Review of Mechanisms of Release of Commonly Prescribed Tetracyclines
Pearl Kwong MD, PhD, FAAD a, Hilary Baldwin MD, FAAD b, Debbie Glaab MSN, CPNP-AC c, Rhonda Schreiber MS, RN c, Emma Higgett BS d

INTRODUCTION

Dermatologists prescribe more oral antibiotics than any other specialty.1 From the mid-1950s to the early 1970s, the predominant oral antibiotic utilized to treat inflammatory skin disease was tetracycline.2 Since then, there has been increased use of three newer generation tetracyclines. Doxycycline was introduced in 1967, minocycline in 1971, and most recently sarecycline in 2018.3,4,5 These are available in various mechanisms of release (MOR). The most common MORs used in dermatology are immediate release (IR), delayed release (DR), and extended release (ER). While clinicians prescribe all these MORs, there is a lack of synthesized information regarding their impact on clinical considerations for use. The data presented here is intended to increase clinician understanding of MORs, provide a quick reference source, and support individualized patient care.

RESULTS

Sixteen publications related to MOR were identified from this review. Consistently, the tetracycline derivatives doxycycline and minocycline were the most frequently used to treat inflammatory skin disease with a long and favorable track record of effectiveness and safety.2 Although newer and with fewer publications, sarecycline was shown to be both efficacious and safe in treating acne vulgaris.6 Currently doxycycline is available in both immediate and delayed-release formulations, minocycline in immediate and extended release, and sarecycline in immediate release. Delayed and extended release formulations were developed to address tolerance issues, achieve desired therapeutic objectives, and improve patient compliance concerns identified with the original immediate release formulations.4 All 3 MORs have value in treatment regimens and may improve patient outcomes when fully understood and utilized in a manner that maximizes their formulation benefits to meet individual needs. Table 1 below provides a quick reference regarding MOR for the currently available branded tetracycline products.

Table 1: MOR Quick Reference

<table>
<thead>
<tr>
<th>Formulations</th>
<th>Immediate Release</th>
<th>Delayed Release</th>
<th>Extended Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active drug released in stomach absorbed in small intestine1,4,6</td>
<td>Active drug released and absorbed in the small intestine</td>
<td>Active drug released in the stomach and absorbed in small intestine1,5</td>
<td></td>
</tr>
<tr>
<td>Intended to achieve rapid onset of pharmacodynamic effect</td>
<td>Intended to reduce side effects related to upper GI tract exposure</td>
<td>Intended to reduce systemic side effects and allow for less frequent dosing</td>
<td></td>
</tr>
<tr>
<td>Can also induce or exacerbate GI side effects3 and vesicular side effects (Minocycline only)4,5,6</td>
<td>Can take with or without food1,2,11</td>
<td>Can take with or without food1,2,11</td>
<td></td>
</tr>
<tr>
<td>Impact of food and daily variables among IR products and prescribing information should be checked prior to dosing</td>
<td>Can take with dairy1,2,11</td>
<td>Longer life with more consistent systemic exposure5</td>
<td></td>
</tr>
<tr>
<td>• Doxycycline hyclate (Targadox®, Acticlate®)3,11</td>
<td>• Doxycycline hyclate (Doryx®)1,12</td>
<td>• Minocycline HCL (Solydyl®)6,11</td>
<td></td>
</tr>
<tr>
<td>• Sarecycline (Sessyara®)11</td>
<td>• Doxycycline hyclate modified polymer coating (Doryx® MPC)12</td>
<td>• Minocycline hydrochloride (Minolira®)6,11</td>
<td></td>
</tr>
<tr>
<td>• Minocycline hydrochloride (Ximino®)6,11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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CONCLUSIONS

This review highlights the evolution of oral formulations most prescribed in dermatology. Distinct differences, based on MOR, have been noted in literature regarding reduction in some side effects and administration.4,5 Tolerability and ease of use, as suggested by MOR, have been correlated to improved compliance with treatment regimens.6,7 The data suggests that understanding the MOR of tetracyclines may be an important consideration to guide individualized treatment and improve patient outcomes. The data reviewing demonstrated that these different mechanisms of release have unique side effect profiles and considerations for treatment that may impact tolerability, patient preference, and compliance with treatment regimens.8

REFERENCES


AFFILIATIONS

1. J. D. Fung is in private dermatology private practice, Orlando, FL. S. D. Baldwin is Medical Director, Acne Treatment and Medical Center, Trivadis, CA and Chief Academic Associate of Dermatology, Rutgers Robert Wood Johnson Medical Center, New Brunswick, NJ. S. M. Eklund and J. L. Poretsky are employed at Wayne Pharma Inc. S. M. Eklund is Chief Medical Officer of Science, Wayne, FL. This poster was sponsored by Wayne Pharma.
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INTRODUCTION

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OBJECTIVE

• To create a resource regarding the MOR of oral tetracyclines used in dermatology.

