

Supplementary Materials: Co-Amorphous Drug Formulations in Numbers: Recent Advances in Co-Amorphous Drug Formulations with Focus on Co-Formability, Molar Ratio, Preparation Methods, Physical Stability, In Vitro and In Vivo Performance, and New Formulation Strategies

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Table S1. Overview of screened CAMS and non-CAMS with amino acids as co-formers. (y: yes. n: no. depends: different outcome depending on the used preparation method and/or parameters of the preparation method).

Drug	Co-former	CAMS (y/no/depends)	References
Budesonide	Arginine	y	[1]
Carbamazepine	Arginine	n (ball milling)	[2–6]
Carbamazepine	Arginine-Tyrosin	n (ball milling)	[2]
Carbamazepine	Phenylalanine-Tryptophan	y	[2]
Carbamazepine	Arginine-Tryptophan	y	[2]
Carbamazepine	Tryptophan-Tyrosine	n (ball milling)	[2]
Carbamazepine	Aspartic acid	n (ball milling)	[3–5]
Carbamazepine	Cysteine	n (ball milling)	[3–5]
Carbamazepine	Glutamic acid	n (ball milling)	[3–5]
Carbamazepine	Glycine	n (ball milling)	[3–5]
Carbamazepine	Histidine	n (ball milling)	[3–5]
Carbamazepine	Lysine	n (ball milling)	[3–5]
Carbamazepine	Proline	n (ball milling)	[3–5]
Carbamazepine	Phenylalanine	n (ball milling)	[2–5]
Carbamazepine	Tryptophan	y	[2–5,7]
Carbamazepine	Alanine	n (ball milling)	[3–5]
Carbamazepine	Asparagine	n (ball milling)	[3–5]
Carbamazepine	Glutamine	n (ball milling)	[3–5]
Carbamazepine	Isoleucine	n (ball milling)	[3–5]
Carbamazepine	Leucine	n (ball milling)	[3–5]
Carbamazepine	Methionine	n (ball milling)	[3–5]
Carbamazepine	Serine	n (ball milling)	[3–5]
Carbamazepine	Threonine	n (ball milling)	[3–5]
Carbamazepine	Tyrosine	n (ball milling)	[2–5]
Carbamazepine	Valine	n (ball milling)	[3–5]
Carvedilol	Arginine	n (ball milling)	[3–5]
Carvedilol	Aspartic acid	depends	[3–5,8–11]
Carvedilol	Cysteine	n (ball milling)	[3–5]
Carvedilol	Glutamic acid	depends	[3–5,8]
Carvedilol	Glycine	n (ball milling)	[3–5]
Carvedilol	Histidine	n (ball milling)	[3–5]
Carvedilol	Lysine	n (ball milling)	[3–5]
Carvedilol	Proline	n (ball milling)	[3–5]
Carvedilol	Phenylalanine	y	[3–5,7]
Carvedilol	Tryptophan	y	[3–5,7,12]
Carvedilol	Alanine	n (ball milling)	[3–5]
Carvedilol	Asparagine	n (ball milling)	[3–5]
Carvedilol	Glutamine	n (ball milling)	[3–5]

Carvedilol	Isoleucine	y	[3–5,7]
Carvedilol	Leucine	y	[3–5,7]
Carvedilol	Methionine	y	[3–5,7]
Carvedilol	Serine	n (ball milling)	[3–5]
Carvedilol	Threonine	n (ball milling)	[3–5]
Carvedilol	Tyrosine	n (ball milling)	[3–5]
Carvedilol	Valine	y	[3–5,7]
Chloramphenicol	Arginine	n (freeze drying)	[13]
Chloramphenicol	Cysteine	n (freeze drying)	[13]
Chloramphenicol	Glycine	n (freeze drying)	[13]
Chloramphenicol	Leucine	n (freeze drying)	[13]
Cimetidine	Arginine	y	[14]
Cimetidine	Citrulline	n (ball milling)	[14]
Furosemide	Arginine	y	[3–5,7,14–16]
Furosemide	Aspartic acid	n (ball milling)	[3–5]
Furosemide	Cysteine	y	[3–5,7]
Furosemide	Glutamic acid	n (ball milling)	[3–5]
Furosemide	Glycine	n (ball milling)	[3–5]
Furosemide	Histidine	y	[3–5,7]
Furosemide	Lysine	y	[3–5,7]
Furosemide	Proline	y	[3–5,7]
Furosemide	Phenylalanine	y	[3–5,7]
Furosemide	Tryptophan	y	[3–5,7,16,17]
Furosemide	Alanine	n (ball milling)	[3–5]
Furosemide	Asparagine	n (ball milling)	[3–5]
Furosemide	Glutamine	n (ball milling)	[3–5]
Furosemide	Isoleucine	y	[3–5,7]
Furosemide	Leucine	y	[3–5,7]
Furosemide	Methionine	y	[3–5,7]
Furosemide	Serine	n (ball milling)	[3–5]
Furosemide	Threonine	n (ball milling)	[3–5]
Furosemide	Tyrosine	n (ball milling)	[3–5]
Furosemide	Valine	y	[3–5,7]
Furosemide	Citrulline	y	[14]
Glibenclamide	Aspartic acid	n (ball milling)	[18]
Glibenclamide	Lysine	n (ball milling)	[18]
Glibenclamide	Serine	y	[18–20]
Glibenclamide	Threonine	y	[18,19]
Glibenclamide	Serin-Threonine	y	[18,19]
Glibenclamide	Arginine	y	[20,21]
Glibenclamide	Arginine-Serine	y	[21]
Glibenclamide	Arginine-Sodium lauryl sulfate	y	[20]
Glimepiride	Arginine	depends	[22]
Griseofulvin	Aspartic acid	n (ball milling)	[23]
Griseofulvin	Valine	n (ball milling)	[23]
Griseofulvin	Methionine	n (ball milling)	[23]
Griseofulvin	Lysine	n (ball milling)	[23]
Griseofulvin	Tryptophan	y	[23]
Hydrochlorothiazide	Arginine	y	[24]
Ibrutinib	Glutamic acid	n (ball milling)	[25]
Ibrutinib	Arginine	n (ball milling)	[25]

Ibrutinib	Histidine	n (ball milling)	[25]
Ibrutinib	Glutamine	n (ball milling)	[25]
Ibrutinib	Valine	n (ball milling)	[25]
Ibrutinib	Tyrosine	n (ball milling)	[25]
Ibrutinib	Alanine	n (ball milling)	[25]
Ibuprofen	Arginine	y	[26,27]
Indomethacin	Arginine-Tyrosin	n (ball milling)	[2]
Indomethacin	Phenylalanine-Tryptophan	y	[2]
Indomethacin	Arginine-Phenylalanine	y	[2]
Indomethacin	Tryptophan-Tyrosine	n (ball milling)	[2]
Indomethacin	Arginine	y	[2–5,7,16,26–35]
Indomethacin	Aspartic acid	n (ball milling)	[3–5]
Indomethacin	Cysteine	n (ball milling)	[3–5]
Indomethacin	Glutamic acid	n (ball milling)	[3–5]
Indomethacin	Glycine	n (ball milling)	[3–5]
Indomethacin	Histidine	depends	[3–5,31,35]
Indomethacin	Lysine	depends	[3–5,7,31,35,36]
Indomethacin	Proline	y	[3–5,7]
Indomethacin	Phenylalanine	y	[2–5,7,29]
Indomethacin	Tryptophan	y	[2–5,7,12,16,17,29,37]
Indomethacin	Alanine	n (ball milling)	[3–5]
Indomethacin	Asparagine	n (ball milling)	[3–5]
Indomethacin	Glutamine	n (ball milling)	[3–5]
Indomethacin	Isoleucine	y	[3–5,7]
Indomethacin	Leucine	y	[3–5,7]
Indomethacin	Methionine	y	[3–5,7]
Indomethacin	Serine	n (ball milling)	[3–5]
Indomethacin	Threonine	n (ball milling)	[3–5]
Indomethacin	Tyrosine	n (ball milling)	[2–5]
Indomethacin	Valine	y	[3–5,7]
Kanamycin sulfate	Valine	y	[38]
Kanamycin sulfate	Methionine	y	[38]
Kanamycin sulfate	Phenylalanine	y	[38]
Kanamycin sulfate	Tryptophan	y	[38]
Lurasidone hydrochloride	Cysteine hydrochloride	y	[39]
Mebendazole	Arginine	n (ball milling)	[3–5,14,40]
Mebendazole	Aspartic acid	n (ball milling)	[3–5,41,42]
Mebendazole	Cysteine	n (ball milling)	[3–5]
Mebendazole	Glutamic acid	n (ball milling)	[3–5,40]
Mebendazole	Glycine	n (ball milling)	[3–5,42]
Mebendazole	Histidine	n (ball milling)	[3–5,42]
Mebendazole	Lysine	y	[3–5,7]
Mebendazole	Proline	depends	[3–5,42]
Mebendazole	Phenylalanine	depends	[3–5,7,41,42]
Mebendazole	Tryptophan	y	[3–5,7,42]
Mebendazole	Alanine	n (ball milling)	[3–5]
Mebendazole	Asparagine	n (ball milling)	[3–5]
Mebendazole	Glutamine	n (ball milling)	[3–5]
Mebendazole	Isoleucine	y	[3–5,7]
Mebendazole	Leucine	y	[3–5,7]
Mebendazole	Methionine	y	[3–5,7]

