

REVOLUTIONIZING ABUSE DETERRENCE: HARNESSING CAFFEINE AS A MODEL FOR INNOVATIVE FORMULATION TECHNOLOGY

Joseph Zeleznik¹, Chhanda Kapadia², Sankalp Gharat³

¹Director, Technical Services, IMCD, Unites States; ² Group Director-Technical Services, Pharmaceuticals IMCD; ³Assistant Manager-Lab, Signet Excipients Ltd. Mumbai, India.



INTRODUCTION





WHY ABUSE DETERENT FORMULAS

As ADFs become more common, they could potentially lead to a wider

adoption of safer opioid

pain management:
ADFs provide a tool for
healthcare providers to effectively
manage pain while minimizing
the risk of abuse, potentially
leading to better patient
outcomes.

Reduced Abuse and Misuse: ADFs are designed to make

ADFs are designed to make manipulation more difficult and non-oral routes of administration less rewarding, thereby reducing the likelihood of drug abuse, misuse, and diversion.

formulations, particularly in settings where prescription drug abuse is a

By deterring manipulation and alternative routes of administration, ADFs contribute to safer opioid use for patients, particularly those prescribed long-term pain management.

owered Risk of Overdose

ADFs, especially those designed for extended release, can help maintain consistent drug levels in the body, reducing the risk of rapid spikes in opioid concentration that can lead to overdose.

PREFORMULATION STUDIES



PROPOSED FORMULATION

Sr. No	Ingredient	% w/w
1	Caffeine Anhydrous	48.54
2	Kollidon® SR (Polyvinyl acetate, Polyvinylpyrrolidone, Povidone / PVP, PVAc, Silica)	29.12
3	Anhydrous dibasic calcium phosphate	19.44
4	Aerosil® 200 Colloidal Silicon Dioxide	0.48
5	Roquette Magnesium stearate	2.42
	Total	100 %

PREPARATION

Co-sift all the ingredient except magnesium stearate through ASTM 30 # sieve and blend using blender at 15 rpm for 10 mins

 Sift magnesium stearate through ASTM 60 #

blender at 15 rpm for 3 mins

• Compress the punches

Step 2

Compress the lubricated blend using suitable punches

sieve and lubricate above mixture using

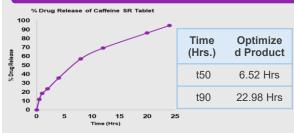
Blend Parameter	Result
Bulk Density (g/mL)	0.581
Tapped Density (g/mL)	0.755
Compressibility (%)	20.93
Hausner's ratio	1.265
Angle of Repose (°)	14.17

EVALUATION TABLETS



Tablet Parameters	Result
Appearance	White to off white, round, FFBE, Uncoated tablet plain on both sides
Tablet weight (mg)	412.00
Weight variation	Average weight ± 3 %
Tablet Hardness (N)	150-160
Tablet Thickness (mm)	2.8 ± 0.3
Compression Force (kN)	1.265
Ejection Force (kN)	14.17
Friability (%)	0.176
Assay (%)	99.50

IN VITRO DISSOLUTION



Parameters	Specification
Apparatus	USP Type II
Media	Water
Volume	900 mL
RPM	50
Temperature	37°C ± 0.5°C
Time interval	30 min, 1,2,4,8,12,16,20, and 24 h

EVALUATION ABUSE DETERENCE

EXTRACTION

Time(min)	Trial 1(%)			
Intact				
5	1.72			
30	19.62			
Manipulated				
5	3.26			
30	24.75			

SYRINGEABILITY

Time(min)	Trial 1(%)			
Intact				
30	5.7			
Manipulated				
30	8.8			

CONCLUSION

- The developed formulation successfully limited caffeine extraction, indicating strong potential as an abuse-deterrent solid oral dosage form.
- The formulation can be manufactured using conventional pharmaceutical processing techniques without the need for specialized equipment or infrastructure.
- Not only reduces production complexity and costs but also enhances scalability, making it a practical and economically viable approach for future implementation in abuse-deterrent drug development.

ACKNOWLEDGEMENTS: The authors would like to thank Roquette, Evonik and BASF for providing excipient support for this study.

REFERENCES:

https://www.fda.gov/files/drugs/published/Abuse-Deterrent-Opioids-Evaluation-and-Labeling.pdf Carinci AJ. Abuse-deterrent opioid analgesics: a guide for clinicians. Pain Management. 2020 Jan 1:10(1):56-62. https://doi.org/10.2217/pmt-2019-0052