**ANNEX I**

**SUMMARY OF PRODUCT CHARACTERISTICS**

## 1. NAME OF THE MEDICINAL PRODUCT

Viekirax 12.5 mg/75 mg/50 mg film-coated tablets

## 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each film-coated tablet contains 12.5 mg of ombitasvir, 75 mg of paritaprevir and 50 mg of ritonavir.

For the full list of excipients, see section 6.1.

## 3. PHARMACEUTICAL FORM

Film-coated tablet (tablet).

Pink, oblong, biconvex, film-coated tablets of dimensions 18.8 mm x 10.0 mm, debossed on one side with 'AV1'.

## 4. CLINICAL PARTICULARS

### 4.1 Therapeutic indications

Viekirax is indicated in combination with other medicinal products for the treatment of chronic hepatitis C (CHC) in adults (see sections 4.2, 4.4, and 5.1).

For hepatitis C virus (HCV) genotype specific activity, see sections 4.4 and 5.1.

### 4.2 Posology and method of administration

Treatment with Viekirax should be initiated and monitored by a physician experienced in the management of chronic hepatitis C.

Posology

The recommended oral dose of Viekirax is two 12.5 mg / 75 mg / 50 mg tablets once daily with food.

Viekirax should be used in combination with other medicinal products for the treatment of HCV (see Table 1).

**Table 1. Recommended co-administered medicinal product(s) and treatment duration for Viekirax by patient population**

| Patient population | Treatment* | Duration |
|---|---|---|
| **Genotype 1b, without cirrhosis or with compensated cirrhosis** | Viekirax + dasabuvir | 12 weeks<br><br>8 weeks may be considered in previously untreated genotype 1b-infected patients with minimal to moderate fibrosis** (see section 5.1, GARNET study) |
| **Genotype 1a, without cirrhosis** | Viekirax + dasabuvir + ribavirin* | 12 weeks |
| **Genotype 1a, with compensated cirrhosis** | Viekirax + dasabuvir + ribavirin* | 24 weeks (see section 5.1.) |
| **Genotype 4, without cirrhosis or with compensated cirrhosis** | Viekirax + ribavirin | 12 weeks |
| *Note: Follow the genotype 1a dosing recommendations in patients with an unknown genotype 1 subtype or with mixed genotype 1 infection.<br>** When assessing severity of liver disease using non-invasive methods, a combination of blood biomarkers or the combination of liver stiffness measurement and a blood test improves accuracy and should be undertaken prior to 8 week treatment in all patients with moderate fibrosis. | | |

For specific dosage instructions for dasabuvir and ribavirin, including dose modification, refer to the respective Summaries of Product Characteristics.

*Missed doses*
In case a dose of Viekirax is missed, the prescribed dose can be taken within 12 hours. If more than 12 hours have passed since Viekirax is usually taken, the missed dose should NOT be taken and the patient should take the next dose per the usual dosing schedule. Patients should be instructed not to take a double dose.

Special populations

*HIV-1 Co-infection*
The dosing recommendations in Table 1 should be followed. For dosing recommendations with HIV antiviral medicinal products, refer to sections 4.4 and 4.5. See sections 4.8 and 5.1 for additional information.

*Liver transplant recipients*
Viekirax and dasabuvir in combination with ribavirin is recommended for 24 weeks in liver transplant recipients with genotype 1 HCV infection. Viekirax in combination with ribavirin is recommended in genotype 4 infection. Lower ribavirin dose at initiation may be appropriate. In the post-liver transplant study, ribavirin dosing was individualized and most subjects received 600 to 800 mg per day (see section 5.1). For dosing recommendations with calcineurin inhibitors see section 4.5.

*Elderly*
No dose adjustment of Viekirax is warranted in elderly patients (see section 5.2).

*Renal impairment*
No dose adjustment of Viekirax is required for patients with mild, moderate, or severe renal impairment, or end-stage-renal disease on dialysis (see section 5.2). For patients that require ribavirin, refer to the ribavirin Summary of Product Characteristics for information regarding use in patients with renal impairment.

*Hepatic impairment*
No dose adjustment of Viekirax is required in patients with mild hepatic impairment (Child-Pugh A). Viekirax is contraindicated in patients with moderate to severe hepatic impairment (Child-Pugh B or C) (see sections 4.3 and 5.2).

*Paediatric population*
The safety and efficacy of Viekirax in children less than 18 years of age have not been established. No data are available.

Method of administration

The film-coated tablets are for oral use. Patients should be instructed to swallow the tablets whole (i.e. patients should not chew, break or dissolve the tablet). To maximise absorption, Viekirax tablets should be taken with food, without regard to fat and calorie content (see section 5.2).

**4.3 Contraindications**

Hypersensitivity to the active substances or to any of the excipients listed in section 6.1.

Patients with moderate to severe hepatic impairment (Child-Pugh B or C) (see section 5.2).

Use of ethinyloestradiol-containing medicinal products such as those contained in most combined oral contraceptives or contraceptive vaginal rings (see sections 4.4 and 4.5).

Medicinal products that are highly dependent on CYP3A for clearance and for which elevated plasma levels are associated with serious events must not be co-administered with Viekirax (see section 4.5). Examples are provided below.

CYP3A4 substrates:

- alfuzosin hydrochloride
- amiodarone, disopyramide, dronedarone, quinidine, ranolazine
- astemizole, terfenadine
- cisapride
- colchicine in patients with renal or hepatic impairment
- ergotamine, dihydroergotamine, ergonovine, methylergometrine
- fusidic acid
- lomitapide
- lovastatin, simvastatin, atorvastatin
- lurasidone
- oral midazolam, triazolam
- pimozide
- quetiapine
- salmeterol
- sildenafil (when used for the treatment of pulmonary arterial hypertension)
- ticagrelor

Co-administration of Viekirax with or without dasabuvir with medicinal products that are strong or moderate enzyme inducers is expected to decrease ombitasvir, paritaprevir, and ritonavir plasma concentrations and reduce their therapeutic effect and must not be co-administered (see section 4.5). Examples of contraindicated strong or moderate enzyme inducers are provided below.

Enzyme inducers:

- carbamazepine, phenytoin, phenobarbital
- efavirenz, nevirapine, etravirine
- apalutamide,enzalutamide
- mitotane
- rifampicin
- St. John's Wort (*Hypericum perforatum*)

Co-administration of Viekirax with or without dasabuvir with medicinal products that are strong inhibitors of CYP3A4 is expected to increase paritaprevir plasma concentrations and must not be co-administered with Viekirax (see section 4.5). Examples of contraindicated strong CYP3A4 inhibitors are provided below.

CYP3A4 inhibitors:

- cobicistat
- indinavir, lopinavir/ritonavir, saquinavir, tipranavir,
- itraconazole, ketoconazole, posaconazole, voriconazole
- clarithromycin, telithromycin
- conivaptan

**4.4 Special warnings and precautions for use**

General

Viekirax is not recommended for administration as monotherapy and must be used in combination with other medicinal products for the treatment of hepatitis C infection (see sections 4.2 and 5.1).

Risk of hepatic decompensation and hepatic failure in patients with cirrhosis

Hepatic decompensation and hepatic failure, including liver transplantation or fatal outcomes, have been reported postmarketing in patients treated with Viekirax with and without dasabuvir and with and without ribavirin. Most patients with these severe outcomes had evidence of advanced or decompensated cirrhosis prior to initiating therapy. Although causality is difficult to establish due to background advanced liver disease, a potential risk cannot be excluded.

Viekirax is contraindicated in patients with moderate to severe hepatic impairment (Child-Pugh B or C) (see sections 4.2, 4.3, 4.8 and 5.2).

For patients with cirrhosis:

- Monitoring should be performed for clinical signs and symptoms of hepatic decompensation (such as ascites, hepatic encephalopathy, variceal haemorrhage).
- Hepatic laboratory testing including direct bilirubin levels should be performed at baseline, during the first 4 weeks of starting treatment and as clinically indicated thereafter.
- Treatment should be discontinued in patients who develop evidence of hepatic decompensation.

ALT elevations

During clinical trials with Viekirax and dasabuvir with or without ribavirin, transient elevations of ALT to greater than 5 times the upper limit of normal occurred in approximately 1% of subjects (35 of 3,039). ALT elevations were asymptomatic and generally occurred during the first 4 weeks of treatment, without concomitant elevations of bilirubin, and declined within approximately two weeks of onset with continued dosing of Viekirax and dasabuvir with or without ribavirin.

These ALT elevations were significantly more frequent in the subgroup of subjects who were using ethinyloestradiol-containing medicinal products such as combined oral contraceptives or contraceptive vaginal rings (6 of 25 subjects); (see section 4.3). In contrast, the rate of ALT elevations in subjects using other types of oestrogens as typically used in hormonal replacement therapy (i.e., oral and topical oestradiol and conjugated oestrogens) was similar to the rate observed in subjects who were not using oestrogen-containing products (approximately 1% in each group).

Patients who are taking ethinyloestradiol-containing medicinal products (i.e. most combined oral contraceptives or contraceptive vaginal rings) must switch to an alternative method of contraception (e.g., progestin only contraception or non-hormonal methods) prior to initiating Viekirax with or without dasabuvir therapy (see sections 4.3 and 4.5).

Although ALT elevations associated with Viekirax and dasabuvir have been asymptomatic, patients should be instructed to watch for early warning signs of liver inflammation, such as fatigue, weakness, lack of appetite, nausea and vomiting, as well as later signs such as jaundice and discoloured faeces, and to consult a doctor without delay if such symptoms occur. Routine monitoring of liver enzymes is not necessary in patients that do not have cirrhosis (for cirrhotics, see above). Early discontinuation may result in drug resistance, but implications for future therapy are not known.

Pregnancy and concomitant use with ribavirin

Also see section 4.6.

Extreme caution must be taken to avoid pregnancy in female patients and female partners of male patients when Viekirax is taken in combination with ribavirin, see section 4.6 and refer to the Summary of Product Characteristics for ribavirin for additional information.

Use with tacrolimus, sirolimus and everolimus

Co-administration of Viekirax and dasabuvir with systemic tacrolimus, sirolimus or everolimus increases the concentrations of the immunosuppressant due to CYP3A inhibition by ritonavir (see section 4.5). Serious and/or life threatening events have been observed with co-administration of Viekirax and dasabuvir with systemic tacrolimus, and a similar risk can be expected with sirolimus and everolimus.

Avoid concomitant use of tacrolimus or sirolimus with Viekirax and dasabuvir unless the benefits outweigh the risks. If tacrolimus or sirolimus are used together with Viekirax and dasabuvir, caution is advised, and recommended doses and monitoring strategies can be found in section 4.5. Everolimus cannot be used due to lack of suitable dose strengths for dose adjustments.

Tacrolimus or sirolimus whole blood concentrations should be monitored upon initiation and throughout co-administration with Viekirax and dasabuvir and the dose and/or dosing frequency should be adjusted as needed. Patients should be monitored frequently for any changes in renal function or tacrolimus or

sirolimus associated adverse reactions. Refer to the tacrolimus or sirolimus Summary of Product Characteristics for additional dosing and monitoring instructions.

Genotype-specific activity

Concerning recommended regimens with different HCV genotypes, see section 4.2. Concerning genotype- specific virological and clinical activity, see section 5.1.

The efficacy of Viekirax has not been established in patients with HCV genotypes 2, 3, 5 and 6; therefore Viekirax should not be used to treat patients infected with these genotypes.

Co-administration with other direct-acting antivirals against HCV

Viekirax safety and efficacy have been established in combination with dasabuvir and/or ribavirin. Co-administration of Viekirax with other antivirals has not been studied and, therefore, cannot be recommended.

Retreatment

The efficacy of Viekirax in patients previously exposed to Viekirax, or to medicinal products of the same classes as those of Viekirax (NS3/4A inhibitors or NS5A inhibitors), has not been demonstrated. Concerning cross-resistance, see also section 5.1.

Use with glucocorticoids metabolised by CYP3A (e.g. fluticasone)

Caution should be used when administering Viekirax with fluticasone or other glucocorticoids that are metabolised by CYP3A4. Concomitant use of inhaled glucocorticoids metabolised with CYP3A can increase systemic exposures of the glucocorticoids, and cases of Cushing's syndrome and subsequent adrenal suppression have been reported with ritonavir-containing regimens. Concomitant use of Viekirax and glucocorticoids, particularly long-term use, should only be initiated if the potential benefit of treatment outweighs the risk of systemic corticosteroid effects (see section 4.5).

Use with colchicine

The interaction between Viekirax with or without dasabuvir and colchicine has not been evaluated. A reduction in colchicine dosage or an interruption of colchicine treatment is recommended in patients with normal renal or hepatic function if treatment with Viekirax with or without dasabuvir is required (see section 4.5). In patients with renal or hepatic impairment, use of colchicine with Viekirax with or without dasabuvir is contraindicated (see sections 4.3 and 4.5).

Use with statins

Simvastatin, lovastatin and atorvastatin are contraindicated (see sections 4.3 and 4.5).

*Rosuvastatin*
Viekirax with dasabuvir is expected to increase the exposure to rosuvastatin more than 3-fold. If rosuvastatin treatment is required during the treatment period, the maximum daily dose of rosuvastatin should be 5 mg (see section 4.5, Table 2).The increase in rosuvastatin when combined with Viekirax without dasabuvir is less pronounced. In this combination, the maximum daily dose of rosuvastatin should be 10 mg (see section 4.5, Table 2).

*Pitavastatin and fluvastatin*
The interactions between pitavastatin and fluvastatin and Viekirax have not been investigated. Theoretically, Viekirax with and without dasabuvir is expected to increase the exposure to pitavastatin and fluvastatin. A temporary suspension of pitavastatin/fluvastatin is recommended for the duration of treatment with Viekirax. If statin treatment is required during the treatment period, a switch to a reduced dose of pravastatin/rosuvastatin is possible (see section 4.5, Table 2).

Treatment of patients with HIV co-infection

Low dose ritonavir, which is part of the fixed dose combination Viekirax, may select for PI resistance in HIV co-infected patients without ongoing antiretroviral therapy. HIV co-infected patients without suppressive antiretroviral therapy should not be treated with Viekirax.

Drug interactions need to be carefully taken into account in the setting of HIV co-infection (for details see section 4.5, Table 2).

Atazanavir can be used in combination with Viekirax and dasabuvir, if administered at the same time. To be noted, atazanavir should be taken without ritonavir, since ritonavir 100 mg once daily is provided as part of Viekirax. The combination carries an increased risk for hyperbilirubinemia (including ocular icterus), in particular when ribavirin is part of the hepatitis C regimen.

Darunavir, dosed 800 mg once daily, if administered at the same time as Viekirax and dasabuvir, can be used in the absence of extensive PI resistance (darunavir exposure lowered). To be noted, darunavir should be taken without ritonavir, since ritonavir 100 mg once daily is provided as part of Viekirax.

HIV protease inhibitors other than atazanavir and darunavir (e.g., indinavir, saquinavir, tipranavir, lopinavir/ritonavir) are contraindicated (see section 4.3).

Raltegravir exposure is substantially increased (2-fold). The combination was not linked to any particular safety issues in a limited set of patients treated for 12-24 weeks.

Rilpivirine exposure is substantially increased (3-fold) when rilpivirine is given in combination with Viekirax and dasabuvir, with a consequent potential for QT-prolongation. If an HIV protease inhibitor is added (atazanavir, darunavir), rilpivirine exposure may increase even further and is, therefore, not recommended. Rilpivirine should be used cautiously, in the setting of repeated ECG monitoring.

NNRTIs other than rilpivirine (efavirenz, etravirine and nevirapine) are contraindicated (see section 4.3).

Hepatitis B virus reactivation

Cases of hepatitis B virus (HBV) reactivation, some of them fatal, have been reported during or after treatment with direct-acting antiviral medicinal products. HBV screening should be performed in all patients before initiation of treatment. HBV/HCV co-infected patients are at risk of HBV reactivation, and should, therefore, be monitored and managed according to current clinical guidelines.

Depression or psychiatric illness

Cases of depression and more rarely of suicidal ideation and suicide attempt have been reported with Viekirax with or without dasabuvir treatment in combination with ribavirin in the majority of the cases. Although some cases had previous history of depression, psychiatric illness and/or substance abuse, a causal relation with Viekirax with or without dasabuvir treatment cannot be excluded. Caution should be used in patients with a pre-existing history of depression or psychiatric illness. Patients and caregivers

should be instructed to notify the prescriber of any changes in behaviour or mood and of any suicidal ideation.

Use in diabetic patients

Diabetics may experience improved glucose control, potentially resulting in symptomatic hypoglycaemia, after initiating HCV direct acting antiviral treatment. Glucose levels of diabetic patients initiating direct acting antiviral therapy should be closely monitored, particularly within the first 3 months, and their diabetic medicinal products modified when necessary. The physician in charge of the diabetic care of the patient should be informed when direct acting antiviral therapy is initiated.

## 4.5 Interaction with other medicinal products and other forms of interaction

Viekirax may be administered with or without dasabuvir. When co-administered, they exert mutual effects on each other (see section 5.2). Therefore, the interaction profile of the compounds must be considered as a combination.

Pharmacodynamic interactions

Coadministration with enzyme inducers may increase the risk of adverse reactions and ALT elevations (see Table 2). Coadministration with ethinyloestradiol may increase the risk of ALT elevations (see sections 4.3 and 4.4). Examples of contraindicated enzyme inducers are provided in section 4.3.

Pharmacokinetic interactions

*Potential for Viekirax to affect the pharmacokinetics of other medicinal products*
*In vivo* drug interaction studies evaluated the net effect of the combination treatment, including ritonavir.

The following section describes the specific transporters and metabolizing enzymes that are affected by Viekirax with or without dasabuvir. See Table 2 for guidance regarding potential interactions with other medicinal products and dosing recommendations.

*Medicinal products metabolised by CYP3A4*
Ritonavir is a strong inhibitor of CYP3A. Co-administration of Viekirax with or without dasabuvir with medicinal products primarily metabolized by CYP3A may result in increased plasma concentrations of these medicinal products. Medicinal products that are highly dependent on CYP3A for clearance and for which elevated plasma levels are associated with serious events are contraindicated (see section 4.3 and Table 2).

CYP3A substrates evaluated in drug interaction studies which may require dose adjustment and/or clinical monitoring include (see Table 2) ciclosporin, sirolimus, tacrolimus, amlodipine, rilpivirine and alprazolam. Examples of other CYP3A4 substrates which may require dose adjustment and/or clinical monitoring include calcium channel blockers (e.g. nifedipine), and trazodone. Although buprenorphine and zolpidem are also metabolized by CYP3A, drug interaction studies indicate that no dose adjustment is needed when co-administering these medicinal products with Viekirax with or without dasabuvir (see Table 2).

*Medicinal products transported by the OATP family and OCT1*
Paritaprevir is an inhibitor of the hepatic uptake transporters OATP1B1 and OATP1B3, and paritaprevir and ritonavir are inhibitors of OATP2B1. Ritonavir is an *in vitro* inhibitor of OCT1, but the clinical relevance is unknown. Co-administration of Viekirax with or without dasabuvir with medicinal products

that are substrates of OATP1B1, OATP1B3, OATP2B1 or OCT1 may increase plasma concentrations of these transporter substrates, potentially requiring dose adjustment/clinical monitoring. Such medicinal products include some statins (see Table 2), fexofenadine, repaglinide and angiotensin II receptor antagonists (e.g., valsartan).

OATP1B1/3 substrates evaluated in drug interaction studies include pravastatin and rosuvastatin (see Table 2).

*Medicinal products transported by BCRP*
Paritaprevir, ritonavir and dasabuvir are inhibitors of BCRP *in vivo*. Co-administration of Viekirax with or without dasabuvir together with medicinal products that are substrates of BCRP may increase plasma concentrations of these transporter substrates, potentially requiring dose adjustment/clinical monitoring. Such medicinal products include sulfasalazine, imatinib and some of the statins (see Table 2).

BCRP substrates evaluated in drug interaction studies include rosuvastatin (see Table 2).

*Medicinal products transported by P-gp in the intestine*
While paritaprevir, ritonavir and dasabuvir are *in vitro* inhibitors of P-gp, no significant change was observed in the exposure of the P-gp substrate digoxin when administered with Viekirax and dasabuvir. However, co-administration of digoxin with Viekirax without dasabuvir may result in increased plasma concentrations (see Table 2). Viekirax may increase the plasma exposure to medicinal products that are sensitive for changed intestinal P-gp activity (such as dabigatran etexilate).

*Medicinal products metabolised by glucuronidation (UGT1A1)*
Paritaprevir, ombitasvir and dasabuvir are inhibitors of UGT1A1. Co-administration of Viekirax with or without dasabuvir with medicinal products that are primarily metabolized by UGT1A1 result in increased plasma concentrations of such medicinal products; routine clinical monitoring is recommended for narrow therapeutic index medicinal products (i.e. levothyroxine). See also Table 2 for specific advice on raltegravir and buprenorphine, which have been evaluated in drug interaction studies.

*Medicinal products metabolised by CYP2C19*
Co-administration of Viekirax with or without dasabuvir can decrease exposures of medicinal products that are metabolized by CYP2C19 (e.g. lansoprazole, esomeprazole, s-mephenytoin), which may require dose adjustment/clinical monitoring. CYP2C19 substrates evaluated in drug interaction studies include omeprazole and escitalopram (see Table 2).

*Medicinal products metabolised by CYP2C9*
Viekirax administered with or without dasabuvir did not affect the exposures of the CYP2C9 substrate, warfarin. Other CYP2C9 substrates (NSAIDs (e.g. ibuprofen), antidiabetics (e.g. glimepiride, glipizide) are not expected to require dose adjustments.

*Medicinal products metabolised by CYP2D6 or CYP1A2*
Viekirax administered with or without dasabuvir did not affect the exposures of the CYP2D6/CYP1A2 substrate, duloxetine. Exposures of cyclobenzaprine, a CYP1A2 substrate, were decreased. Clinical monitoring and dose adjustment may be needed for other CYP1A2 substrates (e.g. ciprofloxacin, cyclobenzaprine, theophylline and caffeine). CYP2D6 substrates (e.g. desipramine, metoprolol and dextromethorphan) are not expected to require dose adjustments.