Mebendazole	Serine	n (ball milling)	[3–5]
Mebendazole	Threonine	n (ball milling)	[3–5]
Mebendazole	Tyrosine	n (ball milling)	[3–5,42]
Mebendazole	Valine	n (ball milling)	[3–5]
Mebendazole	Aspartic acid-Phenylalanine	n (ball milling)	[41]
Mebendazole	Citrulline	n (ball milling)	[14]
Mebendazole	Tryptophan-Phenylalanine	y	[42]
Mebendazole	Aspartic acid-Tyrosine	n (ball milling)	[42]
Mebendazole	Histidine-Glycine	n (ball milling)	[42]
Mebendazole	Proline-Tryptophan	y	[42]
Naproxen	Arginine	y	[43–45]
Naproxen	Tryptophan	n (ball milling)	[43]
Naproxen	Arginine-Proline	y	[43]
Naproxen	Tryptophan-Proline	y	[43]
Naproxen	Lysine	y	[44]
Naproxen	Arginine-Sodium dodecyl sulfate	n (freeze drying)	[44]
Naproxen	Arginine-Pluronic f 127	Y	[44]
Naproxen	Arginine-Polyoxyethylene (40) stearate	Y	[44]
Naproxen	Arginine-Tween 20	n (freeze drying)	[44]
Naproxen	Arginine-TPGS 1000	n (freeze drying)	[44]
Naproxen	Lysine-Sodium dodecyl sulfate	y	[44]
Naproxen	Lysine-Pluronic f 127	y	[44]
Naproxen	Lysine-Polyoxyethylene (40) stearate	y	[44]
Naproxen	Lysine-Tween 20	y	[44]
Naproxen	Lysine-TPGS 1000	n (freeze drying)	[44]
Nitrofurantoin	Arginine	y	[14]
Nitrofurantoin	Citrulline	y	[14]
Ofloxacin	Tryptophan	y	[46]
Piroxicam	Aspartic acid	n (ball milling)	[41]
Piroxicam	Phenylalanine	n (ball milling)	[41]
Piroxicam	Aspartic acid-Phenylalanine	n (ball milling)	[41]
Simvastatin	Lysine-Threonine	n (ball milling)	[18]
Simvastatin	Arginine	n (ball milling)	[3–5]
Simvastatin	Aspartic acid	n (ball milling)	[3–5,18]
Simvastatin	Cysteine	n (ball milling)	[3–5]
Simvastatin	Glutamic acid	n (ball milling)	[3–5]
Simvastatin	Glycine	n (ball milling)	[3–5]
Simvastatin	Histidine	n (ball milling)	[3–5]
Simvastatin	Lysine	y	[3–5,7,18,19,47,48]
Simvastatin	Proline	n (ball milling)	[3–5]
Simvastatin	Phenylalanine	y	[3–5,7]
Simvastatin	Tryptophan	depends	[3–5,7,47]
Simvastatin	Alanine	n (ball milling)	[3–5]
Simvastatin	Asparagine	n (ball milling)	[3–5]
Simvastatin	Glutamine	n (ball milling)	[3–5]
Simvastatin	Isoleucine	n (ball milling)	[3–5]
Simvastatin	Leucine	n (ball milling)	[3–5,47]
Simvastatin	Methionine	n (ball milling)	[3–5]
Simvastatin	Serine	n (ball milling)	[3–5,18]
Simvastatin	Threonine	n (ball milling)	[3–5,18]
Simvastatin	Tyrosine	n (ball milling)	[3–5]

Simvastatin	Valine	n (ball milling)	[3–5]
Tadalafil	Aspartic acid	n (ball milling)	[41]
Tadalafil	Phenylalanine	n (ball milling)	[41]
Tadalafil	Aspartic acid-Phenylalanine	n (ball milling)	[41]
Valsartan	Histidine	y	[49]
Valsartan	Arginine	y	[49]
Valsartan	Lysine	y	[49]
Valsartan	Histidine-Arginine	y	[49]
Valsartan	Histidine-Lysine	y	[49]
Valsartan	Arginine-Lysine	y	[49]

References

- Lu, W.; Rades, T.; Rantanen, J.; Yang, M. Inhalable co-amorphous budesonide-arginine dry powders prepared by spray drying. *Int. J. Pharm.* **2019**, *565*, 1–8.
- Löbmann, K.; Grohgan, H.; Laitinen, R.; Strachan, C.; Rades, T. Amino acids as co-amorphous stabilizers for poorly water soluble drugs--Part 1: preparation, stability and dissolution enhancement. *Eur. J. Pharm. Biopharm.* **2013**, *85*, 873–881.
- Kasten, G.; Grohgan, H.; Rades, T.; Löbmann, K. Development of a screening method for co-amorphous formulations of drugs and amino acids. *Eur. J. Pharm. Sci.* **2016**, *95*, 28–35.
- Meng-Lund, H.; Kasten, G.; Jensen, K.T.; Poso, A.; Pansar, T.; Rades, T.; Rantanen, J.; Grohgan, H. The use of molecular descriptors in the development of co-amorphous formulations. *Eur. J. Pharm. Sci.* **2018**, *119*, 31–38.
- Chambers, L.I.; Grohgan, H.; Palmelund, H.; Löbmann, K.; Rades, T.; Musa, O.M.; Steed, J.W. Predictive identification of co-formers in co-amorphous systems. *Eur. J. Pharm. Sci.* **2021**, *157*, 105636–105643.
- Ueda, H.; Wu, W.; Löbmann, K.; Grohgan, H.; Mullertz, A.; Rades, T. Application of a salt coformer in a co-amorphous drug system dramatically enhances the glass transition temperature: a case study of the ternary system carbamazepine, citric acid, and L-arginine. *Mol. Pharm.* **2018**, *15*, 2036–2044.
- Kasten, G.; Löbmann, K.; Grohgan, H.; Rades, T. Co-former selection for co-amorphous drug-amino acid formulations. *Int. J. Pharm.* **2019**, *557*, 366–373.
- Mishra, J.; Löbmann, K.; Grohgan, H.; Rades, T. Influence of preparation technique on co-amorphization of carvedilol with acidic amino acids. *Int. J. Pharm.* **2018**, *552*, 407–413.
- Petry, I.; Löbmann, K.; Grohgan, H.; Rades, T.; Leopold, C.S. In situ co-amorphisation in coated tablets - the combination of carvedilol with aspartic acid during immersion in an acidic medium. *Int. J. Pharm.* **2019**, *558*, 357–366.
- Influence of polymer addition on the amorphization, dissolution and physical stability of co-amorphous systems. *Int. J. Pharm.* **2020**, *588*, 119768–119776.
- Liu, J.; Rades, T.; Grohgan, H. Determination of the Optimal Molar Ratio in Amino Acid-Based Coamorphous Systems. *Mol. Pharm.* **2020**, *17*, 1335–1342.
- Kissi, E.; Kasten, G.; Löbmann, K.; Rades, T.; Grohgan, H. The role of glass transition temperatures in co-amorphous drug-amino acid formulations. *Mol. Pharm.* **2018**, *15*, 4247–4256.
- Sterren, V.B.; Aiassa, V.; Garner, C.; Linck, Y.G.; Chatah, A.K.; Monti, G.A.; Longhi, M.R.; Zoppi, A. Preparation of chloramphenicol/amino acid combinations exhibiting enhanced dissolution rates and reduced drug-induced oxidative stress. *AAPS PharmSciTech* **2017**, *18*, 2910–2918.
- Wu, W.; Löbmann, K.; Rades, T.; Grohgan, H. On the role of salt formation and structural similarity of co-formers in co-amorphous drug delivery systems. *Int. J. Pharm.* **2018**, *535*, 86–94.
- Petry, I.; Löbmann, K.; Grohgan, H.; Rades, T.; Leopold, C.S. In situ co-amorphisation of arginine with indomethacin or furosemide during immersion in an acidic medium - a proof of concept study. *Eur. J. Pharm. Biopharm.* **2018**, *133*, 151–160.
- Jensen, K.T.; Larsen, F.H.; Löbmann, K.; Rades, T.; Grohgan, H. Influence of variation in molar ratio on co-amorphous drug-amino acid systems. *Eur. J. Pharm. Biopharm.* **2016**, *107*, 32–39.
- Jensen, K.T.; Larsen, F.H.; Cornett, C.; Löbmann, K.; Grohgan, H.; Rades, T. Formation mechanism of coamorphous drug-amino acid mixtures. *Mol. Pharm.* **2015**, *12*, 2484–2492.
- Laitinen, R.; Löbmann, K.; Grohgan, H.; Strachan, C.; Rades, T. Amino acids as co-amorphous excipients for simvastatin and glibenclamide: physical properties and stability. *Mol. Pharm.* **2014**, *11*, 2381–2389.
- Heikkinen, A.; DeClerck, L.; Löbmann, K.; Grohgan, H.; Rades, T.; Laitinen, R. Dissolution properties of co-amorphous drug-amino acid formulations in buffer and biorelevant media. *Pharmazie* **2015**, *70*, 452–457.
- Sormunen, H.; Ruponen, M.; Laitinen, R. The effect of co-amorphization of glibenclamide on its dissolution properties and permeability through an MDCKII-MDR1 cell layer. *Int. J. Pharm.* **2019**, *570*, 118653.
- Ruponen, M.; Visti, M.; Ojarinta, R.; Laitinen, R. Permeability of glibenclamide through a PAMPA membrane: The effect of co-amorphization. *Eur. J. Pharm. Biopharm.* **2018**, *129*, 247–256.

