

SUMMARY OF PRODUCT CHARACTERISTICS

1 NAME OF THE MEDICINAL PRODUCT

Mycophenolate mofetil 500 mg powder for concentrate for solution for infusion

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each vial contains the equivalent of 500 mg Mycophenolate mofetil (as hydrochloride salt).

For the full list of excipients, see section 6.1.

3 PHARMACEUTICAL FORM

Powder for concentrate for solution for infusion.

White to off white lyophilized powder. pH in the range of approximately 2.4 to 4.1 and osmolality in the range of approximately 300 to 340 mOsmol/Kg after reconstitution and dilution with 5 % glucose intravenous infusion solution at 6 mg/ml concentration.

4 CLINICAL PARTICULARS

4.1 Therapeutic indications

Mycophenolate mofetil for infusion is indicated in combination with ciclosporin and corticosteroids for the prophylaxis of acute transplant rejection in patients receiving allogeneic renal or hepatic transplants.

4.2 Posology and method of administration

Treatment with Mycophenolate mofetil for infusion should be initiated and maintained by appropriately qualified transplant specialists.

CAUTION: MYCOPHENOLATE MOFETIL FOR INFUSION I.V. SOLUTION MUST NOT BE ADMINISTERED BY RAPID OR BOLUS INTRAVENOUS INJECTION.

Posology

Mycophenolate mofetil for infusion is an alternative dosage form to Mycophenolate mofetil oral forms (capsules, tablets and powder for oral suspension) that may be administered for up to 14 days. The initial dose of Mycophenolate mofetil for infusion should be given within 24 hours following transplantation.

Renal transplant:

The recommended dose in renal transplant patients is 1 g administered twice daily (2 g daily dose).

Hepatic transplant:

The recommended dose of Mycophenolate mofetil for infusion in hepatic transplant patients is 1 g administered twice daily (2 g daily dose). IV Mycophenolate mofetil for infusion should continue for the first 4 days following hepatic transplant, with oral Mycophenolate mofetil initiated as soon after this as it can be tolerated. The recommended dose of oral Mycophenolate mofetil in hepatic transplant patients is 1.5 g administered twice daily (3 g daily dose).

Use in special populations

Paediatric population:

Safety and efficacy of mycophenolate mofetil in paediatric patients have not been established. No pharmacokinetic data with mycophenolate mofetil are available for paediatric renal transplant patients. No pharmacokinetic data are available for paediatric patients following hepatic transplants.

Elderly:

The recommended dose of 1 g administered twice a day for renal or hepatic transplant patients is appropriate for the elderly.

Renal impairment:

In renal transplant patients with severe chronic renal impairment (glomerular filtration rate $< 25 \text{ ml} \cdot \text{min}^{-1} \cdot 1.73 \text{ m}^{-2}$), outside the immediate post-transplant period, doses greater than 1 g administered twice a day should be avoided. These patients should also be carefully observed. No dose adjustments are needed in patients experiencing delayed renal graft function post-operatively (see section 5.2). No data are available for hepatic transplant patients with severe chronic renal impairment.

Severe hepatic impairment:

No dose adjustments are needed for renal transplant patients with severe hepatic parenchymal disease.

Treatment during rejection episodes:

MPA (mycophenolic acid) is the active metabolite of Mycophenolate mofetil. Renal transplant rejection does not lead to changes in MPA pharmacokinetics; dosage reduction or interruption of Mycophenolate mofetil for infusion is not required. No pharmacokinetic data are available during hepatic transplant rejection.

Paediatric population:

No data are available for treatment of first or refractory rejection in paediatric transplant patients.

Method of administration

Following reconstitution to a concentration of 6 mg/mL, Mycophenolate mofetil 500 mg powder for concentrate for solution for infusion must be administered by slow intravenous infusion over a period of 2 hours by either a peripheral or a central vein (see section 6.6).

Precautions to be taken before handling or administering the medicinal product

Because mycophenolate mofetil has demonstrated teratogenic effects in rats and rabbits, avoid direct contact of the dry powder or prepared solutions of Mycophenolate mofetil 500 mg powder for concentrate for solution for infusion with skin or mucous membranes. If such contact occurs, wash thoroughly with soap and water; rinse eyes with plain water.

For instructions on reconstitution and dilution of the medicinal product before administration, see section 6.6

4.3 Contraindications

Mycophenolate mofetil for infusion should not be given to patients with hypersensitivity to mycophenolate mofetil, mycophenolic acid or to any of the excipients listed in section 6.1. Hypersensitivity reactions to Mycophenolate mofetil for infusion have been observed (see section 4.8). Mycophenolate mofetil for infusion is contraindicated in patients who are allergic to polysorbate 80.

Mycophenolate mofetil for infusion should not be given to women of childbearing potential who are not using highly effective contraception (see section 4.6).

Mycophenolate mofetil for infusion treatment should not be initiated in women of child bearing potential without providing a pregnancy test result to rule out unintended use in pregnancy (see section 4.6).

Mycophenolate mofetil for infusion should not be used in pregnancy unless there is no suitable alternative treatment to prevent transplant rejection (see section 4.6)

Mycophenolate mofetil for infusion should not be given to women who are breastfeeding (see section 4.6).

For information on use in pregnancy and contraceptive requirements, see section 4.6.

4.4 Special warnings and precautions for use

Neoplasms

Patients receiving immunosuppressive regimens involving combinations of medicinal products, including Mycophenolate mofetil for infusion, are at increased risk of developing lymphomas and other malignancies, particularly of the skin (see section 4.8). The risk appears to be related to the intensity and duration of immunosuppression rather than to the use of any specific agent. As general advice to minimise the risk for skin cancer, exposure to sunlight and UV light should be limited by wearing protective clothing and using a sunscreen with a high protection factor.

