

Antiretroviral and Directly Acting Antiviral Drug Metabolism and Transporter Characteristics (Summary)

	Substrate	CYP450 and UGT		Transporters	
		Inhibitor	Inducer	Inhibitor	Inducer
Tenofovir alafenamide ¹	P-gp, BCRP; minimal metabolism via 3A4	3A4 (weak – in vitro only; not an inhibitor in vivo). Does not inhibit CYP1A2, 2B6, 2C8, 2C9, 2C19, 2D6 or UGT1A.	Not an inducer of 3A4 in vivo.		
HIV PIs					
atazanavir ²	Mainly CYP3A P-gp, MRP1	3A4, UGT1A1 >>2C8 (weak)* *Caution when unboosted atazanavir is coadministered with 2C8 substrates with narrow therapeutic indices (e.g., paclitaxel, repaglinide); clinically significant interactions with 2C8 substrates are not expected when atazanavir is boosted with ritonavir.		P-gp, MRP1, OATP1B1, OATP1B3, BCRP	
darunavir ³	Mainly CYP3A, P-gp	CYP3A4			
fosamprenavir ⁴ , indinavir ⁵ , lopinavir/ritonavir ⁶ , saquinavir ⁷	Mainly CYP3A, P-gp, MRP1 (LPV, SQV)	CYP3A4 (saquinavir is a weak inhibitor)		P-gp (LPV) OATP1B1, OATP1B3 (LPV, SQV)	
nelfinavir ⁸	Mainly CYP3A, 2C19, P-gp	CYP3A4	UGT, 2B6, 2C8, 2C9/19 ⁹		
tipranavir ¹⁰	Mainly CYP3A, P-gp	2D6 ¹¹	CYP3A4 (potent) ¹⁰ , UGT	OATP1B1	P-gp
PK Boosters					
ritonavir ¹²	CYP3A4, P-gp, MRP1	CYP3A4 (potent) > 2D6* >2C9 >2C19 >2A6 >1A2 >2E1. *negligible effect at boosting doses ⁵	UGT, CYP1A2, CYP2C9/19, 2B6 (inhibits in vitro, ¹³ but induces in vivo ¹⁴)	P-gp, OATP1B1, OATP1B3, BCRP, OATP2B1, OCT2	
cobicistat	CYP3A, 2D6 (minor)	CYP3A, CYP2D6		P-gp, BCRP, OATP1B1 and OATP1B3, MATE1	
HIV NNRTIs					
delavirdine ¹⁵	CYP3A4	3A4 (potent)			
doravirine (MK-1439)	CYP3A4/5. Not a substrate of OATP1B1	Does not inhibit CYP3A4, 2D6, 1A2, 2B6, 2C8/9, 2C19, or UGT	Unlikely to induce CYP enzymes to a clinically relevant extent.	Not anticipated to inhibit OATP1B1/3, OAT1, OAT3, OCT2, BCRP in a clinically relevant manner.	

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efavirenz ¹⁶	CYP3A4, 2B6 (minor)	2C9, 2C19 ¹⁶ (? Clinical significance).	3A4 (potent), 2B6 ¹⁷ , UGT1A1 ¹⁸		
etravirine ¹⁹	CYP3A4, CYP2C9, and CYP2C19	CYP2C9 (weak), CYP2C19 (moderate), p-glycoprotein (weak)	3A4 (weak)		
nevirapine ²⁰	CYP3A4, 2B6 (minor)		3A4, 2B6 (potent)		
rilpivirine ²¹	CYP3A4 (major), as well as CYP2C19, 1A2, 2C8/9/10 (minor).		2C19 (moderate), CYP1A2, 2B6 and 3A4 (weak). ²² A clinically relevant effect on CYP enzyme activity is considered unlikely with the 25 mg dose. ²¹	OCT2	
HIV INSTIs					
dolutegravir ²³	UGT1A1, CYP3A4 (10-15%); not a substrate of OATP1B1 or 1B3.		Does not induce CYP1A2, CYP2B6, or CYP3A4 in vitro.	OCT2	
elvitegravir ²⁴	CYP3A4		CYP2C9 (modest)		
raltegravir ²⁵	UGT1A1	Raltegravir has no inhibitory or inductive potential in vitro.	Raltegravir has no inhibitory or inductive potential in vitro.		
HIV CCR5 INHIBITORS					
cenicriviroc ²⁶	CYP3A4, 2C8. Not a substrate of OATP1B1/B3 or OCT2.	Not a known CYP inhibitor.	Not a known CYP inducer.	P-gp Not an inhibitor of OATP1B1/B3 or OCT2.	
maraviroc ²⁷	CYP3A4, P-gp	Does not inhibit major CYP isozymes at clinically relevant concentrations.		P-gp (in gut; systemic effects unlikely).	
HIV ATTACHMENT INHIBITOR					
BMS 663068 (prodrug of 626529)	CYP3A4 (partial)	Not anticipated to inhibit UGT1A1, 1A4, 1A9 or CYP450 enzymes.	No CYP3A4 induction.	Inhibitor of OATP1B3. Not anticipated to inhibit other transporters including OCT2, OAT1, OAT3, MATE1, MRP2, BSEP, NTCP and P-gp.	