22. Park, H.; Jin Seo, H.; Hong, S.H.; Ha, E.S.; Lee, S.; Kim, J.S.; Baek, I.H.; Kim, M.S.; Hwang, S.J. Characterization and therapeutic efficacy evaluation of glimepiride and L-arginine co-amorphous formulation prepared by supercritical antisolvent process: Influence of molar ratio and preparation methods. *Int. J. Pharm.* **2020**, *581*, 119232.
23. Franca, M.T.; Marcos, T.M.; Pereira, R.N.; Stulzer, H.K. Could the small molecules such as amino acids improve aqueous solubility and stabilize amorphous systems containing Griseofulvin? *Eur J Pharm Sci* **2020**, *143*, 105178.
24. Ruponen, M.; Rusanen, H.; Laitinen, R. Dissolution and permeability properties of co-amorphous formulations of hydrochlorothiazide. *J. Pharm. Sci.* **2020**, *109*, 2252-2261.
25. Zhang, M.; Suo, Z.; Peng, X.; Gan, N.; Zhao, L.; Tang, P.; Wei, X.; Li, H. Microcrystalline cellulose as an effective crystal growth inhibitor for the ternary Ibrutinib formulation. *Carbohydr. Polym.* **2020**, *229*, 115476.
26. Ojarinta, R.; Lermiaux, L.; Laitinen, R. Spray drying of poorly soluble drugs from aqueous arginine solution. *Int. J. Pharm.* **2017**, *532*, 289-298.
27. Ojarinta, R.; Saarinen, J.; Strachan, C.J.; Korhonen, O.; Laitinen, R. Preparation and characterization of multi-component tablets containing co-amorphous salts: Combining multimodal non-linear optical imaging with established analytical methods. *Eur. J. Pharm. Biopharm.* **2018**, *132*, 112-126.
28. Lenz, E.; Löbmann, K.; Rades, T.; Knop, K.; Kleinebudde, P. Hot melt extrusion and spray drying of co-amorphous indomethacin-arginine with polymers. *J. Pharm. Sci.* **2017**, *106*, 302-312.
29. Ojarinta, R.; Heikkinen, A.T.; Sievanen, E.; Laitinen, R. Dissolution behavior of co-amorphous amino acid-indomethacin mixtures: The ability of amino acids to stabilize the supersaturated state of indomethacin. *Eur. J. Pharm. Biopharm.* **2017**, *112*, 85-95.
30. Petry, I.; Löbmann, K.; Grohgan, H.; Rades, T.; Leopold, C.S. Solid state properties and drug release behavior of co-amorphous indomethacin-arginine tablets coated with Kollicoat® Protect. *Eur. J. Pharm. Biopharm.* **2017**, *119*, 150-160.
31. Mishra, J.; Rades, T.; Löbmann, K.; Grohgan, H. Influence of solvent composition on the performance of spray-dried co-amorphous formulations. *Pharmaceutics* **2018**, *10*.
32. Petry, I.; Löbmann, K.; Grohgan, H.; Rades, T.; Leopold, C.S. Undesired co-amorphisation of indomethacin and arginine during combined storage at high humidity conditions. *Int. J. Pharm.* **2018**, *544*, 172-180.
33. Lenz, E.; Jensen, K.T.; Blaabjerg, L.I.; Knop, K.; Grohgan, H.; Löbmann, K.; Rades, T.; Kleinebudde, P. Solid-state properties and dissolution behaviour of tablets containing co-amorphous indomethacin-arginine. *Eur. J. Pharm. Biopharm.* **2015**, *96*, 44-52.
34. Wickstrom, H.; Palo, M.; Rijckaert, K.; Kolakovic, R.; Nyman, J.O.; Maattanen, A.; Ihalainen, P.; Peltonen, J.; Genina, N.; de Beer, T., et al. Improvement of dissolution rate of indomethacin by inkjet printing. *Eur. J. Pharm. Sci.* **2015**, *75*, 91-100.
35. Jensen, K.T.; Blaabjerg, L.I.; Lenz, E.; Bohr, A.; Grohgan, H.; Kleinebudde, P.; Rades, T.; Lobmann, K. Preparation and characterization of spray-dried co-amorphous drug-amino acid salts. *J. Pharm. Pharmacol.* **2016**, *68*, 615-624.
36. Kasten, G.; Nouri, K.; Grohgan, H.; Rades, T.; Löbmann, K. Performance comparison between crystalline and co-amorphous salts of indomethacin-lysine. *Int. J. Pharm.* **2017**, *533*, 138-144.
37. Walker, G.; Romann, P.; Poller, B.; Löbmann, K.; Grohgan, H.; Rooney, J.S.; Huff, G.S.; Smith, G.P.S.; Rades, T.; Gordon, K.C., et al. Probing pharmaceutical mixtures during milling: the potency of low-frequency raman spectroscopy in identifying disorder. *Mol. Pharm.* **2017**, *14*, 4675-4684.
38. Adhikari, B.R.; Berzins, K.; Fraser-Miller, S.J.; Gordon, K.C.; Das, S.C. Co-amorphization of kanamycin with amino acids improves aerosolization. *Pharmaceutics* **2020**, *12*.
39. Heng, W.; Su, M.; Cheng, H.; Shen, P.; Liang, S.; Zhang, L.; Wei, Y.; Gao, Y.; Zhang, J.; Qian, S. Incorporation of complexation into a coamorphous system dramatically enhances dissolution and eliminates gelation of amorphous lurasidone hydrochloride. *Mol. Pharm.* **2020**, *17*, 84-97.
40. Wu, W.; Grohgan, H.; Rades, T.; Löbmann, K. Comparison of co-former performance in co-amorphous formulations: single amino acids, amino acid physical mixtures, amino acid salts and dipeptides as co-formers. *Eur. J. Pharm. Sci.* **2020**, *156*, 105582-105589.
41. Wu, W.; Löbmann, K.; Schnitzkewitz, J.; Knuhtsen, A.; Pedersen, D.S.; Grohgan, H.; Rades, T. Aspartame as a co-former in co-amorphous systems. *Int. J. Pharm.* **2018**, *549*, 380-387.
42. Wu, W.; Löbmann, K.; Schnitzkewitz, J.; Knuhtsen, A.; Pedersen, D.S.; Rades, T.; Grohgan, H. Dipeptides as co-formers in co-amorphous systems. *Eur. J. Pharm. Biopharm.* **2019**, *134*, 68-76.
43. Jensen, K.T.; Löbmann, K.; Rades, T.; Grohgan, H. Improving co-amorphous drug formulations by the addition of the highly water soluble amino acid, proline. *Pharmaceutics* **2014**, *6*, 416-435.
44. Wostry, M.; Plappert, H.; Grohgan, H. Preparation of co-amorphous systems by freeze-drying. *Pharmaceutics* **2020**, *12*.
45. Kasten, G.; Lobo, L.; Dengale, S.; Grohgan, H.; Rades, T.; Lobmann, K. In vitro and in vivo comparison between crystalline and co-amorphous salts of naproxen-arginine. *Eur. J. Pharm. Biopharm.* **2018**, *132*, 192-199.
46. Zhu, S.; Gao, H.; Babu, S.; Garad, S. Co-amorphous formation of high-dose zwitterionic compounds with amino acids to improve solubility and enable parenteral delivery. *Mol. Pharm.* **2018**, *15*, 97-107.
47. Lu, W.; Rades, T.; Rantanen, J.; Chan, H.K.; Yang, M. Amino acids as stabilizers for spray-dried simvastatin powder for inhalation. *Int. J. Pharm.* **2019**, *572*, 118724.

48. Craye, G.; Lobmann, K.; Grohgan, H.; Rades, T.; Laitinen, R. Characterization of amorphous and co-amorphous simvastatin formulations prepared by spray drying. *Molecules* **2015**, *20*.
49. Huang, Y.; Zhang, Q.; Wang, J.R.; Lin, K.L.; Mei, X. Amino acids as co-amorphous excipients for tackling the poor aqueous solubility of valsartan. *Pharm. Dev. Technol.* **2017**, *22*, 69–76.

Table S2. Overview of screened CAMS and non-CAMS with a drug as a co-former. (y: yes. n: no. depends: dependent on the preparation method and/or the preparation parameters. -: unknown).

Drug 1	Drug 2	CAMS (y/n/depends)	Reference
Aceclofenac	Naproxen	y	[1]
Amoxicillin	Omeprazole	y	[2]
Atenolol	Hydrochlorothiazide	depends	[3,4]
Atorvastatin	Carvedilol	y	[5]
Atorvastatin	Glibenclamide	y	[5]
Atorvastatin	Naringin	y	[6]
Budesonide	Theophylline	y	[7]
Cimetidine	Salicylamide	n (solvent evaporation)	[8]
Cimetidine	Phenacetin	n (solvent evaporation)	[8]
Cimetidine	Diflusal	Y	[9]
Cimetidine	Piroxicam	y	[10,11]
Clotrimazole	Carvedilol	y	[12]
Clotrimazole	Indomethacin	y	[12]
Curcumin	Piperine	y	[13]
Curcumin	Artemisinin	y	[14,15]
Docetaxel	Bicalutamide	y	[16]
Docetaxel	Myricetin	y	[17]
Ezetimib	Indapamide	y	[18]
Ezetimib	Lovastatin	y	[19]
Ezetimib	Simvastatin	y	[20,21]
Famotidine	Ibuprofen	y	[22]
Febuxostat	Indomethacin	y	[23]
Felbinac	Naproxen	n (melt-quench)	[1]
Flutamide	Bicalutamide	y	[24]
Gliclazide	Chlorothiazide	y	[25]
Gliclazide	Hydrochlorothiazide	y	[25]
Gliclazide	Indapamide	y	[25]
Gliclazide	Triamterene	y	[25]
Gliclazide	Nifedipine	y	[25]
Gliclazide	Benzamidine	y	[25]
Glipizide	Atorvastatin	y	[26]
Ibuprofen	Naproxen	n (melt-quench)	[1]
Indomethacin	Naproxen	y	[27–30] [1,31–35]
Indomethacin	Acetylsalicylic acid	y	[36]
Indomethacin	Paracetamol	y	[32,33,36,37]
Indomethacin	Glibenclamide	y	[36]
Indomethacin	Cimetidine	y	[8,32,33,35,38–40]
Indomethacin	Ranitidine hydrochloride	y	[41]
Indomethacin	Antipyrine	-	[42]
Indomethacin	Felodipine	y	[12]
Indomethacin	Cimetidine	y	[12]
Indomethacin	Lidocaine	y	[43]
Indomethacin	Lidocaine hydrochloride	y	[44]

Indomethacin	Nicotinamide	y	[45]
Irbesartan	Atenolol	y	[4]
Irbesartan	Glimepiride	y	[46]
Itraconazole	Indomethacin	y	[12]
Itraconazole	Clotrimazole	y	[12]
Itraconazole	Cimetidine	y	[12]
Itraconazole	Carvedilol	y	[12]
Ketoprofen	Naproxen	y	[1]
Lacidipine	Spironolactone	y	[47]
Loxoprofen	Naproxen	y	[1]
Lurasidone hydrochloride	Puerarin	y	[48]
Lurasidone hydrochloride	Repaglinide	y	[49]
Mebendazole	Ascorbic acid	n (ball milling)	[50]
Mebendazole	Caffeine	n (ball milling)	[50]
Mebendazole	Catechol	n (ball milling)	[50]
Mebendazole	Flurbiprofen	y	[50]
Mebendazole	Ketoprofen	y	[50]
Mebendazole	Piracetam	n (ball milling)	[50]
Mebendazole	Theophylline	y	[50]
Naproxen	Cimetidine	y	[32,33,35,39,51,52]
Naproxen	Naproxen sodium	y	[1]
Naproxen sodium	Indomethacin	y	[29]
Nateglinide	Metformin hydrochloride	y	[53,54]
Nifedipine	Cimetidine	y	[55]
Nifedipine	Nimodipine	y	[56]
Nifedipine	Paracetamol	y	[34]
Nifedipine	Naproxen	y	[12]
Nifedipine	Loratadine	y	[12]
Nifedipine	Indomethacin	y	[12]
Nifedipine	Itraconazole	y	[12]
Nifedipine	Salicin	y	[12]
Nimesulide	Carvedilol	y	[55]
Nimesulide	Indomethacin	y	[57]
Olmesartan medoxomil	Hydrochlorothiazide	y	[58]
Paracetamol	Antipyrine	y	[59]
Paracetamol	Glibenclamide	y	[36]
Paracetamol	Acetylsalicylic acid	y	[36]
Paracetamol	Celecoxib	y	[34]
Phenobarbital	Salicin	-	[42]
Phenobarbital	Antipyrine	-	[42]
Probucol	Nifedipine	y	[12]
Probucol	Itraconazole	y	[12]
Probucol	Salicin	n (melt-quench)	[12]
Probucol	Clotrimazole	y	[12]
Probucol	Indomethacin	y	[12]
Probucol	Carvedilol	n (melt-quench)	[12]
Probucol	Cimetidine	n (melt-quench)	[12]
Quercetin	Ritonavir	y	[60]
Ritonavir	Indomethacin	y	[61]
Ritonavir	Lopinavir	y	[62]
Sacubitril	Valsartan	y	[63]