Infections

Patients treated with immunosuppressants, including Mycophenolate mofetil for infusion, are at increased risk for opportunistic infections (bacterial, fungal, viral and protozoal), fatal infections and sepsis (see section 4.8). Such infections include latent viral reactivation, such as hepatitis B or hepatitis C reactivation and infections caused by polyomaviruses (BK virus associated nephropathy, JC virus associated progressive multifocal leukoencephalopathy PML) . Cases of hepatitis due to reactivation of hepatitis B or hepatitis C have been reported in carrier patients treated with immunosuppressants. These infections are often related to a high total immunosuppressive burden and may lead to serious or fatal conditions that physicians should consider in the differential diagnosis in immunosuppressed patients with deteriorating renal function or neurological symptoms. Mycophenolic acid has a cytostatic effect on B- and T-lymphocytes, therefore an increased severity of COVID-19 may occur, and appropriate clinical action should be considered.

There have been reports of hypogammaglobulinaemia in association with recurrent infections in patients receiving Mycophenolate mofetil in combination with other immunosuppressants. In some of these cases switching Mycophenolate mofetil to an alternative immunosuppressant resulted in serum IgG levels returning to normal. Patients on Mycophenolate mofetil for infusion who develop recurrent infections should have their serum immunoglobulins measured. In cases of sustained, clinically relevant hypogammaglobulinaemia, appropriate clinical action should be considered taking into account the potent cytostatic effects that mycophenolic acid has on T- and B-lymphocytes.

There have been published reports of bronchiectasis in adults and children who received Mycophenolate mofetil in combination with other immunosuppressants. In some of these cases switching Mycophenolate mofetil to another immunosuppressant resulted in improvement in respiratory symptoms. The risk of bronchiectasis may be linked to hypogammaglobulinaemia or to a direct effect on the lung. There have also been isolated reports of interstitial lung disease and pulmonary fibrosis, some of which were fatal (see section 4.8). It is recommended that patients who develop persistent pulmonary symptoms, such as cough and dyspnoea, are investigated.

Blood and immune system

Patients receiving Mycophenolate mofetil for infusion should be monitored for neutropenia, which may be related to Mycophenolate mofetil for infusion itself, concomitant medications, viral infections, or some combination of these causes. Patients taking Mycophenolate mofetil for infusion should have complete blood counts weekly during the first month, twice monthly for the second and third months of treatment, then monthly through the first year. If neutropenia develops (absolute neutrophil count $< 1.3 \times 10^3/\mu\text{l}$) it may be appropriate to interrupt or discontinue Mycophenolate mofetil for infusion.

Cases of pure red cell aplasia (PRCA) have been reported in patients treated with Mycophenolate mofetil in combination with other immunosuppressants. The mechanism for Mycophenolate mofetil induced PRCA is unknown. PRCA may resolve with dose reduction or cessation of Mycophenolate mofetil for infusion therapy. Changes to Mycophenolate mofetil for infusion therapy should only be undertaken under appropriate supervision in transplant recipients in order to minimise the risk of graft rejection (see section 4.8).

Patients receiving Mycophenolate mofetil for infusion should be instructed to report immediately any evidence of infection, unexpected bruising, bleeding or any other manifestation of bone marrow failure.

Patients should be advised that during treatment with Mycophenolate mofetil for infusion, vaccinations may be less effective, and the use of live attenuated vaccines should be avoided (see section 4.5). Influenza vaccination may be of value. Prescribers should refer to national guidelines for influenza vaccination.

Gastro-intestinal

Mycophenolate mofetil has been associated with an increased incidence of digestive system adverse events, including infrequent cases of gastrointestinal tract ulceration, haemorrhage and perforation, Mycophenolate mofetil for infusion should be administered with caution in patients with active serious digestive system disease.

Mycophenolate mofetil is an IMPDH (inosine monophosphate dehydrogenase) inhibitor. Therefore, it should be avoided in patients with rare hereditary deficiency of hypoxanthine-guanine phosphoribosyltransferase (HGPRT) such as Lesch-Nyhan and Kelley-Seegmiller syndrome.

Interactions

Caution should be exercised when switching combination therapy from regimens containing immunosuppressants, which interfere with MPA enterohepatic recirculation e.g. ciclosporin, to others devoid of this effect, e.g. tacrolimus, sirolimus, belatacept, or vice versa, as this might result in changes of MPA exposure. Drugs which interfere with MPA's enterohepatic cycle (e.g. cholesteramine, antibiotics) should be used with caution due to their potential to reduce the plasma levels and efficacy of Mycophenolate mofetil for infusion (see also section 4.5). Some degree of enterohepatic recirculation is anticipated following intravenous administration of Mycophenolate mofetil for infusion. Therapeutic drug monitoring of MPA may be appropriate when switching combination therapy (e.g. from ciclosporin to tacrolimus or vice versa) or to ensure adequate immunosuppression in patients with high immunological risk (e.g. risk of rejection, treatment with antibiotics, addition or removal of an interacting medication).

It is recommended that Mycophenolate mofetil for infusion should not be administered concomitantly with azathioprine because such concomitant administration has not been studied.

The risk/ benefit ratio of mycophenolate mofetil in combination with sirolimus has not been established (see also section 4.5).

Special populations

Elderly patients may be at an increased risk of adverse events such as certain infections (including cytomegalovirus tissue invasive disease) and possibly gastrointestinal haemorrhage and pulmonary oedema, compared with younger individuals (see section 4.8).

Teratogenic effects

Mycophenolate is a powerful human teratogen. Spontaneous abortion (rate of 45% to 49%) and congenital malformations (estimated rate of 23% to 27%) have been reported following MMF exposure during pregnancy. Therefore Mycophenolate mofetil for infusion is contraindicated in pregnancy unless there are no suitable alternative treatments to prevent transplant rejection. Female patients of childbearing potential should be made aware of the risks and follow the recommendations provided in section 4.6. (e.g. contraceptive methods, pregnancy testing) prior to, during, and after therapy with Mycophenolate mofetil for infusion. Physicians should ensure that women taking mycophenolate understand the risk of harm to the baby, the need for effective contraception, and the need to immediately consult their physician if there is a possibility of pregnancy.

Contraception (see section 4.6)

Because of robust clinical evidence showing a high risk of abortion and congenital malformations when mycophenolate mofetil is used in pregnancy every effort to avoid pregnancy during treatment should be taken. Therefore women with childbearing potential must use at least one form of reliable contraception (see section 4.3) before starting Mycophenolate mofetil for infusion therapy, during therapy, and for six weeks after stopping the therapy; unless abstinence is the chosen method of

contraception Two complementary forms of contraception simultaneously are preferred to minimise the potential for contraceptive failure and unintended pregnancy.

