Preparations

USP 31: Gadoversetamide Injection.

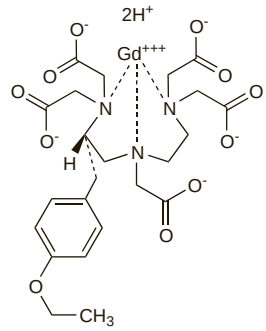
Proprietary Preparations (details are given in Part 3)
Arg.: Optimark; ***Austral.:*** Optimark; ***Canad.:*** Optimark; ***Cz.:*** Optimark; ***Port.:*** Optimark; ***USA:*** Optimark.

Gadoxetic Acid *(rINN)*

Acide Gadoxétique; Ácido gadoxético; Acidum Gadoxeticum; Gd-EOB-DTPA. Dihydrogen [*N*-{(2*S*)-2-[bis(carboxymethyl)-amino]-3-(*p*-ethoxyphenyl)propyl}-*N*-{2-[bis(carboxymethyl)-amino]ethyl}glycinato(5–)]gadolinate(2–).

Гадоксетовая Кислота

$C_{23}H_{30}GdN_3O_{11}$ = 681.7.
CAS — 135326-11-3 (gadoxetic acid).
ATC — V08CA10.
ATC Vet — QV08CA10.



Sodium Gadoxetate *(rINNM)*

Gadoxétate de Sodium; Gadoxetate Disodium *(USAN)*; Gadoxetate Sodium; Gadoxetato de sodio; Natrii Gadoxetas; ZK-139834.

Натрий Гадоксетат

$C_{23}H_{28}GdN_3Na_2O_{11}$ = 725.7.
CAS — 135326-22-6.
ATC — V08CA10.
ATC Vet — QV08CA10.

Adverse Effects and Precautions
As for Gadopentetic Acid, p.1479.

Pharmacokinetics
Gadoxetate is distributed into the extracellular space after intravenous injection and is also taken up by the liver. It is less than 10% bound to plasma proteins. It is excreted in about equal amounts in the bile and in the urine. An elimination half-life of about 1 hour has been reported. Gadoxetate is removed by haemodialysis.

Uses and Administration
Gadoxetic acid is an ionic gadolinium chelate with actions similar to those of gadopentetic acid (p.1480). It has paramagnetic properties and is used as a magnetic resonance contrast medium (p.1474). It is taken up by the liver and excreted in bile and is used in imaging of the liver.

Gadoxetic acid is given intravenously as the sodium salt. It is available as a solution containing sodium gadoxetate 181.4 mg/mL (0.25 mmol/mL). The usual dose is 0.1 mL/kg (0.025 mmol/kg).

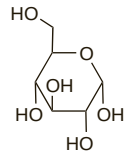
Preparations

Proprietary Preparations (details are given in Part 3)
Austria: Primovist; ***Cz.:*** Primovist; ***Fin.:*** Primovist; ***Gr.:*** Primovist; ***Hung.:*** Primovist; ***Neth.:*** Primovist; ***Norw.:*** Primovist; ***Swed.:*** Primovist; ***Switz.:*** Primovist; ***UK:*** Primovist.

Galactose *(USAN)*

D-Galactopyranose; α-D-Galactopyranose; Galactosa; D-Galactose; Galactosum; Galaktoosi; Galaktos; Galaktosa; Galaktóz; Galaktoza; Galaktozė.

$C_6H_{12}O_6$ = 180.2.
CAS — 59-23-4 (D-galactose); 3646-73-9 (α-D-galactose).
ATC — V04CE01; V08DA02 (microparticles of galactose).
ATC Vet — QV04CE01; QV08DA02 (microparticles of galactose).



Pharmacopoeias. In *Eur.* (see p.vii). Also in *USNF.*
Ph. Eur. 6.2 (Galactose). A white or almost white, crystalline or finely granulated powder. Freely soluble or soluble in water; very slightly soluble in alcohol.
USNF 26 (Galactose). A white, crystalline or finely granulated powder. Soluble in water; very slightly soluble in alcohol. Store in airtight containers.

