Ferristene *(BAN, USAN)*

Ferristeno.

$C_8H_{11}NO_3S,(Fe_2O_3)_{0.725}$.

CAS — 155773-56-1.

ATC — V08CB02.

ATC Vet — QV08CB02.

Description. Ferristene contains about 23.4% of Fe.

Profile
Ferristene consists of iron ferrite crystals carried on monosized spheres of cross-linked poly(ammonium styrenesulfonate). It has superparamagnetic properties and has been used orally as a magnetic resonance contrast medium (p.1474) for imaging of the abdomen.

Preparations
Proprietary Preparations (details are given in Part 3)
UK: Abdoscan†.

Ferucarbotran *(BAN, USAN)*

Ferrixan; Ferucarbotrano; SHU-555A; ZK-132281.

Profile
Ferucarbotran is a colloidal aqueous suspension of iron oxide (magnetite and maghemite) particles coated with carboxydextran. It has superparamagnetic properties and is used similarly to ferumoxides (below) as a magnetic resonance contrast medium (p.1474) for imaging of the liver; the particles are taken up by the reticuloendothelial system of the liver and spleen and provide contrast enhancement. It is given intravenously as a solution containing 28 mg/mL of iron. The usual dose is 0.9 mL for patients weighing less than 60 kg and 1.4 mL for patients weighing 60 kg and over.

◊ References.

1. Reimer P, Balzer T. Ferucarbotran (Resovist): a new clinically approved RES-specific contrast agent for contrast-enhanced MRI of the liver: properties, clinical development, and applications. *Eur Radiol* 2003; **13:** 1266–76.

Preparations
Proprietary Preparations (details are given in Part 3)
Austral.: Resovist†; ***Austria:*** Resovist; ***Belg.:*** Resovist; ***Cz.:*** Resovist; ***Denm.:*** Resovist; ***Fin.:*** Resovist†; ***Ger.:*** Resovist; ***Gr.:*** Resovist; ***Israel:*** Resovist†; ***Ital.:*** Resovist; ***Neth.:*** Resovist; ***Norw.:*** Resovist; ***Port.:*** Resovist; ***Spain:*** Resograf; Resovist; ***Swed.:*** Resovist; ***Switz.:*** Resovist.

Ferumoxides *(BAN, USAN)*

AMI-25; Ferumóxidos.

$(Fe_2O_3)_m(FeO)_n$.

CAS — 119683-68-0.

Adverse Effects and Precautions
The most common adverse effects with ferumoxides are pain, vasodilatation, and hypotension; paraesthesia may also occur. Hypersensitivity reactions have developed. Extravasation may lead to discoloration of the skin around the injection site. Ferumoxides should not be used in patients with known hypersensitivity to iron and should be used with caution in patients with iron overload disorders.

Uses and Administration
Ferumoxides consists of colloidal particles of magnetite (iron oxide). It has superparamagnetic properties and is used as a magnetic resonance contrast medium (p.1474) for imaging of the liver; the particles are taken up by the reticuloendothelial system of the liver and spleen and provide contrast enhancement. It is available as a suspension containing 11.2 mg/mL of iron, which should be diluted in 100 mL of glucose 5% before use and given intravenously over at least 30 minutes. The dose is expressed in terms of iron. In Europe, the usual dose is 0.84 mg/kg; in the USA, a dose of 0.56 mg/kg is used.

◊ Reference to the use of ferumoxides followed by a gadolinium-based contrast medium.[1]

1. Qayyum A, *et al.* Detection of hepatocellular carcinoma by ferumoxides-enhanced MR imaging in cirrhosis: incremental value of dynamic gadolinium-enhancement. *J Magn Reson Imaging* 2006; **23:** 17–22.

Preparations
USP 31: Ferumoxides Injection.

Proprietary Preparations (details are given in Part 3)
Arg.: Feridex†; ***Austria:*** Endorem; ***Belg.:*** Endorem; ***Denm.:*** Endorem; ***Fin.:*** Endorem; ***Fr.:*** Endorem; ***Ger.:*** Endorem; ***Gr.:*** Endorem; ***Israel:*** Feridex†; ***Ital.:*** Endorem; ***Jpn:*** Feridex; ***Neth.:*** Endorem; ***Norw.:*** Endorem; ***Port.:*** Endorem; ***Spain:*** Endorem; ***Swed.:*** Endorem; ***Switz.:*** Endorem; ***USA:*** Feridex.