For contraception advice for men see section 4.6.

Educational materials

In order to assist patients in avoiding foetal exposure to mycophenolate and to provide additional important safety information, the Marketing Authorisation holder will provide educational materials to healthcare professionals. The educational materials will reinforce the warnings about the teratogenicity of mycophenolate, provide advice on contraception before therapy is started and guidance on the need for pregnancy testing. Full patient information about the teratogenic risk and the pregnancy prevention measures should be given by the physician to women of childbearing potential and, as appropriate, to male patients.

Additional precautions

Patients should not donate blood during therapy or for at least 6 weeks following discontinuation of mycophenolate. Men should not donate semen during therapy or for 90 days following discontinuation of mycophenolate.

4.5 Interaction with other medicinal products and other forms of interaction

Aciclovir:

Higher aciclovir plasma concentrations were observed when Mycophenolate mofetil was administered with aciclovir in comparison to the administration of aciclovir alone. The changes in MPAG (the phenolic glucuronide of MPA) pharmacokinetics (MPAG increased by 8 %) were minimal and are not considered clinically significant. Because MPAG plasma concentrations are increased in the presence of renal impairment, as are aciclovir concentrations, the potential exists for Mycophenolate mofetil and aciclovir, or its prodrugs, e.g. valaciclovir, to compete for tubular secretion, and further increases in concentrations of both substances may occur.

Medicinal products that interfere with enterohepatic recirculation (e.g. cholestyramine, ciclosporin A, antibiotics):

Caution should be used with medicinal products that interfere with enterohepatic recirculation because of their potential to reduce the efficacy of mycophenolate mofetil.

Cholestyramine

Following single dose administration of 1.5 g of mycophenolate mofetil to normal healthy subjects pre-treated with 4 g TID of cholestyramine for 4 days, there was a 40% reduction in the AUC of MPA (see section 4.4 and section 5.2). Caution should be used during concomitant administration because of the potential to reduce efficacy of mycophenolate mofetil.

Ciclosporin A:

Ciclosporin A (CsA) pharmacokinetics are unaffected by mycophenolate mofetil. In contrast, if concomitant CsA treatment is stopped, an increase in MPA AUC of around 30% should be expected. CsA interferes with MPA enterohepatic recycling, resulting in reduced MPA exposures by 30-50% in renal transplant patients treated with Mycophenolate mofetil for infusion and CsA compared with patients receiving sirolimus or belatacept and similar doses of Mycophenolate mofetil for infusion (see also section 4.4). Conversely, changes of MPA exposure should be expected when switching patients from CsA to one of the immunosuppressants which does not interfere with MPA's enterohepatic cycle.

Antibiotics eliminating β -glucuronidase-producing bacteria in the intestine (e.g. aminoglycoside, cephalosporin, fluoroquinolone, and penicillin classes of antibiotics) may interfere with MPAG/MPA enterohepatic recirculation thus leading to reduced systemic MPA exposure. Information concerning the following antibiotics is available:

Ciprofloxacin or amoxicillin plus clavulanic acid:

Reductions in pre-dose (trough) MPA concentrations of about 50% have been reported in renal transplant recipients in the days immediately following commencement of oral ciprofloxacin or amoxicillin plus clavulanic acid. This effect tended to diminish with continued antibiotic use and to cease within a few days of antibiotic discontinuation. The change in predose level may not accurately represent changes in overall MPA exposure. Therefore, a change in the dose of mycophenolate mofetil should not normally be necessary in the absence of clinical evidence of graft dysfunction. However, close clinical monitoring should be performed during the combination and shortly after antibiotic treatment.

Norfloxacin and metronidazole:

In healthy volunteers, no significant interaction was observed when mycophenolate mofetil was concomitantly administered with norfloxacin or metronidazole separately. However, norfloxacin and metronidazole combined reduced the MPA exposure by approximately 30% following a single dose of mycophenolate mofetil.

Trimethoprim/sulfamethoxazole:

No effect on the bioavailability of MPA was observed.

Medicinal products that affect glucuronidation (e.g. isavuconazole, telmisartan)

Concomitant administration of drugs affecting glucuronidation of MPA may change MPA exposure. Caution is therefore recommended when administering these drugs concomitantly with mycophenolate mofetil.

Isavuconazole

An increase of MPA AUC_{0-∞} by 35% was observed with concomitant administration of isavuconazole.

Telmisartan

Concomitant administration of telmisartan and Mycophenolate mofetil for infusion resulted in an approximately 30% decrease of MPA concentrations. Telmisartan changes MPA's elimination by enhancing PPAR gamma (peroxisome proliferator-activated receptor gamma) expression, which in turn results in an enhanced UGT1A9 expression and activity. When comparing rates of transplant rejection, rates of graft loss or adverse event profiles between Mycophenolate mofetil patients with and without concomitant telmisartan medication, no clinical consequences of the pharmacokinetic drug-drug interaction were seen.

Ganciclovir:

Based on the results of a single dose administration study of recommended doses of oral mycophenolate and IV ganciclovir and the known effects of renal impairment on the pharmacokinetics of mycophenolate mofetil (see section 4.2) and ganciclovir, it is anticipated that co-administration of these agents (which compete for mechanisms of renal tubular secretion) will result in increases in MPAG and ganciclovir concentration. No substantial alteration of MPA pharmacokinetics is anticipated and mycophenolate mofetil dose adjustment is not required. In patients with renal impairment in which mycophenolate mofetil and ganciclovir or its prodrugs, e.g. valganciclovir, are co-administered, the dose recommendations for ganciclovir should be observed and patients should be monitored carefully.

Oral contraceptives:

The pharmacokinetics and pharmacodynamics of oral contraceptives were unaffected by coadministration of mycophenolate mofetil (see also section 5.2).

Rifampicin:

In patients not also taking ciclosporin, concomitant administration of mycophenolate mofetil and rifampicin resulted in a decrease in MPA exposure (AUC_{0-12h}) of 18% to 70%. It is recommended to monitor MPA exposure levels and to adjust mycophenolate mofetil doses accordingly to maintain clinical efficacy when rifampicin is administered concomitantly.