Profile
Galactose is a naturally occurring monosaccharide used as an ultrasound contrast medium (p.1474); dissolution of galactose microparticles releases microbubbles of air that provide echo-enhancement. Galactose is used to enhance ultrasound imaging of the female genital tract. It is given transcervically as a microbubble-microparticle suspension prepared immediately before use by suspending 3 g of galactose microparticles in 13.5 mL of a solution containing 200 mg/mL galactose. The usual dose is 2 to 5 mL, with additional doses of 1 to 2 mL as required, to a maximum of 30 mL. Similar suspensions of galactose, with palmitic acid to stabilise the microbubbles, have been used in echocardiography.

The clearance of galactose given intravenously has been used as a measure of liver function. Galactose labelled with carbon-13 (p.2277) has also been used.

Precautions. Preparations that contain, or are metabolised to, galactose may interfere with the results from glucose tests (p.2314). Overestimation of glucose results may mask hypoglycaemia, resulting in the inappropriate use of insulin.[1,2]

1. Medicines and Healthcare products Regulatory Agency. Medical device alert: ref MDA/2007/058 issued 19 July 2007. Available at: http://www.mhra.gov.uk/PrintPreview/PublicationSP/CON2031807 (accessed 01/07/08)
2. FDA. Important safety information on interference with blood glucose measurement following use of parenteral maltose/parenteral galactose/oral xylose-containing products (issued November 2005). Available at: http://www.fda.gov/cber/safety/maltose110405.htm (accessed 01/07/08)

Preparations

Proprietary Preparations (details are given in Part 3)
Arg.: Levovist†; ***Austral.:*** Levovist; ***Austria:*** Echovist; Levovist†; Ombravist†; ***Canad.:*** Echovist†; Levovist†; ***Cz.:*** Levovist†; ***Denm.:*** Levovist†; ***Fin.:*** Echovist†; Levovist†; ***Fr.:*** Echovist; Levovist; ***Ger.:*** Echovist; Levovist; ***Hung.:*** Echovist; ***Israel:*** Echovist; ***Ital.:*** Levovist; ***Neth.:*** Echovist†; Levovist; ***Norw.:*** Levovist†; ***NZ:*** Levovist; ***Port.:*** Levovist; ***S.Afr.:*** Echovist†; ***Spain:*** Levograf; Levovist; ***Swed.:*** Echovist; Levovist†; ***Switz.:*** Levovist; ***UK:*** Echovist; Levovist†.

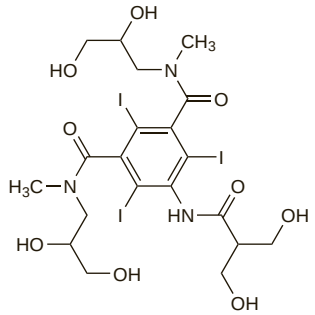
Multi-ingredient: ***Gr.:*** L-Vist.

Iobitridol *(BAN, rINN)*

Iobitridolum; Jobitridol; Jobitridoli. *N,N′*-Bis(2,3-dihydroxypropyl)-5-[2-(hydroxymethyl)hydracrylamido]-2,4,6-triiodo-*N,N′*-dimethylisophthalamide; .

Йобитридол

$C_{20}H_{28}I_3N_3O_9$ = 835.2.
CAS — 136949-58-1.
ATC — V08AB11.
ATC Vet — QV08AB11.



Profile
Iobitridol is a nonionic monomeric iodinated radiographic contrast medium (see p.1474). It may be given intravenously, intra-arterially, or by instillation into body cavities and is used in a wide range of procedures including angiography, arthrography, cholangiopancreatography, and hysterosalpingography. It is also used for contrast enhancement in computed tomography.

It is usually available as solutions containing 54.84 to 76.78% of iobitridol (equivalent to 250 to 350 mg/mL of iodine). The dose and strength used varies depending on the procedure and route.

◊ References.

1. Petersein J, *et al.* Results of the safety and efficacy of iobitridol in more than 61,000 patients. *Eur Radiol* 2003; **13:** 2006–11.