*Medicinal products renally excreted via transport proteins*
Ombitasvir, paritaprevir, and ritonavir do not inhibit organic anion transporter (OAT1) *in vivo* as shown by the lack of interaction with tenofovir (OAT1 substrate). *In vitro* studies show that ombitasvir, paritaprevir, and ritonavir are not inhibitors of organic cation transporters (OCT2), organic anion

transporters (OAT3), or multidrug and toxin extrusion proteins (MATE1 and MATE2K) at clinically relevant concentrations.

Therefore, Viekirax with or without dasabuvir is not expected to affect medicinal products which are primarily excreted by the renal route via these transporters (see section 5.2).

Potential for other medicinal products to affect the pharmacokinetics of ombitasvir, paritaprevir, and dasabuvir

*Medicinal products that inhibit CYP3A4*
Co-administration of Viekirax with or without dasabuvir with strong inhibitors of CYP3A may increase paritaprevir concentrations (see section 4.3 and Table 2).

*Enzyme inducers*
Co-administration of Viekirax and dasabuvir with medicinal products that are moderate or strong enzyme inducers is expected to decrease ombitasvir, paritaprevir, ritonavir and dasabuvir plasma concentrations and reduce their therapeutic effect. Contraindicated enzyme inducers are provided in section 4.3 and Table 2.

*Medicinal products that inhibit CYP3A4 and transport proteins*
Paritaprevir is eliminated via CYP3A4 mediated metabolism and biliary excretion (substrate of the hepatic transporters OATP1B1, P-gp and BCRP). Caution is advised if co-administering Viekirax with medicinal products that are both moderate inhibitors of CYP3A4 and inhibitors of multiple transporters (P-gp, BCRP and/or OATP1B1/ OATP1B3). These medicinal products may show clinically relevant increases in exposures of paritaprevir (e.g., ritonavir with atazanavir, erythromycin, diltiazem or verapamil).

*Medicinal products that inhibit transport proteins*
Potent inhibitors of P-gp, BCRP, OATP1B1 and/or OATP1B3 have the potential to increase the exposure to paritaprevir. Inhibition of these transporters is not expected to show clinically relevant increases in exposures of ombitasvir and dasabuvir.

Patients treated with vitamin K antagonists

As liver function may change during treatment with Viekirax administered with or without dasabuvir, a close monitoring of International Normalised Ratio (INR) values is recommended.

Drug interaction studies

Recommendations for co-administration of Viekirax with and without dasabuvir for a number of medicinal products are provided in Table 2.

If a patient is already taking medicinal product(s) or initiating a medicinal product while receiving Viekirax with or without dasabuvir for which potential for drug interaction is expected, dose adjustment of the concomitant medicinal product(s) or appropriate clinical monitoring should be considered (Table 2).

If dose adjustments of concomitant medicinal products are made due to treatment with Viekirax or Viekirax with dasabuvir, doses should be re-adjusted after administration of Viekirax or Viekirax with dasabuvir is completed.

Table 2 provides the Least Squares Means Ratio (90% Confidence Interval) effect on concentration of Viekirax with or without dasabuvir and concomitant medicinal products.

The magnitude of interaction when administered with medicinal products listed in Table 2 are similar (≤25% difference in the Least Square Means ratio) for Viekirax with or without dasabuvir, unless otherwise noted. Drug interactions were evaluated for the Viekirax and dasabuvir regimen, but not for the Viekirax without dasabuvir, with carbamazepine, furosemide, zolpidem, darunavir twice daily, darunavir (evening administration), atazanavir (evening administration), rilpivirine, abacavir/lamivudine, dolutegravir, metformin, sulfamethoxazole/trimethoprim, cyclobenzaprine, carisoprodol, hydrocodone/ paracetamol or diazepam. Thus, for these medicinal products, results and dosing recommendations of the Viekirax and dasabuvir regimen can be extrapolated to Viekirax without dasabuvir.

The direction of the arrow indicates the direction of the change in exposures ($C_{max}$, and AUC) in paritaprevir, ombitasvir, dasabuvir and the co-administered medicinal product (↑ = *increase (more than 20%),* ↓ = *decrease (of more than 20%),* ↔ = *no change* or change less than 20%). This is not an exclusive list.