Ferumoxsil *(BAN, USAN)*

AMI-121; Ferumoksiili; Ferumoxil; Férumoxsil; Ferumoxsilum.

ATC — V08CB01.

ATC Vet — QV08CB01.

Adverse Effects and Precautions
The most common adverse effects with ferumoxsil are diarrhoea, nausea, vomiting, and abdominal pain; oral paraesthesia has also been reported. Ferumoxsil should be used with caution in patients with iron overload disorders.

Uses and Administration
Ferumoxsil consists of a silicone polymer bonded to colloidal particles of magnetite (iron oxide). It has superparamagnetic properties and is used as a magnetic resonance contrast medium (p.1474) for imaging of the gastrointestinal tract; the particles remain in the stomach and intestine when given orally or rectally and provide contrast enhancement. It is given as a suspension containing 175 micrograms/mL of iron. The usual dose is 600 to 900 mL by mouth, or 300 to 600 mL rectally.

Preparations
USP 31: Ferumoxsil Oral Suspension.

Proprietary Preparations (details are given in Part 3)
Austria: Lumirem; ***Braz.:*** Lumirem†; ***Denm.:*** Lumirem; ***Fin.:*** Lumirem; ***Fr.:*** Lumirem; ***Ger.:*** Lumirem; ***Ital.:*** Lumirem; ***Neth.:*** Lumirem; ***Port.:*** Lumirem; ***Swed.:*** Lumirem; ***USA:*** Gastromark.

Ferumoxtran-10 *(USAN)*

AMI-227; BMS-180549; Code 7227.

CAS — 189047-99-2.

Profile
Ferumoxtran-10 consists of colloidal particles of magnetite (iron oxide) coated with a low-molecular-weight dextran. It has superparamagnetic properties and is under investigation as a magnetic resonance contrast medium for imaging of the lymphatic system.

Gadobenic Acid *(BAN, rINN)*

Acide Gadobénique; Ácido gadobénico; Acidum Gadobenicum; B-19036; Gd-BOPTA. Dihydrogen [(±)-4-carboxy-5,8,11-tris(carboxymethyl)-1-phenyl-2-oxa-5,8,11-triazatridecan-13-oato(5–)]gadolinate(2–).

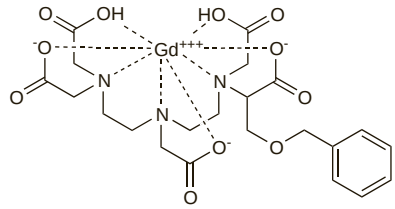
Гадобеновая Кислота

$C_{22}H_{28}GdN_3O_{11}$ = 667.7.

CAS — 113662-23-0.

ATC — V08CA08.

ATC Vet — QV08CA08.



Meglumine Gadobenate *(BANM, rINNM)*

B-19036/7; Gadobenaattidimeglumiini; Gadobenatdimeglumin; Gadobénate de Méglumine; Gadobenate Dimeglumine *(USAN)*; Gadobenato de meglumina; Gadobenatum Dimegluminum; Meglumini Gadobenas.

Меглумина Гадобенат

$C_{22}H_{28}GdN_3O_{11},2C_7H_{17}NO_5$ = 1058.1.

CAS — 127000-20-8.

ATC — V08CA08.

ATC Vet — QV08CA08.

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

◊ References.

1. Kirchin MA, *et al.* Safety assessment of gadobenate dimeglumine (MultiHance): extended clinical experience from phase I studies to post-marketing surveillance. *J Magn Reson Imaging* 2001; **14:** 281–94.
2. Shellock FG, *et al.* Safety of gadobenate dimeglumine (MultiHance): summary of findings from clinical studies and postmarketing surveillance. *Invest Radiol* 2006; **41:** 500–9.

Pharmacokinetics
Gadobenate is rapidly distributed into the extracellular space after intravenous injection. An elimination half-life of about 1.2 to 1.7 hours has been reported. It is not metabolised and about 78 to 94% of a dose is excreted in the urine within 24 hours; about 2 to 4% is excreted in the faeces.

Uses and Administration
Gadobenic acid is an ionic gadolinium chelate with actions and uses similar to those of gadopentetic acid (p.1480). It has paramagnetic properties and is used as a magnetic resonance contrast medium (p.1474). It distributes mainly into extracellular fluid, but does not cross the blood-brain barrier, and is used in imaging of the liver and CNS.