Preparations

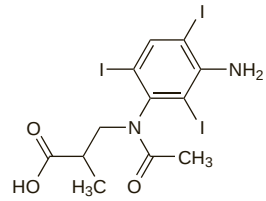
Proprietary Preparations (details are given in Part 3)
Arg.: Xenetic; Xenetix; ***Austria:*** Xenetix; ***Belg.:*** Xenetix; ***Braz.:*** Henetix†; ***Chile:*** Xenetix; ***Cz.:*** Xenetix; ***Denm.:*** Xenetix; ***Fin.:*** Xenetix; ***Fr.:*** Xenetix; ***Ger.:*** Xenetix; ***Gr.:*** Xenetix; ***Hung.:*** Xenetix; ***Israel:*** Xenetix; ***Ital.:*** Xenetix; ***Neth.:*** Xenetix; ***Norw.:*** Xenetix; ***Port.:*** Xenetix; ***Spain:*** Xenetix; ***Swed.:*** Xenetix; ***Switz.:*** Xenetix; ***Venez.:*** Xenetix.

Iocetamic Acid *(BAN, USAN, pINN)*

Acide Iocétamique; Ácido iocetámico; Acidum Iocetamicum; DRC-1201; Jocetamsyra; Josetaamihappo; MP-620. *N*-Acetyl-*N*-(3-amino-2,4,6-tri-iodophenyl)-2-methyl-β-alanine; 2-[*N*-(3-Amino-2,4,6-tri-iodophenyl)acetamidomethyl]-propionic acid.

Йоцетамовая Кислота

$C_{12}H_{13}I_3N_2O_3$ = 614.0.
CAS — 16034-77-8.
ATC — V08AC07.
ATC Vet — QV08AC07.



Description. Iocetamic acid contains about 62% of I.

Profile
Iocetamic acid is an ionic monomeric iodinated radiographic contrast medium with similar properties to iopanoic acid (p.1484). It is absorbed from the gastrointestinal tract and excreted in bile and has been given orally for cholecystography.

Preparations

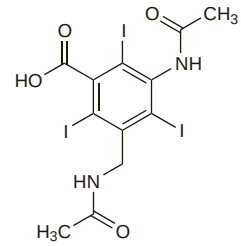
Proprietary Preparations (details are given in Part 3)
Neth.: Cholebrine†.

Iodamide *(BAN, USAN, rINN)*

Ametriodinic Acid; B-4130; Iodamida; Iodamidum; Jodamid; Jodiamidi; SH-926. α,5-Diacetamido-2,4,6-tri-iodo-*m*-toluic acid; 3-Acetamido-5-acetamidomethyl-2,4,6-tri-iodobenzoic acid.

Йодамид

$C_{12}H_{11}I_3N_2O_4$ = 627.9.
CAS — 440-58-4.
ATC — V08AA03.
ATC Vet — QV08AA03.



Description. Iodamide contains about 60.6% of I.
Pharmacopoeias. In *Jpn.*

Meglumine Iodamide *(BANM, rINNM)*

Iodamida de meglumina; Iodamide Meglumine *(USAN)*; Iodamide Méglumine; Meglumini Iodamidum. The *N*-methylglucamine salt of iodamide.

Меглумина Йодамид

$C_{12}H_{11}I_3N_2O_4,C_7H_{17}NO_5$ = 823.2.
CAS — 18656-21-8.
ATC — V08AA03.
ATC Vet — QV08AA03.

Description. Meglumine iodamide contains about 46.3% of I.

Sodium Iodamide *(BANM, rINNM)*

Iodamida sódica; Iodamide Sodique; Iodamide Sodium; Natrii Iodamidum.

Натрий Йодамид

$C_{12}H_{10}I_3N_2NaO_4$ = 649.9.
CAS — 10098-82-5.
ATC — V08AA03.
ATC Vet — QV08AA03.

Description. Sodium iodamide contains about 58.6% of I.

Profile
Iodamide is an ionic monomeric iodinated radiographic contrast medium (see p.1474). It is used in many procedures and may be given intravenously or by other routes, for example by instillation into the bladder or uterus; it has also been used for computed tomography.

It is usually given as a 24 to 65% solution of the meglumine salt, or as a mixture of the sodium and meglumine salts; solutions of the sodium salt have also been used. The dose varies according to the procedure and route.

Preparations
Proprietary Preparations (details are given in Part 3)
Austria: Uromiro; ***Ital.:*** Isteropac ER; Opacist ER; Uromiro 24%, 36%, and 300†; Uromiro 300 Sodico†; Uromiro 340 and 420†; ***Switz.:*** Isteropac†; Opacist ER†; Uromiro†; ***Venez.:*** Angiomiron†; Uromiron.

Iodised Oil

Aceite yodado; Ethiodized Oil.