**Table 2. Interactions between Viekirax with or without dasabuvir and other medicinal products**

| **Medicinal Product/Possible Mechanism of Interaction** | **GIVEN WITH** | **EFFECT** | **$C_{max}$** | **AUC** | **$C_{trough}$** | **Clinical Comments** |
|---|---|---|---|---|---|---|
| **ALPHA 1-ADRENORECEPTOR ANTAGONIST** | | | | | | |
| Alfuzosin<br><br>Mechanism: CYP3A inhibition by ritonavir | Viekirax with or without dasabuvir | Not studied. Expected<br><br>↑ alfuzosin | | | | Concomitant use is contraindicated (see section 4.3). |
| **AMINOSALICYLATE** | | | | | | |
| Sulfasalazine<br><br>Mechanism: BCRP inhibition by paritaprevir, ritonavir and dasabuvir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ sulfasalazine | | | | Caution should be used when sulfasalazine is co-administered with Viekirax with or without dasabuvir.<br><br>. |
| **ANGIOTENSIN RECEPTOR BLOCKER** | | | | | | |
| Valsartan<br>Losartan<br>Candesartan<br><br>Mechanism: CYP3A4 and/or OATP1B inhibition by paritaprevir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ valsartan<br>↑ losartan<br>↑ candesartan | | | | Clinical monitoring and dose reduction is recommended for angiotensin receptor blockers when co-administered with Viekirax with or without dasabuvir. |
| **ANTIANGINA/ANTIARRYTHMICS** | | | | | | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Amiodarone<br>Disopyramide<br>Dronedarone<br>Quinidine<br>Ranolazine<br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ amiodarone<br>↑ disopyramide<br>↑ dronedarone<br>↑ quinidine<br>↑ ranolazine | | | | Concomitant use is contraindicated (see section 4.3). |
| Digoxin<br><br>0.5 mg single dose<br><br>Mechanism: P-gp inhibition by paritaprevir, ritonavir and dasabuvir. | Viekirax + dasabuvir | ↔ digoxin | 1.15 (1.04-1.27) | 1.16 (1.09-1.23) | 1.01 (0.97-1.05) | While no dose adjustment is necessary for digoxin, appropriate monitoring of serum digoxin levels is recommended. |
| | | ↔ ombitasvir | 1.03 (0.97-1.10) | 1.00 (0.98-1.03) | 0.99 (0.96-1.02) | |
| | | ↔ paritaprevir | 0.92 (0.80-1.06) | 0.94 (0.81-1.08) | 0.92 (0.82-1.02) | |
| | | ↔ dasabuvir | 0.99 (0.92-1.07) | 0.97 (0.91-1.02) | 0.99 (0.92-1.07) | |
| | Viekirax without dasabuvir | ↑ digoxin | 1.58 (1.43-1.73) | 1.36 (1.21-1.54) | 1.24 (1.07-1.43) | Decrease digoxin dose by 30-50%. Appropriate monitoring of serum digoxin levels is recommended. |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ paritaprevir | | | | |
| **ANTIBIOTICS (SYSTEMIC ADMINISTRATION)** | | | | | | |
| Clarithromycin<br><br>Telithromycin<br><br>Mechanism: CYP3A4/P-gp inhibition by clarithromycin and ritonavir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ clarithromycin<br>↑ telithromycin<br><br>↑ paritaprevir<br>↑ dasabuvir | | | | Concomitant use is contraindicated (see section 4.3). |
| Erythromycin<br><br>Mechanism: CYP3A4/P-gp inhibition by erythromycin, paritaprevir, ritonavir and dasabuvir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ erythromycin<br><br>↑ paritaprevir<br>↑ dasabuvir | | | | Administration of Viekirax with or without dasabuvir with erythromycin may result in increased concentrations of erythromycin and paritaprevir. Caution is advised. |
| Fusidic Acid | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ fusidic acid | | | | Concomitant use is contraindicated (see section 4.3). |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Mechanism: CYP3A4 inhibition by ritonavir. | | | | | | |
| Sulfameth-oxazole, Trimethoprim<br><br>800/160 mg twice daily<br><br>Mechanism: increase in dasabuvir possibly due to CYP2C8 inhibition by trimethoprim | Viekirax + dasabuvir | ↑ Sulfameth-oxazole, | 1.21 (1.15-1.28) | 1.17 (1.14-1.20) | 1.15 (1.10-1.20) | No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↑ trimetho-prim | 1.17 (1.12-1.22) | 1.22 (1.18-1.26) | 1.25 (1.19-1.31) | |
| | | ↔ ombitasvir | 0.88 (0.83-0.94) | 0.85 (0.80-0.90) | NA | |
| | | ↓ paritaprevir | 0.78 (0.61-1.01) | 0.87 (0.72-1.06) | NA | |
| | | ↑ dasabuvir | 1.15 (1.02-1.31) | 1.33 (1.23-1.44) | NA | |
| | Viekirax without dasabuvir | Not studied:<br>Similar effect is expected as observed with Viekirax + dasabuvir. | | | | |
| **ANTICANCER AGENTS/KINASE INHIBITORS** | | | | | | |
| Encorafenib<br><br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ encorafenib | | | | Co-administration may result in increased risk for adverse events. Refer to the prescribing information of encorafenib for details on co-administration with strong CYP3A inhibitors. |
| Apalutamide<br><br>Enzalutamide<br><br>Mitotane<br><br>Mechanism: CYP3A4 induction apalutamide enzalutamide or mitotane. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↓ombitasvir<br>↓ paritaprevir<br>↓ dasabuvir | | | | Concomitant use is contraindicated (see section 4.3). |
| Fostamatinib<br><br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not Studied. Expected<br><br>↑ fostamatinib | | | | Co-administration may result in increased risk for adverse events. Refer to the prescribing information of fostamatinib for details on co-administration with strong CYP3A inhibitors. |
| Ibrutinib | Viekirax with or | Not studied. Expected:<br><br>↑ ibrutinib | | | | Co-administration may result in increased risk for adverse events. Refer to |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Mechanism: CYP3A4 inhibition by ritonavir. | without dasabuvir | | | | | the prescribing information of ibrutinib for details on co-administration with strong CYP3A inhibitors. |
| Imatinib<br><br>Mechanism: BCRP inhibition by paritaprevir, ritonavir and dasabuvir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ imatinib | | | | Clinical monitoring and lower doses of imatinib are recommended. |
| **ANTICOAGULANTS** | | | | | | |
| Warfarin<br><br>5 mg single dose and other vitamin K antagonists | Viekirax + dasabuvir | ↔ R-warfarin | 1.05 (0.95-1.17) | 0.88 (0.81-0.95) | 0.94 (0.84-1.05) | While no change to the pharmacokinetics of warfarin is expected, close monitoring of INR is recommended with all vitamin K antagonists. This is due to liver function changes during treatment with Viekirax ± dasabuvir. |
| | | ↔ S-warfarin | 0.96 (0.85-1.08) | 0.88 (0.81-0.96) | 0.95 (0.88-1.02) | |
| | | ↔ ombitasvir | 0.94 (0.89-1.00) | 0.96 (0.93-1.00) | 0.98 (0.95-1.02) | |
| | | ↔ paritaprevir | 0.98 (0.82-1.18) | 1.07 (0.89-1.27) | 0.96 (0.85-1.09) | |
| | | ↔ dasabuvir | 0.97 (0.89-1.06) | 0.98 (0.91-1.06) | 1.03 (0.94-1.13) | |
| | Viekirax without dasabuvir | ↔ R-warfarin | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ S-warfarin | | | | |
| | | ↔ paritaprevir | | | | |
| | | ↔ ombitasvir | | | | |
| Dabigatran etexilate<br>Mechanism: Intestinal P-gp inhibition by paritaprevir and ritonavir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ dabigatran etexilate | | | | Viekirax without dasabuvir may increase the plasma concentrations of dabigatran etexilate. Use with caution. |
| **ANTICONVULSANTS** | | | | | | |
| Carbamazepine<br><br>200 mg once daily followed by 200 mg twice daily | Viekirax + dasabuvir | ↔ carbamazepine | 1.10 (1.07-1.14) | 1.17 (1.13-1.22) | 1.35 (1.27-1.45) | Concomitant use is contraindicated (see section 4.3). |
| | | ↓ carbamazepine 10, 11-epoxide | 0.84 (0.82-0.87) | 0.75 (0.73-0.77) | 0.57 (0.54-0.61) | |
| | | ↓ ombitasvir | 0.69 (0.61-0.78) | 0.69 (0.64-0.74) | NA | |
| | | ↓ paritaprevir | 0.34 (0.25-0.48) | 0.30 (0.23-0.38) | NA | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Mechanism: CYP3A4 induction by carbamazepine | | ↓ dasabuvir | 0.45 (0.41-0.50) | 0.30 (0.28-0.33) | NA | |
| | Viekirax without dasabuvir | Not studied: similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Phenobarbital<br><br>Mechanism: CYP3A4 induction by phenobarbital. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↓ ombitasvir<br>↓ paritaprevir<br>↓ dasabuvir | | | | Concomitant use is contraindicated (see section 4.3). |
| Phenytoin<br><br>Mechanism: CYP3A4 induction by phenytoin. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↓ ombitasvir<br>↓ paritaprevir<br>↓ dasabuvir | | | | Concomitant use is contraindicated (see section 4.3). |
| S-mephenytoin<br><br>Mechanism: CYP2C19 induction by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↓ S-mephenytoin | | | | Clinical monitoring and dose adjustment maybe needed for s-mephenytoin. |
| **ANTIDEPRESSANTS** | | | | | | |
| Escitalopram<br><br>10 mg single dose | Viekirax + dasabuvir | ↔ es-citalopram | 1.00 (0.96-1.05) | 0.87 (0.80-0.95) | NA | No dose adjustment is necessary for escitalopram. |
| | | ↑ S-Desmethyl citalopram | 1.15 (1.10-1.21) | 1.36 (1.03-1.80) | NA | |
| | | ↔ ombitasvir | 1.09 (1.01-1.18) | 1.02 (1.00-1.05) | 0.97 (0.92-1.02) | |
| | | ↔ paritaprevir | 1.12 (0.88-1.43) | 0.98 (0.85-1.14) | 0.71 (0.56-0.89) | |
| | | ↔ dasabuvir | 1.10 (0.95-1.27) | 1.01 (0.93-1.10) | 0.89 (0.79-1.00) | |
| | Viekirax without dasabuvir | ↓ es-citalopram | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ S-Desmethyl citalopram | 1.17 (1.08-1.26) | 1.07 (1.01-1.13) | NA | |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ paritaprevir | | | | |
| Duloxetine | Viekirax + dasabuvir | ↓ duloxetine | 0.79 (0.67-0.94) | 0.75 (0.67-0.83) | NA | No dose adjustment is necessary for duloxetine. |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| 60 mg single dose | | ↔ ombitasvir | 0.98 (0.88-1.08) | 1.00 (0.95-1.06) | 1.01 (0.96-1.06) | No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↓ paritaprevir | 0.79 (0.53-1.16) | 0.83 (0.62-1.10) | 0.77 (0.65-0.91) | |
| | | ↔ dasabuvir | 0.94 (0.81-1.09) | 0.92 (0.81-1.04) | 0.88 (0.76-1.01) | |
| | Viekirax without dasabuvir | ↔ duloxetine | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ paritaprevir | 1.07 (0.63-1.81) | 0.96 (0.70-1.32) | 0.93 (0.76-1.14) | |
| Trazodone Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected: ↑ trazodone | | | | Trazodone should be used with caution and a lower dose of trazodone may be considered. |
| **ANTI-DIURETIC HORMONE** | | | | | | |
| Conivaptan Mechanism: CYP3A4/P-gp inhibition by conivaptan and paritaprevir/ ritonavir/ombitasvir | Viekirax with or without dasabuvir | Not studied. Expected: ↑conivaptan ↑ paritaprevir ↑ dasabuvir | | | | Concomitant use is contraindicated (see section 4.3). |
| **ANTIFUNGALS** | | | | | | |
| Ketoconazole 400 mg once daily Mechanism: CYP3A4/P-gp inhibition by ketoconazole and paritaprevir/ ritonavir/ ombitasvir | Viekirax with dasabuvir | ↑ keto-conazole | 1.15 (1.09-1.21) | 2.17 (2.05-2.29) | NA | Concomitant use is contraindicated (see section 4.3). |
| | | ↔ ombitasvir | 0.98 (0.90-1.06) | 1.17 (1.11-1.24) | NA | |
| | | ↑ paritaprevir | 1.37 (1.11-1.69) | 1.98 (1.63-2.42) | NA | |
| | | ↑ dasabuvir | 1.16 (1.03-1.32) | 1.42 (1.26-1.59) | NA | |
| | Viekirax without dasabuvir | ↑ keto-conazole | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ paritaprevir | 1.72 (1.32-2.26) | 2.16 (1.76-2.66) | NA | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Itraconazole<br>Posaconazole<br><br>Mechanism: CYP3A4 and/or P-gp inhibition by itraconazole, posaconazole and paritaprevir/ ritonavir/ombitasvir | Viekirax + dasabuvir<br><br>Viekirax without dasabuvir | Not Studied. Expected:<br><br>↑ itraconazole<br>↑ posaconazole<br>↑ paritaprevir<br>↑ dasabuvir | | | | Concomitant use is contraindicated (see section 4.3). |
| Voriconazole<br><br>Mechanism: CYP2C19 induction and CYP3A4 inhibition by ritonavir | Viekirax with or without dasabuvir | Not studied. Expected in CYP2C19 Extensive Metabolisers:<br><br>↓ voriconazole<br>↑ paritaprevir<br>↑ dasabuvir<br><br>Not studied. Expected in CYP2C19 Poor Metabolisers:<br><br>↑ voriconazole<br>↑ dasabuvir<br>↑ paritaprevir | | | | Concomitant use is contraindicated (see section 4.3). |
| **ANTI-GOUT** | | | | | | |
| Colchicine<br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ colchicine | | | | A reduction in colchicine dosage or an interruption of colchicine treatment is recommended in patients with normal renal or hepatic function if treatment with Viekirax with or without dasabuvir is required. Use of colchicine is contraindicated with Viekirax with or without dasabuvir in patients with renal or hepatic impairment (see sections 4.3 and 4.4). |
| **ANTIHISTAMINES** | | | | | | |
| Astemizole<br>Terfenadine<br>Mechanism: CYP3A4 | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ astemizole/terfenadine | | | | Concomitant use is contraindicated (see section 4.3). |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| inhibition by ritonavir. | | | | | | |
| Fexofenadine<br><br>Mechanism: OATP1B1 inhibition by paritaprevir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ fexofenadine | | | | Caution should be used when Viekirax with or without dasabuvir is coadministered with fexofenadine. |
| **ANTIHYPERLIPIDAEMICS** | | | | | | |
| Gemfibrozil 600 mg twice daily<br><br>Mechanism: Increase in dasabuvir exposure is possibly due to CYP2C8 inhibition and increase in paritaprevir possibly due to OATP1B1 inhibition by gemfibrozil. | Paritaprevir/ ritonavir + dasabuvir | ↑ paritaprevir | 1.21 (0.94-1.57) | 1.38 (1.18-1.61) | NA | Concomitant use of Viekirax with dasabuvir is contraindicated (see section 4.3). |
| | | ↑ dasabuvir | 2.01 (1.71-2.38) | 11.25 (9.05-13.99) | NA | |
| | Viekirax without dasabuvir | Not studied;<br>No interaction expected when gemfibrozil is used in combination with Viekirax without dasabuvir. | | | | No dose adjustment of gemfibrozil is necessary.<br><br>No dose adjustment needed for Viekirax. |
| Lomitapide<br><br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>lomitapide | | | | Concomitant use is contraindicated (see section 4.3). |
| **ANTIMYCOBACTERIALS** | | | | | | |
| Rifampicin<br><br>Mechanism: CYP3A4 induction by rifampicin. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↓ ombitasvir<br>↓ paritaprevir<br>↓ dasabuvir | | | | Concomitant use is contraindicated (see section 4.3). |
| **ANTIPSYCHOTICS** | | | | | | |
| Lurasidone<br>Pimozide<br>Quetiapine<br><br>Mechanism: CYP3A4 | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ pimozide<br>↑ quetiapine<br>↑ lurasidone | | | | Concomitant use is contraindicated (see section 4.3). |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| inhibition by ritonavir. | | | | | | |
| **ANTITPLATELET AGENTS** | | | | | | |
| Ticagrelor<br><br>Mechanism: CYP3A4 inhibition by ritonavir | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ ticagrelor | | | | Concomitant use is contraindicated (see section 4.3). |
| **BIGUANIDE ORAL ANTIHYPERGLYCEMICS** | | | | | | |
| Metformin<br><br>500 mg single dose | Viekirax + dasabuvir | ↓ metformin | 0.77 (0.71-0.83) | 0.90 (0.84-0.97) | NA | No dose adjustment needed for metformin when co-administered with Viekirax with and without dasabuvir. |
| | | ↔ ombitasvir | 0.92 (0.87-0.98) | 1.01 (0.97-1.05) | 1.01 (0.98-1.04) | |
| | | ↓ paritaprevir | 0.63 (0.44-0.91) | 0.80 (0.61-1.03) | 1.22 (1.13-1.31) | |
| | | ↔ dasabuvir | 0.83 (0.74-0.93) | 0.86 (0.78-0.94) | 0.95 (0.84-1.07) | |
| | Viekirax without dasabuvir | Not studied.<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| **CALCIUM CHANNEL BLOCKERS** | | | | | | |
| Amlodipine<br><br>5 mg single dose<br><br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax + dasabuvir | ↑ amlodipine | 1.26 (1.11-1.44) | 2.57 (2.31-2.86) | NA | Decrease amlodipine dose by 50% and monitor patients for clinical effects. |
| | | ↔ ombitasvir | 1.00 (0.95-1.06) | 1.00 (0.97-1.04) | 1.00 (0.97-1.04) | |
| | | ↓ paritaprevir | 0.77 (0.64-0.94) | 0.78 (0.68-0.88) | 0.88 (0.80-0.95) | |
| | | ↔ dasabuvir | 1.05 (0.97-1.14) | 1.01 (0.96-1.06) | 0.95 (0.89-1.01) | |
| | Viekirax without dasabuvir | Not studied:<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Diltiazem<br>Verapamil<br><br>Mechanism: CYP3A4/P-gp inhibition. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ diltiazem, verapamil<br><br>↑ paritaprevir<br>↑/↔ dasabuvir | | | | Caution is advised due to the expected increase in paritaprevir exposures.<br><br>Dose decrease and clinical monitoring of calcium channel blockers is recommended when co-administered with Viekirax with and without dasabuvir. |
| Nifedipine<br><br>Mechanism: CYP3A4 inhibition | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ nifedipine | | | | Dose decrease and clinical monitoring of calcium channel blockers is recommended when co- |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| | | | | | | administered with Viekirax with and without dasabuvir. |
| **CONTRACEPTIVES** | | | | | | |
| Ethinyloestradiol/ norgestimate<br><br>0.035/0.25 mg once daily<br><br>Mechanism: possibly due to UGT inhibition by paritaprevir, ombitasvir and dasabuvir. | Viekirax with or without dasabuvir | ↔ ethinyloestradiol | 1.16 (0.90-1.50) | 1.06 (0.96-1.17) | 1.12 (0.94-1.33) | Ethinyloestradiol-containing oral contraceptives are contraindicated (see section 4.3). |
| | | Norgestimate metabolites: | | | | |
| | | ↑ norgestrel | 2.26 (1.91-2.67) | 2.54 (2.09-3.09) | 2.93 (2.39-3.57) | |
| | | ↑ nor-elgestromine | 2.01 (1.77-2.29) | 2.60 (2.30-2.95) | 3.11 (2.51-3.85) | |
| | | ↔ ombitasvir | 1.05 (0.81-1.35) | 0.97 (0.81-1.15) | 1.00 (0.88-1.12) | |
| | | ↓ paritaprevir | 0.70 (0.40-1.21) | 0.66 (0.42-1.04) | 0.87 (0.67-1.14) | |
| | | ↓ dasabuvir | 0.51 (0.22-1.18) | 0.48 (0.23-1.02) | 0.53 (0.30-0.95) | |
| Nor-ethindrone (progestin only pill) 0.35 mg once daily | Viekirax + dasabuvir | ↔ nor-ethindrone | 0.83 (0.69-1.01) | 0.91 (0.76-1.09) | 0.85 (0.64-1.13) | No dose adjustment is necessary for norethindrone or Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 1.00 (0.93-1.08) | 0.99 (0.94-1.04) | 0.97 (0.90-1.03) | |
| | | ↑ paritaprevir | 1.24 (0.95-1.62) | 1.23 (0.96-1.57) | 1.43 (1.13-1.80) | |
| | | ↔ dasabuvir | 1.01 (0.90-1.14) | 0.96 (0.85-1.09) | 0.95 (0.80-1.13) | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| **DIURETICS** | | | | | | |
| Furosemide<br><br>20 mg single dose<br><br>Mechanism: possibly due to UGT1A1 inhibition by paritaprevir, ombitasvir and dasabuvir. | Viekirax + dasabuvir | ↑ furosemide | 1.42 (1.17-1.72) | 1.08 (1.00-1.17) | NA | Patients should be monitored for clinical effects; a decrease in furosemide dose of up to 50% may be required.<br><br>No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 1.14 (1.03-1.26) | 1.07 (1.01-1.12) | 1.12 (1.08-1.16) | |
| | | ↔ paritaprevir | 0.93 (0.63-1.36) | 0.92 (0.70-1.21) | 1.26 (1.16-1.38) | |
| | | ↔ dasabuvir | 1.12 (0.96-1.31) | 1.09 (0.96-1.23) | 1.06 (0.98-1.14) | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| **ERGOT ALKALOIDS** | | | | | | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Ergotamine Dihydroergotamine Ergonovine Methylergometrine Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br>↑ ergot derivatives | | | | Concomitant use is contraindicated (see section 4.3). |
| **GLUCOCORTICOIDS (INHALED)** | | | | | | |
| Fluticasone<br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br>↑ fluticasone | | | | Concomitant use of fluticasone can increase systemic exposures of fluticasone. Concomitant use of Viekirax and fluticasone particularly long-term use, should only be initiated if the potential benefit of treatment outweighs the risk of systemic corticosteroid effects (see section 4.4). |
| **GASTROINTESTINAL PRODUCTS (PROPULSIVE)** | | | | | | |
| Cisapride Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br>↑ cisapride | | | | Concomitant use is contraindicated (see section 4.3). |
| **HCV ANTIVIRALS** | | | | | | |
| Sofosbuvir<br>400 mg once daily<br>Mechanism: BCRP and P-gp inhibition by paritaprevir, ritonavir and dasabuvir | Viekirax + dasabuvir | ↑ sofosbuvir | 1.61 (1.38-1.88) | 2.12 (1.91-2.37) | NA | No dose adjustment needed for sofosbuvir when administered with Viekirax with or without dasabuvir. |
| | | ↑ GS-331007 | 1.02 (0.90-1.16) | 1.27 (1.14-1.42) | NA | |
| | | ↔ ombitasvir | 0.93 (0.84-1.03) | 0.93 (0.87-0.99) | 0.92 (0.88-0.96) | |
| | | ↔ paritaprevir | 0.81 (0.65-1.01) | 0.85 (0.71-1.01) | 0.82 (0.67-1.01) | |
| | | ↔ dasabuvir | 1.09 (0.98-1.22) | 1.02 (0.95-1.10) | 0.85 (0.76-0.95) | |
| | Viekirax without dasabuvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | | |
| **HERBAL PRODUCTS** | | | | | | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| St. John's Wort (*hypericum perforatum*)<br><br>Mechanism:<br>CYP3A4 induction by St. John's Wort | | Viekirax with or without dasabuvir | | Not studied. Expected:<br><br>↓ dasabuvir<br>↓ ombitasvir<br>↓ paritaprevir | | Concomitant use is contraindicated (see section 4.3). |
| **HIV ANTIVIRALS: PROTEASE INHIBITORS**<br>For a general comment on treatment of HIV co-infected patients, including a discussion on different antiretroviral regimens that may be used, please see section 4.4 (Treatment of HIV co-infected patients). | | | | | | |
| Atazanavir<br><br>300 mg once daily (given at the same time)<br><br>Mechanism: Increase in paritaprevir exposures may be due to inhibition of OATP1B1/B3 and CYP3A by atazanavir. | Viekirax + dasabuvir | ↔ atazanavir | 0.91 (0.84-0.99) | 1.01 (0.93-1.10) | 0.90 (0.81-1.01) | The recommended dose of atazanavir is 300 mg, without ritonavir, in combination with Viekirax with dasabuvir. Atazanavir must be administered at the same time as Viekirax with dasabuvir. Ritonavir dose in Viekirax will provide atazanavir pharmacokinetic enhancement).<br><br>No dose adjustment needed for Viekirax with dasabuvir.<br><br>Treatment with atazanavir + Viekirax without dasabuvir is not recommended-(↑ paritaprevir).<br><br>The combination of atazanavir and Viekirax + dasabuvir increase bilirubin levels, in particular when ribavirin is part of the hepatitis C regimen (see sections 4.4 and 4.8). |
| | | ↓ ombitasvir | 0.77 (0.70-0.85) | 0.83 (0.74-0.94) | 0.89 (0.78-1.02) | |
| | | ↑ paritaprevir | 1.46 (1.06-1.99) | 1.94 (1.34-2.81) | 3.26 (2.06-5.16) | |
| | | ↔ dasabuvir | 0.83 (0.71-0.96) | 0.82 (0.71-0.94) | 0.79 (0.66-0.94) | |
| | | ↔ atazanavir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ paritaprevir | 2.74 (1.76-4.27) | 2.87 (2.08-3.97) | 3.71 (2.87-4.79) | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| | Viekirax without dasabuvir | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| Atazanavir/ ritonavir<br><br>300/100 mg once daily (administered 12 hours apart)<br><br>Mechanism: Increase in paritaprevir exposures may be due to inhibition of OATP1B1/B3 and CYP3A by atazanavir and CYP3A by the additional dose of ritonavir. | Viekirax + dasabuvir | ↔ atazanavir | 1.02 (0.92-1.13) | 1.19 (1.11-1.28) | 1.68 (1.44-1.95) | |
| | | ↔ ombitasvir | 0.83 (0.72-0.96) | 0.90 (0.78-1.02) | 1.00 (0.89-1.13) | |
| | | ↑ paritaprevir | 2.19 (1.61-2.98) | 3.16 (2.40-4.17) | 11.95 (8.94-15.98) | |
| | | ↔ dasabuvir | 0.81 (0.73-0.91) | 0.81 (0.71-0.92) | 0.80 (0.65-0.98) | |
| | Viekirax without dasabuvir | Not studied: Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Darunavir<br><br>800 mg once daily (given at the same time)<br><br>Mechanism: Unknown | Viekirax + dasabuvir | ↓ darunavir | 0.92 (0.87-0.98) | 0.76 (0.71-0.82) | 0.52 (0.47-0.58) | The recommended dose of darunavir is 800 mg once daily, without ritonavir, when administered at the same time as Viekirax + dasabuvir (ritonavir dose in Viekirax will provide darunavir pharmacokinetic enhancement). This regimen can be used in the absence of extensive PI resistance (i.e. lack of darunavir associated RAMs), see also section 4.4. |
| | | ↔ ombitasvir | 0.86 (0.77-0.95) | 0.86 (0.79-0.94) | 0.87 (0.82-0.92) | |
| | | ↑ paritaprevir | 1.54 (1.14-2.09) | 1.29 (1.04-1.61) | 1.30 (1.09-1.54) | |
| | | ↔ dasabuvir | 1.10 (0.88-1.37) | 0.94 (0.78-1.14) | 0.90 (0.76-1.06) | |
| | Viekirax without dasabuvir | ↔ darunavir | 0.99 (0.92-1.08) | 0. 92 (0.84-1.00) | 0.74 (0.63-0.88) | |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ paritaprevir | 2.09 (1.35-3.24) | 1.94 (1.36-2.75) | 1.85 (1.41-2.42) | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| | | | | | | No dose adjustment needed for Viekirax with dasabuvir.<br><br>Darunavir combined with Viekirax + dasabuvir is not recommended in patients with extensive PI resistance.<br><br>Treatment with darunavir + Viekirax without dasabuvir is not recommended-(↑ paritaprevir). |
| Darunavir/ ritonavir<br><br>600/100 mg twice daily<br><br>Mechanism: Unknown | Viekirax + dasabuvir | ↔ darunavir | 0.87 (0.79-0.96) | 0.80 (0.74-0.86) | 0.57 (0.48-0.67) | |
| | | ↓ ombitasvir | 0.76 (0.65-0.88) | 0.73 (0.66-0.80) | 0.73 (0.64-0.83) | |
| | | ↓ paritaprevir | 0.70 (0.43-1.12) | 0.59 (0.44-0.79) | 0.83 (0.69-1.01) | |
| | | ↓ dasabuvir | 0.84 (0.67-1.05) | 0.73 (0.62-0.86) | 0.54 (0.49-0.61) | |
| | Viekirax without dasabuvir | Not studied.<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| darunavir/ ritonavir<br><br>800/100 mg once daily<br><br>(administered 12 hours apart)<br><br>Mechanism: Unknown | Viekirax + dasabuvir | ↑ darunavir | 0.79 (0.70-0.90) | 1.34 (1.25-1.43) | 0.54 (0.48-0.62) | |
| | | ↔ ombitasvir | 0.87 (0.82-0.93) | 0.87 (0.81-0.93) | 0.87 (0.80-0.95) | |
| | | ↓ paritaprevir | 0.70 (0.50-0.99) | 0.81 (0.60-1.09) | 1.59 (1.23-2.05) | |
| | | ↓ dasabuvir | 0.75 (0.64-0.88) | 0.72 (0.64-0.82) | 0.65 (0.58-0.72) | |
| | Viekirax without dasabuvir | Not studied:<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Lopinavir / ritonavir<br><br>400/100 mg twice daily[1] | Viekirax + dasabuvir | ↔ lopinavir | 0.87 (0.76-0.99) | 0.94 (0.81-1.10) | 1.15 (0.93-1.42) | Concomitant use is contraindicated (see section 4.3). |
| | | ↔ ombitasvir | 1.14 (1.01-1.28) | 1.17 (1.07-1.28) | 1.24 (1.14-1.34) | |
| | | ↑ paritaprevir | 2.04 (1.30-3.20) | 2.17 (1.63-2.89) | 2.36 (1.00-5.55) | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Mechanism: Increase in paritaprevir exposures may be due to inhibition of CYP3A/efflux transporters by lopinavir and higher dose of ritonavir | | ↔ dasabuvir | 0.99 (0.75-1.31) | 0.93 (0.75-1.15) | 0.68 (0.57-0.80) | |
| | Viekirax without dasabuvir | ↔ lopinavir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ paritaprevir | 4.76 (3.54-6.39) | 6.10 (4.30-8.67) | 12.33 (7.30-20.84) | |
| Indinavir Saquinavir Tipranavir<br><br>Mechanism: CYP3A4 inhibition by protease inhibitors. | Viekirax with or without dasabuvir | Not studied. Expected<br><br>↑ paritaprevir | | | | Concomitant use is contraindicated (see section 4.3). |
| **HIV ANTIVIRALS: NON-NUCLEOSIDE REVERSE TRANSCRIPTASE INHIBITORS** | | | | | | |
| Rilpivirine[2]<br><br>25 mg once daily administered in the morning, with food<br><br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax + dasabuvir | ↑ rilpivirine | 2.55 (2.08-3.12) | 3.25 (2.80-3.77) | 3.62 (3.12-4.21) | Co-administration of Viekirax with rilpivirine once daily should only be considered in patients without known QT-prolongation, and without other QT-prolongation co-medications. If the combination is used, repeated ECG-monitoring should be done, see section 4.4. No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 1.11 (1.02-1.20) | 1.09 (1.04-1.14) | 1.05 (1.01-1.08) | |
| | | ↑ paritaprevir | 1.30 (0.94-1.81) | 1.23 (0.93-1.64) | 0.95 (0.84-1.07) | |
| | | ↔ dasabuvir | 1.18 (1.02-1.37) | 1.17 (0.99-1.38) | 1.10 (0.89-1.37) | |
| | Viekirax without dasabuvir | Not studied:<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Efavirenz/ emtricitabine/ tenofovir disoproxil fumarate 600/300/200 mg once daily | Viekirax with or without dasabuvir | Co-administration of efavirenz (enzyme inducer) based regimens with paritaprevir /ritonavir + dasabuvir resulted in ALT elevations and therefore, early discontinuation of the study. | | | | Concomitant use with efavirenz is contraindicated (see section 4.3). |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Mechanism: possible CYP3A4 induction by efavirenz. | | | | | | |
| Nevirapine etravirine | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↓ ombitasvir<br>↓ paritaprevir<br>↓ dasabuvir | | | | Concomitant use is contra-indicated (see section 4.3). |
| **HIV ANTIVIRALS: INTEGRASE STRAND TRANSFER INHIBITOR** | | | | | | |
| Dolutegravir<br><br>50 mg once daily<br><br>Mechanism: possibly due to UGT1A1 inhibition by paritaprevir, dasabuvir and ombitasvir and CYP3A4 inhibition by ritonavir | Viekirax + dasabuvir | ↑ dolutegravir | 1.22 (1.15-1.29) | 1.38 (1.30-1.47) | 1.36 (1.19-1.55) | No dose adjustment needed for dolutegravir when coadministered with Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 0.96 (0.89-1.03) | 0.95 (0.90-1.00) | 0.92 (0.87-0.98) | |
| | | ↔ paritaprevir | 0.89 (0.69-1.14) | 0.84 (0.67-1.04) | 0.66 (0.59-0.75) | |
| | | ↔ dasabuvir | 1.01 (0.92-1.11) | 0.98 (0.92-1.05) | 0.92 (0.85-0.99) | |
| | Viekirax without dasabuvir | Not studied.<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Raltegravir<br><br>400 mg twice daily<br><br>Mechanism: Increase in raltegravir exposures may be due to UGT1A1 inhibition by paritaprevir, ombitasvir. and dasabuvir | Viekirax + dasabuvir | ↑ raltegravir | 2.33 (1.66-3.27) | 2.34 (1.70-3.24) | 2.00 (1.17-3.42) | No dose adjustment is necessary for raltegravir or Viekirax with or without dasabuvir. |
| | | No clinically relevant changes in dasabuvir, paritaprevir and ombitasvir exposures (based on comparison with historical data) were observed during co-administration. | | | | |
| | Viekirax without dasabuvir | ↑ raltegravir | 1.22 (0.78-1.89) | 1.20 (0.74-1.95) | 1.13 (0.51-2.51) | |
| | | No clinically relevant changes in dasabuvir, paritaprevir and ombitasvir exposures (based on comparison with historical data) were observed during co-administration. | | | | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| **HIV ANTIVIRALS: NUCLEOSIDE INHIBITORS** | | | | | | |
| Abacavir/ lamivudine<br><br>600/300 mg once daily | Viekirax + dasabuvir | ↔ abacavir | 0.87 (0.78-0.98) | 0.94 (0.90-0.99) | NA | No dose adjustment needed for abacavir or lamivudine when co-administered with Viekirax with or without dasabuvir. |
| | | ↓ lamivudine | 0.78 (0.72-0.84) | 0.88 (0.82-0.93) | 1.29 (1.05-1.58) | |
| | | ↔ ombitasvir | 0.82 (0.76-0.89) | 0.91 (0.87-0.95) | 0.92 (0.88-0.96) | |
| | | ↔ paritaprevir | 0.84 (0.69-1.02) | 0.82 (0.70-0.97) | 0.73 (0.63-0.85) | |
| | | ↔ dasabuvir | 0.94 (0.86-1.03) | 0.91 (0.86-0.96) | 0.95 (0.88-1.02) | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Em-tricitabine/ tenofovir<br><br>200 mg once daily/300 mg once daily | Viekirax + dasabuvir | ↔ em-tricitabine | 1.05 (1.00-1.12) | 1.07 (1.00-1.14) | 1.09 (1.01-1.17) | No dose adjustment is necessary for emtricitabine/tenofovir and Viekirax with or without dasabuvir. |
| | | ↔ tenofovir | 1.07 (0.93-1.24) | 1.13 (1.07-1.20) | 1.24 (1.13-1.36) | |
| | | ↔ ombitasvir | 0.89 (0.81-0.97) | 0.99 (0.93-1.05) | 0.97 (0.90-1.04) | |
| | | ↓ paritaprevir | 0.68 (0.42-1.11) | 0.84 (0.59-1.17) | 1.06 (0.83-1.35) | |
| | | ↔ dasabuvir | 0.85 (0.74-0.98) | 0.85 (0.75-0.96) | 0.85 (0.73-0.98) | |
| | Viekirax without dasabuvir | ↔ em-tricitabine | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ tenofovir | 0.80 (0.71-0.90) | 1.01 (0.96-1.07) | 1.13 (1.06-1.21) | |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ paritaprevir | 1.02 (0.63-1.64) | 1.04 (0.74-1.47) | 1.09 (0.88-1.35) | |
| **HIV ANTIVIRALS: PHARMACOKINETIC ENHANCER** | | | | | | |
| Cobicistat-containing regimens<br>Mechanism: CYP3A4 inhibition by cobicistat | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ ombitasvir<br>↑ paritaprevir<br>↑ dasabuvir | | | | Concomitant use is contraindicated (See section 4.3). |
| **HMG CoA REDUCTASE INHIBITOR** | | | | | | |
| | Viekirax + dasabuvir | ↑ rosuvastatin | 7.13 (5.11-9.96) | 2.59 (2.09-3.21) | 0.59 (0.51-0.69) | |
| | | ↔ ombitasvir | 0.92 (0.82-1.04) | 0.89 (0.83-0.95) | 0.88 (0.83-0.94) | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Rosuvastatin<br><br>5 mg once daily<br><br>Mechanism: OATP1B inhibition by paritaprevir and BCRP inhibition by paritaprevir, ritonavir or dasabuvir. | | ↑ paritaprevir | 1.59 (1.13-2.23) | 1.52 (1.23-1.90) | 1.43 (1.22-1.68) | The maximum daily dose of rosuvastatin should be 5 mg (see section 4.4).<br><br>No dose adjustment needed for Viekirax with dasabuvir |
| | | ↔ dasabuvir | 1.07 (0.92-1.24) | 1.08 (0.92-1.26) | 1.15 (1.05-1.25) | |
| | Viekirax without dasabuvir | ↑ rosuvastatin | 2.61 (2.01-3.39) | 1.33 (1.14-1.56) | 0.65 (0.57-0.74) | The maximum daily dose of rosuvastatin should be 10 mg (see section 4.4).<br><br>No dose adjustment needed for Viekirax. |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ paritaprevir | 1.40 (1.12-1.74) | 1.22 (1.05-1.41) | 1.06 (0.85-1.32) | |
| Pravastatin<br><br>10 mg once daily<br><br>Mechanism: OATP1B1 inhibition by paritaprevir. | Viekirax+ dasabuvir | ↑ pravastatin | 1.37 (1.11-1.69) | 1.82 (1.60-2.08) | NA | Reduce pravastatin dose by 50%.<br><br>No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 0.95 (0.89-1.02) | 0.89 (0.83-0.95) | 0.94 (0.89-0.99) | |
| | | ↔ dasabuvir | 1.00 (0.87-1.14) | 0.96 (0.85-1.09) | 1.03 (0.91-1.15) | |
| | | ↔ paritaprevir | 0.96 (0.69-1.32) | 1.13 (0.92-1.38) | 1.39 (1.21-1.59) | |
| | Viekirax without dasabuvir | ↑ pravastatin | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ paritaprevir | 1.44 (1.15-1.81) | 1.33 (1.09-1.62) | 1.28 (0.83-1.96) | |
| Fluvastatin<br><br>Mechanism: OATP1B/BCRP inhibition by paritaprevir<br><br>Pitavastatin<br>Mechanism: OATP1B inhibition by paritaprevir | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ fluvastatin<br><br>↑ pitavastatin | | | | Concomitant use with fluvastatin and pitavastatin is not recommended (see section 4.4).<br>A temporary suspension of fluvastatin and pitavastatin is recommended for the duration of treatment with Viekirax. If statin treatment is required during the treatment period, a switch to dose reduced pravastatin or rosuvastatin is possible. |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Lovastatin<br>Simvastatin<br>atorvastatin<br><br>Mechanism: CYP3A4/OATP1B inhibition | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ lovastatin, simvastatin, atorvastatin | | | | Concomitant use is contraindicated (see section 4.3). |
| **IMMUNOSUPPRESSANTS** | | | | | | |
| Ciclosporin<br><br>30 mg once daily single dose[3]<br><br>Mechanism: Effect on ciclosporin is due to CYP3A4 inhibition by ritonavir and increase in paritaprevir exposures may be due to OATP/BCRP/P-gp inhibition by ciclosporin. | Viekirax + dasabuvir | ↑ ciclosporin | 1.01 (0.85-1.20) | 5.82 (4.73-7.14) | 15.8 (13.8-18.09) | When starting co-administration with Viekirax, give one fifth of the total daily dose of ciclosporin once daily with Viekirax. Monitor ciclosporin levels and adjust dose and/or dosing frequency as needed.<br><br>No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 0.99 (0.92-1.07) | 1.08 (1.05-1.11) | 1.15 (1.08-1.23) | |
| | | ↑ paritaprevir | 1.44 (1.16-1.78) | 1.72 (1.49-1.99) | 1.85 (1.58-2.18) | |
| | | ↓ dasabuvir | 0.66 (0.58-0.75) | 0.70 (0.65-0.76) | 0.76 (0.71-0.82) | |
| | Viekirax without dasabuvir | ↑ ciclosporin | 0.83 (0.72-0.94) | 4.28 (3.66-5.01) | 12.8 (10.6-15.6) | |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↑ paritaprevir | 1.39 (1.10-1.75) | 1.46 (1.29-1.64) | 1.18 (1.08-1.30) | |
| Everolimus<br><br>0.75 mg single dose<br><br>Mechanism: Effect on everolimus is due to CYP3A4 inhibition by ritonavir | Viekirax + dasabuvir | ↑ everolimus | 4.74 (4.29-5.25) | 27.1 (24.5-30.1) | 16.1 (14.5-17.9)[4] | Co-administration of Viekirax with everolimus is not recommended because of a significant increase in everolimus exposures which cannot be properly dose adjusted with available dose strengths (see section 4.4). |
| | | ↔ ombitasvir | 0.99 (0.95-1.03) | 1.02 (0.99-1.05) | 1.02 (0.99-1.06) | |
| | | ↔ paritaprevir | 1.22 (1.03-1.43) | 1.26 (1.07-1.49) | 1.06 (0.97-1.16) | |
| | | ↔ dasabuvir | 1.03 (0.90-1.18) | 1.08 (0.98-1.20) | 1.14 (1.05-1.23) | |
| | Viekirax without dasabuvir | Not studied:<br>Similar effect is expected as observed with Viekirax + dasabuvir. | | | | |
| Sirolimus | Viekirax + dasabuvir | ↑ sirolimus | 6.40 (5.34-7.68) | 38.0 (31.5-45.8) | 19.6 (16.7-22.9)[6] | Concomitant use of sirolimus with Viekirax and dasabuvir is not |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| 0.5 mg single dose[5]<br><br>Mechanism: Effect on sirolimus is due to CYP3A4 inhibition by ritonavir | | ↔ ombitasvir | 1.03 (0.93-1.15) | 1.02 (0.96-1.09) | 1.05 (0.98-1.12) | recommended unless the benefits outweigh the risks (see section 4.4). If sirolimus is used together with Viekirax + dasabuvir, administer sirolimus 0.2 mg twice a week (every 3 or 4 days on the same two days each week). Sirolimus blood concentrations should be monitored every 4 to 7 days until 3 consecutive trough levels have shown stable concentrations of sirolimus. Sirolimus dose and/or dosing frequency should be adjusted as needed.<br><br>5 days after completion of Viekirax + dasabuvir treatment, the sirolimus dose and dosing frequency prior to receiving Viekirax should be resumed, along with routine monitoring of sirolimus blood concentrations. |
| | | ↔ paritaprevir | 1.18 (0.91-1.54) | 1.19 (0.97-1.46) | 1.16 (1.00-1.34) | |
| | | ↔ dasabuvir | 1.04 (0.89-1.22) | 1.07 (0.95-1.22) | 1.13 (1.01-1.25) | |
| | Viekirax without dasabuvir | Not studied:<br>Similar effect is expected as observed with Viekirax + dasabuvir | | | | |
| Tacrolimus<br><br>2 mg single dose[7]<br><br>Mechanism: Effect on tacrolimus is due to CYP3A4 inhibition by ritonavir. | Viekirax + dasabuvir | ↑ tacrolimus | 3.99 (3.21-4.97) | 57.1 (45.5-71.7) | 16.6 (13.0-21.2) | Concomitant use of tacrolimus with Viekirax and dasabuvir is not recommended unless the benefits outweigh the risks (see section 4.4).<br>If tacrolimus with Viekirax and dasabuvir are used concomitantly, tacrolimus should not be administered on the day Viekirax and dasabuvir are initiated. Beginning the day after Viekirax and dasabuvir are |
| | | ↔ ombitasvir | 0.93 (0.88-0.99) | 0.94 (0.89-0.98) | 0.94 (0.91-0.96) | |
| | | ↓ paritaprevir | 0.57 (0.42-0.78) | 0.66 (0.54-0.81) | 0.73 (0.66-0.80) | |
| | | ↔ dasabuvir | 0.85 (0.73-0.98) | 0.90 (0.80-1.02) | 1.01 (0.91-1.11) | |
| | Viekirax without dasabuvir | ↑ tacrolimus | 4.27 (3.49-5.22) | 85.8 (67.9-108) | 24.6 (19.7-30.8) | |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↓ paritaprevir | | | | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| | | | | | | initiated; reinitiate tacrolimus at a reduced dose based on tacrolimus blood concentrations. The recommended tacrolimus dosing is 0.5 mg every 7 days.<br><br>Tacrolimus whole blood concentrations should be monitored upon initiation and throughout co-administration with Viekirax and dasabuvir and the dose and/or dosing frequency should be adjusted as needed. Upon completion of Viekirax and dasabuvir treatment, the appropriate dose and dosing frequency of tacrolimus should be guided by assessment of tacrolimus blood concentrations. |
| **INHALED BETA AGONISTS** | | | | | | |
| Salmeterol<br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ salmeterol | | | | Concomitant use is contraindicated (see section 4.3). |
| **INSULIN SECRETAGOGUES** | | | | | | |
| Repaglinide<br>Mechanism: OATP1B1 inhibition by paritaprevir. | Viekirax with or without dasabuvir | Not Studied. Expected:<br><br>↑ repaglinide | | | | Caution should be used and dose decrease maybe needed for repaglinide when administered with Viekirax with or without dasabuvir. |
| **MUSCLE RELAXANTS** | | | | | | |
| Carisoprodol 250 mg single dose | Viekirax with dasabuvir | ↓ Carisoprodol | 0.54 (0.47-0.63) | 0.62 (0.55-0.70) | NA | No dose adjustment required for carisoprodol; increase dose if clinically indicated. |
| | | ↔ ombitasvir | 0.98 (0.92-1.04) | 0.95 (0.92-0.97) | 0.96 (0.92-0.99) | |
| | | ↔ paritaprevir | 0.88 (0.75-1.03) | 0.96 (0.85-1.08) | 1.14 (1.02-1.27) | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Mechanism: CYP2C19 induction by ritonavir | | ↔ dasabuvir | 0.96 (0.91-1.01) | 1.02 (0.97-1.07) | 1.00 (0.92-1.10) | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Cyclobenzaprine 5 mg single dose<br><br>Mechanism: decrease possibly due to CYP1A2 induction by ritonavir | Viekirax with dasabuvir | ↓ cyclobenzaprine | 0.68 (0.61-0.75) | 0.60 (0.53-0.68) | NA | No dose adjustment required for cyclobenzaprine; increase dose if clinically indicated. |
| | | ↔ ombitasvir | 0.98 (0.92-1.04) | 1.00 (0.97-1.03) | 1.01 (0.98-1.04) | |
| | | ↔ paritaprevir | 1.14 (0.99-1.32) | 1.13 (1.00-1.28) | 1.13 (1.01-1.25) | |
| | | ↔ dasabuvir | 0.98 (0.90-1.07) | 1.01 (0.96-1.06) | 1.13 (1.07-1.18) | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| **NARCOTIC ANALGESICS** | | | | | | |
| Paracetamol (as given in a fixed-dose hydrocodone/ paracetamol)<br><br>300 mg single dose | Viekirax + dasabuvir | ↔ paracetamol | 1.02 (0.89-1.18) | 1.17 (1.09-1.26) | NA | No dose adjustment necessary for paracetamol when administered with Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 1.01 (0.93-1.10) | 0.97 (0.93-1.02) | 0.93 (0.90-0.97) | |
| | | ↔ paritaprevir | 1.01 (0.80-1.27) | 1.03 (0.89-1.18) | 1.10 (0.97-1.26) | |
| | | ↔ dasabuvir | 1.13 (1.01-1.26) | 1.12 (1.05-1.19) | 1.16 (1.08-1.25) | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Hydrocodone (as given in a fixed-dose hydrocodone/ paracetamol)<br><br>5 mg single dose<br><br>Mechanism: CYP3A4 inhibition by ritonavir | Viekirax + dasabuvir | ↑ hydrocodone | 1.27 (1.14-1.40) | 1.90 (1.72-2.10) | NA | A reduction of hydrocodone dose by 50% and/or clinical monitoring should be considered when administered with Viekirax with or without dasabuvir . |
| | | Changes for ombitasvir, paritaprevir and dasabuvir the same as shown for paracetamol above | | | | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| **OPIOIDS** | | | | | | |
| Methadone<br><br>20-120 mg once daily[8] | Viekirax + dasabuvir | ↔ R-Methadone | 1.04 (0.98-1.11) | 1.05 (0.98-1.11) | 0.94 (0.87-1.01) | No dose adjustment is necessary for methadone and Viekirax with or without dasabuvir. |
| | | ↔ S-Methadone | 0.99 (0.91-1.08) | 0.99 (0.89-1.09) | 0.86 (0.76-0.96) | |
| | | ↔ paritaprevir /ombitasvir/dasabuvir (based on the cross-study comparison) | | | | |
| | Viekirax without dasabuvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | | |
| Buprenorphine / naloxone<br><br>4-24 mg/1-6 mg once daily[8]<br><br>Mechanism: CYP3A4 inhibition by ritonavir and UGT inhibition by paritaprevir, ombitasvir and dasabuvir. | Viekirax + dasabuvir | ↑ bu-prenorphine | 2.18 (1.78-2.68) | 2.07 (1.78-2.40) | 3.12 (2.29-4.27) | No dose adjustment is necessary for buprenorphine/naloxone and Viekirax with or without dasabuvir. |
| | | ↑ norbu-prenorphine | 2.07 (1.42-3.01) | 1.84 (1.30-2.60) | 2.10 (1.49-2.97) | |
| | | ↑ naloxone | 1.18 (0.81-1.73) | 1.28 (0.92-1.79) | NA | |
| | | ↔ ombitasvir/paritaprevir/dasabuvir (based on the cross-study comparison) | | | | |
| | Viekirax without dasabuvir | ↑ bu-prenorphine | 1.19 (1.01-1.40) | 1.51 (1.27-1.78) | 1.65 (1.30-2.08) | |
| | | ↑ norbu-prenorphine | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ naloxone | | | | |
| | | ↔ ombitasvir/paritaprevir (based on the cross-study comparison) | | | | |
| **PHOSPHODIESTERASE-(PDE-5) INHIBITORS** | | | | | | |
| Sildenafil (when used for treatment of pulmonary hypertension)<br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with and without dasabuvir | Not studied. Expected:<br><br>↑ sildenafil | | | | Concomitant use is contraindicated (see section 4.3). |
| **PROTON PUMP INHIBITORS** | | | | | | |
| | Viekirax + dasabuvir | ↓ omeprazole | 0.62 (0.48-0.80) | 0.62 (0.51-0.75) | NA | If clinically indicated higher doses of |
| | | ↔ ombitasvir | 1.02 (0.95-1.09) | 1.05 (0.98-1.12) | 1.04 (0.98-1.11) | |
| | | ↔ paritaprevir | 1.19 (1.04-1.36) | 1.18 (1.03-1.37) | 0.92 (0.76-1.12) | |
| | | ↔ dasabuvir | 1.13 (1.03-1.25) | 1.08 (0.98-1.20) | 1.05 (0.93-1.19) | |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| Omeprazole<br><br>40 mg once daily<br><br>Mechanism: CYP2C19 induction by ritonavir. | Viekirax without dasabuvir | ↓ omeprazole | 0.48 (0.29-0.78) | 0.46 (0.27-0.77) | NA | omeprazole should be used.<br><br>No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | The magnitude of interaction was similar to that observed with Viekirax + dasabuvir. | | | |
| | | ↔ paritaprevir | | | | |
| Esomeprazole Lansoprazole Mechanism: CYP2C19 induction by ritonavir. | Viekirax with and without dasabuvir | Not studied. Expected:<br>↓ esomeprazole, lansoprazole | | | | If clinically indicated, higher doses of esomeprazole/lansoprazole may be needed. |
| **SEDATIVES / HYPNOTICS** | | | | | | |
| Zolpidem<br><br>5 mg single dose | Viekirax + dasabuvir | ↔ zolpidem | 0.94 (0.76-1.16) | 0.95 (0.74-1.23) | NA | No dose adjustment is necessary for zolpidem.<br><br>No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 1.07 (1.00-1.15) | 1.03 (1.00-1.07) | 1.04 (1.00-1.08) | |
| | | ↓ paritaprevir | 0.63 (0.46-0.86) | 0.68 (0.55-0.85) | 1.23 (1.10-1.38) | |
| | | ↔ dasabuvir | 0.93 (0.84-1.03) | 0.95 (0.84-1.08) | 0.92 (0.83-1.01) | |
| | Viekirax without dasabuvir | Not studied.<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Alprazolam<br><br>0.5 mg single dose<br><br>Mechanism: CYP3A4 inhibition by ritonavir | Viekirax + dasabuvir | ↑ alprazolam | 1.09 (1.03-1.15) | 1.34 (1.15-1.55) | NA | Clinical monitoring of patients is recommended. A decrease in alprazolam dose can be considered based on clinical response.<br><br>No dose adjustment needed for Viekirax with or without dasabuvir. |
| | | ↔ ombitasvir | 0.98 (0.93-1.04) | 1.00 (0.96-1.04) | 0.98 (0.93-1.04) | |
| | | ↔ paritaprevir | 0.91 (0.64-1.31) | 0.96 (0.73-1.27) | 1.12 (1.02-1.23) | |
| | | ↔ dasabuvir | 0.93 (0.83-1.04) | 0.98 (0.87-1.11) | 1.00 (0.87-1.15) | |
| | Viekirax without dasabuvir | Not studied.<br>Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| Oral midazolam Triazolam<br><br>Mechanism: CYP3A4 inhibition by ritonavir. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ midazolam or triazolam | | | | Concomitant use is contraindicated (see section 4.3).<br><br>If parenteral midazolam is co-administered with Viekirax with or without dasabuvir, close clinical |