Simvastatin	Glipizide	y	[64]
Simvastatin	Nifedipine	y	[65]
Talinolol	Naringin	y	[66]
Telmisartan	Atenolol	n (co-grinding)	[4]
Terfenadine	Paracetamol	y	[36,37]
Terfenadine	Indomethacin	y	[32,36,37]
Terfenadine	Acetylsalicylic acid	y	[36]
Tranilast	Diphenhydramine hydrochloride	y	[67]
Valsartan	Nifedipine	y	[68]

References

1. Ueda, H.; Muranushi, N.; Sakuma, S.; Ida, Y.; Endoh, T.; Kadota, K.; Tozuka, Y. A Strategy for Co-former Selection to Design Stable Co-amorphous Formations Based on Physicochemical Properties of Non-steroidal Inflammatory Drugs. *Pharm. Res.* **2016**, *33*, 1018–1029, doi:10.1007/s11095-015-1848-2.
2. Russo, M.G.; Sancho, M.I.; Silva, L.M.; Baldoni, H.A.; Venancio, T.; Ellena, J.; Narda, G.E. Looking for the interactions between omeprazole and amoxicillin in a disordered phase. An experimental and theoretical study. *Spectrochim. Acta. A Mol. Biomol. Spectrosc.* **2016**, *156*, 70–77, doi:10.1016/j.saa.2015.11.021.
3. Moinuddin, S.M.; Ruan, S.; Huang, Y.; Gao, Q.; Shi, Q.; Cai, B.; Cai, T. Facile formation of co-amorphous atenolol and hydrochlorothiazide mixtures via cryogenic-milling: Enhanced physical stability, dissolution and pharmacokinetic profile. *Int J Pharm* **2017**, *532*, 393–400, doi:10.1016/j.ijpharm.2017.09.020.
4. Haneef, J.; Chadha, R. Drug-Drug Multicomponent Solid Forms: Cocrystal, Coamorphous and Eutectic of Three Poorly Soluble Antihypertensive Drugs Using Mechanochemical Approach. *AAPS PharmSciTech* **2017**, *18*, 2279–2290, doi:10.1208/s12249-016-0701-1.
5. Shayanfar, A.; Jouyban, A. Drug-Drug Coamorphous Systems: Characterization and Physicochemical Properties of Coamorphous Atorvastatin with Carvedilol and Glibenclamide. *Journal of Pharmaceutical Innovation* **2013**, *8*, 218–228, doi:10.1007/s12247-013-9162-1.
6. Nair, A.; Varma, R.; Gourishetti, K.; Bhat, K.; Dengale, S. Influence of Preparation Methods on Physicochemical and Pharmacokinetic Properties of Co-amorphous Formulations: The Case of Co-amorphous Atorvastatin: Naringin. *Journal of Pharmaceutical Innovation* **2019**, *15*, 365–379, doi:10.1007/s12247-019-09381-9.
7. Leng, D.; Kissi, E.O.; Lobmann, K.; Thanki, K.; Fattal, E.; Rades, T.; Foged, C.; Yang, M. Design of Inhalable Solid Dosage Forms of Budesonide and Theophylline for Pulmonary Combination Therapy. *AAPS PharmSciTech* **2019**, *20*, 137, doi:10.1208/s12249-019-1344-9.
8. Yamamura, S.; Gotoh, H.; Sakamoto, Y.; Momose, Y. Physicochemical properties of amorphous precipitates of cimetidine–indomethacin binary system. *European journal of pharmaceutics and biopharmaceutics* **2000**, *49*, 259–265.
9. Yamamura, S.; Gotoh, H.; Sakamoto, Y.; Momose, Y. Physicochemical properties of amorphous salt of cimetidine and diflunisal system. *Int. J. Pharm.* **2002**, *241*, 213–221.
10. Tantishaiyakul, V.; Songkro, S.; Suknuntha, K.; Permkum, P.; Pipatwarakul, P. Crystal structure transformations and dissolution studies of cimetidine-piroxicam coprecipitates and physical mixtures. *AAPS PharmSciTech* **2009**, *10*, 789–795, doi:10.1208/s12249-009-9263-9.
11. Tantishaiyakul, V.; Suknuntha, K.; Vao-Soongnern, V. Characterization of cimetidine-piroxicam coprecipitate interaction using experimental studies and molecular dynamic simulations. *AAPS PharmSciTech* **2010**, *11*, 952–958, doi:10.1208/s12249-010-9461-5.
12. Mizoguchi, R.; Waraya, H.; Hirakura, Y. Application of Co-Amorphous Technology for Improving the Physicochemical Properties of Amorphous Formulations. *Mol Pharm* **2019**, *16*, 2142–2152, doi:10.1021/acs.molpharmaceut.9b00105.
13. Wang, R.; Han, J.; Jiang, A.; Huang, R.; Fu, T.; Wang, L.; Zheng, Q.; Li, W.; Li, J. Involvement of metabolism-permeability in enhancing the oral bioavailability of curcumin in excipient-free solid dispersions co-formed with piperine. *Int J Pharm* **2019**, *561*, 9–18, doi:10.1016/j.ijpharm.2019.02.027.
14. Suresh, K.; Mannava, M.K.C.; Nangia, A. A novel curcumin–artemisinin coamorphous solid: physical properties and pharmacokinetic profile. *RSC Adv.* **2014**, *4*, 58357–58361, doi:10.1039/c4ra11935e.
15. Mannava, M.K.C.; Suresh, K.; Kumar Bommaka, M.; Bhavani Konga, D.; Nangia, A. Curcumin-Artemisinin Coamorphous Solid: Xenograft Model Preclinical Study. *Pharmaceutics* **2018**, *10*, doi:10.3390/pharmaceutics10010007.
16. Bohr, A.; Nascimento, T.L.; Harmankaya, N.; Weisser, J.J.; Wang, Y.; Grohgan, H.; Rades, T.; Lobmann, K. Efflux Inhibitor Bicalutamide Increases Oral Bioavailability of the Poorly Soluble Efflux Substrate Docetaxel in Co-Amorphous Anti-Cancer Combination Therapy. *Molecules* **2019**, *24*, doi:10.3390/molecules24020266.
17. Wei, Y.; Zhou, S.; Hao, T.; Zhang, J.; Gao, Y.; Qian, S. Further enhanced dissolution and oral bioavailability of docetaxel by coamorphization with a natural P-gp inhibitor myricetin. *Eur J Pharm Sci* **2019**, *129*, 21–30, doi:10.1016/j.ejps.2018.12.016.

18. Knapik, J.; Wojnarowska, Z.; Grzybowska, K.; Jurkiewicz, K.; Tajber, L.; Paluch, M. Molecular Dynamics and Physical Stability of Coamorphous Ezetimib and Indapamide Mixtures. *Mol Pharm* **2015**, *12*, 3610–3619, doi:10.1021/acs.molpharmaceut.5b00334.
19. Riekes, M.K.; Engelen, A.; Appeltans, B.; Rombaut, P.; Stulzer, H.K.; Van den Mooter, G. New Perspectives for Fixed Dose Combinations of Poorly Water-Soluble Compounds: a Case Study with Ezetimibe and Lovastatin. *Pharm. Res.* **2016**, *33*, 1259–1275, doi:10.1007/s11095-016-1870-z.
20. Knapik-Kowalczyk, J.; Chmiel, K.; Jurkiewicz, K.; Correia, N.T.; Sawicki, W.; Paluch, M. Physical Stability and Viscoelastic Properties of Co-Amorphous Ezetimibe/Simvastatin System. *Pharmaceutics (Basel)* **2019**, *12*, doi:10.3390/ph12010040.
21. Phan, A.D.; Knapik-Kowalczyk, J.; Paluch, M.; Hoang, T.X.; Wakabayashi, K. Theoretical Model for the Structural Relaxation Time in Coamorphous Drugs. *Mol Pharm* **2019**, *16*, 2992–2998, doi:10.1021/acs.molpharmaceut.9b00230.
22. Russo, M.G.; Baldoni, H.A.; Davila, Y.A.; Brusau, E.V.; Ellena, J.A.; Narda, G.E. Rational Design of a Famotidine-Ibuprofen Coamorphous System: An Experimental and Theoretical Study. *J Phys Chem B* **2018**, *122*, 8772–8782, doi:10.1021/acs.jpcc.8b06105.
23. Moinuddin, S.M.; Shi, Q.; Tao, J.; Guo, M.; Zhang, J.; Xue, Q.; Ruan, S.; Cai, T. Enhanced Physical Stability and Synchronized Release of Febuxostat and Indomethacin in Coamorphous Solids. *AAPS PharmSciTech* **2020**, *21*, 41, doi:10.1208/s12249-019-1578-6.
24. Pacult, J.; Rams-Baron, M.; Chmiel, K.; Jurkiewicz, K.; Antosik, A.; Szafraniec, J.; Kurek, M.; Jachowicz, R.; Paluch, M. How can we improve the physical stability of co-amorphous system containing flutamide and bicalutamide? The case of ternary amorphous solid dispersions. *Eur J Pharm Sci* **2019**, *136*, 104947, doi:10.1016/j.ejps.2019.06.001.
25. Aljohani, M.; MacFhionnghaile, P.; McArdle, P.; Erxleben, A. Investigation of the formation of drug-drug cocrystals and coamorphous systems of the antidiabetic drug gliclazide. *Int J Pharm* **2019**, *561*, 35–42, doi:10.1016/j.ijpharm.2019.02.024.
26. Renuka; Singh, S.K.; Gulati, M.; Narang, R. Stable amorphous binary systems of glipizide and atorvastatin powders with enhanced dissolution profiles: formulation and characterization. *Pharm Dev Technol* **2017**, *22*, 13–25, doi:10.3109/10837450.2015.1125921.
27. Beyer, A.; Grohgan, H.; Lobmann, K.; Rades, T.; Leopold, C.S. Multivariate Quantification of the Solid State Phase Composition of Co-Amorphous Naproxen-Indomethacin. *Molecules* **2015**, *20*, 19571–19587, doi:10.3390/molecules201019571.
28. Beyer, A.; Grohgan, H.; Lobmann, K.; Rades, T.; Leopold, C.S. Influence of the cooling rate and the blend ratio on the physical stability of co-amorphous naproxen/indomethacin. *Eur J Pharm Biopharm* **2016**, *109*, 140–148, doi:10.1016/j.ejpb.2016.10.002.
29. Beyer, A.; Grohgan, H.; Lobmann, K.; Rades, T.; Leopold, C.S. Improvement of the physicochemical properties of Co-amorphous naproxen-indomethacin by naproxen-sodium. *Int J Pharm* **2017**, *526*, 88–94, doi:10.1016/j.ijpharm.2017.04.011.
30. Beyer, A.; Radi, L.; Grohgan, H.; Lobmann, K.; Rades, T.; Leopold, C.S. Preparation and recrystallization behavior of spray-dried co-amorphous naproxen-indomethacin. *Eur J Pharm Biopharm* **2016**, *104*, 72–81, doi:10.1016/j.ejpb.2016.04.019.
31. Löbmann, K.; Laitinen, R.; Grohgan, H.; Gordon, K.C.; Strachan, C.; Rades, T. Coamorphous Drug Systems: Enhanced Physical Stability and Dissolution Rate of Indomethacin and Naproxen. *Molecular Pharmaceutics* **2011**, *8*, 1919–1928, doi:10.1021/mp2002973.
32. Pajula, K.; Hyyryläinen, J.; Koistinen, A.; Leskinen, J.T.T.; Korhonen, O. Detection of amorphous-amorphous phase separation in small molecular co-amorphous mixtures with SEM-EDS. *Eur J Pharm Biopharm* **2020**, *150*, 43–49, doi:10.1016/j.ejpb.2020.03.002.
33. Chieng, N.; Teo, X.; Cheah, M.H.; Choo, M.L.; Chung, J.; Hew, T.K.; Keng, P.S. Molecular Dynamics and Physical Stability of Pharmaceutical Co-amorphous Systems: Correlation Between Structural Relaxation Times Measured by Kohlrausch-Williams-Watts With the Width of the Glass Transition Temperature (ΔT_g) and the Onset of Crystallization. *J. Pharm. Sci.* **2019**, *108*, 3848–3858, doi:10.1016/j.xphs.2019.09.013.
34. Kissi, E.O.; Khorami, K.; Rades, T. Determination of Stable Co-Amorphous Drug-Drug Ratios from the Eutectic Behavior of Crystalline Physical Mixtures. *Pharmaceutics* **2019**, *11*, doi:10.3390/pharmaceutics11120628.
35. Liu, W.; Liu, Y.; Huang, J.; Lin, Z.; Pan, X.; Zeng, X.; Lamy de la Chapelle, M.; Zhang, Y.; Fu, W. Identification and investigation of the vibrational properties of crystalline and co-amorphous drugs with Raman and terahertz spectroscopy. *Biomed Opt Express* **2019**, *10*, 4290–4304, doi:10.1364/BOE.10.004290.
36. Pajula, K.; Wittoek, L.; Lehto, V.P.; Ketolainen, J.; Korhonen, O. Phase separation in coamorphous systems: in silico prediction and the experimental challenge of detection. *Mol Pharm* **2014**, *11*, 2271–2279, doi:10.1021/mp400712m.
37. Kilpeläinen, T.; Pajula, K.; Ervasti, T.; Uurasjärvi, E.; Koistinen, A.; Korhonen, O. Raman imaging of amorphous-amorphous phase separation in small molecule co-amorphous systems. *Eur J Pharm Biopharm* **2020**, *155*, 49–54, doi:10.1016/j.ejpb.2020.08.007.
38. Otsuka, Y.; Kuwashima, W.; Tanaka, Y.; Yamaki, Y.; Shimada, Y.; Goto, S. Effects of Heat Treatment on Indomethacin-Cimetidine Mixture; Investigation of Drug-Drug Interaction Using Singular Value Decomposition in FTIR Spectroscopy. *J. Pharm. Sci.* **2020**, 10.1016/j.xphs.2020.09.049, doi:10.1016/j.xphs.2020.09.049.
39. Lim, A.W.; Lobmann, K.; Grohgan, H.; Rades, T.; Chieng, N. Investigation of physical properties and stability of indomethacin-cimetidine and naproxen-cimetidine co-amorphous systems prepared by quench cooling, coprecipitation and ball milling. *J Pharm Pharmacol* **2016**, *68*, 36–45, doi:10.1111/jphp.12494.