CAS — 8001-40-9 (iodised oil); 8008-53-5 (ethiodized oil injection).
ATC — V08AD01.
ATC Vet — QV08AD01.

Description. Iodised oil is an iodine addition product of the ethyl esters of the fatty acids obtained from poppy-seed oil. It contains about 35 to 39% of combined iodine.

Incompatibility. Because of its solvent action on polystyrene, iodised oil injection should not be given in syringes made with polystyrene.

Adverse Effects and Precautions
The risk of hypersensitivity reactions or iodism is greater after the use of iodised oil than after water-soluble iodinated contrast media such as the amidotrizoates. Pulmonary oil embolism is reported to be relatively frequent after lymphography but is not usually severe; however, hypotension, tachycardia, and pulmonary oedema and infarction may occur rarely and deaths have been reported in patients with pulmonary disease. Chemical pneumonitis, oedema, granuloma formation, and goitre have occurred.

Great care must be taken to avoid vascular structures, because of the danger of oil embolism; it should therefore not be used in areas affected by haemorrhage or local trauma. Iodised oil should be used with care in patients with thyroid dysfunction or a history of allergic reactions. Use may interfere with thyroid-function tests for several months.

Hysterosalpingography. The use of oily contrast media such as iodised oil for hysterosalpingography has been associated with serious adverse effects, including tubal occlusion,[1] and cerebral and pulmonary oil embolism,[2,3] and water-soluble contrast media are usually preferred. However, diagnostic hysterosalpingography using iodised oil has been associated with an increase in fertility[4] and randomised trials[5,6] using iodised oil for treatment in patients with unexplained infertility have found a similar effect.

1. Wright FW, Stallworthy J. Female sterility produced by investigation. *BMJ* 1973; **3:** 632.
2. Dan U, *et al.* Cerebral embolization and coma after hysterosalpingography with oil-soluble contrast medium. *Fertil Steril* 1990; **53:** 939–40.
3. Uzun O, *et al.* Pulmonary and cerebral oil embolism after hysterosalpingography with oil soluble contrast medium. *Respirology* 2004; **9:** 134–6.
4. Johnson NP. A review of the use of lipiodol flushing for unexplained infertility. *Treat Endocrinol* 2005; **4:** 233–43.
5. Nugent D, *et al.* A randomized controlled trial of tubal flushing with lipiodol for unexplained infertility. *Fertil Steril* 2002; **77:** 173–5.
6. Johnson NP, *et al.* The FLUSH trial—flushing with lipiodol for unexplained (and endometriosis-related) subfertility by hysterosalpingography: a randomized trial. *Hum Reprod* 2004; **19:** 2043–51.

Pharmacokinetics
Iodised oil may persist in the body for several weeks or months. It is only slowly absorbed from most body sites, although absorption from the peritoneal cavity is stated to be relatively rapid. It is reported to be slowly metabolised to fatty acids and iodine.

Uses and Administration
Iodised oil is an iodinated radiographic contrast medium (p.1474) that is used mainly for lymphography. It has been used for hysterosalpingography but water-soluble agents are preferred. Although some preparations have been used in bronchography, the fluid injection of iodised oil is unsuitable for such use. Doses are dependent upon the procedure.

Because it is slowly metabolised to release iodine, iodised oil is used in the management of iodine deficiency (p.2170).

Infertility. For reference to the use of iodised oil in the management of infertility, see Hysterosalpingography under Adverse Effects and Precautions, above.

Malignant neoplasms. Intra-arterial injection of iodised oil has been used in both the diagnosis and management of malignant neoplasms of the liver (p.667). After injection into the hepatic artery, iodised oil is selectively retained by hepatic carcinomas and may have a role as an adjunct to computed tomography for both diagnosis and monitoring.[1-3] It has also been used in the management of hepatic carcinoma,[2,4] either to increase the retention of antineoplastics (chemoembolisation),[5] or to provide targeted delivery of radioactive iodine.[6]