Sevelamer:

Decrease in MPA C_{max} and AUC(0-12h) by 30% and 25%, respectively, were observed when mycophenolate mofetil was concomitantly administered with sevelamer without any clinical consequences (i.e. graft rejection). It is recommended, however, to administer mycophenolate mofetil at least one hour before or three hours after sevelamer intake to minimise the impact on the absorption of MPA. There are no data on mycophenolate mofetil with phosphate binders other than sevelamer.

Tacrolimus:

In hepatic transplant patients initiated on mycophenolate mofetil and tacrolimus, the AUC and C_{max} of MPA, the active metabolite of mycophenolate mofetil, were not significantly affected by coadministration with tacrolimus. In contrast, there was an increase of approximately 20 % in tacrolimus AUC when multiple doses of mycophenolate mofetil (1.5 g BID) were administered hepatic transplant to patients taking tacrolimus. However, in renal transplant patients, tacrolimus concentration did not appear to be altered by mycophenolate mofetil (see also section 4.4).

Live vaccines:

Live vaccines should not be given to patients with an impaired immune response. The antibody response to other vaccines may be diminished (see also section 4.4).

Paediatric population

Interaction studies have only been performed in adults.

Potential interaction:

Co-administration of probenecid with mycophenolate mofetil in monkeys raises plasma AUC of MPAG by 3-fold. Thus, other substances known to undergo renal tubular secretion may compete with MPAG, and thereby raise plasma concentrations of MPAG or the other substance undergoing tubular secretion.

4.6 Fertility, pregnancy and lactation

Women of childbearing potential

Pregnancy whilst taking mycophenolate must be avoided. Therefore women of childbearing potential must use at least one form of reliable contraception (see section 4.3) before starting mycophenolate mofetil therapy, during therapy, and for six weeks after stopping the therapy, unless abstinence is the chosen method of contraception. Two complementary forms of contraception simultaneously are preferred.

Pregnancy:

Mycophenolate mofetil for infusion is contraindicated during pregnancy unless there is no suitable alternative treatment to prevent transplant rejection. Treatment should not be initiated without providing a negative pregnancy test result to rule out unintended use in pregnancy.

Female patients of reproductive potential must be made aware of the increased risk of pregnancy loss and congenital malformations at the beginning of the treatment and must be counselled regarding pregnancy prevention, and planning.

Before starting Mycophenolate mofetil for infusion treatment, women of child bearing potential should have two negative serum or urine pregnancy tests with a sensitivity of at least 25 mIU/mL in order to exclude unintended exposure of an embryo to mycophenolate. It is recommended that the second test should be performed 8 – 10 days after the first test. For transplants from deceased donors, if it is not possible to perform two tests 8-10 days apart before treatment starts (because of the timing of transplant organ availability), a pregnancy test must be performed

immediately before starting treatment and a further test 8-10 days later. Pregnancy tests should be repeated as clinically required (e.g. after any gap in contraception is reported). Results of all pregnancy tests should be discussed with the patient. Patients should be instructed to consult their physician immediately should pregnancy occur.

Mycophenolate is a powerful human teratogen, with an increased risk of spontaneous abortions and congenital malformations in case of exposure during pregnancy;

- Spontaneous abortions have been reported in 45 to 49% of pregnant women exposed to mycophenolate mofetil, compared to a reported rate of between 12 and 33% in solid organ transplant patients treated with immunosuppressants other than mycophenolate mofetil.
- Based on literature reports, malformations occurred in 23 to 27% of live births in women exposed to mycophenolate mofetil during pregnancy (compared to 2 to 3 % of live births in the overall population and approximately 4 to 5% of live births in solid organ transplant recipients treated with immunosuppressants other than mycophenolate mofetil).

Congenital malformations, including reports of multiple malformations, have been observed post-marketing in children of patients exposed to mycophenolate mofetil during pregnancy in combination with other immunosuppressants. The following malformations were most frequently reported:

- Abnormalities of the ear (e.g. abnormally formed or absent external), external auditory canal atresia (middle ear);
- Facial malformations such as cleft lip, cleft palate, micrognathia and hypertelorism of the orbits;
- Abnormalities of the eye (e.g. coloboma);
- Congenital heart disease such as atrial and ventricular septal defects;
- Malformations of the fingers (e.g. polydactyly, syndactyly);
- Tracheo-Oesophageal malformations (e.g. oesophageal atresia);
- Nervous system malformations such as spina bifida;
- Renal abnormalities.

In addition there have been isolated reports of the following malformations:

- Microphthalmia;
- Congenital choroid plexus cyst;
- Septum pellucidum agenesis;
- Olfactory nerve agenesis.

Studies in animals have shown reproductive toxicity (see section 5.3).

Breast-feeding

Limited data show that mycophenolic acid is excreted in human milk. Because of the potential for serious adverse reactions to mycophenolic acid in breast-fed infants, Mycophenolate mofetil for infusion is contraindicated in nursing mothers (see section 4.3).

Men

Limited clinical evidence does not indicate an increased risk of malformations or miscarriage following paternal exposure to mycophenolate mofetil.

MPA is a powerful teratogen. It is not known if MPA is present in semen. Calculations based on animal data show that the maximum amount of MPA that

could potentially be transferred to woman is so low that it would be unlikely to have an effect. Mycophenolate has been shown to be genotoxic in animal studies at concentrations exceeding the human therapeutic exposures by small margins, such that the risk of genotoxic effects on sperm cells cannot completely be excluded.

Therefore, the following precautionary measures are recommended: sexually active male patients or their female partners are recommended to use reliable contraception during treatment of the male patient and for at least 90 days after cessation of mycophenolate mofetil. Male patients of reproductive potential should be made aware of and discuss with a qualified health-care professional the potential risks of fathering a child.

