrups and chewables by offering precise dosing, taste masking and reduced choking risks.

As the pharma industry continues to prioritise patient needs, tablet-in-capsule technology is poised to redefine drug delivery, ensuring that medications are not only effective but also user-friendly.

Redefining drug delivery for geriatric and paediatric populations

For geriatric patients, the challenges of medication intake extend beyond the chemical composition of drugs. Dysphagia, cognitive impairments and complex dosing regimens often result in poor adherence, leading to suboptimal health outcomes. Tablet-in-capsule formulations offer a solution by enclosing tablets in a smooth, easy-to-swallow capsule, making ingestion simpler.

Additionally, they provide dose flexibility, allowing healthcare providers to tailor medication regimens by

incorporating multiple drugs within a single capsule, thus reducing pill burden.

Similarly, paediatric patients face unique barriers to medication adherence, including an aversion to unpleasant tastes and difficulties in swallowing traditional tablets.

Mini-tablets enclosed within capsules address these concerns by offering a more palatable and easily administered solution. Unlike syrups or chewable tablets, which often contain artificial flavourings that some children reject, mini-tablets ensure precise dosing without taste interference.

Parents and caregivers also benefit from the convenience of pre-measured doses, eliminating the guesswork associated with liquid formulations.

Key advantages of tablet-in-capsule formulations

Ease of swallowing
Tablets and capsules must be designed with considerations for patients of all ages, including children, the elderly and individuals with physical or cognitive impairments.

Tablet-in-capsule formulations allow the drug to be enclosed in a capsule,



which can be easier to swallow than larger tablets or traditional pills. This approach is especially valuable when multiple APIs in a formulation are incompatible with one another, as the capsule provides a safe and effective means by preventing any chemical interaction between them, without compromising the drugs' efficacy.

Taste masking
Many active ingredients have an unpleasant taste or odour that may deter patients from taking their medication. Coated tablets can also mask taste to some degree, but tablet-in-capsule formulations offer superior taste masking as the capsule completely encases the tablet, preventing the patient

from experiencing any unpleasant taste or odour.

Simplified dosing regimens
Elderly patients often encounter difficulties with complex medication regimens. Tablet-in-capsule formulations provide the advantage of less frequent dosing, such as once-daily administration, rather than multiple doses throughout the day. This simplification of medication schedules enhances adherence and significantly reduces the risk of missed doses or dosing errors.

Minimising side effects and improving tolerability
Elderly patients are more susceptible to gastrointestinal issues such as acid

reflux, ulcers, or general stomach irritation.¹ Encasing the tablet in capsules can mask potential harshness or bitterness of the medication, leading to improved patient tolerance.

Greater control over release profile
Tablet-in-capsule formulations offer enhanced flexibility in tailoring the release profile by incorporating multiple tablets with different release mechanisms within a single capsule.²

This allows for more precise tailoring of the release, accommodating a range of therapeutic needs. For instance, one tablet inside the capsule might release immediately, while another tablet releases gradually over a longer period. In contrast, extended-release (ER) and

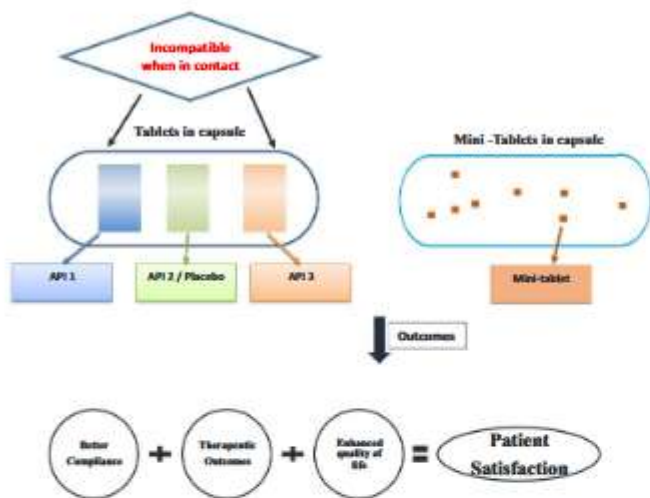


Figure 1. Illustration of the role of tablets and mini-tablets in capsule packaging for paediatric patients.