METHODS

• A systematic literature search of peer-reviewed publications was conducted over a 25-year period.

The primary focus of the review was to summarize differences between IR, ER, and DR and examine them pharmacologically and clinically.

Data was summarized into tabular format for ease of reference.

RESULTS

Sixteen publications related to MOR were identified from this review. Consistently, the tetracycline derivatives doxycycline and minocycline were the most frequently used to treat inflammatory skin disease with a long and favorable track record of effectiveness and safety. Although newer and with fewer publications, tetracycline was shown to be both efficacious and safe in treating acne vulgaris. Currently doxycycline is available in both immediate and delayed-release formulations, minocycline in immediate and extended release, and tetracycline in immediate release. Delayed and extended release formulations were developed to address tolerance issues, achieve desired therapeutic objectives, and improve patient compliance concerns identified with the original immediate release formulations. All 3 MORs have value in treatment regimens and may improve patient outcomes when fully understood and utilized in a manner that maximizes their formulation benefits to meet individual needs. Table 1 below provides a quick reference regarding MOR for the currently available branded tetracycline products.

Figure 1: Mechanisms of Release

IR formulations release most of the active drug very quickly after oral administration.3

DR formulations are enteric coated, allowing most of the active drug to bypass the upper GI tract.2

ER formulations release active drug over a longer period of time to provide stabilized pharmacodynamic effect.5

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<th>Extended Release</th>
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<tbody>
<tr>
<td>Active drug released in stomach absorbed in small intestine1,4</td>
<td>Active drug released and absorbed in the small intestine1,4</td>
<td>Active drug released in the stomach and absorbed in small intestine1,5</td>
</tr>
<tr>
<td>Intended to achieve rapid onset of pharmacodynamic effect1</td>
<td>Intended to reduce side effects related to upper GI tract exposure4</td>
<td>Intended to reduce systemic side effects and allow for less frequent dosing5</td>
</tr>
<tr>
<td>Can also induce or exacerbate GI side effects6 and vestibular side effects (Minocycline only)1,3,11</td>
<td>Can take with or without food12,13</td>
<td>Longer half-life with more consistent systemic exposure5</td>
</tr>
<tr>
<td>Impact of food and diabetes among IR products and prescribing information should be checked prior to dosing14,15,16,17</td>
<td>Can take with dairy15,13</td>
<td>Impact of diarrhea varies among ER products and prescribing information should be checked prior to dosing15,16,17</td>
</tr>
</tbody>
</table>

Examples

Doxycycline hyclate (Targadox5, Acticlate7,8,10

Sancycline (Seyraya)11

Minocycline hydrochloride)17

Doxycycline hyclate (Doryx)17

Doxycycline hyclate modified polymer coating (Doryx MPO)15

Minocycline HCL (Soliqox)14

Minocycline hydrochloride (Minocycla)15

Minocycline hydrochloride (Ximeyx)15

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CONCLUSIONS

This review highlights the evolution of oral formulations of tetracyclines most prescribed in dermatology. Distinct differences, based on MOR, have been noted in literature regarding some side effects and administration.1,5 Tolerance and ease of use, as suggested by MOR, have been correlated to improved compliance with treatment regimens.6,7 The data suggests that understanding the MOR of tetracyclines may be an important consideration to guide individualized treatment and improve patient outcomes. The data reviewed demonstrates that these different mechanisms of release have unique side effect profiles and considerations for treatment which may impact tolerability, patient preference, and compliance with treatment regimens.9

REFERENCES


AFFILIATIONS

a. Dr. Kwong is in pediatric dermatology private practice, Jacksonville, FL. b. Dr. Baldwin is in Medical Dermatology, Arvada Treatment and Research Center, Broomfield, CO and Clinical Associate Professor of Dermatology, Western Pennsylvania Hospital, Pittsburgh, PA. c. Dr. Baldwin is in Medical Dermatology, Arvada Treatment and Research Center, Broomfield, CO and Clinical Associate Professor of Dermatology, Western Pennsylvania Hospital, Pittsburgh, PA. d. Dr. Baldwin is in Medical Dermatology, Arvada Treatment and Research Center, Broomfield, CO and Clinical Associate Professor of Dermatology, Western Pennsylvania Hospital, Pittsburgh, PA.

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