40. Arnfast, L.; Kamruzzaman, M.; Lobmann, K.; Aho, J.; Baldursdottir, S.; Rades, T.; Rantanen, J. Melt Extrusion of High-Dose Co-Amorphous Drug-Drug Combinations : Theme: Formulation and Manufacturing of Solid Dosage Forms Guest Editors: Tony Zhou and Tonglei Li. *Pharm. Res.* **2017**, *34*, 2689–2697, doi:10.1007/s11095-017-2254-8.
41. Chieng, N.; Aaltonen, J.; Saville, D.; Rades, T. Physical characterization and stability of amorphous indomethacin and ranitidine hydrochloride binary systems prepared by mechanical activation. *Eur J Pharm Biopharm* **2009**, *71*, 47–54, doi:10.1016/j.ejpb.2008.06.022.
42. FUKUOKA, E.; MAKITA, M.; YAMAMURA, S. Glassy state of pharmaceuticals. III.: Thermal properties and stability of glassy pharmaceuticals and their binary glass systems. *Chemical and pharmaceutical bulletin* **1989**, *37*, 1047–1050.
43. Shimada, Y.; Goto, S.; Uchiro, H.; Hirabayashi, H.; Yamaguchi, K.; Hirota, K.; Terada, H. Features of heat-induced amorphous complex between indomethacin and lidocaine. *Colloids Surf. B. Biointerfaces* **2013**, *102*, 590–596, doi:10.1016/j.colsurfb.2012.08.060.
44. Shimada, Y.; Goto, S.; Uchiro, H.; Hirota, K.; Terada, H. Characteristics of amorphous complex formed between indomethacin and lidocaine hydrochloride. *Colloids Surf. B. Biointerfaces* **2013**, *105*, 98–105, doi:10.1016/j.colsurfb.2012.12.026.
45. Tawfeek, H.M.; Chavan, T.; Kunda, N.K. Effect of Spray Drying on Amorphization of Indomethacin Nicotinamide Cocrystals; Optimization, Characterization, and Stability Study. *AAPS PharmSciTech* **2020**, *21*, 181, doi:10.1208/s12249-020-01732-x.
46. Cruz-Angeles, J.; Videa, M.; Martinez, L.M. Highly Soluble Glimepiride and Irbesartan Co-amorphous Formulation with Potential Application in Combination Therapy. *AAPS PharmSciTech* **2019**, *20*, 144, doi:10.1208/s12249-019-1359-2.
47. Wang, Z.; Sun, M.; Liu, T.; Gao, Z.; Ye, Q.; Tan, X.; Hou, Y.; Sun, J.; Wang, D.; He, Z. Co-amorphous solid dispersion systems of lacidipine-spironolactone with improved dissolution rate and enhanced physical stability. *Asian J Pharm Sci* **2019**, *14*, 95–103, doi:10.1016/j.ajps.2018.11.001.
48. Wang, S.; Heng, W.; Wang, X.; He, X.; Zhang, Z.; Wei, Y.; Zhang, J.; Gao, Y.; Qian, S. Coamorphization combined with complexation enhances dissolution of lurasidone hydrochloride and puerarin with synchronized release. *Int J Pharm* **2020**, *588*, 119793, doi:10.1016/j.ijpharm.2020.119793.
49. Qian, S.; Li, Z.; Heng, W.; Liang, S.; Ma, D.; Gao, Y.; Zhang, J.; Wei, Y. Charge-assisted intermolecular hydrogen bond formed in coamorphous system is important to relieve the pH-dependent solubility behavior of lurasidone hydrochloride. *RSC Advances* **2016**, *6*, 106396–106412, doi:10.1039/c6ra18022a.
50. Chambers, L.I.; Grohgan, H.; Palmelund, H.; Lobmann, K.; Rades, T.; Musa, O.M.; Steed, J.W. Predictive Identification of Co-formers in Co-amorphous Systems. *Eur J Pharm Sci* **2020**, *10.1016/j.ejps.2020.105636*, 105636, doi:10.1016/j.ejps.2020.105636.
51. Alleso, M.; Chieng, N.; Rehder, S.; Rantanen, J.; Rades, T.; Aaltonen, J. Enhanced dissolution rate and synchronized release of drugs in binary systems through formulation: Amorphous naproxen-cimetidine mixtures prepared by mechanical activation. *J Control Release* **2009**, *136*, 45–53, doi:10.1016/j.jconrel.2009.01.027.
52. Yamamura, S.; Momose, Y.; Takahashi, K.; Nagatani, S. Solid-state interaction between cimetidine and naproxen. *Drug Stability* **1996**, *1*, 173–178.
53. Wairkar, S.; Gaud, R. Co-Amorphous Combination of Nateglinide-Metformin Hydrochloride for Dissolution Enhancement. *AAPS PharmSciTech* **2016**, *17*, 673–681, doi:10.1208/s12249-015-0371-4.
54. Wairkar, S.; Gaud, R. Development and Characterization of Microstructured, Spray-Dried Co-Amorphous Mixture of Antidiabetic Agents Stabilized by Silicate. *AAPS PharmSciTech* **2019**, *20*, 141, doi:10.1208/s12249-019-1352-9.
55. Martinez, L.M.; Videa, M.; Sosa, N.G.; Ramirez, J.H.; Castro, S. Long-Term Stability of New Co-Amorphous Drug Binary Systems: Study of Glass Transitions as a Function of Composition and Shelf Time. *Molecules* **2016**, *21*, doi:10.3390/molecules21121712.
56. Knapik-Kowalczyk, J.; Tu, W.; Chmiel, K.; Rams-Baron, M.; Paluch, M. Co-Stabilization of Amorphous Pharmaceuticals-The Case of Nifedipine and Nimodipine. *Mol Pharm* **2018**, *15*, 2455–2465, doi:10.1021/acs.molpharmaceut.8b00308.
57. Wang, M.; Liu, S.; Jia, L.; Zhang, J.; Du, S.; Gong, J. Exploring the physical stability of three nimesulide-indomethacin co-amorphous systems from the perspective of molecular aggregates. *Eur J Pharm Sci* **2020**, *147*, 105294, doi:10.1016/j.ejps.2020.105294.
58. Abdelquader, M.M.; Essa, E.A.; El Maghraby, G.M. Inhibition of Co-Crystallization of Olmesartan Medoxomil and Hydrochlorothiazide for Enhanced Dissolution Rate in Their Fixed Dose Combination. *AAPS PharmSciTech* **2018**, *20*, 3, doi:10.1208/s12249-018-1207-9.
59. Martinez, L.M.; Videa, M.; Lopez-Silva, G.A.; de Los Reyes, C.A.; Cruz-Angeles, J.; Gonzalez, N. Stabilization of amorphous paracetamol based systems using traditional and novel strategies. *Int J Pharm* **2014**, *477*, 294–305, doi:10.1016/j.ijpharm.2014.10.021.
60. Dengale, S.J.; Hussen, S.S.; Krishna, B.S.; Musmade, P.B.; Gautham Shenoy, G.; Bhat, K. Fabrication, solid state characterization and bioavailability assessment of stable binary amorphous phases of Ritonavir with Quercetin. *Eur J Pharm Biopharm* **2015**, *89*, 329–338, doi:10.1016/j.ejpb.2014.12.025.
61. Dengale, S.J.; Ranjan, O.P.; Hussen, S.S.; Krishna, B.S.; Musmade, P.B.; Gautham Shenoy, G.; Bhat, K. Preparation and characterization of co-amorphous Ritonavir-Indomethacin systems by solvent evaporation technique: improved dissolution behavior and physical stability without evidence of intermolecular interactions. *Eur J Pharm Sci* **2014**, *62*, 57–64, doi:10.1016/j.ejps.2014.05.015.