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|
| | | | | | | monitoring for respiratory depression and/or prolonged sedation should be exercised and dosage adjustment should be considered. |
| Diazepam<br><br>2 mg single dose<br><br>Mechanism: CYP2C19 induction by ritonavir | Viekirax + dasabuvir | ↓diazepam | 1.18 (1.07-1.30) | 0.78 (0.73-0.82) | NA | No dose adjustment required for diazepam; increase dose if clinically indicated. |
| | | ↓ nordiazepam | 1.10 (1.03-1.19) | 0.56 (0.45-0.70) | NA | |
| | | ↔ ombitasvir | 1.00 (0.93-1.08) | 0.98 (0.93-1.03) | 0.93 (0.88-0.98) | |
| | | ↔ paritaprevir | 0.95 (0.77-1.18) | 0.91 (0.78-1.07) | 0.92 (0.82-1.03) | |
| | | ↔ dasabuvir | 1.05 (0.98-1.13) | 1.01 (0.94-1.08) | 1.05 (0.98-1.12) | |
| | Viekirax without dasabuvir | Not studied. Similar effect expected as observed with Viekirax + dasabuvir. | | | | |
| **THYROID HORMONES** | | | | | | |
| Levothyroxine<br><br>Mechanism: UGT1A1 inhibition by paritaprevir, ombitasvir and dasabuvir. | Viekirax with or without dasabuvir | Not studied. Expected:<br><br>↑ levothyroxine | | | | Clinical monitoring and dose adjustment may be required for levothyroxine |

1. Lopinavir/ritonavir 800/200 mg once daily (administered in the evening) was also administered with Viekirax with or without dasabuvir. The effect on $C_{max}$ and AUC of DAAs and lopinavir was similar to that observed when lopinavir/ritonavir 400/100 mg twice daily was administered with Viekirax with or without dasabuvir.

2. Rilpivirine was also administered in the evening with food and at night 4 hours after dinner with Viekirax + dasabuvir in other two arms in the study. The effect on rilpivirine exposures was similar to that observed when rilpivirine was administered in the morning with food with Viekirax + dasabuvir (shown in the table above).

3. Ciclosporin 100 mg dosed alone, 10 mg administered with Viekirax and 30 mg administered with Viekirax + dasabuvir. Dose normalized cyclosporine ratios are shown for interaction with Viekirax with or without dasabuvir.

4. $C_{12}$:= concentration at 12 hours following single dose of everolimus.

| Medicinal Product/Possible Mechanism of Interaction | GIVEN WITH | EFFECT | $C_{max}$ | AUC | $C_{trough}$ | Clinical Comments |
|---|---|---|---|---|---|---|

5. Sirolimus 2 mg was dosed alone, 0.5 mg administered with Viekirax + dasabuvir. Dose normalized sirolimus ratios are shown for interaction with Viekirax + dasabuvir.

6. $C_{24}$:= concentration at 24 hours following single dose of cyclosporine, tacrolimus or sirolimus.

7. Tacrolimus 2 mg was dosed alone, 0.5 mg administered with Viekirax and 2 mg was administered with Viekirax + dasabuvir. Dose normalized tacrolimus ratios are shown for interaction with Viekirax with or without dasabuvir.

8. Dose normalised parameters reported for methadone, buprenorphine and naloxone.

Note: Doses used for Viekirax and dasabuvir were: ombitasvir 25 mg, paritaprevir 150 mg, ritonavir 100 mg, once daily and dasabuvir 400 mg twice daily or 250 mg twice daily. The dasabuvir exposures obtained with the 400 mg formulation and the 250 mg tablet are similar. Viekirax with or without dasabuvir was administered as multiple doses in all the drug interaction studies except the drug interaction studies with carbamazepine, gemfibrozil, ketoconazole, and sulfamethoxazole/trimethoprim..

Paediatric population

Drug interaction studies have only been performed in adults.

**4.6 Fertility, pregnancy and lactation**

Women of childbearing potential / contraception in males and females

Extreme caution must be taken to avoid pregnancy in female patients and female partners of male patients when Viekirax is taken in combination with ribavirin. Significant teratogenic and/or embryocidal effects have been demonstrated in all animal species exposed to ribavirin; therefore, ribavirin is contraindicated in women who are pregnant and in the male partners of women who are pregnant. Refer to the Summary of Product Characteristics for ribavirin for additional information.

*Female patients:* Women of childbearing potential should not receive ribavirin unless they are using an effective form of contraception during treatment with ribavirin and for 4 months after treatment. Ethinyloestradiol is contraindicated in combination with Viekirax (see sections 4.3 and 4.4).

*Male patients and their female partners:* Either male patients or their female partners of childbearing potential must use a form of effective contraception during treatment with ribavirin and for 7 months after treatment.

Pregnancy

There are very limited data from the use of Viekirax in pregnant women. Studies with ombitasvir and paritaprevir/ritonavir in animals have shown malformations (see section 5.3). The potential risk for humans is unknown. Viekirax should not be used during pregnancy or in women of childbearing potential not using effective contraception.

If ribavirin is co-administered with Viekirax, the contraindications regarding use of ribavirin during pregnancy apply (see also the Summary of Product Characteristics of ribavirin).

Breast-feeding

It is not known whether paritaprevir /ritonavir or ombitasvir and their metabolites are excreted in human breast milk. Available pharmacokinetic data in animals have shown excretion of active substance and metabolite in milk (see section 5.3). Because of the potential for adverse reactions from the medicinal product in breastfed infants, a decision must be made whether to discontinue breast-feeding or discontinue treatment with Viekirax, taking into account the importance of the therapy to the mother. For patients co-administered ribavirin refer to the Summary of Product Characteristics of ribavirin.

Fertility

No human data on the effect of Viekirax on fertility are available. Animal studies do not indicate harmful effects on fertility (see section 5.3).

## 4.7 Effects on ability to drive and use machines

Viekirax has no or negligible influence on the ability to drive and use machines. Patients should be informed that fatigue has been reported during treatment with Viekirax in combination with dasabuvir and ribavirin (see section 4.8).

## 4.8 Undesirable effects

Summary of the safety profile

In subjects receiving Viekirax and dasabuvir with ribavirin, the most commonly reported adverse reactions (greater than 20% of subjects) were fatigue and nausea. The proportion of subjects who permanently discontinued treatment due to adverse reactions was 0.2% (5/2,044) and 4.8% (99/2,044) of subjects had ribavirin dose reductions due to adverse reactions.

Tabulated list of adverse reactions

The safety summary is based on pooled data from phase 2 and 3 clinical trials in subjects who received Viekirax and dasabuvir with or without ribavirin. The majority of adverse reactions presented in Table 3 were of grade 1 severity in Viekirax and dasabuvir-containing regimens.

The adverse reactions are listed below by system organ class and frequency. Frequencies are defined as follows: very common (≥1/10), common (≥1/100 to <1/10), uncommon (≥1/1,000 to <1/100), rare (≥1/10,000 to <1/1,000) or very rare (<1/10,000).