Gadobenic acid is given intravenously as the meglumine salt. It is available as a solution containing meglumine gadobenate 529 mg/mL (0.5 mmol/mL). Usual doses for imaging are:

- liver: 0.1 mL/kg (0.05 mmol/kg) intravenously
- brain or spine: 0.2 mL/kg (0.1 mmol/kg) intravenously.

Preparations
Proprietary Preparations (details are given in Part 3)
Austria: MultiHance; ***Belg.:*** MultiHance; ***Cz.:*** MultiHance; ***Denm.:*** MultiHance; ***Fin.:*** MultiHance; ***Fr.:*** MultiHance; ***Ger.:*** MultiHance; ***Gr.:*** MultiHance; ***Hung.:*** MultiHance; ***Irl.:*** MultiHance†; ***Israel:*** MultiHance; ***Ital.:*** MultiHance; ***Neth.:*** MultiHance; ***Norw.:*** MultiHance; ***NZ:*** MultiHance; ***Port.:*** MultiHance; ***Spain:*** MultiHance; ***Swed.:*** MultiHance; ***Switz.:*** MultiHance; ***UK:*** MultiHance; ***USA:*** MultiHance.

Gadobutrol *(rINN)*

Gadobutrolum. {10-[(1*RS*,2*SR*)-2,3-Dihydroxy-1-(hydroxymethyl)propyl]-1,4,7,10-tetraazacyclododecane-1,4,7-triacetato-(3–)}gadolinium.

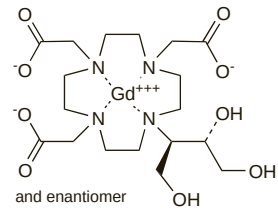
Гадобутрол

$C_{18}H_{31}GdN_4O_9$ = 604.7.

CAS — 138071-82-6.

ATC — V08CA09.

ATC Vet — QV08CA09.



Adverse Effects and Precautions
As for Gadopentetic Acid, p.1479. Gadobutrol may prolong cardiac repolarisation and should not be used in patients with uncorrected hypokalaemia. Caution is required in patients with severe cardiovascular disease, and in those with congenital long QT syndrome or a history of drug-induced arrhythmias.

Pharmacokinetics
Gadobutrol is rapidly distributed into the extracellular space following intravenous injection. It is not significantly bound to plasma proteins. An elimination half-life of about 1.8 hours has been reported. It is not metabolised and more than 90% of a dose is excreted in the urine within 12 hours; less than 0.1% is excreted in the faeces.

Uses and Administration
Gadobutrol is a nonionic gadolinium chelate with actions and uses similar to those of gadopentetic acid (p.1480). It has paramagnetic properties and is used as a magnetic resonance contrast medium (p.1474). It distributes mainly into extracellular fluid, but does not cross the blood-brain barrier, and is used in imaging of the CNS, kidneys, and liver, and in magnetic resonance angiography.

Gadobutrol is available as a solution containing 605 mg/mL (1 mmol/mL). Usual doses are:

- cranial and spinal imaging: 0.1 mL/kg (0.1 mmol/kg) intravenously. A second dose of up to 0.2 mL/kg (0.2 mmol/kg) may be given within 30 minutes if required
- kidneys and liver: 0.1 mL/kg (0.1 mmol/kg) intravenously
- angiography: 0.1 to 0.3 mL/kg (0.1 to 0.3 mmol/kg) intravenously

A solution containing 302.5 mg/mL (0.5 mmol/mL) has also been used.

◊ References.

1. Huppertz A, Rohrer M. Gadobutrol, a highly concentrated MR-imaging contrast agent: its physicochemical characteristics and the basis for its use in contrast-enhanced MR angiography and perfusion imaging. *Eur Radiol* 2004; **14** (suppl 5): M12–M18.

Preparations
Proprietary Preparations (details are given in Part 3)
Austral.: Gadovist; ***Austria:*** Gadovist; ***Belg.:*** Gadovist; ***Canad.:*** Gadovist; ***Cz.:*** Gadovist; ***Denm.:*** Gadovist; ***Fin.:*** Gadovist; ***Ger.:*** Gadovist; ***Gr.:*** Gadovist; ***Hung.:*** Gadovist; ***Ital.:*** Gadovist; ***Neth.:*** Gadovist; ***Norw.:*** Gadovist; ***NZ:*** Gadovist; ***Port.:*** Gadovist; ***Rus.:*** Gadovist (Гадовист); ***S.Afr.:*** Gadovist; ***Spain:*** Gadograf; Gadovist; ***Swed.:*** Gadovist; ***Switz.:*** Gadovist; ***UK:*** Gadovist.