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CO-FORMULATED/COMBINATION HCV REGIMENS					
Epclusa®					
velpatasvir ^{28, 29}	CYP3A4, 2C8, 2B6; OATP1B1, OATP1B3, P-gp, BCRP.	No inhibiting or inducing effects on P450.	No inhibiting or inducing effects on P450.	P-gp (weak), OATP1B1, 1B3, 2B1 (weak), BCRP (moderate).	
sofosbuvir ³⁰	P-gp, BCRP.GS-331007 (primary systemic nucleoside metabolite, accounts for >90% of systemic drug exposure): not a P-gp substrate	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P-gp, BCRP, OATP1B1, OATP1B3, OCT1, BSEP.	No inhibiting or inducing effects on P-gp, BCRP, OATP1B1, OATP1B3, OCT1, BSEP.
Harvoni®					
ledipasvir ³¹	P-gp (likely)	Not an inhibitor or inducer of P450 or UGT.	Not an inhibitor or inducer of P450 or UGT.	Weak inhibitor of P-gp and BCRP (intestinal, not systemic). Likely a weak inhibitor of OATP1B1/1B3.	
sofosbuvir ³⁰	P-gp, BCRP.GS-331007 (primary systemic nucleoside metabolite, accounts for >90% of systemic drug exposure): not a P-gp substrate	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P-gp, BCRP, OATP1B1, OATP1B3, OCT1, BSEP.	No inhibiting or inducing effects on P-gp, BCRP, OATP1B1, OATP1B3, OCT1, BSEP.
Holkira Pak®^{32, 33}					
paritaprevir (NS3/4A PI)	3A4, P-gp, OATP1B1, OATP1B3, BCRP.	UGT1A1 (<i>net effect of 3D is UGT1A1 inhibition</i>) ³⁴		OATP1B1 and OATP1B3; P-gp, BCRP (potential).	
ombitasvir (NS5A inhibitor)	3A4, P-gp, BCRP.	UGT1A1 (<i>net effect of 3D is UGT1A1 inhibition</i>) ³⁴			
dasabuvir (NS5B inhibitor)	CYP2C8>3A4, P-gp, BCRP.	UGT1A1 (<i>net effect of 3D is UGT1A1 inhibition</i>) ³⁴		BCRP, P-gp (potential)	
ritonavir ¹²	CYP3A4, P-gp, MRP1	CYP3A4 (potent)> >2D6* >2C9 >2C19 >2A6 >1A2>2E1. *negligible effect at boosting	UGT, CYP1A2, CYP2C9/19, 2B6 (inhibits in vitro, ¹³ but induces in vivo ¹⁴)	P-gp, OATP1B1, OATP1B3, BCRP, OATP2B1, OCT2	