**Table 3. Adverse drug reactions identified with Viekirax in combination with dasabuvir with and without ribavirin**

| Frequency | Viekirax + dasabuvir + ribavirin* N = 2,044 | Viekirax + dasabuvir N = 588 |
|---|---|---|
| *Blood and lymphatic system disorders* | | |
| Common | Anaemia | |
| *Immune system disorders* | | |
| Frequency unknown | Anaphylactic reactions | Anaphylactic reactions |
| *Metabolism and nutrition disorders* | | |
| Uncommon | Dehydration | |
| *Psychiatric disorders* | | |
| Very common | Insomnia | |
| *Gastrointestinal disorders* | | |
| Very common | Nausea, Diarrhoea | |
| Common | Vomiting | |
| *Hepatobiliary disorders* | | |
| Frequency unknown | Hepatic decompensation and hepatic failure | Hepatic decompensation and hepatic failure |
| *Skin and subcutaneous tissue disorders* | | |
| Very common | Pruritus | |
| Common | | Pruritus |
| Rare | Angioedema | Angioedema |
| | | |
| | | |
| *General disorders and administration and administration site conditions* | | |
| Very common | Asthenia<br>Fatigue | |

*Data set includes all genotype 1-infected subjects in Phase 2 and 3 trials including subjects with cirrhosis.
Note: For laboratory abnormalities, refer to Table 4

Description of selected adverse reactions

Compared to subjects without cirrhosis, in subjects with compensated cirrhosis there was an increased rate of indirect hyperbilirubinemia when ribavirin was part of the regimen.

*Laboratory abnormalities*
Changes in selected laboratory parameters are described in Table 4. A side-by-side tabulation is shown to simplify presentation; direct comparison across trials should not be made due to differing trial designs.

**Table 4. Selected treatment emergent laboratory abnormalities**

| Laboratory Parameters | SAPPHIRE I and II | PEARL II, III, and IV | TURQUOISE II (subjects with cirrhosis) |
|---|---|---|---|
| | Viekirax and dasabuvir + ribavirin<br><br>12 weeks<br>N = 770<br>n (%) | Viekirax and dasabuvir<br><br>12 weeks<br>N = 509<br>n (%) | Viekirax and dasabuvir + ribavirin<br><br>12 or 24 weeks<br>N = 380<br>n (%) |
| **ALT** | | | |
| >5-20 × ULN* (Grade 3) | 6/765 (0.8%) | 1/509 (0.2%) | 4/380 (1.1%) |
| >20 × ULN (Grade 4) | 3/765 (0.4%) | 0 | 2/380 (0.5%) |
| **Haemoglobin** | | | |
| <100-80 g/L (grade 2) | 41/765 (5.4%) | 0 | 30/380 (7.9%) |
| <80-65 g/L (grade 3) | 1/765 (0.1%) | 0 | 3/380 (0.8%) |
| <65 g/L (Grade 4) | 0 | 0 | 1/380 (0.3%) |
| **Total bilirubin** | | | |
| >3-10 × ULN (grade 3) | 19/765 (2.5%) | 2/509 (0.4%) | 37/380 (9.7%) |
| >10 × ULN (grade 4) | 1/765 (0.1%) | 0 | 0 |
| *ULN: Upper limit of normal according to testing laboratory. | | | |

*Serum ALT elevations*

In a pooled analysis of clinical trials with Viekirax and dasabuvir with and without ribavirin, 1% of subjects experienced serum ALT levels greater than 5 times the upper limit of normal (ULN) after starting treatment. As the incidence of such elevations was 26% among women taking a concomitant ethinyloestradiol-containing medicinal product, such medicinal products are contraindicated with Viekirax with or without dasabuvir. No increase in incidence of ALT elevations was observed with other types of estrogens commonly used for hormone replacement therapy (e.g. oestradiol and conjugated estrogens). ALT elevations were typically asymptomatic, generally occurred during the first 4 weeks of treatment (mean time 20 days, range 8-57 days) and most resolved with ongoing therapy. Two patients discontinued Viekirax and dasabuvir due to elevated ALT, including one on ethinyloestradiol. Three interrupted Viekirax and dasabuvir for one to seven days, including one on ethinyloestradiol. The majority of these ALT elevations were transient and assessed as drug-related. Elevations in ALT were generally not associated with bilirubin elevations. Cirrhosis was not a risk factor for elevated ALT (see section 4.4).

*Serum bilirubin elevations*

Transient elevations in serum bilirubin (predominantly indirect) were observed in subjects receiving Viekirax and dasabuvir with ribavirin, related to the inhibition of the bilirubin transporters OATP1B1/1B3 by paritaprevir and ribavirin-induced haemolysis. Bilirubin elevations occurred after initiation of treatment, peaked by study Week 1, and generally resolved with ongoing therapy. Bilirubin elevations were not associated with aminotransferase elevations. The frequency of indirect bilirubin elevations was lower among subjects who did not receive ribavirin.

*Liver transplant recipients*

The overall safety profile in HCV-infected transplant recipients who were administered Viekirax and dasabuvir and ribavirin (in addition to their immunosuppressant medications) was similar to subjects

treated with Viekirax and dasabuvir and ribavirin in phase 3 clinical trials, although some adverse reactions were increased in frequency. 10 subjects (29.4%) had at least one post baseline haemoglobin value of less than 10 g/dL. 10 of 34 subjects (29.4%) dose modified ribavirin due to decrease in haemoglobin and 2.9% (1/34) had an interruption of ribavirin. Ribavirin dose modification did not impact SVR rates. 5 subjects required erythropoietin, all of whom initiated ribavirin at the starting dose of 1000 to 1200 mg daily. No subject received a blood transfusion.

*HIV/HCV co-infected patients*

The overall safety profile in HCV/HIV-1 co-infected subjects was similar to that observed in HCV mono-infected subjects. Transient elevations in total bilirubin >3 x ULN (mostly indirect) occurred in 17 (27.0%) subjects; 15 of these subjects were receiving atazanavir. None of the subjects with hyperbilirubinemia had concomitant elevations of aminotransferases.

*GT1-infected subjects with or without cirrhosis with severe renal impairment or end-stage renal disease (ESRD)*
Viekirax and dasabuvir with or without ribavirin were assessed in 68 subjects with genotype 1 infection with or without cirrhosis who have severe renal impairment or ESRD (see Section 5.1). The overall safety profile in subjects with severe renal impairment was similar to that seen in prior Phase 3 studies in subjects without severe renal impairment, except that a greater proportion of subjects required intervention due to ribavirin-associated decreases in serum haemoglobin. The mean baseline haemoglobin level was 12.1 g/dL and the mean decline in haemoglobin at the end of treatment for subjects taking RBV was 1.2 g/dL. Thirty-nine of the 50 subjects who received ribavirin required interruption of ribavirin, and 11 of these subjects were also treated with erythropoietin. Four subjects experienced a haemoglobin level < 8 g/dL. Two subjects received a blood transfusion. Adverse events of anaemia were not seen in the 18 GT1b-infected subjects who did not receive ribavirin. Viekirax with or without dasabuvir was also evaluated without ribavirin in 18 GT1a- and GT4-infected patients; no adverse events of anaemia were seen in these subjects.

Paediatric population

The safety of Viekirax in children and adolescents aged < 18 years has not yet been established. No data are available.

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via the national reporting system listed in Appendix V.

**4.9 Overdose**

The highest documented single dose administered to healthy volunteers was 400 mg for paritaprevir (with 100 mg ritonavir), 200 mg for ritonavir (with 100 mg paritaprevir) and 350 mg for ombitasvir. No study related adverse reactions with paritaprevir, ritonavir, or ombitasvir were observed. Transient increases in indirect bilirubin were observed at the highest doses of paritaprevir/ritonavir. In case of overdose, it is recommended that the patient be monitored for any signs or symptoms of adverse reactions or effects and appropriate symptomatic treatment instituted immediately.

## 5. PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Antivirals for systemic use; direct-acting antivirals, ATC code: J05AP53

Mechanism of action

Viekirax, when co-administered with dasabuvir, combines three direct-acting antiviral medicinal products with distinct mechanisms of action and non-overlapping resistance profiles to target HCV at multiple steps in the viral lifecycle. Refer to the Summary of Product Characteristics of dasabuvir for its pharmacological properties.

*Ritonavir*
Ritonavir is not active against HCV. Ritonavir is a CYP3A inhibitor that increases the systemic exposure of the CYP3A substrate paritaprevir.

*Ombitasvir*
Ombitasvir is an inhibitor of HCV NS5A which is essential for viral replication.

*Paritaprevir*
Paritaprevir is an inhibitor of HCV NS3/4A protease which is necessary for the proteolytic cleavage of the HCV encoded polyprotein (into mature forms of the NS3, NS4A, NS4B, NS5A, and NS5B proteins) and is essential for viral replication.

Activity in cell culture and/or biochemical studies

*Ombitasvir*
The $EC_{50}$ of ombitasvir against genotype 1a-H77 and 1b-Con1 strains in HCV replicon cell culture assays was 14.1 and 5 pM, respectively. The activity of ombitasvir was attenuated 11- to 13-fold in the presence of 40% human plasma. The mean $EC_{50}$ of ombitasvir against replicons containing NS5A from a panel of treatment-naïve genotype 1a and 1b isolates in the HCV replicon cell culture assay was 0.66 pM (range 0.35 to 0.88 pM; n=11) and 1.0 pM (range 0.74 to 1.5 pM; n=11), respectively. Ombitasvir has $EC_{50}$ values of 12, 4.3, 19, 1.7, 3.2, and 366 pM against replicon cell lines constructed with NS5A from single isolates representing genotypes 2a, 2b, 3a, 4a, 5a, and 6a, respectively.

*Paritaprevir*
The $EC_{50}$ of paritaprevir against genotype 1a-H77 and 1b-Con1 strains in the HCV replicon cell culture assay was 1.0 and 0.21 nM, respectively. The activity of paritaprevir was attenuated 24 to 27 -fold in the presence of 40% human plasma. The mean $EC_{50}$ of paritaprevir against replicons containing NS3 from a panel of treatment-naïve genotype 1a and 1b isolates in the HCV replicon cell culture assay was 0.86 nM (range 0.43 to 1.87 nM; n=11) and 0.06 nM (range 0.03 to 0.09 nM; n=9), respectively. Paritaprevir had an $EC_{50}$ value of 5.3 nM against the 2a-JFH-1 replicon cell line, and $EC_{50}$ values of 19, 0.09, and 0.68 nM against replicon cell lines containing NS3 from a single isolate each of genotype 3a, 4a, and 6a, respectively
Ritonavir did not exhibit a direct antiviral effect on the replication of HCV subgenomic replicons, and the presence of ritonavir did not affect the *in vitro* antiviral activity of paritaprevir.

Resistance

*In cell culture*

*Genotype 1*

Resistance to paritaprevir and ombitasvir conferred by variants in NS3 and NS5A respectively, selected in cell culture or identified in Phase 2b and 3 clinical trials were phenotypically characterised in the appropriate genotype 1a or 1b replicons.

In genotype 1a, substitutions F43L, R155K, A156T, and D168A/F/H/V/Y in HCV NS3 reduced susceptibility to paritaprevir. In the genotype 1a replicon, the activity of paritaprevir was reduced 20-, 37-, and 17-fold by the F43L, R155K and A156T substitutions, respectively. The activity of paritaprevir was reduced 96-fold by D168V, and 50- to 219-fold by each of the other D168 substitutions. The activity of paritaprevir in genotype 1a was not significantly affected (less than or equal to 3-fold) by single substitutions V36A/M, V55I, Y56H, Q80K or E357K. Double variants including combinations of V36LM, F43L, Y56H, Q80K or E357K with R155K or with a D168 substitution reduced the activity of paritaprevir by an additional 2 to 3-fold relative to the single R155K or D168 substitution. In the genotype 1b replicon, the activity of paritaprevir was reduced 76- and 159-and 337- fold by D168A, D168H, D168V, and D168Y respectively. Y56H alone could not be evaluated due to poor replication capacity, however, the combination of Y56H and D168A/V/Y reduced the activity of paritaprevir by 700- to 4118-fold.

In genotype 1a, substitutions M28T/V, Q30E/R, L31V, H58D, Y93C/H/N, and M28V + Q30R in HCV NS5A reduced susceptibility to ombitasvir. In the genotype 1a replicon, the activity of ombitasvir was reduced by 896-, 58- and 243-fold against the M28T/V and H58D substitutions, respectively, and 1326-, 800-, 155-foldand 1675- to 66740- fold by the Q30E/R, L31V and Y93C/H/N substitutions, respectively. Y93H, Y93N or M28V in combination with Q30R reduced the activity of ombitasvir by more than 42,802-fold. In genotype 1b, substitutions L28T, L31F/V, as well as Y93H alone or in combination with L28M, R30Q, L31F/M/V or P58S in HCV NS5A reduced susceptibility to ombitasvir. In the genotype 1b replicon, the activity of ombitasvir was reduced by less than 10-fold by variants at amino acid positions 30 and 31. The activity of ombitasvir was reduced by 661-, 77-, 284- and 142-fold against the genotype 1b substitutions L28T, Y93H, R30Q in combination with Y93H, and L31M in combination with Y93H, respectively. All other double substitutions of Y93H in combination with substitutions at positions 28, 31, or 58 reduced the activity of ombitasvir by more than 400-fold.

*Genotype 4*

In genotype 4a, resistance to paritaprevir or ombitasvir by variants in NS3 or NS5A, respectively, selected in cell culture were phenotypically characterised. Substitutions R155C, A156T/V, and D168H/V in HCV NS3 reduced susceptibility to paritaprevir by 40- to 323-fold. Substitution L28V in HCV NS5A reduced the susceptibility to ombitasvir by 21-fold.

*Effect of baseline HCV substitutions/polymorphisms on treatment outcome*
A pooled analysis of subjects with genotype 1 HCV infection, who were treated with ombitasvir, paritaprevir, and dasabuvir (a non-nucleotide NS5B inhibitor) with or without ribavirin in the Phase 2b and 3 clinical trials was conducted to explore the association between baseline NS3/4A, NS5A or NS5B substitutions/polymorphisms and treatment outcome in recommended regimens.

In the greater than 500 genotype 1a baseline samples in this analysis, the most frequently observed resistance-associated variants were M28V (7.4%) in NS5A and S556G (2.9%) in NS5B. Q80K, although a highly prevalent polymorphism in NS3 (41.2% of samples), confers minimal resistance to paritaprevir.

Resistance-associated variants at amino acid positions R155 and D168 in NS3 were rarely observed (less than 1%) at baseline. In the greater than 200 genotype 1b baseline samples in this analysis, the most frequently observed resistance-associated variants observed were Y93H (7.5%) in NS5A, and C316N (17.0%) and S556G (15%) in NS5B. Given the low virologic failure rates observed with recommended treatment regimens for HCV genotype 1a- and 1b-infected subjects, the presence of baseline variants appears to have little impact on the likelihood of achieving SVR.

*In clinical studies*

Of the 2,510 HCV genotype 1 infected subjects who were treated with regimens containing ombitasvir, paritaprevir, and dasabuvir with or without ribavirin (for 8, 12, or 24 weeks) in Phase 2b and 3 clinical trials, a total of 74 subjects (3%) experienced virologic failure (primarily post-treatment relapse). Treatment-emergent variants and their prevalence in these virologic failure populations are shown in Table 5. In the 67 genotype 1a infected subjects, NS3 variants were observed in 50 subjects, NS5A variants were observed in 46 subjects, NS5B variants were observed in 37 subjects, and treatment-emergent variants were seen in all 3 drug targets in 30 subjects. In the 7 genotype 1b infected subjects, treatment-emergent variants were observed in NS3 in 4 subjects, in NS5A in 2 subjects, and in both NS3 and NS5A in 1 subject. No genotype 1b infected subjects had treatment-emergent variants in all 3 drug targets.

**Table 5. Treatment-emergent amino acid substitutions in the pooled analysis of Viekirax and dasabuvir with and without RBV regimens in Phase 2b and Phase 3 clinical trials (N=2510)**

| Target | Emergent amino acid substitutions[a] | Genotype 1a N=67[b] % (n) | Genotype 1b N=7 % (n) |
|---|---|---|---|
| NS3 | V55I[c] | 6 (4) | -- |
| | Y56H[c] | 9 (6) | 42.9 (3)[d] |
| | I132V[c] | 6 (4) | -- |
| | R155K | 13.4 (9) | -- |
| | D168A | 6 (4) | -- |
| | D168V | 50.7 (34) | 42.9 (3)[d] |
| | D168Y | 7.5 (5) | -- |
| | V36A[c], V36M[c], F43L[c], D168H, E357K[c] | < 5% | -- |
| NS5A | M28T | 20.9 (14) | -- |
| | M28V[e] | 9 (6) | -- |
| | Q30R[e] | 40.3 (27) | -- |
| | Y93H | | 28.6 (2) |
| | H58D, H58P, Y93N | < 5% | -- |
| NS5B | A553T | 6.1 (4) | -- |
| | S556G | 33.3 (22) | -- |
| | C316Y, M414T, G554S, S556R, G558R, D559G, D559N, Y561H | < 5% | -- |

a. Observed in at least 2 subjects of the same subtype.
b. N=66 for the NS5B target.
c. Substitutions were observed in combination with other emergent substitutions at NS3 position R155 or D168.
d. Observed in combination in genotype 1b-infected subjects.
e. Observed in combination in 6% (4/67) of the subjects.

Note: The following variants were selected in cell culture but were not treatment-emergent: NS3 variants A156T in genotype 1a, and R155Q and D168H in genotype 1b; NS5A variants Y93C/H in

genotype 1a, and L31F/V or Y93H in combination with L28M, L31F/V or P58S in genotype 1b; and NS5B variants Y448H in genotype 1a, and M414T and Y448H in genotype 1b.

Persistence of resistance-associated substitutions

The persistence of paritaprevir, ombitasvir, and dasabuvir resistance-associated amino acid substitutions in NS3, NS5A, and NS5B, respectively, was assessed in genotype 1a-infected subjects in Phase 2b trials. Paritaprevir treatment-emergent variants V36A/M, R155K or D168V were observed in NS3 in 47 subjects. Ombitasvir treatment-emergent variants M28T, M28V or Q30R in NS5A were observed in 32 subjects. Dasabuvir treatment-emergent variants M414T, G554S, S556G, G558R or D559G/N in NS5B were observed in 34 subjects.

NS3 variants V36A/M and R155K and NS5B variants M414T and S556G remained detectable at post-treatment Week 48, whereas NS3 variant D168V and all other NS5B variants were not observed at post-treatment Week 48. All treatment-emergent variants in NS5A remained detectable at post-treatment Week 48. Due to high SVR rates in genotype 1b, trends in persistence of treatment-emergent variants in this genotype could not be established.

The lack of detection of virus containing a resistance-associated substitution does not indicate that the resistant virus is no longer present at clinically significant levels. The long-term clinical impact of the emergence or persistence of virus containing Viekirax- and dasabuvir-resistance-associated substitutions on future treatment is unknown.

Cross-resistance

Cross-resistance is expected among NS5A inhibitors, NS3/4A protease inhibitors, and non-nucleoside NS5B inhibitors by class. The impact of prior ombitasvir, paritaprevir or dasabuvir treatment experience on the efficacy of other NS5A inhibitors, NS3/4A protease inhibitors, or NS5B inhibitors has not been studied.

Clinical efficacy and safety

*Clinical studies in subjects with genotype 1 hepatitis C infection*
The efficacy and safety of Viekirax in combination with dasabuvir with and without ribavirin was evaluated in eight Phase 3 clinical trials, including two trials exclusively in subjects with cirrhosis (Child-Pugh A), in over 2,360 subjects with genotype 1 chronic hepatitis C infection as summarised in Table 6.

**Table 6. Phase 3 global multicentre studies conducted with Viekirax and dasabuvir with or without ribavirin (RBV).**

| Trial | Number of subjects treated | HCV genotype (GT) | Summary of study design |
|---|---|---|---|
| **Treatment-naïve, without cirrhosis** | | | |
| SAPPHIRE I | 631 | GT1 | Arm A: Viekirax and dasabuvir + RBV<br>Arm B: Placebo |
| PEARL III | 419 | GT1b | Arm A: Viekirax and dasabuvir + RBV<br>Arm B: Viekirax and dasabuvir |
| PEARL IV | 305 | GT1a | Arm A: Viekirax and dasabuvir + RBV<br>Arm B: Viekirax and dasabuvir |
| GARNET (open-label) | 166 | GT1b | Viekirax and dasabuvir (8 weeks) |
| **Peginterferon+ribavirin experienced -, without cirrhosis** | | | |
| SAPPHIRE II | 394 | GT1 | Arm A: Viekirax and dasabuvir + RBV<br>Arm B: Placebo |
| PEARL II (open-label) | 179 | GT1b | Arm A: Viekirax and dasabuvir + RBV<br>Arm B: Viekirax and dasabuvir |
| **Treatment-naïve and peginterferon+ribavirin -experienced, with compensated cirrhosis** | | | |
| TURQUOISE II (open-label) | 380 | GT1 | Arm A: Viekirax and dasabuvir + RBV (12 weeks)<br>Arm B: Viekirax and dasabuvir + RBV (24 weeks) |
| TURQUOISE III (open-label) | 60 | GT1b | Viekirax and dasabuvir (12 weeks) |

In all eight trials, the Viekirax dose was 25 mg/150 mg/100 mg once daily and the dasabuvir dose was 250 mg twice daily. For subjects who received ribavirin, the ribavirin dose was 1000 mg per day for subjects weighing less than 75 kg or 1200 mg per day for subjects weighing greater than or equal to 75 kg.

Sustained virologic response (SVR) was the primary endpoint to determine the HCV cure rate in the Phase 3 studies and was defined as unquantifiable or undetectable HCV RNA 12 weeks after the end of treatment (SVR12). Treatment duration was fixed in each trial and was not guided by subjects' HCV RNA levels (no response guided algorithm). Plasma HCV RNA values were measured during the clinical trials using the COBAS TaqMan HCV test (version 2.0), for use with the High Pure System (except GARNET which used COBAS AmpliPrep/COBAS TaqMan HCV Test v2.0). The High Pure system assay had a lower limit of quantification (LLOQ) of 25 IU per mL and the AmpliPrep assay had a LLOQ of 15 IU per mL.