Gadodiamide *(BAN, USAN, rINN)*

Gadodiamid; Gadodiamida; Gadodiamidi; Gadodiamidum; Gd-DTPA-BMA; S-041. [*N*,*N*-Bis(2-{(carboxymethyl)[(methylcarbamoyl)methyl]amino}ethyl)glycinato(3–)]gadolinium; a complex of gadolinium with diethylenetriamine penta-acetic acid bis-methylamide.

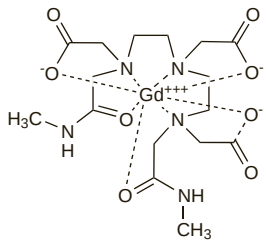
Гадодиамид

$C_{16}H_{26}GdN_5O_8$ = 573.7.

CAS — 131410-48-5 (anhydrous gadodiamide); 122795-43-1 (gadodiamide hydrate).

ATC — V08CA03.

ATC Vet — QV08CA03.



Pharmacopoeias. In *US.*

USP 31 (Gadodiamide). A white, odourless, powder. Freely soluble in water and in methyl alcohol; soluble in alcohol; slightly soluble in acetone and in chloroform. Store in airtight containers.

Adverse Effects and Precautions

As for Gadopentetic Acid, below.

Effects on the pancreas. Acute pancreatitis developed in a patient shortly after injection of gadodiamide for hepatic imaging.[1] Another patient[2] developed both acute pancreatitis and acute renal failure after use of gadodiamide for angiography.

1. Terzi C, Sökmen S. Acute pancreatitis induced by magnetic-resonance-imaging contrast agent. *Lancet* 1999; **354:** 1789–90. Correction. *ibid.* 2000; **355:** 660.
2. Schenker MP, *et al.* Gadolinium arteriography complicated by acute pancreatitis and acute renal failure. *J Vasc Interv Radiol* 2001; **12:** 393.

Interference with diagnostic tests. Gadodiamide may interfere with colorimetric methods for measuring serum calcium concentrations, resulting in falsely low measurements. Severe pseudohypocalcaemia has been reported[1-3] after the use of gadodiamide, particularly in patients with renal impairment.[2] There is also *in vitro* evidence that a similar interference may occur with gadoversetamide.[2]

1. Doorenbos CJ, *et al.* Severe pseudohypocalcemia after gadolinium-enhanced magnetic resonance angiography. *N Engl J Med* 2003; **349:** 817–18.
2. Prince MR, *et al.* Gadodiamide administration causes spurious hypocalcemia. *Radiology* 2003; **227** 639–46.
3. Williams SF, *et al.* Spurious hypocalcemia after gadodiamide administration. *Mayo Clin Proc* 2005; **80:** 1655–7.

Renal impairment. For the view that gadodiamide may carry a particular risk of the development of nephrogenic systemic sclerosis in patients with renal impairment, see p.1479.

Pharmacokinetics

Gadodiamide is rapidly distributed into extracellular fluid. About 96% of a dose is excreted unchanged in the urine within 24 hours. An elimination half-life of about 70 minutes has been reported. Gadodiamide is not bound to plasma proteins. It is removed by haemodialysis.

Uses and Administration

Gadodiamide is a nonionic gadolinium chelate with actions and uses similar to those of gadopentetic acid (p.1480). It has paramagnetic properties and is used as a magnetic resonance contrast medium (p.1474). It distributes mainly into extracellular fluid, but does not cross the blood-brain barrier, and is used in imaging of cranial and spinal structures, imaging of the whole body, angiography, and mammography.

Gadodiamide is available as a solution containing 287 mg/mL (0.5 mmol/mL). Usual doses are:

- cranial and spinal imaging: for adults and children, 0.2 mL/kg (0.1 mmol/kg). Adults may be given a second dose of 0.4 mL/kg (0.2 mmol/kg) within 20 minutes if required.
- whole body imaging: for adults and children, 0.2 mL/kg (0.1 mmol/kg)
- kidneys: 0.1 mL/kg (0.05 mmol/kg) may be adequate
- angiography: for adults, 0.2 mL/kg (0.1 mmol/kg)
- mammography: 0.2 to 0.4 mL/kg (0.1 to 0.2 mmol/kg).

Preparations

USP 31: Gadodiamide Injection.