62. Sai Krishna Anand, V.; Sakhare, S.D.; Navya Sree, K.S.; Nair, A.R.; Raghava Varma, K.; Gourishetti, K.; Dengale, S.J. The relevance of co-amorphous formulations to develop supersaturated dosage forms: In-vitro, and ex-vivo investigation of Ritonavir-Lopinavir co-amorphous materials. *Eur J Pharm Sci* **2018**, *123*, 124–134, doi:10.1016/j.ejps.2018.07.046.
63. Zhang, Y.; Gao, Y.; Du, X.; Guan, R.; He, Z.; Liu, H. Combining Co-Amorphous-Based Spray Drying with Inert Carriers to Achieve Improved Bioavailability and Excellent Downstream Manufacturability. *Pharmaceutics* **2020**, *12*, doi:10.3390/pharmaceutics12111063.
64. Lobmann, K.; Strachan, C.; Grohgan, H.; Rades, T.; Korhonen, O.; Laitinen, R. Co-amorphous simvastatin and glipizide combinations show improved physical stability without evidence of intermolecular interactions. *Eur J Pharm Biopharm* **2012**, *81*, 159–169, doi:10.1016/j.ejpb.2012.02.004.
65. Martinez-Jimenez, C.; Cruz-Angeles, J.; Vide, M.; Martinez, L.M. Co-Amorphous Simvastatin-Nifedipine with Enhanced Solubility for Possible Use in Combination Therapy of Hypertension and Hypercholesterolemia. *Molecules* **2018**, *23*, doi:10.3390/molecules23092161.
66. Teja, A.; Musmade, P.B.; Khade, A.B.; Dengale, S.J. Simultaneous improvement of solubility and permeability by fabricating binary glassy materials of Talinolol with Naringin: Solid state characterization, in-vivo in-situ evaluation. *Eur J Pharm Sci* **2015**, *78*, 234–244, doi:10.1016/j.ejps.2015.08.002.
67. Ueda, H.; Kadota, K.; Imono, M.; Ito, T.; Kunita, A.; Tozuka, Y. Co-amorphous Formation Induced by Combination of Tranilast and Diphenhydramine Hydrochloride. *J. Pharm. Sci.* **2017**, *106*, 123–128, doi:10.1016/j.xphs.2016.07.009.
68. Lodagekar, A.; Chavan, R.B.; Mannava, M.K.C.; Yadav, B.; Chella, N.; Nangia, A.K.; Shastri, N.R. Co amorphous valsartan nifedipine system: Preparation, characterization, in vitro and in vivo evaluation. *Eur J Pharm Sci* **2019**, *139*, 105048, doi:10.1016/j.ejps.2019.105048.

Table S3. Overview of screened CAMS and non-CAMS with organic acids as co-formers. (y: yes. n: no. –: unknown).

Drug	Organic Acid	CAMS	Reference
Acyclovir	Tartaric acid	n (solvent evaporation)	[1]
Acyclovir	Citric acid	y	[1]
Azelnidipine	Oxalic acid	y	[2]
Azelnidipine	Maleic acid	y	[3]
Carbamazepine	Citric acid	y	[4]
Carbamazepine	Benzoic acid	y	[5]
Carbamazepine	Maleic acid	y	[5]
Carbamazepine	Succinic acid	y	[5]
Carbamazepine	Tartaric acid	y	[5]
Carvedilol	Benzoic acid	y	[6]
Carvedilol	Malic acid	y	[6]
Carvedilol	Citric acid	y	[6]
Ciprofloxacin	Tartaric acid	y	[7]
Ciprofloxacin	Succinic acid	y	[8]
Clozapine	Tartaric acid	y	[9]
Clozapine	Citric acid	y	[9]
Clozapine	Oxalic acid	y	[9]
Curcumin	Folic acid dihydrate	y	[10]
Curcumin	Suberic acid	n (Liquid-assisted grinding)	[10]
Desloratadine	Benzoic acid	y	[11]
Ibrutinib	Tartaric acid	n (ball milling)	[12]
Ibrutinib	Citric acid	y	[12]
Ibrutinib	Succinic acid	y	[12]
Ibrutinib	Oxalic acid	y	[12]
Indomethacin	Citric acid	y	[13]
Itraconazole	Fumaric acid	y	[14]
Itraconazole	Tartaric acid	y	[14]
Ketoconazole	Oxalic acid	y	[15,16]
Ketoconazole	Tartaric acid	y	[15,16]
Ketoconazole	Citric acid	y	[15,16]

Ketoconazole	Succinic acid	y	[15,16]
Loratadine	Citric acid	y	[17]
Mebendazole	2,4-Dihydroxybenzoic acid	y	[18]
Mebendazole	3,5-Dihydroxybenzoic acid	y	[18]
Mebendazole	3-Aminobenzoic acid	n (ball milling)	[18]
Mebendazole	4-Aminobenzoic acid	y	[18]
Mebendazole	4-Aminosalicylic acid	y	[18]
Mebendazole	5-Aminosalicylic acid	n (ball milling)	[18]
Mebendazole	Fumaric acid	y	[18]
Mebendazole	Gallic acid	y	[18]
Mebendazole	Glycolic acid	n (ball milling)	[18]
Mebendazole	Maleic acid	y	[18]
Mebendazole	Oxalic acid	y	[18]
Mebendazole	Succinic acid	n (ball milling)	[18]
Mebendazole	Tartaric acid	n (ball milling)	[18]
Mirabegron	Fumaric acid	y	[19]
Mirabegron	Pyroglutamic acid	y	[19]
Mirabegron	Citric acid	y	[19]
Naproxen	Flufenamic acid	y	[20]
Olanzapine	Ascorbic acid	y	[21]
Olanzapine	Citric acid	y	[21]
Olanzapine	Tartaric acid	y	[21]
Paracetamol	Citric acid	y	[22,23]
Paracetamol	Citric acid anhydrate	y	[23]
Rofecoxib	Citric acid	-	[24]
Sulfamerazine	Citric acid	y	[25]
Sulfamerazine	Deoxycholic acid	y	[26]
Sulfamerazine	Oxalic acid	y	[27]
Sulfamerazine	Tartaric acid	y	[27]
Sulfamerazine	Citric acid	y	[26,27]
Sulfamerazine	Adipic acid	n (ball milling)	[27]
Sulfamerazine	Barbituric acid	y	[27]
Sulfamerazine	Fumaric acid	y	[27]
Sulfamerazine	Glutaric acid	n (ball milling)	[27]
Sulfamerazine	Maleic acid	n (ball milling)	[27]
Sulfamerazine	Malonic acid	n (ball milling)	[27]
Sulfamerazine	Pimelic acid	n (ball milling)	[27]
Sulfamerazine	Succinic acid	n (ball milling)	[27]
Sulfamerazine	Terephthalic acid	n (ball milling)	[27]
Sulfathiazole I	Oxalic acid	n (ball milling)	[28]
Sulfathiazole I	Tartaric acid	y	[28]
Sulfathiazole I	Citric acid	y	[28]
Sulfathiazole I	Fumaric acid	n (ball milling)	[28]
Sulfathiazole I	Malic acid	n (ball milling)	[28]
Sulfathiazole I	Malonic acid	n (ball milling)	[28]
Sulfathiazole I	Succinic acid	n (ball milling)	[28]
Sulfathiazole I	Glutaric acid	n (ball milling)	[28]
Sulfathiazole I	Adipic acid	n (ball milling)	[28]
Sulfathiazole I	Pimelic acid	n (ball milling)	[28]
Sulfathiazole III	Oxalic acid	n (ball milling)	[28]
Sulfathiazole III	Tartaric acid	y	[28]

Sulfathiazole III	Citric acid	y	[28]
Sulfathiazole III	Fumaric acid	n (ball milling)	[28]
Sulfathiazole III	Malic acid	n (ball milling)	[28]
Sulfathiazole III	Malonic acid	n (ball milling)	[28]
Sulfathiazole III	Succinic acid	n (ball milling)	[28]
Sulfathiazole III	Glutaric acid	n (ball milling)	[28]
Sulfathiazole III	Adipic acid	n (ball milling)	[28]
Sulfathiazole III	Pimelic acid	n (ball milling)	[28]
Sulfathiazole V	Oxalic acid	n (ball milling)	[28]
Sulfathiazole V	Tartaric acid	y	[28]
Sulfathiazole V	Citric acid	y	[28]
Sulfathiazole V	Fumaric acid	n (ball milling)	[28]
Sulfathiazole V	Malic acid	n (ball milling)	[28]
Sulfathiazole V	Malonic acid	n (ball milling)	[28]
Sulfathiazole V	Succinic acid	n (ball milling)	[28]
Sulfathiazole V	Glutaric acid	n (ball milling)	[28]
Sulfathiazole V	Adipic acid	n (ball milling)	[28]
Sulfathiazole V	Pimelic acid	n (ball milling)	[28]