Fertility

Mycophenolate mofetil had no effect on fertility of male rats at oral doses up to 20 mg/kg/day. The systemic exposure at this dose represents 2 – 3 times the clinical exposure at the recommended clinical dose of 2 g/day. In a female fertility and reproduction study conducted in rats, oral doses of 4.5 mg/kg/day caused malformations (including anophthalmia, agnathia, and hydrocephaly) in the first generation offspring in the absence of maternal toxicity. The systemic exposure at this dose was approximately 0.5 times the clinical exposure at the recommended clinical dose of 2 g/day. No effects on fertility or reproductive parameters were evident in the dams or in the subsequent generation.

4.7 Effects on ability to drive and use machines

Mycophenolate mofetil has a moderate influence on the ability to drive and use machines.

Mycophenolate mofetil may cause somnolence, confusion, dizziness, tremor or hypotension and therefore patients are advised to use caution when driving or using machines.

4.8 Undesirable effects

Summary of the safety profile

Diarrhoea (up to 52.6%), leukopenia (up to 45.8%), bacterial infections (up to 39.9%) and vomiting (up to 39.1%) were among the most common and/or serious adverse reactions associated with the administration of mycophenolate mofetil in combination with ciclosporin and corticosteroids. There is also evidence of a higher frequency of certain types of infections (see section 4.4).

Tabulated list of adverse reactions

The adverse reactions from clinical trials and post-marketing experience are listed in Table-1, by MedDRA system organ class (SOC) along with their frequencies. The corresponding frequency category for each adverse reaction is based on the following convention: very common ($\geq 1/10$), common ($\geq 1/100$ to $< 1/10$), uncommon ($\geq 1/1,000$ to $< 1/100$), rare ($\geq 1/10,000$ to $< 1/1,000$) and very rare ($< 1/10,000$). Due to the large differences observed in the frequency of certain adverse reactions across the different transplant indications, the frequency is presented separately for renal and hepatic transplant patients.

Table 1 Adverse reactions

Adverse drug reaction (MedDRA) System Organ Class	Renal transplant	Hepatic transplant
	Frequency	Frequency
Infections and infestations		
Bacterial infections	Very Common	Very Common
Fungal infections	Common	Very Common
Protozoal infections	Uncommon	Uncommon
Viral infections	Very Common	Very Common
Neoplasms benign, malignant and unspecified (including cysts and polyps)		
Benign neoplasm of skin	Common	Common
Lymphoma	Uncommon	Uncommon
Lymphoproliferative disorder	Uncommon	Uncommon
Neoplasm	Common	Common
Skin cancer	Common	Uncommon
Blood and lymphatic system disorders		
Anemia	Very Common	Very Common
Aplasia pure red cell	Uncommon	Uncommon
Bone marrow failure	Uncommon	Uncommon
Ecchymosis	Common	Common
Leukocytosis	Common	Very Common
Leukopenia	Very Common	Very Common
Pancytopenia	Common	Common
Pseudolymphoma	Uncommon	Uncommon
Thrombocytopenia	Common	Very Common
Metabolism and nutrition disorders		
Acidosis	Common	Common
Hypercholesterolemia	Very Common	Common
Hyperglycemia	Common	Very Common
Hyperkalemia	Common	Very Common
Hyperlipidemia	Common	Common
Hypocalcemia	Common	Very Common
Hypokalemia	Common	Very Common
Hypomagnesemia	Common	Very Common
Hypophosphatemia	Very Common	Very Common
Hyperuricaemia	Common	Common
Gout	Common	Common
Weight decreased	Common	Common
Psychiatric disorders		
Confusional state	Common	Very Common
Depression	Common	Very Common
Insomnia	Common	Very Common
Agitation	Uncommon	Common
Anxiety	Common	Very Common
Thinking abnormal	Uncommon	Common
Nervous system disorders		

Dizziness	Common	Very Common
Headache	Very Common	Very Common
Hypertonia	Common	Common
Paresthesia	Common	Very Common
Somnolence	Common	Common
Tremor	Common	Very Common
Convulsion	Common	Common
Dysgeusia	Uncommon	Uncommon
Cardiac disorders		
Tachycardia	Common	Very Common
Vascular disorders		
Hypertension	Very Common	Very Common
Hypotension	Common	Very Common
Lymphocele	Uncommon	Uncommon
Venous thrombosis	Common	Common
Vasodilatation	Common	Common
Respiratory, thoracic and mediastinal disorders		
Bronchiectasis	Uncommon	Uncommon
Cough	Very Common	Very Common
Dyspnea	Very Common	Very Common
Interstitial lung disease	Uncommon	Very Rare
Pleural effusion	Common	Very Common
Pulmonary fibrosis	Very Rare	Uncommon
Gastrointestinal disorders		
Abdominal distension	Common	Very Common
Abdominal pain	Very Common	Very Common
Colitis	Common	Common
Constipation	Very Common	Very Common
Decreased appetite	Common	Very Common
Diarrhea	Very Common	Very Common
Dyspepsia	Very Common	Very Common
Esophagitis	Common	Common
Eructation	Uncommon	Uncommon
Flatulence	Common	Very Common
Gastritis	Common	Common
Gastrointestinal hemorrhage	Common	Common
Gastrointestinal ulcer	Common	Common
Gingival hyperplasia	Common	Common
Ileus	Common	Common
Mouth ulceration	Common	Common
Nausea	Very Common	Very Common
Pancreatitis	Uncommon	Common
Stomatitis	Common	Common
Vomiting	Very Common	Very Common
Immune system disorders		
Hypersensitivity	Uncommon	Common
Hypogammaglobulinaemia	Uncommon	Very Rare
Hepatobiliary disorders		

Blood alkaline phosphatase increased	Common	Common
Blood lactate dehydrogenase increased	Common	Uncommon
Hepatic enzyme increased	Common	Very Common
Hepatitis	Common	Very Common
Hyperbilirubinaemia	Common	Very Common
Jaundice	Uncommon	Common
Skin and subcutaneous tissue disorders		
Acne	Common	Common
Alopecia	Common	Common
Rash	Common	Very Common
Skin hypertrophy	Common	Common
Musculoskeletal and connective tissue disorders		
Arthralgia	Common	Common
Muscular weakness	Common	Common
Renal and urinary disorders		
Blood creatinine increased	Common	Very Common
Blood urea increased	Uncommon	Very Common
Hematuria	Very Common	Common
Renal impairment	Common	Very Common
General disorders and administration site conditions		
Asthenia	Very Common	Very Common
Chills	Common	Very Common
Edema	Very Common	Very Common
Hernia	Common	Very Common
Malaise	Common	Common
Pain	Common	Very Common
Pyrexia	Very Common	Very Common
de novo purine synthesis inhibitors-associated acute inflammatory syndrome	Uncommon	Uncommon

Adverse reactions attributable to peripheral venous infusion were phlebitis and thrombosis, both observed at 4% in patients treated with mycophenolate mofetil.