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		Inhibitor	Inducer	Inhibitor	Inducer
		doses ⁵			
Zepatier®³⁵					
elbasvir ^{36, 37} (NS5A inhibitor)	CYP3A4, P-glycoprotein (P-gp) and OATP in vitro.	Does not inhibit CYP3A4	Does not induce CYP1A2, 2B6 or 3A4. ³⁵	BCRP (intestinal) ³⁵ , P-gp (in vitro only; not expected to cause clinically significant interactions via P-gp inhibition at usual clinical doses) ³⁸ Does not inhibit OATP1B ³⁵	
grazoprevir ^{37, 39} (NS3/4A PI)	CYP3A4, P-gp and OATP1B1	CYP2C8 (not clinically meaningful), ⁴⁰ 3A4 (weak), UGT1A1 (weak)	Does not induce CYP1A2, 2B6 or 3A4. ³⁵	BCRP (intestinal) ³⁵ . Does not inhibit OATP1B ³⁵	
SOF/VEL/VOX					
sofosbuvir ³⁰	P-gp, BCRP.GS-331007 (primary systemic nucleoside metabolite, accounts for >90% of systemic drug exposure): not a P-gp substrate	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P-gp, BCRP, OATP1B1, OATP1B3, OCT1, BSEP.	No inhibiting or inducing effects on P-gp, BCRP, OATP1B1, OATP1B3, OCT1, BSEP.
velpatasvir ^{28, 29}	CYP3A4, 2C8, 2B6; OATP1B1, OATP1B3, P-gp, BCRP.	No inhibiting or inducing effects on P450.	No inhibiting or inducing effects on P450.	P-gp (weak), OATP1B1, 1B3, 2B1 (weak), BCRP (moderate).	
voxilaprevir (GS-9857) ⁴¹	CYP3A4, 2C8, P-gp, BCRP, OATPs			P-gp, BCRP, OATPs	
Daclatasvir-TRIO					
asunaprevir (NS3 PI) ^{42 43}	CYP3A4, P-gp; OATP1B/2B1	CYP2D6 (moderate)	CYP3A4 (weak)	P-gp, OATP1B1/2B1 (weak)	
beclabuvir ^{44, 45} (NS5B inhibitor)	CYP3A4, P-gp; OATP1B1/1B3		CYP3A4 (weak-moderate); 46-50% ↓ midazolam AUC	P-gp	
daclatasvir ⁴⁶ (NS5A inhibitor)	CYP3A4, P-gp, OCT1. (*inhibition of P-gp alone with no/minimal CYP3A4		CYP3A4 (weak; no meaningful effect on midazolam kinetics)	P-gp (weak-moderate), weak inhibitor of OATP1B1, OCT1, and BCRP.	

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	inhibition not expected to significantly increase daclatasvir exposure)				
HCV NS5A INHIBITORS					
daclatasvir ⁴⁶	CYP3A4, P-gp, OCT1. (*inhibition of P-gp alone with no/minimal CYP3A4 inhibition not expected to significantly increase daclatasvir exposure)		CYP3A4 (weak; no meaningful effect on midazolam kinetics)	P-gp (weak-moderate), weak inhibitor of OATP1B1, OCT1, and BCRP.	
elbasvir ^{36, 37}	CYP3A4, P-glycoprotein (P-gp) and OATP in vitro.	Does not inhibit CYP3A4	Does not induce CYP1A2, 2B6 or 3A4. ³⁵	BCRP (intestinal) ³⁵ , P-gp (in vitro only; not expected to cause clinically significant interactions via P-gp inhibition at usual clinical doses) ³⁸ Does not inhibit OATP1B ³⁵	
ledipasvir ³¹	P-gp (likely)	Not an inhibitor or inducer of P450 or UGT.	Not an inhibitor or inducer of P450 or UGT.	Weak inhibitor of P-gp and BCRP (intestinal, not systemic). Likely a weak inhibitor of OATP1B1/1B3.	
ombitasvir ^{32, 33}	3A4, P-gp, BCRP.	UGT1A1 (<i>net effect of 3D is UGT1A1 inhibition</i>) ³⁴			
velpatasvir (GS-5816) ^{28, 29}	CYP3A4, 2C8, 2B6; OATP1B1, OATP1B3, P-gp, BCRP.	No inhibiting or inducing effects on P450.	No inhibiting or inducing effects on P450.	P-gp (weak), OATP1B1, 1B3, 2B1 (weak), BCRP (moderate).	
HCV NS5B INHIBITORS					
beclabuvir ^{44, 45}	CYP3A4, P-gp; OATP1B1/1B3		CYP3A4 (weak-moderate); 46-50% ↓ midazolam AUC	P-gp	
dasabuvir ^{32, 33}	CYP2C8>3A4, P-gp, BCRP.	UGT1A1 (<i>net effect of 3D is UGT1A1 inhibition</i>) ³⁴		BCRP, P-gp (potential)	
sofosbuvir ³⁰	P-gp, BCRP.GS-331007 (primary systemic nucleoside	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P450 and UGT1A1.	No inhibiting or inducing effects on P-gp, BCRP, OATP1B1,	No inhibiting or inducing effects on P-gp, BCRP,

