FORMULATION STUDY

Key Words: Anti-Reflux, Sodium Alginate, Chewable Tablet, Direct Compression
JRS Products: VIVAPHARM® Sodium Alginate PH R5, EMDEX®, PROSOLV® SMCC 50, PRUV®

Chewable Anti-Reflux Tablets with VIVAPHARM® Sodium Alginate

4282-071

Aim of the study

Many anti-reflux medications on the market are available in the form of suspensions containing sodium alginate as the active ingredient. Corresponding tablet formulations are still less common, despite their greater convenience and stability.

The aim of the study was to develop a chewable anti-reflux tablet by direct compression. A formulation composed of VIVAPHARM® Sodium Alginate PH R5, and the excipients PROSOLV® SMCC 50, EMDEX® and PRUV® was developed, leading to an effective solid dosage form to prevent reflux.

Sodium Alginate

Alginates are salts derived from alginic acid, which is a structural component in the cell walls of brown algae. Sodium alginate has the ability to build gels in the presence of calcium and gastric acid. In anti-reflux formulations, carbon dioxide is incorporated into the gel, contributing to its flotation as a raft.
The raft forms a protective layer in the stomach and functions as a physical barrier in order to prevent reflux of gastric acid into the esophagus.

VIVAPHARM® Sodium Alginate PH R5 was specifically developed for anti-reflux applications, including the described raft formation.[1,2]

Pic. 1 Brown Algae

Formulation

VIVAPHARM® Sodium Alginate PH R5, sodium bicarbonate and calcium carbonate were used as the active components for the manufacturing of the chewable anti-reflux tablets.

Product	Active Content [mg]	mg/ Tablet	Contribution [%]
VIVAPHARM® Sodium Alginate PH R5	250.3	250.3	18.5
Sodium Bicarbonate	106.9	106.9	7.9
Calcium Carbonate, heavy	188.1	188.1	13.9
EMDEX®		476.3	35.2
PROSOLV® SMCC 50		318.0	23.5
PRUV®		13.5	1.0
Total		1353.1	100.0

Tab. 1 Ingredients

Excipients Used

PROSOLV® SMCC 50, silicified microcrystalline cellulose NF*, is a high functionality excipient composed of two ingredients: microcrystalline cellulose as a filler-binder and colloidal silicon dioxide as a glidant. Due to the special co-processing of PROSOLV® SMCC 50, it provides excellent flowability and compactability. These properties enable direct compression and lead to high mechanical robustness of the tablets.[3]

EMDEX®, dextrates NF*, is a tablet binder that consists of glucose monohydrate and oligosaccharides. Its superior flowability and compaction make it ideal for direct compression. Due to ist natural sweetness, it is ideally suited for application in chewable tablets.[4]

PRUV®, sodium stearyl fumarate NF*, is a lubricant, which offers high robustness to over-lubrication.[5]
PRUV® is particularly well suited for chewable tablets due to its neutral taste.

*Regulatory Data for other regions available upon request

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Procedure

The ingredients, except the lubricant, were blended to homogeneity. After the addition and incorporation of the lubricant, the formulation was used for direct compression of tablets.

Equipment	
Tablet Press	Korsch EK 0, 15 mm punches with beveled edge
Hardness Tester	Erweka TBH 425 TD
Texture Analyzer	Stable Micro Systems TA.XTplus

Tab. 2 Equipment

The raft strength of the formulation corresponding to two, three, and four tablets was determined according to the British Pharmacopoeia using a texture analyzer. Before adding the samples in powder form into the 0.1 M HCl, they were suspended with 20 g demineralized water for 3 minutes.

Tablet Characteristics

Tablet Weight	1.353 g
Tablet Dimensions	15 mm flat-faced, beveled edge, tablet height 5.88 mm
Compaction Force	15.6 kN
Crushing Strength	163 N

Tab. 3 Tablet Characteristics

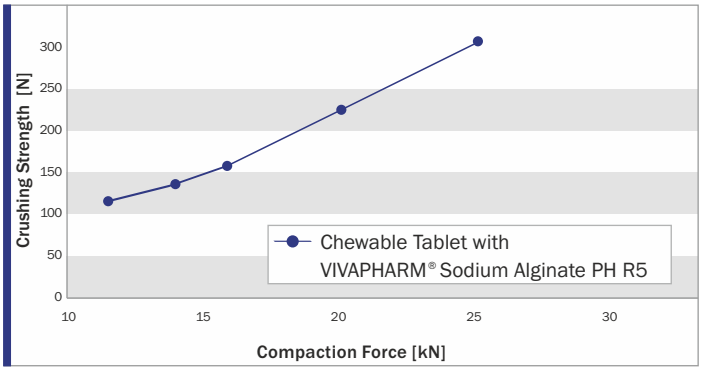

Chart 1 Compaction Profile of Chewable Tablets Composed of VIVAPHARM® Sodium Alginate PH R5

Chart 1 shows the compaction profile for the formulation described in Tab. 1. In the interest of chewability, the tablets for subsequent testing were compressed to a hardness of about 160 N.

Raft Formation

Pic. 2 Gel Raft in 0.1 M HCl, with Two, Three and Four Chewable Tablets Composed of VIVAPHARM® Sodium Alginate PH R5

The raft formation was tested for two, three and four tablets, respectively, according to the dosing recommendation of a marketed anti-reflux tablet. While the dose affected the raft height, the measured raft strength remained constant in all three cases.

Conclusion

The tested formulation was suited for direct compression resulting in robust tablets due to the excellent compaction properties of PROSOLV® SMCC 50 and EMDEX®. The chewable tablets containing VIVAPHARM® Sodium Alginate PH R5 showed high effectiveness when tested in 0.1 M Hcl.

References

[1] Mandel, K. G. et al.: Review Article: Alginate-Raft Formulations in the Treatment of Heartburn and Acid Reflux, Alimentary Pharmacology & Therapeutics, 14 (6), 669 - 690 (2000)

[2] Brochure: The Use of Alginates in Anti-Reflux Suspensions. JRS Pharma GmbH & Co.KG

[3] Brochure: PROSOLV® SMCC JRS Pharma GmbH & Co.KG

[4] Brochure: EMDEX® JRS Pharma GmbH & Co.KG

[5] Brochure: PRUV® JRS Pharma GmbH & Co.KG

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