*Clinical trials in treatment-naïve adults*

*SAPPHIRE-I – genotype 1, treatment-naïve, without cirrhosis*

Design: randomised, global multicentre, double-blind, placebo-controlled
Treatment: Viekirax and dasabuvir with weight-based ribavirin for 12 weeks

Treated subjects (N=631) had a median age of 52 years (range: 18 to 70); 54.5% were male; 5.4% were Black; 15.2% had a history of depression or bipolar disorder; 79.1% had baseline HCV RNA levels of at least 800,000 IU/mL; 15.4% had portal fibrosis (F2) and 8.7% had bridging fibrosis (F3); 67.7% had HCV genotype 1a infection; 32.3% had HCV genotype 1b infection.

**Table 7. SVR12 for genotype 1-infected treatment-naïve subjects in SAPPHIRE-I**

| Treatment outcome | Viekirax and dasabuvir with RBV for 12 weeks | | |
|---|---|---|---|
| | n/N | % | 95% CI |
| **Overall SVR12** | 456/473 | 96.4 | 94.7, 98.1 |
| HCV genotype 1a | 308/322 | 95.7 | 93.4, 97.9 |
| HCV genotype 1b | 148/151 | 98.0 | 95.8, 100.0 |
| **Outcome for subjects without SVR12** | | | |
| On-treatment VF[a] | 1/473 | 0.2 | |
| Relapse | 7/463 | 1.5 | |
| Other[b] | 9/473 | 1.9 | |

a. Confirmed HCV ≥ 25 IU/mL after HCV RNA < 25 IU/mL during treatment, confirmed 1 $\log_{10}$ IU/mL increase in HCV RNA from nadir, or HCV RNA persistently ≥ 25 IU/mL with at least 6 weeks of treatment.

b. Other includes early drug discontinuation not due to virologic failure missing HCV RNA values in the SVR12 window.

No subjects with HCV genotype 1b infection experienced on-treatment virologic failure and one subject with HCV genotype 1b infection experienced relapse.

*PEARL-III – genotype 1b, treatment-naïve, without cirrhosis*

Design: randomised, global multicentre, double-blind, regimen-controlled
Treatment: Viekirax and dasabuvir without ribavirin or with weight-based ribavirin for 12 weeks

Treated subjects (N=419) had a median age of 50 years (range: 19 to 70), 45.8% were male; 4.8% were Black; 9.3% had a history of depression or bipolar disorder; 73.3% had baseline HCV RNA of at least 800,000 IU/mL; 20.3% had portal fibrosis (F2) and 10.0% had bridging fibrosis (F3).

**Table 8. SVR12 for genotype 1b-infected treatment-naïve subjects in PEARL III**

| Treatment outcome | Viekirax and dasabuvir for 12 weeks | | | | | |
|---|---|---|---|---|---|---|
| | With RBV | | | Without RBV | | |
| | n/N | % | 95% CI | n/N | % | 95% CI |
| **Overall SVR12** | 209/210 | 99.5 | 98.6, 100.0 | 20 9/209 | 100 | 98.2, 100.0 |
| **Outcome for subjects without SVR12** | | | | | | |
| On-treatment VF | 1/210 | 0.5 | | 0/209 | 0 | |
| Relapse | 0/210 | 0 | | 0/209 | 0 | |
| Other | 0/210 | 0 | | 0/209 | 0 | |

*PEARL-IV – genotype 1a, treatment-naïve, without cirrhosis*

Design: randomised, global multicentre, double-blind, regimen-controlled

Treatment: Viekirax and dasabuvir without ribavirin or with weight-based ribavirin for 12 weeks

Treated subjects (N=305) had a median age of 54 years (range: 19 to 70); 65.2% were male; 11.8% were Black; 20.7% had a history of depression or bipolar disorder; 86.6% had baseline HCV RNA levels of at least 800,000 IU/mL; 18.4% had portal fibrosis (F2) and 17.7% had bridging fibrosis (F3).

**Table 9. SVR12 for genotype 1a-infected treatment-naïve subjects in PEARL IV**

| Treatment outcome | Viekirax and dasabuvir for 12 weeks | | | | | |
|---|---|---|---|---|---|---|
| | With RBV | | | Without RBV | | |
| | n/N | % | 95% CI | n/N | % | 95% CI |
| **Overall SVR12** | 97/100 | 97.0 | 93.7, 100.0 | 185/205 | 90.2 | 86.2, 94.3 |
| **Outcome for subjects without SVR12** | | | | | | |
| On-treatment VF | 1/100 | 1.0 | | 6/205 | 2.9 | |
| Relapse | 1/98 | 1.0 | | 10/194 | 5.2 | |
| Other | 1/100 | 1.0 | | 4/205 | 2.0 | |

*GARNET – Genotype 1b, Treatment-Naïve without cirrhosis*

Design: open-label, single-arm, global multicentre
Treatment: Viekirax and dasabuvir for 8 weeks

Treated subjects (N=166) had a median age of 53 years (range: 22 to 82); 56.6% were female; 3.0% were Asian; 0.6% were Black; 7.2% had baseline HCV RNA levels of at least 6,000,000 IU per mL; 9% had advanced fibrosis (F3) and 98.2% had HCV genotype 1b infection (one subject each had genotype 1a, 1d, and 6 infection).

**Table 10. SVR12 for Genotype 1b-infected treatment-naïve subjects without cirrhosis**

| | Viekirax and dasabuvir for 8 weeks n/N (%) |
|---|---|
| $SVR_{12}$ | 160/163 (98.2) |
| 95% CI[a] | 96.1, 100.0 |
| F0-F1 | 138/139 (99.3)[b] |
| F2 | 9/9 (100) |
| F3 | 13/15 (86.7)[c] |

a. Calculated using the normal approximation to the binomial distribution
b. 1 patient discontinued due to non-compliance
c. Relapse in 2/15 patients (confirmed HCV RNA ≥ 15 IU/mL post-treatment before or during SVR12 window among subjects with HCV RNA < 15 IU/mL at last observation with at least 51 days of treatment).

*Clinical trials in peginterferon+ribavirin-experienced adults*

*SAPPHIRE-II – genotype 1, pegIFN+RBV-experienced, without cirrhosis*

Design: randomised, global multicentre, double-blind, placebo-controlled
Treatment: Viekirax and dasabuvir with weight-based ribavirin for 12 weeks

Treated subjects (N=394) had a median age of 54 years (range: 19 to 71); 49.0% were prior pegIFN/RBV null responders; 21.8/% were prior pegIFN/RBV partial responders, and 29.2% were prior pegIFN/RBV relapsers; 57.6% were male; 8.1% were Black; 20.6% had a history of depression or bipolar disorder; 87.1% had baseline HCV RNA levels of at least 800,000 IU per mL; 17.8% had portal fibrosis (F2) and 14.5% had bridging fibrosis (F3); 58.4% had HCV genotype 1a infection; 41.4% had HCV genotype 1b infection.

**Table 11. SVR12 for genotype 1-infected peginterferon+ribavirin-experienced subjects in SAPPHIRE-II**

| | Viekirax and dasabuvir with RBV for 12 weeks | | |
|---|---|---|---|
| **Treatment outcome** | **n/N** | **%** | **95% CI** |
| **Overall SVR12** | 286/297 | 96.3 | 94.1, 98.4 |
| **HCV genotype 1a** | 166/173 | 96.0 | 93.0, 98.9 |
| Prior pegIFN/RBV null responder | 83/87 | 95.4 | 91.0, 99.8 |
| Prior pegIFN/RBV partial responder | 36/36 | 100 | 100.0, 100.0 |
| Prior pegIFN/RBV relapser | 47/50 | 94.0 | 87.4, 100.0 |
| **HCV genotype 1b** | 119/123 | 96.7 | 93.6, 99.9 |
| Prior pegIFN/RBV null responder | 56/59 | 94.9 | 89.3, 100.0 |
| Prior pegIFN/RBV partial responder | 28/28 | 100 | 100.0, 100.0 |
| Prior pegIFN/RBV relapser | 35/36 | 97.2 | 91.9, 100.0 |
| **Outcome for subjects without SVR12** | | | |
| On-treatment VF | 0/297 | 0 | |
| Relapse | 7/293 | 2.4 | |
| Other | 4/297 | 1.3 | |

No subjects with HCV genotype 1b infection experienced on-treatment virologic failure and 2 subjects with HCV genotype 1b infection experienced relapse.

*PEARL-II – genotype 1b, pegIFN+RBV-experienced, without cirrhosis*

Design: randomised, global multicentre, open-label
Treatment: Viekirax and dasabuvir without ribavirin or with weight-based ribavirin for 12 weeks

Treated subjects (N=179) had a median age of 57 years (range: 26 to 70); 35.2% were prior pegIFN/RBV null responders; 28.5% were prior pegIFN/RBV partial responders, and 36.3% were prior pegIFN/RBV relapsers; 54.2% were male; 3.9% were Black; 12.8% had a history of depression or bipolar disorder; 87.7% had baseline HCV RNA levels of at least 800,000 IU/mL; 17.9% had portal fibrosis (F2) and 14.0% had bridging fibrosis (F3).

**Table 12. SVR12 for genotype 1b-infected peginterferon+ribavirin-experienced subjects in PEARL II**

| Treatment outcome | Viekirax and dasabuvir for 12 weeks | | | | | |
|---|---|---|---|---|---|---|
| | With RBV | | | Without RBV | | |
| | n/N | % | 95% CI | n/N | % | 95% CI |
| **Overall SVR12** | 86/88 | 97.7 | 94.6, 100.0 | 91/91 | 100 | 95.9, 100.0 |
| Prior pegIFN/RBV null responder | 30/31 | 96.8 | 90.6, 100.0 | 32/32 | 100 | 89.3, 100.0 |
| Prior pegIFN/RBV partial responder | 24/25 | 96.0 | 88.3, 100.0 | 26/26 | 100 | 87.1, 100.0 |
| Prior pegIFN/RBV relapser | 32/32 | 100 | 89.3, 100.0 | 33/33 | 100 | 89.6, 100.0 |
| **Outcome for subjects without SVR12** | | | | | | |
| On-treatment VF | 0/88 | 0 | | 0/91 | 0 | |
| Relapse | 0/88 | 0 | | 0/91 | 0 | |
| Other | 2/88 | 2.3 | | 0/91 | 0 | |

*Clinical trial in subjects with compensated cirrhosis*

*TURQUOISE-II – treatment-naïve or pegIFN + RBV-experienced with compensated cirrhosis*

Design: randomised, global multicentre, open-label
Treatment: Viekirax and dasabuvir with weight-based ribavirin for 12 or 24 weeks

Treated subjects (N=380) had a median age of 58 years (range: 21 to 71); 42.1% were treatment-naïve, 36.1% were prior pegIFN/RBV null responders; 8.2% were prior pegIFN/RBV partial responders, 13.7% were prior pegIFN/RBV relapsers; 70.3% were male; 3.2% were Black; 14.7% had platelet counts of less than 90 x $10^9$/L; 49.7% had albumin less than 40 g/L; 86.1% had baseline HCV RNA levels of at least 800,000 IU/mL; 24.7% had a history of depression or bipolar disorder; 68.7% had HCV genotype 1a infection, 31.3% had HCV genotype 1b infection.

**Table 13. SVR12 for genotype 1-infected subjects with compensated cirrhosis who were treatment-naïve or previously treated with pegIFN/RBV**

| Treatment outcome | Viekirax and dasabuvir with RBV | | | | | |
|---|---|---|---|---|---|---|
| | 12 weeks | | | 24 weeks | | |
| | n/N | % | CI[a] | n/N | % | CI[a] |
| **Overall SVR12** | 191/208 | 91.8 | 87.6, 96.1 | 166/172 | 96.5 | 93.4, 99.6 |
| **HCV genotype 1a** | 124/140 | 88.6 | 83.3, 93.8 | 115/121 | 95.0 | 91.2, 98.9 |
| Treatment naïve | 59/64 | 92.2 | | 53/56 | 94.6 | |
| Prior pegIFN/RBV null responders | 40/50 | 80.0 | | 39/42 | 92.9 | |
| Prior pegIFN/RBV partial responders | 11/11 | 100 | | 10/10 | 100 | |
| Prior pegIFN/RBV Prior relapsers | 14/15 | 93.3 | | 13/13 | 100 | |
| **HCV genotype 1b** | 67/68 | 98.5 | 95.7, 100 | 51/51 | 100 | 93.0, 100 |
| Treatment naïve | 22/22 | 100 | | 18/18 | 100 | |
| Prior pegIFN/RBV null responders | 25/25 | 100 | | 20/20 | 100 | |
| Prior pegIFN/RBV partial responders | 6/7 | 85.7 | | 3/3 | 100 | |
| Prior pegIFN/RBV Prior relapsers | 14/14 | 100 | | 10/10 | 100 | |
| **Outcome for subjects without SVR12** | | | | | | |
| On-treatment VF | 1/208 | 0.5 | | 3/172 | 1.7 | |
| Relapse | 12/203 | 5.9 | | 1/164 | 0.6 | |
| Other | 4/208 | 1.9 | | 2/172 | 1.21 | |

a. 97.5% confidence intervals are used for the primary efficacy endpoints (overall SVR12 rate); 95% confidence intervals are used for additional efficacy endpoints (SVR12 rates in HCV genotype 1a and 1b-infected subjects).

Relapse rates in GT1a cirrhotic subjects by baseline laboratory values are presented in Table 14.

**Table 14. TURQUOISE-II: Relapse Rates by Baseline Laboratory Values after 12 and 24 Weeks of Treatment in Subjects with Genotype 1a Infection and Compensated Cirrhosis**

| | Viekirax and dasabuvir with RBV 12-week arm | Viekirax and dasabuvir with RBV 24-week arm |
|---|---|---|
| Number of Responders at the End of Treatment | 135 | 113 |
| AFP* < 20 ng/mL, platelets ≥ 90 x $10^9$/L, AND albumin ≥ 35 g/L prior to treatment | | |
| Yes (for all three parameters listed above) | 1/87 (1%) | 0/68 (0%) |
| No (for any parameter listed above) | 10/48 (21%) | 1/45 (2%) |
| *AFP= serum alpha fetoprotein | | |

In subjects with all three favourable baseline laboratory values (AFP < 20 ng/mL, platelets ≥ 90 x $10^9$/L, and albumin ≥ 35 g/L), relapse rates were similar in subjects treated for 12 or 24 weeks.

*TURQUOISE-III: treatment-naïve or pegIFN + RBV-experienced with compensated cirrhosis*

Design: global multicentre, open-label
Treatment: Viekirax and dasabuvir without ribavirin for 12 weeks

60 patients were randomized and treated, and 60/60 (100%) achieved SVR12. Main characteristics are shown below.

**Table 15. Main demographics in TURQUOISE-III**

| **Characteristics** | **N = 60** |
|---|---|
| Age, median (range) years | 60.5 (26-78) |
| Male gender, n (%) | 37 (61) |
| Prior HCV Treatment: | |
| naïve, n (%) | 27 (45) |
| Peg-IFN + RBV, n (%) | 33 (55) |
| Baseline albumin, median g/L | 40.0 |
| < 35, n (%) | 10 (17) |
| ≥ 35, n (%) | 50 (83) |
| Baseline platelet count, median ($\times 10^9$/L) | 132.0 |
| < 90, n (%) | 13 (22) |
| ≥ 90, n (%) | 47 (78) |

Pooled analyses of clinical trials

*Durability of response*

Overall, 660 subjects in Phase 2 and 3 clinical trials had HCV RNA results for both the SVR12 and SVR24 time points. Among these subjects, the positive predictive value of SVR12 on SVR24 was 99.8%.

*Pooled efficacy analysis*

In Phase 3 clinical trials, 1075 subjects (including 181 with compensated cirrhosis) with genotype 1 HCV infection received the recommended regimen (see section 4.2). Table 16 shows SVR rates for these subjects.

In subjects who received the recommended regimen, 97% achieved SVR overall (among which 181 subjects with compensated cirrhosis achieved 97% SVR), while 0.5% experienced virologic breakthrough and 1.2% experienced post-treatment relapse.

**Table 16. SVR12 rates for recommended treatment regimens by patient population**

| | HCV Genotype 1b Viekirax and dasabuvir | | HCV Genotype 1a Viekirax and dasabuvir with RBV | |
|---|---|---|---|---|
| | Without cirrhosis | With compensated cirrhosis | Without cirrhosis | With compensated cirrhosis |
| **Treatment duration** | **12 weeks** | **12 weeks** | **12 weeks** | **24 weeks** |
| Treatment-naïve | 100% (210/210) | 100% (27/27) | 96% (403/420) | 95% (53/56) |
| pegIFN + RBV experienced | 100% (91/91) | 100% (33/33) | 96% (166/173) | 95% (62/65) |
| Prior relapse | 100% (33/33) | 100% (3/3) | 94% (47/50) | 100% (13/13) |
| Prior partial response | 100% (26/26) | 100% (5/5) | 100% (36/36) | 100% (10/10) |
| Prior null response | 100% (32/32) | 100% (7/7) | 95% (83/87) | 93% (39/42) |
| Other pegIFN/RBV failures | 0 | 100% (18/18)+ | 0 | 0 |
| **TOTAL** | 100% (301/301) | 100% (60/60) | 96% (569/593) | 95% (115/121) |

+Other types of pegIFN/RBV failure include less well documented non-response, relapse/breakthrough or other pegIFN failure.

Viekirax without ribavirin and without dasabuvir was also evaluated in genotype 1b infected subjects in Phase 2 studies M13-393 (PEARL-I) and M12-536. PEARL I was conducted in the US and Europe, M12-536 in Japan. The treatment-experienced subjects studied were primarily pegIFN/RBV null responders. The doses of ombitasvir, paritaprevir, ritonavir were 25 mg 150 mg, 100 mg once daily in PEARL-I, while the dose of paritaprevir was 100 mg or 150 mg in study M12-536. Treatment duration was 12 weeks for treatment naïve subjects, 12-24 weeks for treatment experienced subjects and 24 weeks for subjects with cirrhosis. Overall, 107 of 113 subjects without cirrhosis and 147 of 155 subjects with cirrhosis achieved SVR12 after 12-24 weeks of treatment.

Viekirax with ribavirin & without dasabuvir was evaluated for 12 weeks in genotype 1 treatment naive and treatment experienced non-cirrhotic subjects in a phase 2 study M11-652 (AVIATOR). The doses of paritaprevir were 100 mg and 200 mg and ombitasvir 25 mg. Ribavirin was dosed based on weight (1000 mg – 1200 mg per day). Overall, 72 of 79 treatment-naive subjects (45 of 52 GT1a and 27 of 27 GT1b) and 40 of 45 treatment-experienced subjects (21 of 26 GT1a and 19 of 19 GT1b) achieved SVR12 after 12 weeks of treatment.

*Impact of ribavirin dose adjustment on probability of SVR*

In Phase 3 clinical trials, 91.5% of subjects did not require ribavirin dose adjustments during therapy. In the 8.5% of subjects who had ribavirin dose adjustments during therapy, the SVR rate (98.5%) was comparable to subjects who maintained their starting ribavirin dose throughout treatment.

*TURQUOISE-I: treatment-naïve or pegIFN + RBV-experienced with HCV GT1 or GT4/HIV-1 co-infection, without cirrhosis or with compensated cirrhosis*

Design: randomised, global multicentre, open-label
Treatment: Viekirax with or without dasabuvir coadminstered with or without weight-based ribavirin for 12 or 24 weeks

See section 4.2 for dosing recommendations in HCV/HIV-1 co-infected patients. HCV GT1- or 4-infected subjects with HIV-1 coinfection were on a stable HIV-1 antiretroviral therapy (ART) regimen that included ritonavir-boosted atazanavir, raltegravir, dolutegravir (Part 2 only), or darunavir (Part 1b and Part 2 GT4 only)-, co-administered with a backbone of tenofovir plus emtricitabine or lamivudine.

Part 1 of the study was a Phase 2 pilot cohort consisting of 2 parts, Part 1a (63 subjects) and Part 1b (22 subjects). Part 2 was a Phase 3 cohort consisting of 233 subjects.

In Part 1a, all subjects received Viekirax and dasabuvir with ribavirin for 12 or 24 weeks. Treated subjects (N = 63) had a median age of 51 years (range: 31 to 69); 24% were Black; 19% had compensated cirrhosis; 67% were treatment-naïve; 33% had failed prior treatment with pegIFN/RBV; 89% had HCV genotype 1a infection.

In Part 1b, all subjects received Viekirax and dasabuvir with ribavirin for 12 weeks. Treated subjects (N = 22) had a median age of 54 years (range: 34 to 68); 41% were Black; 14% had compensated cirrhosis; 86% were HCV treatment-naïve; 14% had failed prior treatment with pegIFN/RBV; 68% had HCV genotype 1a infection.

In Part 2, subjects with HCV GT1 received Viekirax and dasabuvir with or without ribavirin for 12 or 24 weeks. Subjects with HCV GT4 received Viekirax with ribavirin for 12 or 24 Weeks. Treated subjects (N = 233) had a median age of 49 years (range: 26 to 69); 10% were Black; 12% had compensated cirrhosis; 66% were treatment-naïve; 32% had failed prior treatment with pegIFN/RBV; 2% had failed prior treatment with sofosbuvir.

Table 17 shows the primary efficacy analysis of SVR12 performed on subjects with HCV GT1/HIV-1 co-infection that received recommended regimen in Part 2 of the TURQUOISE-I study.

**Table 17. Primary SVR12 Assessment for Part 2 Subjects with HCV GT1/HIV-1 co-infection in TURQUOISE-I**

| Endpoint | Viekirax and dasabuvir with/without ribavirin for 12 or 24 Weeks N = 200[a] |
|---|---|
| SVR12, n/N (%) [95% CI] | 194/200 (97.0) [93.6, 98.6] |
| Outcome for subjects not achieving SVR12 | |
| On-treatment virologic failure | 1 |
| Post-treatment relapse | 1 |
| Other[b] | 4 |

a. Includes all HCV GT1 subjects in Part 2 excluding Arm G subjects that did not receive recommended regimen.

b. Includes subjects who discontinued due to adverse event, loss to follow-up or subject withdrawal, and subjects with reinfection

Efficacy analyses performed on other parts of the study demonstrated similarly high SVR12 rates. In Part 1a, SVR12 was achieved by 29/31 (93.5%) subjects on the 12-week arm (95% CI: 79.3%, 98.2%) and by 29/32 (90.6%) subjects on the 24-week arm (95% CI: 75.8% – 96.8%). There was 1 relapse in the 12-week arm and 1 on-treatment virologic failure in the 24-week arm. In Part 1b, SVR12 was achieved by 22/22 (100%) subjects (95% CI: 85.1%, 100%). In Part 2, SVR12 was achieved by 27/28 (96.4%) subjects with HCV GT4/HIV-1 coinfection (95% CI: 82.3%, 99.4%) with no virologic failures.