References

- Masuda, T.; Yoshihashi, Y.; Yonemochi, E.; Fujii, K.; Uekusa, H.; Terada, K. Cocrystallization and amorphization induced by drug-excipient interaction improves the physical properties of acyclovir. *Int J Pharm* **2012**, *422*, 160–169, doi:10.1016/j.ijpharm.2011.10.046.
- Pan, Y.; Pang, W.; Lv, J.; Wang, J.; Yang, C.; Guo, W. Solid state characterization of azelnidipine-oxalic acid co-crystal and co-amorphous complexes: The effect of different azelnidipine polymorphs. *J Pharm Biomed Anal* **2017**, *138*, 302–315, doi:10.1016/j.jpba.2017.02.005.
- Han, Y.; Pan, Y.; Lv, J.; Guo, W.; Wang, J. Powder grinding preparation of co-amorphous β -azelnidipine and maleic acid combination: Molecular interactions and physicochemical properties. *Powder Technol.* **2016**, *291*, 110–120, doi:10.1016/j.powtec.2015.11.068.
- Ueda, H.; Wu, W.; Lobmann, K.; Grohgan, H.; Mullertz, A.; Rades, T. Application of a Salt Coformer in a Co-Amorphous Drug System Dramatically Enhances the Glass Transition Temperature: A Case Study of the Ternary System Carbamazepine, Citric Acid, and L-Arginine. *Mol Pharm* **2018**, *15*, 2036–2044, doi:10.1021/acs.molpharmaceut.8b00174.
- Wu, W.; Wang, Y.; Lobmann, K.; Grohgan, H.; Rades, T. Transformations between co-amorphous and co-crystal systems and their influence on the formation and physical stability of co-amorphous systems. *Molecular Pharmaceutics* **2019**, *10.1021/acs.molpharmaceut.8b01229*, doi:10.1021/acs.molpharmaceut.8b01229.
- Wu, W.; Ueda, H.; Lobmann, K.; Rades, T.; Grohgan, H. Organic acids as co-formers for co-amorphous systems - Influence of variation in molar ratio on the physicochemical properties of the co-amorphous systems. *Eur J Pharm Biopharm* **2018**, *131*, 25–32, doi:10.1016/j.ejpb.2018.07.016.
- Mohammed, A.; Zurek, J.; Madueke, S.; Al-Kassimy, H.; Yaqoob, M.; Houacine, C.; Ferraz, A.; Kalgudi, R.; Zariwala, M.G.; Hawkins, N., et al. Generation of High Dose Inhalable Effervescent Dispersions against *Pseudomonas aeruginosa* Biofilms. *Pharm. Res.* **2020**, *37*, 150, doi:10.1007/s11095-020-02878-w.
- Paluch, K.J.; McCabe, T.; Muller-Bunz, H.; Corrigan, O.I.; Healy, A.M.; Tajber, L. Formation and physicochemical properties of crystalline and amorphous salts with different stoichiometries formed between ciprofloxacin and succinic acid. *Mol Pharm* **2013**, *10*, 3640–3654, doi:10.1021/mp400127r.
- Ali, A.M.; Ali, A.A.; Maghrabi, I.A. Clozapine-carboxylic acid plasticized co-amorphous dispersions: Preparation, characterization and solution stability evaluation. *Acta. Pharm.* **2015**, *65*, 133–146, doi:10.1515/acph-2015-0014.
- Skieneh, J.M.; Sathisaran, I.; Dalvi, S.V.; Rohani, S. Co-amorphous Form of Curcumin–Folic Acid Dihydrate with Increased Dissolution Rate. *Cryst. Growth Des.* **2017**, *17*, 6273–6280, doi:10.1021/acs.cgd.7b00947.
- Ainurofiq, A.; Mauludin, R.; Mudhakir, D.; Soewandhi, S.N. A Novel Desloratadine-Benzoinic Acid Co-Amorphous Solid: Preparation, Characterization, and Stability Evaluation. *Pharmaceutics* **2018**, *10*, doi:10.3390/pharmaceutics10030085.
- Zhang, M.; Suo, Z.; Peng, X.; Gan, N.; Zhao, L.; Tang, P.; Wei, X.; Li, H. Microcrystalline cellulose as an effective crystal growth inhibitor for the ternary lbrutinib formulation. *Carbohydr. Polym.* **2020**, *229*, 115476, doi:10.1016/j.carbpol.2019.115476.
- Lu, Q.; Zografi, G. Phase behavior of binary and ternary amorphous mixtures containing indomethacin, citric acid, and PVP. *Pharm. Res.* **1998**, *15*, 1202–1206.

14. Yamamoto, K.; Kojima, T.; Karashima, M.; Ikeda, Y. Physicochemical evaluation and developability assessment of co-amorphous of low soluble drugs and comparison to the co-crystals. *Chemical and Pharmaceutical Bulletin* **2016**, c16-00604.
15. Fung, M.; Be Rzins, K.R.; Suryanarayanan, R. Physical Stability and Dissolution Behavior of Ketoconazole-Organic Acid Coamorphous Systems. *Mol Pharm* **2018**, *15*, 1862-1869, doi:10.1021/acs.molpharmaceut.8b00035.
16. Fung, M.H.; DeVault, M.; Kuwata, K.T.; Suryanarayanan, R. Drug-Excipient Interactions: Effect on Molecular Mobility and Physical Stability of Ketoconazole-Organic Acid Coamorphous Systems. *Mol Pharm* **2018**, *15*, 1052-1061, doi:10.1021/acs.molpharmaceut.7b00932.
17. Wang, J.; Chang, R.; Zhao, Y.; Zhang, J.; Zhang, T.; Fu, Q.; Chang, C.; Zeng, A. Coamorphous Loratadine-Citric Acid System with Enhanced Physical Stability and Bioavailability. *AAPS PharmSciTech* **2017**, *18*, 2541-2550, doi:10.1208/s12249-017-0734-0.
18. Chambers, L.I.; Grohgan, H.; Palmelund, H.; Lobmann, K.; Rades, T.; Musa, O.M.; Steed, J.W. Predictive Identification of Co-formers in Co-amorphous Systems. *Eur J Pharm Sci* **2020**, 10.1016/j.ejps.2020.105636, 105636, doi:10.1016/j.ejps.2020.105636.
19. An, J.H.; Lim, C.; Kiyonga, A.N.; Chung, I.H.; Lee, I.K.; Mo, K.; Park, M.; Youn, W.; Choi, W.R.; Suh, Y.G., et al. Co-Amorphous Screening for the Solubility Enhancement of Poorly Water-Soluble Mirabegron and Investigation of Their Intermolecular Interactions and Dissolution Behaviors. *Pharmaceutics* **2018**, *10*, doi:10.3390/pharmaceutics10030149.
20. Ueda, H.; Muranushi, N.; Sakuma, S.; Ida, Y.; Endoh, T.; Kadota, K.; Tozuka, Y. A Strategy for Co-former Selection to Design Stable Co-amorphous Formations Based on Physicochemical Properties of Non-steroidal Inflammatory Drugs. *Pharm. Res.* **2016**, *33*, 1018-1029, doi:10.1007/s11095-015-1848-2.
21. Maher, E.M.; Ali, A.M.; Salem, H.F.; Abdelrahman, A.A. In vitro/in vivo evaluation of an optimized fast dissolving oral film containing olanzapine co-amorphous dispersion with selected carboxylic acids. *Drug Deliv* **2016**, *23*, 3088-3100, doi:10.3109/10717544.2016.1153746.
22. Hoppu, P.; Hietala, S.; Schantz, S.; Juppo, A.M. Rheology and molecular mobility of amorphous blends of citric acid and paracetamol. *Eur J Pharm Biopharm* **2009**, *71*, 55-63, doi:10.1016/j.ejpb.2008.06.029.
23. Hoppu, P.; Jouppila, K.; Rantanen, J.; Schantz, S.; Juppo, A.M. Characterisation of blends of paracetamol and citric acid. *J Pharm Pharmacol* **2007**, *59*, 373-381, doi:10.1211/jpp.59.3.0006.
24. Ahuja, N.; Katore, O.P.; Singh, B. Studies on dissolution enhancement and mathematical modeling of drug release of a poorly water-soluble drug using water-soluble carriers. *Eur J Pharm Biopharm* **2007**, *65*, 26-38, doi:10.1016/j.ejpb.2006.07.007.
25. Hirakawa, Y.; Ueda, H.; Takata, Y.; Minamihata, K.; Wakabayashi, R.; Kamiya, N.; Goto, M. Co-amorphous formation of piroxicam-citric acid to generate supersaturation and improve skin permeation. *Eur J Pharm Sci* **2021**, *158*, 105667, doi:10.1016/j.ejps.2020.105667.
26. Gniado, K.; Lobmann, K.; Rades, T.; Erxleben, A. The influence of co-formers on the dissolution rates of co-amorphous sulfamerazine/excipient systems. *Int J Pharm* **2016**, *504*, 20-26, doi:10.1016/j.ijpharm.2016.03.023.
27. Macfhionnghaile, P.; Hu, Y.; Gniado, K.; Curran, S.; McArdle, P.; Erxleben, A. Effects of ball-milling and cryomilling on sulfamerazine polymorphs: a quantitative study. *J. Pharm. Sci.* **2014**, *103*, 1766-1778, doi:10.1002/jps.23978.
28. Hu, Y.; Gniado, K.; Erxleben, A.; McArdle, P. Mechanochemical Reaction of Sulfathiazole with Carboxylic Acids: Formation of a Cocrystal, a Salt, and Coamorphous Solids. *Cryst. Growth Des.* **2014**, *14*, 803-813, doi:10.1021/cg401673z.

Table S4. Overview of screened CAMS and non-CAMS with various (other) co-formers. (y: yes. n: no. -: unknown).

Drug	Coformer	CAMS	Reference
6-Mercaptopurine	Sodium taurocholate	y	[1]
Acyclovir	Sodium taurocholate	y	[1]
Allopurinol	Sodium taurocholate	y	[1]
Amoxicillin	Sodium taurocholate	y	[1]
Atenolol	Urea	y	[2]
Atorvastatin calcium	Nicotinamide	y	[3]
Azithromycin	N-Acetylcysteine	y	[4]
Benzamidine	Sodium taurocholate	y	[1]
Carbamazepine	Sodium taurocholate	y	[1]
Carbamazepine	Tannic acid	y	[5]
Carbamazepine	Saccharin	y	[6]
Carbamazepine	Nicotinamide	y	[6]
Ciprofloxacin	Sodium taurocholate	y	[1]
Ciprofloxacin	N-Acetylcysteine	n (spray drying)	[4]
Curcumin	Piperazine	y	[7]

Diflusal	Sodium taurocholate	y	[1]
Glibenclamide	Quercetin	y	[8]
Hydrochlorothiazide	Sodium lauryl sulfate	n (ball milling)	[9]
Ibrutinib	Oxalic acid	y	[10]
Ibrutinib	Saccharin	y	[11]
Ibuprofen	Nicotinamide	y	[12]
Ibuprofen	Sodium taurocholate	y	[1]
Indomethacin	Sodium taurocholate	y	[1]
Indomethacin	Tannic acid	Y	[5]
Lurasidone hydrochloride	Saccharin	y	[13]
Mebendazole	Glutamic acid-Arginine	n (ball milling)	[14]
Mebendazole	Arginine-Glutamic acid	n (ball milling)	[14]
Mebendazole	Aspartame	y	[15]
Mebendazole	Tryptophan-Phenylalanine	y	[16]
Mebendazole	Phenylalanine-Tryptophan	y	[16]
Mebendazole	Aspartic acid-Tyrosine	y	[16]
Mebendazole	Histidine-Glycine	y	[16]
Mebendazole	Proline-Tryptophan	y	[16]
Mebendazole	Glutamic acid-Arginine (crystalline salt)	y	[14]
Mebendazole	Glutamic acid-Arginine (amorphous salt)	y	[14]
Mebendazole	4,4'-Bipyridine	n (ball milling)	[17]
Mebendazole	Imidazole	n (ball milling)	[17]
Mebendazole	Isonicotinamide	n (ball milling)	[17]
Mebendazole	Nicotinamide	n (ball milling)	[17]
Mebendazole	Phenazine	n (ball milling)	[17]
Mebendazole	Piperazine	n (ball milling)	[17]
Mebendazole	Pyrogallol	y	[17]
Mebendazole	Salicylic acid	y	[17]
Mebendazole	Urea	n (ball milling)	[17]
Mefenamic acid	Sodium taurocholate	y	[1]
Naproxen	Sodium taurocholate	y	[1]
Naproxen	Meglumine	y	[18]
Nifedipine	Sodium taurocholate	y	[1]
Norfloxacin	Sodium taurocholate	y	[1]
Olanzapine	Saccharin	y	[19]
Paracetamol	Sodium taurocholate	y	[1]
Piroxicam	Aspartame	y	[15]
Probutol	Maltitol	n (melt-quench)	[20]
Quetiapine	Nicotinamide	n (freeze drying)	[21]
Quinine	Sodium taurocholate	y	[1]
Repaglinide	Saccharin	y	[22]
Rofecoxib	Mannitol	-	[23]
Rofecoxib	Sorbitol	-	[23]
Rofecoxib	Urea	-	[23]
Rofecoxib	Nicotinamide	-	[23]
ROY	Pyrogallol	y	[24]
Sulfamerazine	Sodium taurocholate	y	[1]
Sulfamerazine	Mannitol	n (melt-quench)	[25]
Sulfamerazine	Saccharin	n (melt-quench)	[25]
Sulfamerazine	Sorbitol	n (melt-quench)	[25]
Sulfathiazole	Sodium taurocholate	y	[1]