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

Gadofosveset Trisodium *(USAN, rINNM)*

Gadofosveset trisódico; Gadofosvéset Trisodique; Gadofosvesetum Trinatricum; MS-32520; MS-325 (gadofosveset). Trisodium (*N*-{2-[bis(carboxymethyl)amino]ethyl}-*N*-{(*R*)-2-[bis(carboxymethyl)amino]-3-hydroxypropyl}glycine 4,4-diphenylcyclohexyl hydrogen phosphato(6–))gadolinate(3–).

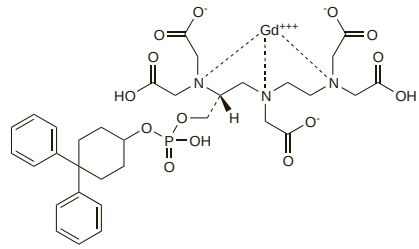
Тринатрий Гадофосвезет

$C_{33}H_{38}GdN_3Na_3O_{14}P$ = 957.9.

CAS — 201688-00-8 (gadofosveset); 193901-90-5 (gadofosveset trisodium).

ATC — V08CA11.

ATC Vet — QV08CA11.



(gadofosveset)

Profile

Gadofosveset is a gadolinium chelate used as a paramagnetic contrast medium (p.1474) in magnetic resonance angiography. It binds to plasma proteins, particularly albumin, and therefore acts as a blood pool agent, allowing visualisation of the vasculature.

Gadofosveset is given intravenously as the trisodium salt. It is available as a solution containing gadofosveset trisodium 244 mg/mL (0.25 mmol/mL). The usual dose is 0.12 mL/kg (0.03 mmol/kg) by intravenous injection.

◊ References.

1. Henness S, Keating GM. Gadofosveset. *Drugs* 2006; **66:** 851–7.

Preparations

Proprietary Preparations (details are given in Part 3)
Cz.: Vasovist; ***Gr.:*** Vasovist; ***Hung.:*** Vasovist; ***Neth.:*** Vasovist; ***Port.:*** Vasovist; ***UK:*** Vasovist.

Gadopentetic Acid *(BAN, rINN)*

Acide Gadopentétique; Ácido gadopentético; Acidum Gadopenteticum; Gadolinium-DTPA. Dihydrogen (*N*,*N*-bis{2-[bis(carboxymethyl)amino]ethyl}glycinato(5–))gadolinate(2–); a complex of gadolinium with diethylenetriamine penta-acetic acid.

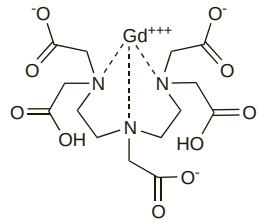
Гадопентетовая Кислота

$C_{14}H_{20}GdN_3O_{10}$ = 547.6.

CAS — 80529-93-7.

ATC — V08CA01.

ATC Vet — QV08CA01.



Meglumine Gadopentetate *(BANM, rINNM)*

Dimeglumine Gadopentetate; Gadopentétate de Méglumine; Gadopentetate Dimeglumine *(USAN)*; Gadopentetate Meglumine; Gadopentétate méglumine; Gadopentetato de meglumina; Meglumini gadopentetas; SH-L-451-A.

Меглумина Гадопентетат

$C_{14}H_{20}GdN_3O_{10}.(C_7H_{17}NO_5)_2$ = 938.0.

CAS — 86050-77-3.

ATC — V08CA01.

ATC Vet — QV08CA01.

Pharmacopoeias. *Chin.* and *US* include only as an injection.

Adverse Effects

There may be headache, nausea, vomiting, and transient sensations of heat or cold or taste disturbances on injection of gadopentetate or other gadolinium chelates. Rarely, convulsions, hypotension, allergic or anaphylactoid reactions, and shock may occur. Paraesthesias, dizziness, and localised pain have also been reported. Transient elevations of serum iron and bilirubin values have been observed. Nephrogenic systemic fibrosis may occur rarely in patients with renal impairment (see under Precautions, below).

◊ General references.

1. Nelson KL, *et al.* Clinical safety of gadopentetate dimeglumine. *Radiology* 1995; **196:** 439–43.

Effects on the nervous system. Subacute encephalopathy has been reported[1] in a woman who was given repeated doses of a gadolinium chelate for magnetic resonance imaging. It was suggested that renal impairment may have contributed to retention of gadolinium, with subsequent diffusion into the CSF.