The SVR12 rates in HCV/HIV-1 co-infected subjects were thus consistent with SVR12 rates in the phase 3 trials of HCV mono-infected subjects.

*CORAL-I: treatment-naïve or pegIFN + RBV-experienced, at least 3 months post liver transplant or 12 months post renal transplant*

Design: randomised, global multicentre, open-label
Treatment: Viekirax and dasabuvir for 12 or 24 weeks with or without ribavirin ( investigator chosen dose ) for GT1 and GT4 infection

In subjects with liver transplant, no cirrhosis and GT1 infection, patients were dosed with Viekirax and dasabuvir for 12-24 weeks, with and without RBV. Liver transplant subjects with cirrhosis were dosed with Viekirax and dasabuvir with RBV (GT1a for 24 weeks [n=4], GT1b for 12 weeks [n=2]). Subjects with renal transplant and no cirrhosis were dosed for 12 weeks (with RBV for GT1a [n=9], without RBV for GT1b [n=3]). Subjects with liver transplant and GT4 infection were dosed with Viekirax with RBV (non-cirrhotic for 12 weeks [n=2] and cirrhotic for 24 weeks [n=1]. The dose of ribavirin was left to the discretion of the investigator, with most subjects receiving 600 to 800 mg per day as a starting dose, and most subjects also receiving 600 to 800 mg per day at the end of treatment.

A total of 129 subjects were treated, 84 with GT1a, 41 with GT1b, 1 with GT1 other, 3 with GT4 infection. Overall, 61% had fibrosis stage F0-F1, 26% F2, 9% F3, and 4% F4. 61% had prior HCV treatment experience before transplant. For immunosuppressive medication, most subjects were taking tacrolimus (81%), with the remainder taking cyclosporine.

Among all GT1 subjects who were post liver transplant, 111/114 (97.4%) achieved SVR12; with 2 relapsing post treatment and 1 breakthrough on treatment. Among the GT1 subjects who were post renal transplant, 9/12 (75%) achieved SVR12; however, there were no virologic failures. All 3 (100%) subjects with GT4 infection who were post liver transplant achieved SVR12.

*Clinical trial in patients receiving opioid substitution therapy*

In a phase 2, multicentre, open-label, single arm study, 38 treatment-naïve or pegIFN/RBV treatment experienced, non-cirrhotic subjects with genotype 1 infection who were on stable doses of methadone (N=19) or buprenorphine +/- naloxone (N=19) received 12 weeks of Viekirax and dasabuvir with ribavirin. Treated subjects had a median age of 51 years (range: 26 to 64); 65.8% were male and 5.3% were Black. A majority (86.8%) had baseline HCV RNA levels of at least 800,000 IU/mL and a majority (84.2%) had genotype 1a infection; 15.8% had portal fibrosis (F2) and 5.3% had bridging fibrosis (F3); and 94.7% were naïve to prior HCV treatment.

Overall, 37 (97.4%) of 38 subjects achieved SVR12. No subjects experienced on-treatment virologic failure or relapse.

*RUBY-I; treatment-naïve or pegIFN + RBV experienced with or without cirrhosis who have severe renal impairment or end stage renal disease (ESRD)*

Design: multicentre, open-label
Treatment: Viekirax and dasabuvir with or without RBV for 12 or 24 weeks

Severe renal impairment or ESRD includes CKD Stage 4 defined as eGFR <30-15 mL/min/1.73 $m^2$ or CKD Stage 5 defined as <15 mL/min/1.73 $m^2$ or requiring haemodialysis. Treated subjects (N=68) had a median age of 58 years (range: 32-77 years); 83.8% were male; 58.8% were Black; 73.5% of subjects were infected with HCV GT1a; 75.0%% had Stage 5 CKD and 69.1% were on haemodialysis.

Sixty four of 68 (94.1%) subjects achieved SVR12. One subject experienced relapse at Post-Treatment Week 4, 2 subjects prematurely discontinued study drug and 1 subject had missing SVR12 data.

See also Section 4.8 for discussion of safety information for RUBY-I.

In another open-label phase 3b study evaluating 12 weeks of Viekirax with or without dasabuvir and without RBV in non-cirrhotic, treatment-naive GT1a and GT4 patients with CKD stage 4 or 5 (Ruby II), the SVR12 rate was 94.4% (17/18), with no subjects experiencing on-treatment virologic failure or relapse.

*Clinical trials in subjects with genotype 4 chronic hepatitis C*

*PEARL- I– genotype 4, treatment-naïve or pegIFN + RBV experienced without cirrhosis*

Design: randomised, global multicentre, open-label
Treatment: treatment naïve: Viekirax without ribavirin or with weight-based ribavirin for 12 weeks
pegIFN + RBV experienced: Viekirax with weight-based ribavirin for 12 weeks

Subjects (N=135) had a median age of 51 years (range: 19 to 70); 63,7% were treatment-naïve, 17.0% were prior pegIFN/RBV null responders, 6.7% were prior pegIFN/RBV partial responders, 12.6% were prior pegIFN/RBV relapsers; 65.2%were male; 8.9% were Black, 69.6% had baseline HCV RNA levels at least 800,000 IU/mL; 6.7% had bridging fibrosis (F3).

**Table 18. SVR12 for genotype 4-infected, subjects who were treatment-naïve or previously treated with pegIFN/RBV in PEARL I**

| Treatment outcome | Ombitasvir + paritaprevir + ritonavir* for 12 weeks | | | | | |
|---|---|---|---|---|---|---|
| | Treatment-naïve With RBV | | Treatment-naïve Without RBV | | pegIFN + RBV-experienced With RBV | |
| | n/N | % | n/N | % | n/N | % |
| **Overall SVR12** | 42/42 | 100% | 40/44 | 90.9% | 49/49 | 100% |
| **Outcome for subjects without SVR12** | | | | | | |
| On-treatment VF | 0/42 | 0 | 1/44 | 2.3% | 0/49 | 0 |
| Relapse | 0/42 | 0 | 2/44 | 4.5% | 0/49 | 0 |
| Other | 0/42 | 0 | 1/44 | 2.3% | 0/49 | 0 |

* Ombitasvir tablets, paritaprevir tablets and ritonavir capsules administered separately.

*AGATE-1 –treatment-naïve or pegIFN +RBV experienced patients with compensated cirrhosis*

Design: randomised, global multicentre, open-label
Treatment: Viekirax with weight-based ribavirin for 12 or 16 weeks

Subjects had a median age of 56 years (range: 32 to 81); 50% were treatment-naïve, 28% were prior pegIFN/RBV null responders; 10% were prior pegIFN/RBV partial responders, 13% were prior pegIFN/RBV relapsers; 70% were male; 17% were Black; 73% had baseline HCV RNA levels of at least 800,000 IU per mL; 17% had platelet counts of less than 90 x $10^9$ per L; and 4% had albumin less than 3.5 mg per dL.

**Table 19. SVR12 for HCV Genotype 4-Infected Subjects with Compensated Cirrhosis**

| | **Ombitasvir + Paritaprevir + Ritonavir with RBV** | |
|---|---|---|
| | **12 Weeks** | **16 Weeks** |
| **SVR12 % (n/N)** | 97% (57/59) | 98% (60/61) |
| **Outcome for subjects without SVR12** | | |
| On-treatment virologic failure | 2 (1/59) | 0 (0/61) |
| Post-treatment relapse | 0 (0/57) | 0 (0/59) |
| Other | 2 (1/59) | 2 (1/61) |

*Paediatric population*

The European Medicines Agency has deferred the obligation to submit the results of studies with Viekirax in one or more subsets of the paediatric populations in the treatment of chronic hepatitis C (see section 4.2 for information on paediatric use).

## 5.2 Pharmacokinetic properties

The pharmacokinetic properties of the combination of Viekirax with dasabuvir have been evaluated in healthy adult subjects and in subjects with chronic hepatitis C. Table 20 shows mean $C_{max}$ and AUC of Viekirax 25 mg/150 mg/100 mg once daily with dasabuvir 250 mg twice daily following multiple doses with food in healthy volunteers.

**Table 20. Geometric mean $C_{max}$, AUC of multiple doses of Viekirax 150 mg/100 mg/25 mg once daily with dasabuvir 250 mg twice daily with food in healthy volunteers**

| | **$C_{max}$ (ng/ml) (% CV)** | **AUC (ng*hr/ml) (% CV)** |
|---|---|---|
| Ombitasvir | 127 (31) | 1420 (36) |
| Paritaprevir | 1470 (87) | 6990 (96) |
| Ritonavir | 1600 (40) | 9470 (41) |

Absorption

Ombitasvir, paritaprevir and ritonavir were absorbed after oral administration with mean $T_{max}$ of approximately 4 to 5 hours. While ombitasvir exposures increased in a dose proportional manner, paritaprevir and ritonavir exposures increased in a more than dose proportional manner. Accumulation is

minimal for ombitasvir and approximately 1.5- to 2-fold for ritonavir and paritaprevir. Pharmacokinetic steady state for the combination is achieved after approximately 12 days of dosing.

The absolute bioavailability of ombitasvir and paritaprevir was approximately 50% when administered with food as Viekirax.

*Effect of paritaprevir/ritonavir on ombitasvir and dasabuvir*

In the presence of paritaprevir/ritonavir, dasabuvir exposures decreased by approximately 50% to 60% while ombitasvir exposures increased by 31-47%.

*Effect of ombitasvir on paritaprevir/ritonavir and dasabuvir*

In the presence of ombitasvir, paritaprevir exposures were minimally affected (5% to 27% change) while dasabuvir exposures increase by approximately 30%.

*Effect of dasabuvir on paritaprevir/ritonavir and ombitasvir*

In the presence of dasabuvir, paritaprevir exposures increased by 50% to 65% while there was no change in ombitasvir exposures.

*Effects of food*

Ombitasvir, paritaprevir and ritonavir should be administered with food. All clinical trials with ombitasvir, paritaprevir and ritonavir have been conducted following administration with food.

Food increased the exposure (AUC) of ombitasvir, paritaprevir and ritonavir by up to 82%, 211% and 49%, respectively relative to the fasting state. The increase in exposure was similar regardless of meal type (e.g., high-fat versus moderate-fat) or calorie content (approximately 600 Kcal versus approximately 1000 Kcal). To maximise absorption, Viekirax should be taken with food without regard to fat or calorie content.

Distribution

Ombitasvir, paritaprevir and ritonavir are highly bound to plasma proteins. Plasma protein binding is not meaningfully altered in subjects with renal or hepatic impairment. The blood to plasma concentration ratios in humans ranged from 0.6 to 0.8 indicating that ombitasvir and paritaprevir were preferentially distributed in the plasma compartment of whole blood. Ombitasvir was approximately 99.9% bound to human plasma proteins. Paritaprevir was approximately 97-98.6% bound to human plasma proteins. Ritonavir was greater than 99% bound to human plasma proteins.

*In vitro* data indicate that paritaprevir is a substrate for the human hepatic uptake transporters, OATP1B1 and OATP1B3.

Biotransformation

*Ombitasvir*

Ombitasvir is metabolised via amide hydrolysis followed by oxidative metabolism. Following a 25 mg single dose of $^{14}$C-ombitasvir given alone, unchanged parent drug accounted for 8.9% of total radioactivity in human plasma; a total of 13 metabolites were identified in human plasma. These metabolites are not expected to have antiviral activity or off-target pharmacologic activity.

*Paritaprevir*

Paritaprevir is metabolised predominantly by CYP3A4 and to a lesser extent CYP3A5. Following administration of a single 200 mg/100 mg oral dose of $^{14}C$ paritaprevir /ritonavir to humans, the parent drug was the major circulating component, accounting for approximately 90% of the plasma radioactivity. At least 5 minor metabolites of paritaprevir have been identified in circulation that accounted for approximately 10% of plasma radioactivity. These metabolites are not expected to have antiviral activity.

*Ritonavir*

Ritonavir is predominantly metabolised by CYP3A and to a lesser extent, by CYP2D6. Nearly the entire plasma radioactivity after a single 600 mg dose of $^{14}C$-ritonavir oral solution in humans was attributed to unchanged ritonavir.

Elimination

*Ombitasvir*

Following dosing of ombitasvir/paritaprevir/ritonavir with or without dasabuvir, mean plasma half-life of ombitasvir was approximately 21 to 25 hours. Following a single 25 mg dose of $^{14}C$- ombitasvir approximately 90% of the radioactivity was recovered in faeces and 2% in urine. Unchanged parent drug accounted for 88% of total radioactivity recovered in faeces, indicating that biliary excretion is a major elimination pathway for ombitasvir.

*Paritaprevir*

Following dosing of ombitasvir/paritaprevir /ritonavir with or without dasabuvir, mean plasma half-life of paritaprevir was approximately 5.5 hours. Following a 200 mg $^{14}C$ -paritaprevir dose with 100 mg ritonavir, approximately 88% of the radioactivity was recovered in faeces with limited radioactivity (8.8%) in urine. Metabolism as well as biliary excretion of parent drug contribute to the elimination of paritaprevir.

*Ritonavir*

Following dosing of ombitasvir/paritaprevir /ritonavir, mean plasma half-life of ritonavir was approximately 4 hours. Following a 600 mg dose of $^{14}C$ -ritonavir oral solution, 86.4% of the radioactivity was recovered in the faeces and 11.3% of the dose was excreted in the urine.

*In vitro* interaction data

Ombitasvir and paritaprevir do not inhibit organic anion transporter (OAT1) *in vivo* and are not expected to inhibit organic cation transporters (OCT1 and OCT2), organic anion transporters (OAT3), or multidrug and toxin extrusion proteins (MATE1 and MATE2K) at clinically relevant concentrations. Ritonavir does not inhibit OAT1 and is not expected to inhibit OCT2, OAT3, MATE1 and MATE2K at clinically relevant concentrations.

Special populations

*Elderly*

Based on population pharmacokinetic analysis of data from Phase 3 clinical studies, a 10 year increase or decrease in age from 54 years (median age in the Phase 3 studies) would result in approximately 10% change in ombitasvir exposures, and ≤20% change in paritaprevir exposures. There is no pharmacokinetic information in patients >75 years.

*Sex or body weight*

Based on population pharmacokinetic analysis of data from Phase 3 clinical studies, female subjects would have approximately 55% higher, 100% higher and 15% higher ombitasvir, paritaprevir and ritonavir exposures than male subjects. However, no dose-adjustment based on gender is warranted. A 10 kg change in body weight from 76 kg (median weight in the Phase 3 studies) would results in <10% change in ombitasvir exposures, and no change in paritaprevir exposures. Body weight is not a significant predictor of ritonavir exposures.

*Race or ethnicity*

Based on population pharmacokinetic analysis of data from Phase 3 clinical studies, Asian subjects had 18% to 21% higher ombitasvir exposures, and 37% to 39% higher paritaprevir exposures than non-Asian subjects. The ritonavir exposures were comparable between Asians and non-Asians.

*Renal impairment*

The changes in ombitasvir, paritaprevir, and ritonavir exposures in subjects with mild, moderate and severe renal impairment are not considered to be clinically significant. Limited data in patients with end-stage renal disease indicate no clinically significant changes in exposure also in this patient group. No dose adjustment of Viekirax with and without dasabuvir is required for patients with mild, moderate or severe renal impairment , or end-stage-renal disease on dialysis (see section 4.2).

Pharmacokinetics of the combination of ombitasvir 25 mg, paritaprevir 150 mg, and ritonavir 100 mg, with or without dasabuvir 400 mg were evaluated in subjects with mild (CrCl: 60 to 89 ml/min), moderate (CrCl: 30 to 59 ml/min) and severe (CrCl: 15 to 29 ml/min) renal impairment.

*Following administration of Viekirax and dasabuvir*

Compared to the subjects with normal renal function, ombitasvir exposures were comparable in subjects with mild, moderate and severe renal impairment. Compared to the subjects with normal renal function, paritaprevir $C_{max}$ values were comparable, but AUC values were 19%, 33% and 45% higher in mild, moderate and severe renal impairment, respectively. Ritonavir plasma concentrations increased when renal function was reduced: $C_{max}$ and AUC values were 26% to 42% higher**,** 48% to 80% higher and 66% to 114% higher in subjects with mild, moderate and severe renal impairment, respectively.

*Following administration of Viekirax*

Following administration of Viekirax, the changes in ombitasvir, paritaprevir, and ritonavir exposures in subjects with mild, moderate and severe renal impairment were similar to those observed when Viekirax was administered with dasabuvir, and are not considered to be clinically significant.

*Hepatic impairment*

*Following administration of Viekirax and dasabuvir*

Pharmacokinetics of the combination of ombitasvir 25 mg, paritaprevir 200 mg, and ritonavir 100 mg, with dasabuvir 400 mg were evaluated in non-HCV infected subjects with mild (Child-Pugh A), moderate (Child-Pugh B) and severe (Child-Pugh C) hepatic impairment.

In subjects with mild hepatic impairment, paritaprevir, ritonavir and ombitasvir mean $C_{max}$ and AUC values decreased by 29% to 48%, 34% to 38% and up to 8%, respectively, compared to subjects with normal hepatic function.

In subjects with moderate hepatic impairment, ombitasvir and ritonavir mean $C_{max}$ and AUC values decreased by 29% to 30% and 30 to 33%, respectively, while paritaprevir mean $C_{max}$ and AUC values increased by 26% to 62% compared to subjects with normal hepatic function. (see sections 4.2, 4.4, and 4.8).

In subjects with severe hepatic impairment, paritaprevir mean $C_{max}$ and AUC values increased by 3.2-to 9.5-fold; ritonavir mean $C_{max}$ values were 35% lower and AUC values were 13% higher and ombitasvir mean $C_{max}$ and AUC values decreased by 68% and 54%, respectively, compared to subjects with normal hepatic function, therefore, Viekirax must not be used in patients with severe hepatic impairment (see sections 4.2 and 4.4).

In HCV-infected subjects, in comparison to those without cirrhosis, paritaprevir AUC increased to 2.2- to 2.4-fold for those with compensated cirrhosis (Child-Pugh A) and 3- to 4-fold for those with Child-Pugh B cirrhosis.

*Following administration of Viekirax*

Pharmacokinetics of the combination of ombitasvir 25 mg, paritaprevir 200 mg, and ritonavir 100 mg were not evaluated in subjects with mild (Child-Pugh A), moderate (Child-Pugh B) and severe (Child-Pugh C) hepatic impairment. Results from the pharmacokinetic evaluation of the combination of ombitasvir 25 mg, paritaprevir 200 mg, and ritonavir 100 mg, with dasabuvir 400 mg can be extrapolated to the combination of ombitasvir 25 mg, paritaprevir 200 mg, and ritonavir 100 mg.

*Paediatric population*

The pharmacokinetics of Viekirax in paediatric patients has not been established (see section 4.2).

## 5.3 Preclinical safety data

*Ombitasvir*

Ombitasvir and its major inactive human metabolites (M29, M36) were not genotoxic in a battery of *in vitro* or *in vivo* assays, including bacterial mutagenicity, chromosome aberration using human peripheral blood lymphocytes and *in vivo* mouse micronucleus assays.

Ombitasvir was not carcinogenic in a 6-month transgenic mouse study up to the highest dosage tested (150 mg/kg/day), resulting in ombitasvir AUC exposures approximately 26-fold higher than those in humans at the recommended clinical dose of 25 mg.

Similarly, ombitasvir was not carcinogenic in a 2-year rat study up to the highest dose tested (30 mg per kg per day), resulting in ombitasvir exposures approximately 16-fold higher than those in humans at 25 mg.

Ombitasvir has shown malformations in rabbits at maximal feasible exposures 4-fold higher than the AUC exposure at recommended clinical dose. Malformations at low incidence were observed mainly in the eyes (microphthalmia) and teeth (absent incisors). In mice, an increased incidence of open eye lid was present in foetuses of dams administered ombitasvir; however, the relationship to treatment with ombitasvir is uncertain. The major, inactive human metabolites of ombitasvir were not teratogenic in mice at exposures approximately 26 times higher than in humans at the recommended clinical dose. Ombitasvir had no effect on fertility when evaluated in mice.
Unchanged ombitasvir was the predominant component observed in the milk of lactating rats, without effect on nursing pups. Ombitasvir-derived material was minimally transferred through the placenta in pregnant rats.

*Paritaprevir/ritonavir*

Paritaprevir was positive in an *in vitro* human chromosome aberration test. Paritaprevir was negative in a bacterial mutation assay, and in two *in vivo* genetic toxicology assays (rat bone marrow micronucleus and rat liver Comet tests).

Paritaprevir /ritonavir was not carcinogenic in a 6-month transgenic mouse study up to the highest dosage tested (300 mg/30 mg/kg/day), resulting in paritaprevir AUC exposures approximately 38-fold higher than those in humans at the recommended dose of 150 mg. Similarly, paritaprevir/ritonavir was not carcinogenic in a 2-year rat study up to the highest dosage tested (300 mg/30 mg/kg/day), resulting in paritaprevir AUC exposures approximately 8-fold higher than those in humans at 150 mg.

Paritaprevir/ritonavir has shown malformations (open eye lids) at a low incidence in mice at exposures 32/8-fold higher than the exposure in humans at the recommended clinical dose. Paritaprevir/ritonavir had no effects on embryo-foetal viability or on fertility when evaluated in rats at exposures 2- to 8-fold higher than the exposure in humans at the recommended clinical dose.
Paritaprevir and its hydrolysis product M13 were the predominant components observed in the milk of lactating rats, without effect on nursing pups. Paritaprevir -derived material was minimally transferred through the placenta in pregnant rats.