Tadalafil	Aspartame	y	[15]
Tobramycin	N-Acetylcysteine	y	[4]
Ursolic acid	Piperine	y	[26]
Valsartan	Vanillin	y	[27]

References

- Gniado, K.; MacFhionnghaile, P.; McArdle, P.; Erxleben, A. The natural bile acid surfactant sodium taurocholate (NaTC) as a coformer in coamorphous systems: Enhanced physical stability and dissolution behavior of coamorphous drug-NaTC systems. *Int J Pharm* **2018**, *535*, 132–139, doi:10.1016/j.ijpharm.2017.10.049.
- Hirakawa, Y.; Ueda, H.; Miyano, T.; Kamiya, N.; Goto, M. New insight into transdermal drug delivery with supersaturated formulation based on co-amorphous system. *Int J Pharm* **2019**, *569*, 118582, doi:10.1016/j.ijpharm.2019.118582.
- Shayanfar, A.; Jouyban, A. Drug–Drug Coamorphous Systems: Characterization and Physicochemical Properties of Coamorphous Atorvastatin with Carvedilol and Glibenclamide. *Journal of Pharmaceutical Innovation* **2013**, *8*, 218–228, doi:10.1007/s12247-013-9162-1.
- Lababidi, N.; Ofosu Kissi, E.; Elgaher, W.A.M.; Sigal, V.; Haupenthal, J.; Schwarz, B.C.; Hirsch, A.K.H.; Rades, T.; Schneider, M. Spray-drying of inhalable, multifunctional formulations for the treatment of biofilms formed in cystic fibrosis. *J Control Release* **2019**, *314*, 62–71, doi:10.1016/j.jconrel.2019.10.038.
- Fael, H.; Demirel, A.L. Tannic acid as a co-former in co-amorphous systems: Enhancing their physical stability, solubility and dissolution behavior. *Int J Pharm* **2020**, *581*, 119284, doi:10.1016/j.ijpharm.2020.119284.
- Wu, W.; Wang, Y.; Loebmann, K.; Grohgan, H.; Rades, T. Transformations between co-amorphous and co-crystal systems and their influence on the formation and physical stability of co-amorphous systems. *Molecular Pharmaceutics* **2019**, *10*, 1021/acs.molpharmaceut.8b01229, doi:10.1021/acs.molpharmaceut.8b01229.
- Pang, W.; Lv, J.; Du, S.; Wang, J.; Wang, J.; Zeng, Y. Preparation of Curcumin-Piperazine Coamorphous Phase and Fluorescence Spectroscopic and Density Functional Theory Simulation Studies on the Interaction with Bovine Serum Albumin. *Mol Pharm* **2017**, *14*, 3013–3024, doi:10.1021/acs.molpharmaceut.7b00217.
- Sormunen, H.; Ruponen, M.; Laitinen, R. The effect of co-amorphization of glibenclamide on its dissolution properties and permeability through an MDCKII-MDR1 cell layer. *Int J Pharm* **2019**, *570*, 118653, doi:10.1016/j.ijpharm.2019.118653.
- Ruponen, M.; Rusanen, H.; Laitinen, R. Dissolution and Permeability Properties of Co-Amorphous Formulations of Hydrochlorothiazide. *J. Pharm. Sci.* **2020**, *109*, 2252–2261, doi:10.1016/j.xphs.2020.04.008.
- Zhang, M.; Suo, Z.; Peng, X.; Gan, N.; Zhao, L.; Tang, P.; Wei, X.; Li, H. Microcrystalline cellulose as an effective crystal growth inhibitor for the ternary Ibrutinib formulation. *Carbohydr. Polym.* **2020**, *229*, 115476, doi:10.1016/j.carbpol.2019.115476.
- Shi, X.; Song, S.; Ding, Z.; Fan, B.; Huang, W.; Xu, T. Improving the Solubility, Dissolution, and Bioavailability of Ibrutinib by Preparing It in a Coamorphous State With Saccharin. *J. Pharm. Sci.* **2019**, *108*, 3020–3028, doi:10.1016/j.xphs.2019.04.031.
- Bi, Y.; Xiao, D.; Ren, S.; Bi, S.; Wang, J.; Li, F. The Binary System of Ibuprofen-Nicotinamide Under Nanoscale Confinement: From Cocrystal to Coamorphous State. *J. Pharm. Sci.* **2017**, *106*, 3150–3155, doi:10.1016/j.xphs.2017.06.005.
- Qian, S.; Heng, W.; Wei, Y.; Zhang, J.; Gao, Y. Coamorphous Lurasidone Hydrochloride–Saccharin with Charge-Assisted Hydrogen Bonding Interaction Shows Improved Physical Stability and Enhanced Dissolution with pH-Independent Solubility Behavior. *Cryst. Growth Des.* **2015**, *15*, 2920–2928, doi:10.1021/acs.cgd.5b00349.
- Wu, W.; Grohgan, H.; Rades, T.; Lobmann, K. Comparison of co-former performance in co-amorphous formulations: single amino acids, amino acid physical mixtures, amino acid salts and dipeptides as co-formers. *Eur J Pharm Sci* **2020**, *10*, 1016/j.ejps.2020.105582, 105582, doi:10.1016/j.ejps.2020.105582.
- Wu, W.; Lobmann, K.; Schnitzkewitz, J.; Knuhtsen, A.; Pedersen, D.S.; Grohgan, H.; Rades, T. Aspartame as a co-former in co-amorphous systems. *Int J Pharm* **2018**, *549*, 380–387, doi:10.1016/j.ijpharm.2018.07.063.
- Wu, W.; Lobmann, K.; Schnitzkewitz, J.; Knuhtsen, A.; Pedersen, D.S.; Rades, T.; Grohgan, H. Dipeptides as co-formers in co-amorphous systems. *Eur J Pharm Biopharm* **2019**, *134*, 68–76, doi:10.1016/j.ejpb.2018.11.016.
- Chambers, L.I.; Grohgan, H.; Palmelund, H.; Lobmann, K.; Rades, T.; Musa, O.M.; Steed, J.W. Predictive Identification of Co-formers in Co-amorphous Systems. *Eur J Pharm Sci* **2020**, *10*, 1016/j.ejps.2020.105636, 105636, doi:10.1016/j.ejps.2020.105636.
- Liu, X.; Zhou, L.; Zhang, F. Reactive Melt Extrusion To Improve the Dissolution Performance and Physical Stability of Naproxen Amorphous Solid Dispersions. *Mol Pharm* **2017**, *14*, 658–673, doi:10.1021/acs.molpharmaceut.6b00960.
- da Costa, N.F.; Fernandes, A.I.; Pinto, J.F. Measurement of the amorphous fraction of olanzapine incorporated in a co-amorphous formulation. *Int J Pharm* **2020**, *588*, 119716, doi:10.1016/j.ijpharm.2020.119716.
- Mizoguchi, R.; Waraya, H.; Hirakura, Y. Application of Co-Amorphous Technology for Improving the Physicochemical Properties of Amorphous Formulations. *Mol Pharm* **2019**, *16*, 2142–2152, doi:10.1021/acs.molpharmaceut.9b00105.
- Ali, A.M.; Al-Remawi, M.M. Freeze Dried Quetiapine-Nicotinamide Binary Solid Dispersions: A New Strategy for Improving Physicochemical Properties and Ex Vivo Diffusion. *J Pharm (Cairo)* **2016**, *2016*, 2126056, doi:10.1155/2016/2126056.

22. Gao, Y.; Liao, J.; Qi, X.; Zhang, J. Coamorphous repaglinide-saccharin with enhanced dissolution. *Int J Pharm* **2013**, *450*, 290-295, doi:10.1016/j.ijpharm.2013.04.032.
23. Ahuja, N.; Katare, O.P.; Singh, B. Studies on dissolution enhancement and mathematical modeling of drug release of a poorly water-soluble drug using water-soluble carriers. *Eur J Pharm Biopharm* **2007**, *65*, 26-38, doi:10.1016/j.ejpb.2006.07.007.
24. Corner, P.A.; Harburn, J.J.; Steed, J.W.; McCabe, J.F.; Berry, D.J. Stabilisation of an amorphous form of ROY through a predicted co-former interaction. *Chem. Commun. (Camb.)* **2016**, *52*, 6537-6540, doi:10.1039/c6cc02949c.
25. Macfhionnghaile, P.; Hu, Y.; Gniado, K.; Curran, S.; McArdle, P.; Erxleben, A. Effects of ball-milling and cryomilling on sulfamerazine polymorphs: a quantitative study. *J. Pharm. Sci.* **2014**, *103*, 1766-1778, doi:10.1002/jps.23978.
26. Yu, D.; Kan, Z.; Shan, F.; Zang, J.; Zhou, J. Triple Strategies to Improve Oral Bioavailability by Fabricating Coamorphous Forms of Ursolic Acid with Piperine: Enhancing Water-Solubility, Permeability, and Inhibiting Cytochrome P450 Isozymes. *Mol Pharm* **2020**, *17*, 4443-4462, doi:10.1021/acs.molpharmaceut.0c00443.
27. Hashim Ali, K.; Mohsin Ansari, M.; Ali Shah, F.; Ud Din, F.; Abdul Basit, M.; Kim, J.K.; Zeb, A. Enhanced dissolution of valsartan-vanillin binary co-amorphous system loaded in mesoporous silica particles. *J Microencapsul* **2019**, *36*, 10-20, doi:10.1080/02652048.2019.1579265.