Description of selected adverse reactions

Malignancies

Patients receiving immunosuppressive regimens involving combinations of medicinal products, including mycophenolate mofetil, are at increased risk of developing lymphomas and other malignancies, particularly of the skin (see section 4.4). Three-year safety data in renal transplant patients did not reveal any unexpected changes in incidence of malignancy compared to the 1-year data. Hepatic transplant patients were followed for at least 1 year, but less than 3 years.

Infections

All patients treated with immunosuppressants are at increased risk of bacterial, viral and fungal infections (some of which may lead to a fatal outcome), including those

caused by opportunistic agents and latent viral reactivation. The risk increases with total immunosuppressive load (see section 4.4). The most serious infections were sepsis, peritonitis, meningitis, endocarditis tuberculosis and atypical mycobacterial infection. The most common opportunistic infections in patients receiving mycophenolate mofetil (2 g or 3 g daily) with other immunosuppressants in controlled clinical trials in renal and hepatic transplant patients followed for at least 1 year were candida mucocutaneous, CMV viraemia/syndrome and Herpes simplex. The proportion of patients with CMV viraemia/syndrome was 13.5%. Cases of BK virus associated nephropathy, as well as cases of JC virus associated progressive multifocal leukoencephalopathy (PML), have been reported in patients treated with immunosuppressants, including mycophenolate mofetil.

Blood and lymphatic disorders

Cytopenias, including leukopenia, anemia, thrombocytopenia and pancytopenia, are known risks associated with mycophenolate mofetil and may lead or contribute to the occurrence of infections and hemorrhages (see section 4.4). Agranulocytosis and neutropenia have been reported; therefore, regular monitoring of patients taking mycophenolate mofetil is advised (see section 4.4). There have been reports of aplastic anaemia and bone marrow failure in patients treated with mycophenolate mofetil, some of which have been fatal.

Cases of pure red cell aplasia (PRCA) have been reported in patients treated with mycophenolate mofetil (see section 4.4).

Isolated cases of abnormal neutrophil morphology, including the acquired Pelger-Huet anomaly, have been observed in patients treated with mycophenolate mofetil. These changes are not associated with impaired neutrophil function. These changes may suggest a 'left shift' in the maturity of neutrophils in haematological investigations, which may be mistakenly interpreted as a sign of infection in immunosuppressed patients such as those that receive mycophenolate mofetil.

Gastrointestinal disorders

The most serious gastrointestinal disorders were ulceration and hemorrhage which are known risks associated with mycophenolate mofetil. Mouth, esophageal, gastric, duodenal, and intestinal ulcers often complicated by hemorrhage, as well as hematemesis, melena, and hemorrhagic forms of gastritis and colitis were commonly reported during the pivotal clinical trials. The most common gastrointestinal disorders, however, were diarrhea, nausea and vomiting. Endoscopic investigation of patients with mycophenolate mofetil-related diarrhea have revealed isolated cases of intestinal villous atrophy (see section 4.4).

Hypersensitivity

Hypersensitivity reactions, including angioneurotic oedema and anaphylactic reaction, have been reported.

Pregnancy, puerperium and perinatal conditions

Cases of spontaneous abortion have been reported in patients exposed to mycophenolate mofetil, mainly in the first trimester, see section 4.6.

Congenital disorders

Congenital malformations have been observed post-marketing in children of patients exposed to mycophenolate mofetil in combination with other immunosuppressants, see section 4.6.

Respiratory, thoracic and mediastinal disorders

There have been isolated reports of interstitial lung disease and pulmonary fibrosis in patients treated with mycophenolate mofetil in combination with other immunosuppressants, some of which have been fatal. There have also been reports of bronchiectasis in children and adults.

Immune system disorders

Hypogammaglobulinaemia has been reported in patients receiving mycophenolate mofetil in combination with other immunosuppressants.

General disorders and administration site conditions

Oedema, including peripheral, face and scrotal oedema, was reported very commonly during the pivotal trials. Musculoskeletal pain such as myalgia, and neck and back pain were also very commonly reported.

De novo purine synthesis inhibitors-associated acute inflammatory syndrome has been described from post-marketing experience as a paradoxical proinflammatory reaction associated with mycophenolate mofetil and mycophenolic acid, characterised by fever, arthralgia, arthritis, muscle pain and elevated inflammatory markers. Literature case reports showed rapid improvement following discontinuation of the medicinal product.

Special populations

Elderly

Elderly patients (≥ 65 years) may generally be at increased risk of adverse reactions due to immunosuppression. Elderly patients receiving mycophenolate mofetil as part of a combination immunosuppressive regimen may be at increased risk of certain infections (including cytomegalovirus tissue invasive disease) and possibly gastrointestinal haemorrhage and pulmonary oedema, compared to younger individuals.

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

Yellow Card Scheme Website: www.mhra.gov.uk/yellowcard or search for MHRA Yellow Card in the Google Play or Apple App Store.

4.9 Overdose

Reports of overdoses with mycophenolate mofetil have been received from clinical trials and during post-marketing experience. In many of these cases, no adverse events were reported. In those overdose cases in which adverse events were reported, the events fall within the known safety profile of the medicinal product.

It is expected that an overdose of Mycophenolate mofetil could possibly result in oversuppression of the immune system and increase susceptibility to infections and bone marrow suppression (see section 4.4). If neutropenia develops, dosing with Mycophenolate mofetil for infusion should be interrupted or the dose reduced (see section 4.4).

Haemodialysis would not be expected to remove clinically significant amounts of MPA or MPAG. Bile acid sequestrants, such as cholestyramine, can remove MPA by decreasing the enterohepatic recirculation of the drug (see section 5.2).