## 6. PHARMACEUTICAL PARTICULARS

### 6.1 List of excipients

Tablet core

Copovidone
Tocofersolan
Propylene glycol monolaurate
Sorbitan monolaurate
Colloidal anhydrous silica (E 551)
Sodium stearyl fumarate

Film-coating

Poly(vinyl alcohol) (E 1203)
Macrogol (3350)
Talc (E 553b)
Titanium dioxide (E 171)

Iron oxide red (E 172)

### 6.2 Incompatibilities

Not applicable.

### 6.3 Shelf life

3 years.

### 6.4 Special precautions for storage

This medicinal product does not require any special storage conditions.

### 6.5 Nature and contents of container

PVC/PE/PCTFE aluminium foil blister packs.
Pack-size of 56 tablets (multipack carton containing 4 inner cartons of 14 tablets each).

### 6.6 Special precautions for disposal

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

## 7. MARKETING AUTHORISATION HOLDER

AbbVie Deutschland GmbH & Co. KG
Knollstrasse
67061 Ludwigshafen
Germany

## 8. MARKETING AUTHORISATION NUMBER(S)

EU/1/14/982/001

## 9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

Date of first authorisation: 15 January 2015
Date of latest renewal: 19 September 2019

## 10. DATE OF REVISION OF THE TEXT

Detailed information on this medicinal product is available on the website of the European Medicines Agency http://www.ema.europa.eu.

# ANNEX II

**A. MANUFACTURER(S) RESPONSIBLE FOR BATCH RELEASE**

**B. CONDITIONS OR RESTRICTIONS REGARDING SUPPLY AND USE**

**C. OTHER CONDITIONS AND REQUIREMENTS OF THE MARKETING AUTHORISATION**

**D. CONDITIONS OR RESTRICTIONS WITH REGARD TO THE SAFE AND EFFECTIVE USE OF THE MEDICINAL PRODUCT**

## A. MANUFACTURER(S) RESPONSIBLE FOR BATCH RELEASE

AbbVie Deutschland GmbH & Co. KG
Knollstrasse
67061 Ludwigshafen
GERMANY

## B. CONDITIONS OR RESTRICTIONS REGARDING SUPPLY AND USE

Medicinal product subject to restricted medical prescription (see Annex I: Summary of Product Characteristics, section 4.2).

## C. OTHER CONDITIONS AND REQUIREMENTS OF THE MARKETING AUTHORISATION

- **Periodic safety update reports (PSURs)**

The requirements for submission of PSURs for this medicinal product are set out in the list of Union reference dates (EURD list) provided for under Article 107c(7) of Directive 2001/83/EC and any subsequent updates published on the European medicines web-portal.

## D. CONDITIONS OR RESTRICTIONS WITH REGARD TO THE SAFE AND EFFECTIVE USE OF THE MEDICINAL PRODUCT

- **Risk management plan (RMP)**

The marketing authorisation holder (MAH) shall perform the required pharmacovigilance activities and interventions detailed in the agreed RMP presented in Module 1.8.2 of the marketing authorisation and any agreed subsequent updates of the RMP.

An updated RMP should be submitted:

- At the request of the European Medicines Agency;
- Whenever the risk management system is modified, especially as the result of new information being received that may lead to a significant change to the benefit/risk profile or as the result of an important (pharmacovigilance or risk minimisation) milestone being reached.

**ANNEX III**

**LABELLING AND PACKAGE LEAFLET**

**A. LABELLING**

**PARTICULARS TO APPEAR ON THE OUTER PACKAGING**

**Outer carton of multipack containing 56 (4 packs of 14) film-coated tablets - including blue box**

## 1. NAME OF THE MEDICINAL PRODUCT

Viekirax 12.5 mg / 75 mg / 50 mg film-coated tablets
ombitasvir / paritaprevir / ritonavir

## 2. STATEMENT OF ACTIVE SUBSTANCE(S)

Each film coated tablet contains 12.5 mg of ombitasvir, 75 mg of paritaprevir and 50 mg of ritonavir.

## 3. LIST OF EXCIPIENTS

## 4. PHARMACEUTICAL FORM AND CONTENTS

Multipack: 56 (4 packs of 14) film-coated tablets

## 5. METHOD AND ROUTE(S) OF ADMINISTRATION

Read the package leaflet before use.
Oral use
Take **two** tablets in the morning

## 6. SPECIAL WARNING THAT THE MEDICINAL PRODUCT MUST BE STORED OUT OF THE SIGHT AND REACH OF CHILDREN

Keep out of the sight and reach of children.

## 7. OTHER SPECIAL WARNING(S), IF NECESSARY

## 8. EXPIRY DATE

EXP

## 9. SPECIAL STORAGE CONDITIONS

**10. SPECIAL PRECAUTIONS FOR DISPOSAL OF UNUSED MEDICINAL PRODUCTS OR WASTE MATERIALS DERIVED FROM SUCH MEDICINAL PRODUCTS, IF APPROPRIATE**

**11. NAME AND ADDRESS OF THE MARKETING AUTHORISATION HOLDER**

AbbVie Deutschland GmbH & Co. KG
Knollstrasse
67061 Ludwigshafen
Germany

**12. MARKETING AUTHORISATION NUMBER(S)**

EU/1/14/982/001

**13. BATCH NUMBER**

Lot

**14. GENERAL CLASSIFICATION FOR SUPPLY**

**15. INSTRUCTIONS ON USE**

**16. INFORMATION IN BRAILLE**

viekirax

**17. UNIQUE IDENTIFIER – 2D BARCODE**

2D barcode carrying the unique identifier included.

**18. UNIQUE IDENTIFIER - HUMAN READABLE DATA**

PC:
SN:
NN:

**PARTICULARS TO APPEAR ON THE OUTER PACKAGING**

**Inner carton of multipack of 14 film-coated tablets – without blue box**

## 1. NAME OF THE MEDICINAL PRODUCT

Viekirax 12.5 mg / 75 mg / 50 mg film-coated tablets
ombitasvir / paritaprevir / ritonavir

## 2. STATEMENT OF ACTIVE SUBSTANCE(S)

Each film coated tablet contains 12.5 mg of ombitasvir, 75 mg of paritaprevir and 50 mg of ritonavir.

## 3. LIST OF EXCIPIENTS

## 4. PHARMACEUTICAL FORM AND CONTENTS

14 film-coated tablets
Component of a multipack, can't be sold separately.

## 5. METHOD AND ROUTE(S) OF ADMINISTRATION

Read the package leaflet before use.
Oral use
Take **two** tablets in the morning.

## 6. SPECIAL WARNING THAT THE MEDICINAL PRODUCT MUST BE STORED OUT OF THE SIGHT AND REACH OF CHILDREN

Keep out of the sight and reach of children.

## 7. OTHER SPECIAL WARNING(S), IF NECESSARY

## 8. EXPIRY DATE

EXP

## 9. SPECIAL STORAGE CONDITIONS

**10. SPECIAL PRECAUTIONS FOR DISPOSAL OF UNUSED MEDICINAL PRODUCTS OR WASTE MATERIALS DERIVED FROM SUCH MEDICINAL PRODUCTS, IF APPROPRIATE**

**11. NAME AND ADDRESS OF THE MARKETING AUTHORISATION HOLDER**

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**12. MARKETING AUTHORISATION NUMBER(S)**

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**13. BATCH NUMBER**

Lot

**14. GENERAL CLASSIFICATION FOR SUPPLY**

**15. INSTRUCTIONS ON USE**

**16. INFORMATION IN BRAILLE**

viekirax

**17. UNIQUE IDENTIFIER – 2D BARCODE**

**18. UNIQUE IDENTIFIER - HUMAN READABLE DATA**

**MINIMUM PARTICULARS TO APPEAR ON BLISTERS OR STRIPS**

**BLISTER FOIL**

**1. NAME OF THE MEDICINAL PRODUCT**

Viekirax 12.5 mg / 75 mg / 50 mg tablets
ombitasvir / paritaprevir / ritonavir

**2. NAME OF THE MARKETING AUTHORISATION HOLDER**

AbbVie (as logo)

**3. EXPIRY DATE**

EXP

**4. BATCH NUMBER**

Lot

**5. OTHER**

**B. PACKAGE LEAFLET**

**Package leaflet: Information for the patient**

**Viekirax 12.5 mg/75 mg/50 mg film-coated tablets**
ombitasvir/paritaprevir/ritonavir

**Read all of this leaflet carefully before you start taking this medicine because it contains important information for you.**
- Keep this leaflet. You may need to read it again.
- If you have any further questions, ask your doctor or pharmacist.
- This medicine has been prescribed for you only. Do not pass it on to others. It may harm them, even if their signs of illness are the same as yours.
- If you get any side effects, talk to your doctor or pharmacist. This includes any possible side effects not listed in this leaflet. See section 4.

**What is in this leaflet**


## 1. What Viekirax is and what it is used for

Viekirax contains the active substances ombitasvir, paritaprevir and ritonavir. It is an antiviral medicine used to treat adults with chronic (long-term) hepatitis C (an infectious disease that affects the liver, caused by the hepatitis C virus).
The combined action of the three active substances stops the hepatitis C virus from multiplying and infecting new cells, thus clearing the virus from your blood over a period of time. Ombitasvir and paritaprevir block two proteins essential for the virus to multiply. Ritonavir acts as a 'booster' to prolong the action of paritaprevir in the body.

Viekirax tablets are taken with other antiviral medicines such as dasabuvir and ribavirin. Your doctor will talk with you about which of these medicines to take with Viekirax.

It is very important that you also read the package leaflets for the other antiviral medicines that you take with Viekirax. If you have any questions about your medicines, please ask your doctor or pharmacist.

## 2. What you need to know before you take Viekirax

**Do not take Viekirax**
- If you are allergic to ombitasvir, paritaprevir, ritonavir, or any of the other ingredients of this medicine (listed in section 6).
- If you have moderate to severe liver problems other than hepatitis C.
- If you are taking any of the medicines listed in the following table. This is because serious or life-threatening effects can occur when Viekirax is taken with these medicines. These medicines can affect the way Viekirax works and Viekirax can affect the way these other medicines work.

| Medicines you must not take with Viekirax | |
|---|---|
| **Medicine or active substance** | **Purpose of the medicine** |
| alfuzosin | for an enlarged prostate |
| amiodarone, disopyramide, dronedarone | used to correct irregular heartbeats |
| astemizole, terfenadine | for allergy symptoms. These medicines may be available without a prescription. |
| atorvastatin, lovastatin, simvastatin, lomitapide | to lower blood cholesterol |
| carbamazepine, phenytoin, phenobarbital | for epilepsy |
| cisapride | for relieving certain stomach problems |
| clarithromycin, fusidic acid, rifampicin, telithromycin | for bacterial infections |
| colchicine in patients who have severe problems with their liver or kidneys | for treating gout attacks |
| conivaptan | for making the sodium levels in the blood normal |
| efavirenz, etravirine, lopinavir/ritonavir, saquinavir, tipranavir, nevirapine, indinavir, cobicistat | for HIV infection |
| apalutamide,enzalutamide | for prostate cancer |
| ergotamine, dihydroergotamine | for migraine headaches |
| ergonovine, methylergometrine | used in childbirth |
| ethinyloestradiol-containing medicines such as those contained in most contraceptive pills and vaginal rings used for contraception | for contraception |
| itraconozole, ketoconozole, posaconazole, voriconazole | for fungal infections |
| midazolam, triazolam (when taken by mouth) | for anxiety or trouble sleeping |
| mitotane | for symptoms of malignant tumours of the adrenal glands |
| pimozide, lurasidone | for schizophrenia |
| quetiapine | for schizophrenia, bipolar disorder and major depressive disorder |
| quinidine | for abnormal heart rhythms or malaria |
| ranolazine | for chronic angina (chest pain) |
| salmeterol | for asthma |
| sildenafil | when used to treat a heart and lung disorder called “pulmonary arterial hypertension” |
| St. John’s Wort (*hypericum perforatum*) | a herbal medicine for anxiety and mild depression. This medicine is available without a prescription |
| ticagrelor | stops blood from clotting |



Do not take Viekirax if any of the above apply to you. If you are not sure, talk to your doctor or pharmacist before taking Viekirax.

**Warnings and precautions**

Talk to your doctor or pharmacist before taking Viekirax if you:

- have liver disease other than hepatitis C;

-have a current or previous infection with the hepatitis B virus, since your doctor may want to monitor you more closely.

-have diabetes. You may need closer monitoring of your blood glucose levels and/or adjustment of your diabetes medicines after starting Viekirax. Some diabetic patients have experienced low sugar levels in the blood (hypoglycaemia) after starting treatment with medicines like Viekirax.

When taking Viekirax with dasabuvir, tell your doctor if you have the following symptoms as they may be a sign of worsening liver problems:
- Feel sick (nauseous), are sick (vomit) or lose your appetite
- Notice yellowing of your skin or eyes
- Your urine is darker than normal
- Confusion
- Notice swelling of your stomach area

If any of the above apply to you (or you are not sure), talk to your doctor or pharmacist before taking Viekirax.

Tell your doctor if you have a history of depression or psychiatric illness. Depression, including suicidal thoughts and behaviours, has been reported in some patients taking this medicine, particularly in patients with a prior history of depression or psychiatric illness or in patients taking ribavirin with this medicine. You or your caregiver should also immediately inform your doctor of any changes in behaviour or mood and of any suicidal thoughts you may have.

**Blood tests**
Your doctor will test your blood before, during and after your treatment with Viekirax. This is so that your doctor can:
- Decide what other medicines you should take with Viekirax and for how long.
- Confirm if your treatment has worked and if you are free of the hepatitis C virus.
- Check for side effects of Viekirax or other antiviral medicines your doctor has prescribed for you to use with Viekirax (such as “dasabuvir” and “ribavirin”).

**Children and adolescents**
Do not give Viekirax to children and adolescents under 18 years of age. The use of Viekirax in children and adolescents has not yet been studied.

**Other medicines and Viekirax**
Tell your doctor or pharmacist if you are taking, have recently taken and before starting any other medicines.

There are some medicines you **must not take** with Viekirax see the previous table “Medicines you must not take with Viekirax”.

**Tell your doctor or pharmacist** before taking Viekirax, if you are taking any of the medicines in the table below. The doctor may need to change your dose of these medicines. Tell your doctor or pharmacist before taking Viekirax also if you are using hormonal contraceptives. See the section on contraception below.

| Medicines you must tell your doctor about before taking Viekirax | |
|---|---|
| **Medicine or active substance** | **Purpose of the medicine** |
| alprazolam, diazepam | for anxiety, panic attacks and trouble sleeping |
| ciclosporin, everolimus, sirolimus, tacrolimus | to suppress the immune system |
| cyclobenzaprine, carisoprodol | for muscle spasms |
| colchicine for patients whose kidney and liver function test are normal | for treating gout attacks or familial Mediterranean fever |
| digoxin, amlodipine, nifedipine, valsartan, diltiazem, verapamil, candesartan, losartan | for heart problems or high blood pressure |
| encorafenib | for skin cancer |
| furosemide | for the build-up of too much fluid in the body |
| fostamatinib | for low platelet counts |
| hydrocodone | for pain |
| levothyroxine | for thyroid problems |
| rilpivirine, darunavir, atazanavir | for HIV infection |
| omeprazole, lansoprazole, esomeprazole | for stomach ulcers and other stomach problems |
| ibrutinib, imatinib | for the treatment of some cancers of the blood |
| fluvastatin, pitavastatin, pravastatin, rosuvastatin | to lower blood cholesterol |
| dabigatran | to thin the blood |
| fexofenadine | for hay fever |
| s-mephenytoin | for epilepsy |
| sulfasalazine | for inflammatory bowel disease |
| repaglinide | for lowering blood sugar |
| erythromycin | for bacterial infections |
| steroid or corticosteroid medicines (such as fluticasone) | for many different conditions including serious illnesses and allergies |
| trazodone | for anxiety and depression |
| warfarin and other similar medicines called vitamin K antagonists* | to thin the blood |

*Your doctor may need to increase the frequency of your blood tests to check how well your blood can clot.

If any of the above apply to you (or you are not sure), talk to your doctor or pharmacist before taking Viekirax.

**Pregnancy and contraception**

The effects of Viekirax during pregnancy are not known. Viekirax should not be used during pregnancy or in women of childbearing potential not using effective contraception.

- You or your partner must use an effective method of contraception during treatment. Contraceptive medicines that contain ethinyloestradiol cannot be used in combination with Viekirax. Ask your doctor about the best contraception for you.

Extra precautions are needed if Viekirax is taken together with ribavirin. Ribavirin may cause severe birth defects. Ribavirin stays for a long time in the body after treatment is stopped, and effective contraception is therefore needed both during treatment and for some time afterwards.

- There is a risk for birth defects when ribavirin is given to a female patient that becomes pregnant.
- There may also be a risk for birth defects if ribavirin is taken by a male patient, whose female partner becomes pregnant.
- Read the "Contraception" section of the package leaflet for ribavirin very carefully. It is important that both men and women read the information.
- If you or your partner becomes pregnant during treatment with Viekirax and ribavirin or in the months that follow, you must contact your doctor immediately.

**Breastfeeding**
You should not breast-feed during treatment with Viekirax. It is not known whether the active substances in Viekirax (ombitasvir, paritaprevir and ritonavir) pass into breast milk.

**Driving and using machines**
Some patients have reported feeling very tired when taking Viekirax with other medicines for their hepatitis C infection. If you feel tired, do not drive or use machines.

## 3. How to take Viekirax

Always take this medicine exactly as your doctor has told you. Check with your doctor or pharmacist if you are not sure.

Viekirax tablets are usually taken with other anti-viral medicines such as "dasabuvir" and "ribavirin".

**How much to take**
The recommended dose is two tablets taken together in the morning.

**How to take**
- Take the tablets in the morning with food. The type of food is not important.
- Swallow the tablets whole with water.
- Do not chew, crush or break the tablets as they may have a bitter taste.

**How long to take Viekirax for**
You will take Viekirax for 8, 12 or 24 weeks. Your doctor will tell you how long your treatment will last. Do not stop taking Viekirax unless your doctor tells you to. It is very important that you complete the full course of treatment. This will give the medicines the best chance to clear the hepatitis C virus infection.

**If you take more Viekirax than you should**
If you accidentally take more than the recommended dose, you should contact your doctor or go to the nearest hospital straight away. Keep the medicine pack with you so that you can easily describe what you have taken.

**If you forget to take Viekirax**
It is important not to miss a dose of this medicine. If you do miss a dose and it is:
- **More than 12 hours** until your next dose - take the missed dose with food as soon as possible.

- **Less than 12 hours** until your next dose - do not take the missed dose, take your next dose as usual with food.

Do not take a double dose to make up for a forgotten dose.

If you have any further questions on the use of this medicine, ask your doctor or pharmacist.

## 4. Possible side effects

**Stop taking Viekirax and talk to your doctor or get medical help immediately if any of the following occur:**

**Side effects when taking Viekirax with or without dasabuvir and with or without ribavirin:**

**Frequency not known:** cannot be estimated based on available data

- Serious allergic reactions, signs may include:
  - Difficulty breathing or swallowing
  - Dizziness or light-headedness, which may be due to low blood pressure
  - Swelling of the face, lips, tongue or throat
  - Rash and itching of the skin

- Worsening liver problems. Symptoms include:
  - Feel sick (nauseous), are sick (vomit) or lose your appetite
  - Notice yellowing of your skin or eyes
  - Your urine is darker than normal
  - Confusion
  - Notice swelling of your stomach area

Like all medicines, this medicine can cause side effects, although not everybody gets them.

**Tell your doctor or pharmacist if you notice any of the following side effects.**

**Side effects when taking Viekirax with dasabuvir:**

**Common:** may affect up to 1 in 10 people

- Itching.

**Rare:** may affect up to 1 in 1,000 people

- Swelling of the layers of skin which can affect any part of the body including the face, tongue or throat and may cause difficulty swallowing or breathing (angioedema)

**Side effects when taking Viekirax with dasabuvir and ribavirin:**

**Very common:** may affect more than 1 in 10 people

- Feeling very tired (fatigue)
- Feeling sick (nausea)
- Itching
- Trouble sleeping (insomnia)
- Feeling weak or lack of energy (asthenia)
- Diarrhoea

**Common:** may affect up to 1 in 10 people

- Anaemia (low number of red blood cells)
- Vomiting

**Uncommon:** may affect up to 1 in 100 people

- Dehydration

**Rare:** may affect up to 1 in 1,000 people
- Swelling of the layers of skin which can affect any part of the body including the face, tongue or throat and may cause difficulty swallowing or breathing (angioedema)

**Reporting of side effects**
If you get any side effects, talk to your doctor or pharmacist. This includes any possible side effects not listed in this leaflet. You can also report side effects directly via the national reporting system listed in Appendix V. By reporting side effects you can help provide more information on the safety of this medicine.

## 5. How to store Viekirax

Keep this medicine out of the sight and reach of children.

Do not use the medicine after the expiry date which is stated on the carton after 'EXP'. The expiry date refers to the last day of that month.

This medicine does not require any special storage conditions.

Do not throw away any medicines via wastewater or household waste. Ask your pharmacist how to throw away medicines you no longer use. These measures will help to protect the environment.

## 6. Contents of the pack and other information

**What Viekirax contains**
- Each tablet contains 12.5 mg of ombitasvir, 75 mg of paritaprevir and 50 mg of ritonavir.
- The other ingredients are:
  - Tablet core: copovidone, tocofersolan, propylene glycol monolaurate, sorbitan monolaurate, colloidal anhydrous silica (E 551), sodium stearyl fumarate.
  - Tablet film-coating: poly(vinyl alcohol) (E 1203), macrogol (3350), talc (E 553b), titanium dioxide (E 171) and red iron oxide (E 172).

**What Viekirax looks like and contents of the pack**
Viekirax tablets are pink, oblong film-coated tablets of dimmensions 18.8 mm x 10.0 mm, marked with 'AV1'. Viekirax tablets are packed into foil blisters containing 2 tablets. Each carton contains 56 tablets (multipack carton containing 4 inner cartons of 14 tablets each).

**Marketing Authorisation Holder and Manufacturer**

AbbVie Deutschland GmbH & Co. KG
Knollstrasse
67061 Ludwigshafen
Germany

For any information about this medicine, please contact the local representative of the Marketing Authorisation Holder:

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**This leaflet was last revised in**

**Other sources of information**

Detailed information on this medicine is available on the European Medicines Agency web site: http://www.ema.europa.eu.