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	metabolite, accounts for >90% of systemic drug exposure): not a P-gp substrate			OATP1B3, OCT1, BSEP.	OATP1B1, OATP1B3, OCT1, BSEP.
HCV NS3/4A PIs					
asunaprevir ^{42, 43}	CYP3A4, P-gp; OATP1B/2B1	CYP2D6 (moderate)	CYP3A4 (weak)	P-gp, OATP1B1/2B1 (weak)	
grazoprevir ^{37, 39}	CYP3A4, P-gp and OATP1B1	CYP2C8 (not clinically meaningful), ⁴⁰ 3A4 (weak), UGT1A1 (weak)	Does not induce CYP1A2, 2B6 or 3A4. ³⁵	BCRP (intestinal) ³⁵ . Does not inhibit OATP1B ³⁵	
paritaprevir ^{32, 33}	3A4, P-gp, OATP1B1, OATP1B3, BCRP.	UGT1A1 (<i>net effect of 3D is UGT1A1 inhibition</i>) ³⁴		OATP1B1 and OATP1B3; P-gp, BCRP (potential).	
simeprevir	CYP3A4, P-gp, OATP1B1.	Mild inhibitor of intestinal (but not hepatic) CYP3A4, and 1A2. ⁴⁷ No clinically relevant effects on CYP2C9, 2C19 and 2D6. ⁴⁸		P-gp, OATP1B1/3	
voxilaprevir (GS-9857) ⁴¹	CYP3A4, 2C8, P-gp, BCRP, OATPs			P-gp, BCRP, OATPs	

Key: BCRP = breast cancer resistance protein; CYP= Hepatic Cytochrome P450 isoenzyme; Substrate= route of hepatic elimination of that specific drug (specified by a specific cytochrome P450 isoenzyme); inducer = leads to more rapid clearance of substrates of a specific hepatic isoenzyme (lowers serum concentrations of the respective drug and may lead to decreased efficacy); inhibitor= leads to decreased clearance of substrates of a specific hepatic isoenzyme (increases serum concentrations of a respective drug and may lead to toxicity). OCT2 = renal organic cation transporter; P-gp= P-glycoprotein; UGT= Uridine diphosphate glucuronyltransferase.

Please note: This chart summarizes currently available data, and should be used in conjunction with other reliable sources of information. Due to the rapidly changing nature of information about HIV treatment and therapies, users are advised to recheck the information contained herein with the original source before applying it to patient care.

References

1. Gilead Sciences Canada Inc. Descovy (emtricitabine, tenofovir alafenamide) Product Monograph. Mississauga, ON April 28, 2016.
2. Bristol-Myers Squibb Canada. Reyataz (atazanavir) Product Monograph. Montreal, QC July 4, 2013.
3. Janssen Inc. Prezista (darunavir) Product Monograph. Toronto, Ontario September 18, 2014.
4. ViiV Healthcare ULC. Telzir (fosamprenavir) Prescribing Information. Montreal, QC February 11, 2014.