1. Maramattom BV, *et al.* Gadolinium encephalopathy in a patient with renal failure. *Neurology* 2005; **64:** 1276–8.

Hypersensitivity. Although rare, anaphylactoid reactions have occurred with a number of gadolinium chelates.[1] Severe reactions have been reported with gadopentetate,[2] gadoterate,[3,4] and gadoteridol,[5] including a fatal reaction with gadopentetate.[6] There has also been a report[7] of a severe reaction with gadoteridol in a patient who had previously tolerated gadopentetate. Reactions may occur despite premedication with antihistamines and corticosteroids.[8]

1. Runge VM. Safety of approved MR contrast media for intravenous injection. *J Magn Reson Imaging* 2000; **12:** 205–13.
2. Tardy B, *et al.* Anaphylactic shock induced by intravenous gadopentetate dimeglumine. *Lancet* 1992; **339**: 494.
3. Meuli RA, Maeder P. Life-threatening anaphylactoid reaction after IV injection of gadoterate meglumine. *Am J Roentg* 1996; **166:** 729.
4. Beaudouin E, *et al.* Anaphylactic shock induced by gadoterate meglumine (DOTAREM). *Allerg Immunol (Paris)* 2003; **35:** 382–5.
5. Shellock FG, *et al.* Adverse reaction to intravenous gadoteridol. *Radiology* 1993; **189:** 151–2.
6. Jordan RM, Mintz RD. Fatal reaction to gadopentetate dimeglumine. *Am J Roentg* 1995; **164:** 743–4.
7. Witte RJ, Anzai LL. Life-threatening anaphylactoid reaction after intravenous gadoteridol administration in a patient who had previously received gadopentetate dimeglumine. *Am J Neuroradiol* 1994; **15:** 523–4.
8. Dillman JR, *et al.* Allergic-like breakthrough reactions to gadolinium contrast agents after corticosteroid and antihistamine premedication. *Am J Roentg* 2008; **190:** 187–90.

Precautions

Gadopentetate should not be used in patients with severe renal impairment (GFR less than 30 mL/minute per 1.73 m^2) or with acute renal impairment associated with hepato-renal syndrome or liver transplantation (see Renal Impairment, below). It should be given with care to patients with moderate renal impairment, epilepsy, hypotension, or a history of hypersensitivity, asthma, or other allergic respiratory disorders. Care should be taken to avoid extravasation. Gadopentetate may interfere with tests of serum iron or bilirubin concentrations.

Breast feeding. Studies[1-3] have shown that gadopentetate is distributed into breast milk in very small amounts; the total amount excreted in the milk within 24 hours was less than 0.04% of the intravenous dose in all cases. No adverse effects have been seen in breast-feeding infants whose mothers were receiving gadopentetic acid and the American Academy of Pediatrics considers[4] that it is therefore usually compatible with breast feeding.

1. Schmiedl U, *et al.* Excretion of gadopentetate dimeglumine in human breast milk. *Am J Roentg* 1990; **154:** 1305–6.
2. Rofsky NM, *et al.* Quantitative analysis of gadopentetate dimeglumine excreted in breast milk. *J Magn Reson Imaging* 1993; **3:** 131–2.
3. Kubik-Huch RA, *et al.* Gadopentetate dimeglumine excretion into human breast milk during lactation. *Radiology* 2000; **216:** 555–8.
4. American Academy of Pediatrics. The transfer of drugs and other chemicals into human milk. *Pediatrics* 2001; **108:** 776–89. Correction. *ibid.*; 1029. Also available at: http://aappolicy.aappublications.org/cgi/content/full/pediatrics%3b108/3/776 (accessed 27/03/06)

Myasthenia gravis. Acute deterioration of myasthenia gravis has been reported[1] in a patient after imaging of the brain using gadopentetate.

1. Nordenbo AM, Somnier FE. Acute deterioration of myasthenia gravis after intravenous administration of gadolinium-DTPA. *Lancet* 1992; **340:** 1168.

Renal impairment. Nephrogenic systemic fibrosis (nephrogenic fibrosing dermopathy) is a rare condition that has been reported in patients with renal impairment. Use of gadolinium-containing contrast media appears to be a risk factor;[1-3] most cases have occurred with gadodiamide given in high doses for magnetic resonance angiography, but there have also been reports with other gadolinium-containing contrast media and with lower doses. It has been suggested that the mechanism involves release of free gadolinium ions into the tissues, and that the potential for this varies between the different gadolinium-based contrast media available, with gadodiamide and gadoversetamide more likely to do so.[4] The macrocyclic structure of gadoteridol and gadoterate was thought to be less prone to this effect, but further research is needed. The FDA[5] and the MHRA[6] advise that use of