1. Dalla Palma L. Diagnostic imaging and interventional therapy of hepatocellular carcinoma. *Br J Radiol* 1998; **71:** 808–18.
2. Ryder SD. Guidelines for the diagnosis and treatment of hepatocellular carcinoma (HCC) in adults. *Gut* 2003; **52** (suppl): iii1–iii8. Also available at: http://www.bsg.org.uk/pdf_word_docs/hcc.pdf (accessed 27/03/06)
3. Zheng X-H, *et al.* Detection of hypervascular hepatocellular carcinoma: comparison of multi-detector CT with digital subtraction angiography and Lipiodol CT. *World J Gastroenterol* 2005; **11:** 200–203.
4. Trinchet JC, *et al.* Review article: intra-arterial treatments in patients with hepatocellular carcinoma *Aliment Pharmacol Ther* 2003; **17** (suppl 2): 111–118.
5. Group d'Etude et de Traitement du Carcinome Hépatocellulaire. A comparison of Lipiodol chemoembolization and conservative treatment for unresectable hepatocellular carcinoma. *N Engl J Med* 1995; **332:** 1256–61.
6. Lau WY, *et al.* Adjuvant intra-arterial iodine-131-labelled lipiodol for resectable hepatocellular carcinoma: a prospective randomised trial. *Lancet* 1999; **353:** 797–801.

Preparations
BP 2008: Iodised Oil Fluid Injection;
USP 31: Ethiodized Oil Injection.

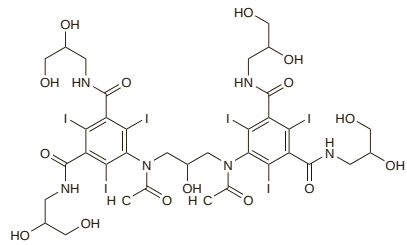
Proprietary Preparations (details are given in Part 3)
Arg.: Lipiodol; ***Austral.:*** Lipiodol; ***Austria:*** Lipiodol; ***Belg.:*** Lipiodol; ***Braz.:*** Lipiodol†; ***Chile:*** Lipiodol; ***Cz.:*** Lipiodol; ***Denm.:*** Lipiodol; ***Fr.:*** Lipiodol; ***Ger.:*** Lipiodol; ***Gr.:*** Lipiodol; ***Hung.:*** Lipiodol; ***Israel:*** Lipiodol; ***Ital.:*** Lipiodol; ***Neth.:*** Lipiodol; ***Norw.:*** Lipiodol†; ***NZ:*** Lipiodol; ***Port.:*** Lipiodol; ***Switz.:*** Lipiodol; ***UK:*** Lipiodol; ***USA:*** Ethiodol; ***Venez.:*** Lipiodol.

Iodixanol *(BAN, USAN, rINN)*

2-5410-3A; Iodixanolum; Jodiksanoli; Jodixanol. 5,5′-[(2-Hydroxytrimethylene)bis(acetylimino)]bis[*N*,*N*′-bis(2,3-dihydroxypropyl)-2,4,6-triiodoisophthalamide].

Йодиксанол

$C_{35}H_{44}I_6N_6O_{15}$ = 1550.2.
CAS — 92339-11-2.
ATC — V08AB09.
ATC Vet — QV08AB09.



Description. Iodixanol contains about 49.1% of I.

Pharmacopoeias. In *US.*
USP 31 (Iodixanol). A white to off-white, amorphous, odourless, hygroscopic powder. Freely soluble in water. Store at a temperature of 25°, excursions permitted between 15° and 30°. Protect from light.

Adverse Effects, Treatment, and Precautions
See under the amidotrizoates, p.1475. For adverse effects relating to the use of nonionic contrast media such as iodixanol for myelography, see under Iohexol (p.1483).

Pharmacokinetics
Iodixanol is rapidly distributed into extracellular fluid after intravenous injection. It is not bound to plasma proteins. It is not metabolised and about 97% of a dose is excreted in the urine within 24 hours. A terminal elimination half-life of about 2 hours has been reported. Iodixanol is removed by dialysis.

Uses and Administration
Iodixanol is a nonionic dimeric iodinated radiographic contrast medium (see p.1474); it is iso-osmolar with blood. It may be given intravenously, intra-arterially, intrathecally, orally, or by instillation into body cavities, and is used in procedures including angiography, arthrography, cholangiopancreatography, hysterosalpingography, myelography, and urography, as well as for imaging of the upper gastrointestinal tract and for contrast enhancement during computed tomography.

Iodixanol is usually available as a solution containing between 30.5 and 65.2% of iodixanol (equivalent to between 150 and 320 mg/mL of iodine). The dose and strength used vary according to the procedure and route.

◊ References.