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5. Merck Frosst Canada Ltd. Crixivan (indinavir) Product Monograph. Kirkland, QC April 17, 2012.
6. AbbVie Corporation. Kaletra (lopinavir/ritonavir) Prescribing Information. Saint Laurent, Canada November 1, 2012.
7. Hoffmann-La Roche Ltd. Invirase (saquinavir) Product Monograph. Mississauga, ON May 11, 2012.
8. Pfizer Canada Inc. Viracept (nelfinavir) Product Monograph. Kirkland, QC March 4, 2011.
9. Dixit V, Hariparsad N, Li F, et al. Cytochrome P450 enzymes and transporters induced by anti-human immunodeficiency virus protease inhibitors in human hepatocytes: implications for predicting clinical drug interactions. *Drug Metab Dispos* 2007;35(10):1853-9.
10. Boehringer Ingelheim. Aptivus (tipranavir) Product Monograph. Burlington, ON March 11, 2011.
11. Vourvahis M, Dumond J, Patterson K, et al. Effects of tipranavir/ritonavir on the activity of cytochrome p450 enzymes 1A2, 2C9 and 2D6 in healthy volunteers [abstract 52]. 8th International Workshop on Clinical Pharmacology of HIV Therapy, April 16-18, 2007, Budapest, Hungary.
12. AbbVie Corporation. Norvir (ritonavir) Prescribing Information. Saint-Laurent, QC December 18, 2012.
13. Hesse LM, von Moltke LL, Shader RI, et al. Ritonavir, efavirenz, and nelfinavir inhibit CYP2B6 activity in vitro: potential drug interactions with bupropion. *Drug Metabolism & Disposition* 2001;29:100-02.
14. Kharasch ED, Mitchell D, Coles R, et al. Rapid clinical induction of hepatic cytochrome P4502B6 activity by ritonavir. *Antimicrob Agents Chemother* 2008;52(5):1663-9.
15. ViiV Healthcare ULC. Rescriptor (delavirdine) Product Monograph. Montreal, QC December 15, 2009.
16. Bristol-Myers Squibb Canada. Sustiva (efavirenz) Prescribing Information. Montreal, QC June 19, 2015.
17. Robertson SM, Maldarelli F, Natarajan V, et al. Efavirenz induces CYP2B6-mediated hydroxylation of bupropion in healthy subjects. *J Acquir Immune Defic Syndr* 2008;49(5):513-9.
18. Lee L, Soon GH, Shen P, et al. Effect of efavirenz and darunavir/ritonavir on bilirubin levels in healthy adult volunteers: role of induction of UGT1A1 and bile efflux transporters [abstract 27]. 11th International Workshop on Clinical Pharmacology of HIV Therapy, April 5-7, 2010, Sorrento, Italy.
19. Janssen Inc. Intelence (etravirine) Product Monograph. Titusville, NJ November 16, 2013.
20. Boehringer Ingelheim (Canada) Ltd. Viramune and Viramune XR (nevirapine) Product Monograph. Burlington, ON May 30, 2011.
21. Janssen Inc. Edurant (rilpivirine) Product Monograph. Toronto, ON July 20, 2011.

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22. Crauwels HM, Van Heeswijk R, Stevens T, et al. The effect of TMC278, a next-generation non-nucleoside reverse transcriptase inhibitor (NNRTI) on CYP3A activity in vivo [abstract P_28]. 10th International Workshop on Clinical Pharmacology of HIV Therapy, April 15-17, 2009, Amsterdam.
23. ViiV Healthcare ULC. Tivicay (dolutegravir) Prescribing Information. Research Triangle Park, NC August, 2013.
24. Gilead Sciences Inc. Stribild (elvitegravir, cobicistat, emtricitabine, tenofovir disoproxil fumarate) Prescribing Information. Foster City, CA August, 2012.
25. Merck Frosst Canada Ltd. Isentress (raltegravir) Prescribing Information. Kirkland, QC January 20, 2015.
26. Lefebvre E, Enejosa J, Chang W, et al. Cenicriviroc (CVC) drug–drug interactions with guideline-preferred HIV antiretrovirals [abstract O_09A/O_09B]. 14th International Workshop on Clinical Pharmacology of HIV Therapy, April 22-24, 2013, Amsterdam, Netherlands.
27. ViiV Healthcare ULC. Celsentri (maraviroc) Product Monograph. Montreal, QC February 13, 2012.
28. Mogalian E, German P, Kearney BP, et al. Use of multiple probes to assess transporter- and cytochrome p450-mediated drug–drug interaction potential of the pangenotypic HCV NS5A inhibitor velpatasvir. *Clinical Pharmacokinetics* 2016;55(5):605-13.
29. Mogalian E, Stamm L, Osinusi A, et al. Drug interaction studies between sofosbuvir/velpatasvir and boosted HIV ARV regimens [abstract 100]. Conference on Retroviruses and Opportunistic Infections (CROI), February 22-25, 2016, Boston, MA.
30. Gilead Sciences Canada I. Sovaldi (sofosbuvir) Product Monograph Mississauga, ON December 12, 2013.
31. Mathias A. Clinical pharmacology of DAAs for hepatitis C: what's new and what's in the pipeline. 14th International Workshop on Clinical Pharmacology of HIV Therapy, April 22-24, 2013, Amsterdam.
32. Abbvie Corporation. Viekira Pak (ombitasvir, paritaprevir and ritonavir tablets; dasabuvir tablets) Prescribing Information. North Chicago, IL December, 2014.
33. Menon RM, Badri PS, Wang T, et al. Drug-drug interaction profile of the all-oral anti-hepatitis C virus regimen of paritaprevir/ritonavir, ombitasvir, and dasabuvir. *J Hepatol* 2015;63(2):20-9.
34. Badri PS, King JR, Polepally AR, et al. Dosing Recommendations for Concomitant Medications During 3D Anti-HCV Therapy. *Clin Pharmacokinet* 2015 Sep 2.
35. Merck Canada Inc. Zepatier (elbasvir/grazoprevir) Product Monograph. Kirkland, QD January 19, 2016.
36. Marshall WL, Yeh W, Caro L, et al. Age and gender effects on the pharmacokinetics of HCV NS5A inhibitor MK-8742 [abstract PP_03]. 15th International Workshop on Clinical Pharmacology of HIV and Hepatitis Therapy, May 19-21, 2014, Washington, DC.
37. Caro L, Marshall WL, Feng HP, et al. Coadministration of HCV protease inhibitor grazoprevir with HCV NS5A inhibitor elbasvir has no effect on pravastatin but increases rosuvastatin exposure in healthy subjects [abstract 17]. 16th International Workshop on Clinical Pharmacology of HIV & Hepatitis Therapy, May 26-28, 2015, Washington, DC.