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: immunosuppressive agents ATC code L04AA06

Mechanism of action

Mycophenolate mofetil is the 2-morpholinoethyl ester of MPA. MPA is a potent, selective, uncompetitive and reversible inhibitor of inosine monophosphate dehydrogenase, and therefore inhibits the *de novo* pathway of guanosine nucleotide synthesis without incorporation into DNA. Because T- and B-lymphocytes are critically dependent for their proliferation on *de novo* synthesis of purines whereas other cell types can utilise salvage pathways, MPA has more potent cytostatic effects on lymphocytes than on other cells.

In addition to its inhibition of IMPDH and the resulting deprivation of lymphocytes, MPA also influences cellular checkpoints responsible for metabolic programming of lymphocytes. It has been shown, using human CD4+ T-cells, that MPA shifts transcriptional activities in lymphocytes from a proliferative state to catabolic processes relevant to metabolism and survival leading to an anergic state of T-cells, whereby the cells become unresponsive to their specific antigen.

5.2 Pharmacokinetic properties

Distribution

Following intravenous administration, mycophenolate mofetil undergoes rapid and complete metabolism to the active metabolite, MPA. The parent substance mycophenolate mofetil can be measured systemically during intravenous infusion. MPA at clinically relevant concentrations is 97 % bound to plasma albumin.

As a result of enterohepatic recirculation, secondary increases in plasma MPA concentration are usually observed at approximately 6 – 12 hours post-dose. A reduction in the AUC of MPA of approximately 40 % is associated with the co-administration of cholestyramine (4 g TID), indicating that there is a significant amount of enterohepatic recirculation.

In the early post-transplant period (< 40 days post-transplant), renal, cardiac and hepatic transplant patients had mean MPA AUCs approximately 30 % lower and C_{max} approximately 40 % lower compared to the late post-transplant period (3 – 6 months post-transplant).

Biotransformation

MPA is metabolised principally by glucuronyl transferase (isoform UGT1A9) to form the inactive phenolic glucuronide of MPA (MPAG). In vivo, MPAG is converted back to free MPA via enterohepatic recirculation. A minor acylglucuronide (AcMPAG) is also formed. AcMPAG is not pharmacologically active and is suspected to be responsible for some of MMF's side effects (diarrhoea, leucopenia).

Elimination

A negligible amount of substance is excreted as MPA (< 1 % of the dose) in the urine. Orally administered radiolabelled Mycophenolate mofetil results in complete recovery of the administered dose, with 93 % of the administration dose recovered in the urine and 6 % recovered in faeces. Most (about 87 %) of the administered dose is excreted in the urine as MPAG.

At clinically encountered concentrations, MPA and MPAG are not removed by haemodialysis. However, at high MPAG plasma concentrations (> 100µg/ml), small amounts of MPAG are removed. By interfering with enterohepatic circulation of the drug, bile acid sequestrants such as cholestyramine, reduce MPA AUC (see section 4.9).

MPA's disposition depends on several transporters. Organic anion-transporting polypeptides (OATPs) and multidrug resistance-associated protein 2 (MRP2) are involved in MPA's disposition; OATP isoforms, MRP2 and breast cancer resistance protein (BCRP) are transporters associated with the glucuronides' biliary excretion. Multidrug resistance protein 1 (MDR1) is also able to transport MPA, but its contribution seems to be confined to the absorption process. In the kidney MPA and its metabolites potently interact with renal organic anion transporters.

Enterohepatic recirculation interferes with accurate determination of MPA's disposition parameters; only apparent values can be indicated. In healthy volunteers and patients with autoimmune disease approximate clearance values of 10.6 L/h and 8.27 L/h respectively and half-life values of 17 h were observed. In transplant patients mean clearance values were higher (range 11.9-34.9 L/h) and mean half-life values shorter (5-11 h) with little difference between renal, hepatic or cardiac transplant patients. In the individual patients, these elimination parameters vary based on type of co-treatment with other immunosuppressants, time post-transplantation, plasma albumin concentration and renal function. These factors explain why reduced exposure is seen when mycophenolate mofetil is co-administered with cyclosporine (see section 4.5) and why plasma concentrations tend to increase over time compared to what is observed immediately after transplantation.

Equivalence with oral dosage forms

MPA AUC values obtained following administration of 1 g BID intravenous mycophenolate mofetil to renal transplant patients in the early post-transplant phase are comparable to those observed following 1 g BID oral mycophenolate mofetil. In

hepatic transplant patients, administration of 1 g BID intravenous mycophenolate mofetil followed by 1.5 g BID oral mycophenolate mofetil resulted in MPA AUC values similar to those found in renal transplant patients administered 1 g mycophenolate mofetil BID.

Special populations

Renal impairment:

In a single dose study (6 subjects/group), mean plasma MPA AUC observed in subjects with severe chronic renal impairment (glomerular filtration rate < 25 ml/min/1.73 m²) were 28 – 75 % higher relative to the means observed in normal healthy subjects or subjects with lesser degrees of renal impairment. The mean single dose MPAG AUC was 3 – 6 fold higher in subjects with severe renal impairment than in subjects with mild renal impairment or normal healthy subjects, consistent with the known renal elimination of MPAG. Multiple dosing of mycophenolate mofetil in patients with severe chronic renal impairment has not been studied. No data are available for hepatic transplant patients with severe chronic renal impairment.

Delayed renal graft function:

In patients with delayed renal graft function post-transplant, mean MPA AUC (0–12h) was comparable to that seen in post-transplant patients without delayed graft function. Mean plasma MPAG AUC (0-12h) was 2 – 3-fold higher than in post-transplant patients without delayed graft function. There may be a transient increase in the free fraction and concentration of plasma MPA in patients with delayed renal graft function. Dose adjustment of Mycophenolate mofetil for infusion does not appear to be necessary.

Hepatic impairment:

In volunteers with alcoholic cirrhosis, hepatic MPA glucuronidation processes were relatively unaffected by hepatic parenchymal disease. Effects of hepatic disease on these processes probably depend on the particular disease. Hepatic disease with predominantly biliary damage, such as primary biliary cirrhosis, may show a different effect.