1. Spencer CM, Goa KL. Iodixanol: a review of its pharmacodynamic and pharmacokinetic properties and diagnostic use as an x-ray contrast medium. *Drugs* 1996; **52:** 899–927.

Preparations
USP 31: Iodixanol Injection.

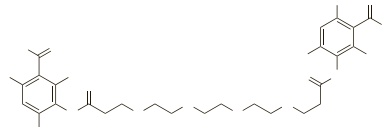
Proprietary Preparations (details are given in Part 3)
Austral.: Visipaque; ***Austria:*** Visipaque; ***Belg.:*** Visipaque; ***Braz.:*** Visipaque†; ***Canad.:*** Visipaque; ***Chile:*** Visipaque; ***Cz.:*** Visipaque; ***Denm.:*** Visipaque; ***Fin.:*** Visipaque; ***Fr.:*** Visipaque; ***Ger.:*** Visipaque; ***Gr.:*** Visipaque; ***Hung.:*** Visipaque; ***Israel:*** Visipaque; ***Ital.:*** Visipaque; ***Neth.:*** Visipaque; ***Norw.:*** Visipaque; ***NZ:*** Visipaque; ***Port.:*** Visipaque; ***Rus.:*** Visipaque (Визипак)†; ***Spain:*** Visipaque; ***Swed.:*** Visipaque; ***Switz.:*** Visipaque; ***UK:*** Visipaque; ***USA:*** Visipaque.

Iodoxamic Acid *(BAN, USAN, rINN)*

Acide Iodoxamique; Ácido iodoxámico; Acidum Iodoxamicum; B-10610; Jodoksaamihappo; Jodoxamsyra; SQ-21982. 3,3′-(4,7,10,13-Tetraoxahexadecanedioyldiamino)bis(2,4,6-tri-iodobenzoic acid).

Йодоксамовая Кислота

$C_{26}H_{26}I_6N_2O_{10}$ = 1287.9.
CAS — 31127-82-9.
ATC — V08AC01.
ATC Vet — QV08AC01.



Description. Iodoxamic acid contains about 59.1% of I.

Meglumine Iodoxamate *(BANM, rINNM)*

Dimeglumine Iodoxamate; Iodoxamate de Méglumine; Iodoxamate Meglumine *(USAN)*; Iodoxamato de meglumina; Meglumini Iodoxamas. The di(*N*-methylglucamine) salt of iodoxamic acid.

Меглумина Йодоксамат

$C_{26}H_{26}I_6N_2O_{10}.(C_7H_{17}NO_5)_2$ = 1678.3.
CAS — 51764-33-1.
ATC — V08AC01.
ATC Vet — QV08AC01.

Description. Meglumine iodoxamate contains about 45.4% of I.

Profile
Iodoxamic acid is an ionic dimeric iodinated radiographic contrast medium (p.1474) that has been used intravenously as the meglumine salt for cholecystography and cholangiography.

Iofendylate *(BAN, rINN)*

Ethyl Iodophenylundecylate; Iodophendylate; Iofendilato; Iofendylatum; Iophendylate; Jofendylaatti; Jofendylat. A mixture of stereoisomers of ethyl 10-(4-iodophenyl)undecanoate.

Йофендилат

$C_{19}H_{29}IO_2$ = 416.3.
CAS — 99-79-6; 1320-11-2.
ATC — V08AD04.
ATC Vet — QV08AD04.

Description. Iofendylate contains about 30.5% of I.

Pharmacopoeias. In *Chin.* and *US.*
USP 31 (Iophendylate). A colourless to pale yellow, viscous liquid, darkening on long exposure to air. Is odourless or has a faintly ethereal odour. Very slightly soluble in water; freely soluble in alcohol, in chloroform, in ether, and in benzene. Store in airtight containers at a temperature of 25°, excursions permitted between 15° and 30°. Protect from light.

Profile
Iofendylate is an ionic monomeric iodinated radiographic contrast medium (p.1474). It was formerly used for myelography, but was associated with serious adverse effects, including allergy, arachnoiditis, and aseptic meningitis, and has now been superseded by nonionic media. Residues of iofendylate remaining years after myelography have been associated with adverse effects. Other former uses included ventriculography, and visualisation of the fetus in the amniotic sac.

Preparations
BP 2008: Iofendylate Injection;
USP 31: Iophendylate Injection.