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38. Marshall WL, Feng HP, Dupuis M, et al. Co-administration of digoxin with the HCV NS5A protease inhibitor elbasvir has no effect on digoxin exposure in healthy subjects [abstract 64]. HEPDART 2015, December 6-10, 2015, Maui, Hawaii.
39. Yeh W, Fraser IP, Reitmann C, et al. Pharmacokinetic interaction of HCV protease inhibitor MK-5172 and ritonavir in healthy subjects [abstract 52]. HEPDART 2013: Frontiers in Drug Development for Viral Hepatitis, December 8-12, 2013, Big Island, Hawaii.
40. Wolford D, Caro L, Guo Z, et al. No clinically meaningful pharmacokinetic interactions between HCV protease inhibitor grazoprevir and montelukast (a CYP2C8 substrate) in healthy subjects [abstract 66]. HEPDART 2015, December 6-10, 2015, Maui, Hawaii.
41. Kirby B, Taylor J, Stamm L, et al. Evaluation of transporter and cytochrome P450-mediated drug-drug interactions with the pan genotypic HCV NS3/4A protease inhibitor voxilaprevir (GS-9857) or sofosbuvir/velpatasvir/voxilaprevir and phenotypic probe drugs [abstracts O-24 and O-25]. 17th International Workshop on Clinical Pharmacology of HIV & Hepatitis Therapy, June 8-10, 2016, Washington, DC.
42. Eley T, Gardiner D, Persson A, et al. Evaluation of drug interaction potential of the HCV protease inhibitor BMS-650032 at 200mg twice daily (bid) in metabolic cocktail and p-glycoprotein (p-gp) probe studies in healthy volunteers [abstract 381]. Hepatology 2011;54(S1).
43. Eley T, Han Y, Huang S, et al. In vivo and in vitro assessment of asunaprevir as an inhibitor and substrate of OATP transporters in healthy volunteers [abstract PK_04]. 7th International Workshop on Clinical Pharmacology of Hepatitis Therapy, June 27-28, 2012, Cambridge, MA.
44. Eley T, Li W, Huang S, et al. Evaluation of pharmacokinetic drug drug interaction between BMS-791325, an NS5B non-nucleotide polymerase inhibitor, daclatasvir and asunaprevir in triple combination in HCV genotype 1 infected patients [abstract O_18]. 8th International Workshop on Clinical Pharmacology of Hepatitis Therapy, June 26-27, 2013, Cambridge, MA.
45. AbuTarif M, He B, Ding Y, et al. The effect of steady-state BMS-791325, a non-nucleoside hcv ns5b polymerase inhibitor, on the pharmacokinetics of midazolam in healthy japanese and caucasian males [abstract]. 15th International Workshop on Clinical Pharmacology of HIV and Hepatitis Therapy, May 19-21, 2014, Washington, DC.
46. Bristol-Myers-Squibb. Daklinza (daclatasvir) Summary of Product Characteristics. European Union 2014.
47. Sekar V, Verloes R, Meyvisch P, et al. Evaluation of metabolic interactions for TMC435 via cytochrome P450 enzymes in healthy volunteers [abstract 1076]. 45th Annual Meeting of the European Association for the Study of the Liver (EASL), April 14-18, 2010, Vienna, Austria.
48. Sekar V, Verloes R, Meyvisch P, et al. Evaluation of metabolic interactions for TMC435 via cytochrome P450 (CYP) enzymes in healthy volunteers [abstract 1076]. 45th Annual Meeting of the European Association for the Study of the Liver (EASL), April 14-18, 2010, Vienna, Austria.