sustained-release (SR) tablets typically feature a fixed release mechanism that delivers the drug at a consistent rate over time. While these tablets are designed to provide steady drug release, they lack the flexibility to combine multiple release profiles within the same dosage form, limiting their ability to address diverse therapeutic needs as effectively as tablet-in-capsule formulations.⁴

Improved psychological comfort

Elderly patients often experience heightened anxiety regarding their medication regimens, particularly when they are required to take multiple pills daily.

The simplicity of taking a single capsule, even if it contains several tablets with different active ingredients, can make the medication regimen feel more manageable.⁴

This streamlined approach offers psychological reassurance, helping to reduce the perceived complexity of the treatment plan. As a result, this sense of ease and convenience can enhance medication adherence and alleviate the stress associated with managing intricate or burdensome regimens.

Extended shelf life and stability

Tablet-in-capsule formulations offer enhanced protection compared to coated tablets by providing a dual layer of defence – both the capsule and the tablet coating (if present).

The gelatin or hydroxypropyl methylcellulose (HPMC) capsule acts as a robust barrier, safeguarding the tablet's contents from environmental factors such as humidity, light and air.⁶ This dual-layer protection ensures enhanced stability, particularly for sensitive medications. In contrast,

coated tablets offer only a single protective layer, which may be less effective in safeguarding the active ingredients from prolonged exposure to environmental conditions.

This added protection is especially valuable for elderly patients who often require long-term treatment regimens, ensuring the medication's stability and efficacy over extended periods.⁶

Mini-tablets in capsules: a step forward for paediatric care

Administering medication to paediatric patients presents significant challenges, primarily due to taste-sensitivity, difficulty in swallowing and the necessity for precise dosing based on age and weight. Mini-tablets encapsulated within capsules provide an effective solution to these challenges. Their small size

facilitates ease of swallowing while enabling precise dose adjustments by modifying the number of mini-tablets administered.

When paediatric patients require a lower dosage, parents or caregivers may attempt to divide larger traditional tablets, often leading to inaccurate dosing.

Mini-tablets encapsulated within capsules address this issue by offering pre-measured doses that can be precisely adjusted without the need for tablet division. This approach ensures greater dosing accuracy, thereby enhancing both the safety and efficacy of paediatric medication administration.

Furthermore, encapsulation effectively masks unpleasant tastes, improving patient compliance.⁷ Traditional paediatric formulations, such as liquids, syrups and chewable tablets, frequently present limitations, including taste aversion, dosing inaccuracies and reduced adherence to prescribed regimens.

As a result, there is a growing interest in innovative drug delivery systems, particularly mini-tablets enclosed within capsules, to improve both the effectiveness and acceptability of paediatric medication administration (see Figure 1).

A new era in pharmaceutical innovation

The shift toward patient-centric drug formulations, particularly the adoption of tablet-in-capsule and mini-tablet-in-capsule technologies, marks a significant milestone in pharmaceutical science.

These innovations not only address the limitations of traditional oral dosage forms but also redefine the standards of medication adherence and therapeutic effectiveness.

By ensuring ease of swallowing, optimising drug release and enhancing

patient compliance, these formulations provide a pragmatic approach to medication management for both geriatric and paediatric patients.

In contrast to outdated formulations that struggle with issues of stability, palatability and dosing accuracy, tablet-in-capsule technology represents a forward-thinking solution aligned with modern healthcare priorities.

As pharmaceutical companies continue to prioritise patient needs, embracing innovations such as tablet-in-capsule formulations will be instrumental in shaping the future of drug delivery.

This approach not only enhances the safety and efficacy of medications but also empowers patients and caregivers with more accessible, convenient and effective treatment options.

The era of rigid, one-size-fits-all medications is being replaced with flexible, patient-centric solutions that drive superior health outcomes and quality of life.

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