Elderly:

The pharmacokinetics of mycophenolate mofetil and its metabolites have not been found to be altered in the elderly patients (≥ 65 years) when compared to younger transplant patients.

Patients taking oral contraceptives:

A study of the coadministration of mycophenolate mofetil (1 g bid) and combined oral contraceptives containing ethinylestradiol (0.02 mg to 0.04 mg) and levonorgestrel (0.05 mg to 0.20 mg), desogestrel (0.15 mg) or gestodene (0.05 mg to 0.10 mg) conducted in 18 non-transplant women (not taking other immunosuppressants) over 3 consecutive menstrual cycles showed no clinically relevant influence of mycophenolate mofetil on the ovulation suppressing action of the oral contraceptives. Serum levels of LH, FSH and progesterone were not significantly affected. The pharmacokinetics of oral contraceptives were not affected to a clinically relevant degree by co-administration of mycophenolate mofetil (see also section 4.5).

5.3 Preclinical safety data

In experimental models, Mycophenolate mofetil was not tumourigenic. The highest dose tested in the animal carcinogenicity studies resulted in approximately 2 – 3 times the systemic exposure (AUC or C_{max}) observed in renal transplant patients at the recommended clinical dose of 2 g/day.

Two genotoxicity assays (*in vitro* mouse lymphoma assay and *in vivo* mouse bone marrow micronucleus test) showed a potential of mycophenolate mofetil to cause chromosomal aberrations. These effects can be related to the pharmacodynamic mode of action, i.e. inhibition of nucleotide synthesis in sensitive cells. Other *in vitro* tests for detection of gene mutation did not demonstrate genotoxic activity.

In teratology studies in rats and rabbits, foetal resorptions and malformations occurred in rats at 6 mg•kg⁻¹•day⁻¹ (including anophthalmia, agnathia, and hydrocephaly) and in rabbits at 90 mg•kg⁻¹•day⁻¹ (including cardiovascular and renal anomalies, such as ectopia cordis and ectopic kidneys, and diaphragmatic and umbilical hernia), in the absence of maternal toxicity. The systemic exposure at these levels is approximately equivalent to or less than 0.5 times the clinical exposure at the recommended clinical dose of 2 g/day (see section 4.6).

The haematopoietic and lymphoid systems were the primary organs affected in toxicology studies conducted with mycophenolate mofetil in the rat, mouse, dog and monkey. These effects occurred at systemic exposure levels that are equivalent to or less than the clinical exposure at the recommended dose of 2 g/day. Gastrointestinal effects were observed in the dog at systemic exposure levels equivalent to or less than the clinical exposure at the recommended dose. Gastrointestinal and renal effects consistent with dehydration were also observed in the monkey at the highest dose (systemic exposure levels equivalent to or greater than clinical exposure). The nonclinical toxicity profile of Mycophenolate mofetil appears to be consistent with adverse events observed in human clinical trials which now provide safety data of more relevance to the patient population (see section 4.8).

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Mycophenolate mofetil for infusion :

polysorbate 80

citric acid

hydrochloric acid

sodium chloride

sodium hydroxide (for pH-adjustment).

6.2 Incompatibilities

Mycophenolate mofetil for infusion should not be mixed or administered concurrently via the same catheter with other intravenous medicinal products or infusion admixtures.

This medicinal product must not be mixed with other medicinal products except those mentioned in section 6.6.

6.3 Shelf life

Powder for concentrate for solution for infusion: 2 years.

Reconstitution and dilution:

After reconstitution and dilution, chemical and physical in-use stability of solution for infusion has been demonstrated for 24 hours at 20 to 30 °C.

From a microbiological point of view, the product should be used immediately. If not used immediately, in-use storage times and conditions prior to use are the responsibility of the user.

6.4 Special precautions for storage

Powder for concentrate for solution for infusion: Do not store above 30°C.

For storage conditions after reconstitution and dilution of the medicinal product, see section 6.3.

6.5 Nature and contents of container

20 ml type I clear glass vials with grey butyl rubber stopper and aluminium flip off seal. Mycophenolate mofetil for infusion is available in packs containing either 4 vials or 1 vial.

Not all pack sizes may be marketed.

6.6 Special precautions for disposal

Preparation of Infusion Solution (6 mg/ml)

Mycophenolate mofetil for infusion does not contain an antibacterial preservative; therefore, reconstitution and dilution of the product must be performed under aseptic conditions.

Mycophenolate mofetil for infusion must be prepared in two steps: the first step is a reconstitution step with glucose intravenous infusion 5 % and the second step is a dilution step with glucose intravenous infusion 5 %. A detailed description of the preparation is given below:

Step 1

- a. Two vials of Mycophenolate mofetil for infusion are used for preparing each 1 g dose. Reconstitute the content of each vial by injecting 14 ml of glucose intravenous infusion 5 %.
- b. Gently shake the vial to dissolve the medicinal product yielding a slightly yellow solution.
- c. Inspect the resulting solution for particulate matter and discoloration prior to further dilution. Discard the vial if particulate matter or discoloration is observed.

Step 2

- a. Further dilute the content of the two reconstituted vials (approx. 2 x 15 ml) into 140 ml of glucose intravenous infusion 5 %. The final concentration of the solution is 6 mg/ml mycophenolate mofetil.
- b. Inspect the infusion solution for particulate matter or discoloration. Discard the infusion solution if particulate matter or discoloration is observed.

If the infusion solution is not prepared immediately prior to administration, the commencement of administration of the infusion solution should be within 24 hours from reconstitution and dilution of the medicinal product. Keep solutions at 15 – 30° C.

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

7 MARKETING AUTHORISATION HOLDER

Accord Healthcare Limited

Ground Floor, Sage House, 319 Pinner Road, North Harrow, Middlesex, HA1 4HF,
United Kingdom

8 MARKETING AUTHORISATION NUMBER(S)

PL 20075/0395

**9 DATE OF FIRST AUTHORISATION/RENEWAL OF THE
AUTHORISATION**

29/04/2024

10 DATE OF REVISION OF THE TEXT

11/06/2024