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Add the following:

▲Vardenafil Orally Disintegrating Tablets

DEFINITION

Vardenafil Orally Disintegrating Tablets contain an amount of Vardenafil Hydrochloride equivalent to NLT 95.0% and NMT 105.0% of the labeled amount of vardenafil ($C_{23}H_{32}N_6O_4S$).

IDENTIFICATION

- **A.** The UV spectrum of the major peak of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.
- **B.** The retention time of the major peak of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.

ASSAY

- **Procedure**

[Note—Protect all solutions containing vardenafil from light.]

Solution A: 0.8 g/L of ammonium acetate in a mixture of acetonitrile and water (10:90), prepared as follows. Dissolve the ammonium acetate in water, and then add acetonitrile to volume.

Solution B: 0.8 g/L of ammonium acetate in a mixture of acetonitrile and water (90:10), prepared as follows. Dissolve the ammonium acetate in water, and then add acetonitrile to volume.

Mobile phase: See *Table 1*.

Table 1

Time (min)	Solution A (%)	Solution B (%)
0	80	20
20	0	100
21	80	20
25	80	20

Diluent: Acetonitrile and 0.1 N hydrochloric acid (20:80)

System suitability solution: 0.15 mg/mL of USP Vardenafil System Suitability RS in *Diluent*. Sonicate to dissolve, if necessary.

Standard solution: 0.22 mg/mL of USP Vardenafil Hydrochloride RS, equivalent to 0.2 mg/mL of vardenafil, in *Diluent*. Sonicate to dissolve, if necessary.

Sample solution: Nominally 0.2 mg/mL of vardenafil in *Diluent* prepared as follows. Transfer Tablets (NLT 5) into a suitable volumetric flask and add 80% of the flask volume of *Diluent*. Sonicate to dissolve, and dilute with *Diluent* to volume. Use the clear supernatant for analysis.

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: LC

Detector: UV 245 nm. For *Identification A*, use a diode array detector in the range of 200–400 nm.

Column: 4.6-mm × 15-cm; 5-µm packing L1

Column temperature: 40°

Flow rate: 1.5 mL/min

Injection volume: 5 µL

System suitability

Samples: *System suitability solution* and *Standard solution*

[NOTE—The relative retention times for 7-methyl vardenafil and vardenafil are 0.6 and 1.0, respectively.]

Suitability requirements

Resolution: NLT 5.0 between vardenafil and 7-methyl vardenafil, *System suitability solution*

Tailing factor: NMT 1.5, *Standard solution*

Relative standard deviation: NMT 1.5% from 6 replicate injections, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of the labeled amount of vardenafil ($C_{23}H_{32}N_6O_4S$) in the portion of Tablets taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times (M_{r1}/M_{r2}) \times 100$$

r_U = peak response of vardenafil from the *Sample solution*

r_S = peak response of vardenafil from the *Standard solution*

C_S = concentration of USP Vardenafil Hydrochloride RS in the *Standard solution* (mg/mL)

C_U = nominal concentration of vardenafil in the *Sample solution* (mg/mL)

M_{r1} = molecular weight of vardenafil, 488.61

M_{r2} = molecular weight of anhydrous vardenafil hydrochloride, 525.07

Acceptance criteria: 95.0%–105.0%

PERFORMANCE TESTS

• **Disintegration ⟨701⟩:** NMT 30 s

• **Uniformity of Dosage Units ⟨905⟩:** Meet the requirements

IMPURITIES

• **Organic Impurities**

[NOTE—Protect all solutions containing vardenafil from light.]

Solution A, Solution B, Mobile phase, Diluent, Sample solution, and **Chromatographic system:** Proceed as directed in the *Assay*.

System suitability stock solution: 0.1 mg/mL each of USP Vardenafil Related Compound D RS and USP Vardenafil Related Compound E RS, in *Diluent*. Sonicate to dissolve, if necessary.

System suitability solution: 0.22 mg/mL of USP Vardenafil Hydrochloride RS, and 0.001 mg/mL each of USP Vardenafil Related Compound D RS and USP Vardenafil Related Compound E RS, from *System suitability stock solution*, in *Diluent*

Standard stock solution: Use the *Standard solution* from the *Assay*.

Standard solution: 0.00022 mg/mL of USP Vardenafil Hydrochloride RS, equivalent to 0.0002 mg/mL of vardenafil, in *Diluent* from *Standard stock solution*

System suitability

Samples: *System suitability solution* and *Standard solution*

[NOTE—See *Table 2* for the relative retention times. The relative retention times for 7-methyl vardenafil, vardenafil, and vardenafil dimer are 0.6, 1.0, and 1.3, respectively.]

Suitability requirements

Resolution: NLT 2.0 between vardenafil related compound D and vardenafil related compound E, *System suitability solution*

Relative standard deviation: NMT 10.0% from 6 replicate injections, *Standard solution*

Signal-to-noise ratio: NLT 10, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of each individual degradation product in the portion of Tablets taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times (M_{r1}/M_{r2}) \times 100$$

r_U = peak response of each individual degradation product from the *Sample solution*

r_S = peak response of vardenafil from the *Standard solution*

C_S = concentration of USP Vardenafil Hydrochloride RS in the *Standard solution* (mg/mL)

C_U = nominal concentration of vardenafil in the *Sample solution* (mg/mL)

M_{r1} = molecular weight of vardenafil, 488.61

M_{r2} = molecular weight of anhydrous vardenafil hydrochloride, 525.07

Acceptance criteria: See *Table 2*. The reporting threshold is 0.1%.

Table 2

Name	Relative Retention Time	Acceptance Criteria, NMT (%)
Vardenafil acid[a]	0.2	0.5
Vardenafil related compound D	0.5	1.0
Vardenafil related compound E	0.55	0.5
Vardenafil	1.0	—
Any unspecified degradation product	—	0.2
Total degradation products	—	2.0

[a] 4-Ethoxy-3-(5-methyl-4-oxo-7-propyl-3,4-dihydroimidazo[5,1-*f*][1,2,4]triazin-2-yl)benzenesulfonic acid.

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in tight containers. Store at controlled room temperature. Protect from light.

• **USP Reference Standards** ⟨11⟩

USP Vardenafil Hydrochloride RS

USP Vardenafil Related Compound D RS

2-{2-Ethoxy-5-[(4-ethyl-4-oxido-1-piperazinyl)sulfonyl]phenyl}-5-methyl-7-propyl-imidazo[5,1-*f*][1,2,4]triazin-4(3*H*)-one.

$C_{23}H_{32}N_6O_5S$ 504.61

USP Vardenafil Related Compound E RS

2-[2-Ethoxy-5-(1-piperazinylsulfonyl)phenyl]-5-methyl-7-propylimidazo[5,1-*f*][1,2,4]triazin-4(3*H*)-one.

$C_{21}H_{28}N_6O_4S$ 460.55

USP Vardenafil System Suitability RS

Contains a mixture of the following two compounds:

Vardenafil hydrochloride.

7-Methyl vardenafil (approximately 1%): (2-{2-Ethoxy-5-[(4-ethylpiperazin-1-yl)sulfonyl]phenyl}-5,7-dimethylimidazo[5,1-*f*][1,2,4]triazin-4(3*H*)-one).

$C_{21}H_{28}N_6O_4S$ 460.55▲ (USP 1-Aug-2022)

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
VARDENAFIL ORALLY DISINTEGRATING TABLETS	Documentary Standards Support	SM52020 Small Molecules 5
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM52020 Small Molecules 5

Chromatographic Database Information: Chromatographic Database

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