SUMMARY OF PRODUCT CHARACTERISTICS

1. NAME OF THE MEDICINAL PRODUCT

Lysodren 500 mg tablets

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each tablet contains 500 mg of mitotane.

For the full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Tablet.

White, biconvex, round, scored tablets.
They are bisected on one side and impressed "BL" over "L1" on the other side.

4. CLINICAL PARTICULARS

4.1 Therapeutic indications

Symptomatic treatment of advanced (unresectable, metastatic or relapsed) adrenal cortical carcinoma (ACC).

The effect of Lysodren on non functional adrenal cortical carcinoma is not established.

4.2 Posology and method of administration

Treatment should be initiated and followed by a suitably experienced specialist.

Posology
Treatment in adults should be started with 2 - 3 g mitotane per day and increased progressively (e.g. at two-week intervals) until mitotane plasma levels reach the therapeutic window 14 – 20 mg/L.

If it is urgent to control Cushing's symptoms in highly symptomatic patients, higher starting doses between 4 - 6 g per day could be necessary and daily dose increased more rapidly (e.g. every week). A starting dose higher than 6 g/day is generally not recommended.

Dose adjustments, monitoring and discontinuation
Dose adjustment is aimed to reach a therapeutic window (mitotane plasma levels 14 - 20 mg/L) which ensures optimal use of Lysodren with acceptable safety. Indeed, neurologic toxicity has been associated with levels above 20 mg/L and therefore this threshold should not be reached. There are some data suggesting that mitotane plasma above 14 mg/L may result in enhanced efficacy (see section 5.1). Mitotane plasma levels higher than 20 mg/L may be associated with severe undesirable effects and offer no further benefit in terms of efficacy. Mitotane plasma levels should therefore be monitored in order to adjust the Lysodren dose and to avoid reaching toxic levels. For further information on the sample testing please contact the Marketing Authorisation Holder or its local representative (see section 7).

Dosing should be individually adjusted based on mitotane plasma levels monitoring and clinical tolerance until mitotane plasma levels reach the therapeutic window 14 - 20 mg/L. The target plasma concentration is usually reached within a period of 3 to 5 months.

Mitotane plasma levels should be assessed after each dose adjustment and at frequent intervals (e.g.

every two weeks), until the optimal maintenance dose is reached. Monitoring should be more frequent (e.g. every week) when a high starting dose has been used. It should be taken into account that dose adjustments do not produce immediate changes in plasma levels of mitotane (see section 4.4). In addition, because of tissue accumulation, mitotane plasma levels should be monitored regularly (e.g. monthly) once the maintenance dose has been reached.

Regular monitoring (e.g. every two months) of mitotane plasma levels is also necessary after interruption of treatment. Treatment can be resumed when mitotane plasma levels will be ranged between 14 - 20 mg/L. Due to the prolonged half-life, significant serum concentrations may persist for weeks after cessation of therapy.

If serious adverse reactions occur, such as neurotoxicity, treatment with mitotane may need to be temporarily interrupted. In case of mild toxicity, the dose should be reduced until the maximum tolerated dose is attained.

Treatment with Lysodren should be continued as long as clinical benefits are observed. If no clinical benefits are observed after 3 months at optimal dose, treatment should be permanently discontinued.

Special populations

Paediatric population
The experience in children is limited.

The paediatric posology of mitotane has not been well characterised but appears equivalent to that of adults after correction for body surface.

Treatment should be initiated at 1.5 to 3.5 g/m^2/day in children and adolescents with the objective of reaching 4 g/m^2/day. Mitotane plasma levels should be monitored as for adults, with particular attention when plasma levels reach 10 mg/L as a quick increase in plasma levels may be observed. Dose may be reduced after 2 or 3 months according to the mitotane plasma levels or in case of serious toxicity.

Hepatic impairment
There is no experience in the use of mitotane in patients with hepatic impairment, so data are insufficient to give a dose recommendation in this group. Since mitotane is mainly metabolised through the liver, mitotane plasma levels are expected to increase if liver function is impaired. The use of mitotane in patients with severe hepatic impairment is not recommended. In patients with mild to moderate hepatic impairment, caution should be exercised and monitoring of liver function should be performed. Monitoring of mitotane plasma levels is specially recommended in these patients (see section 4.4).

Renal impairment
There is no experience in the use of mitotane in patients with renal impairment, so data are insufficient to give a dose recommendation in this group. The use of mitotane in patients with severe renal impairment is not recommended and, in cases of mild to moderate renal impairment, caution should be exercised. Monitoring of mitotane plasma levels is specially recommended in these patients (see section 4.4).

Older patients (≥ 65 years old)
There is no experience on the use of mitotane in older patients, so data are insufficient to give a dose recommendation in this group. Caution should be exercised and frequent monitoring of mitotane plasma levels is especially recommended in these patients.

Method of administration
The total daily dose may be divided in two or three doses according to patient's convenience. Tablets should be taken with a glass of water during meals containing fat-rich food (see section 4.5). Patients should be advised not to use any tablets showing signs of deterioration, and caregivers to wear

disposable gloves when handling the tablets.

4.3 Contraindications

Hypersensitivity to the active substance or to any of the excipients listed in section 6.1
Lactation (see section 4.6)
Concomitant use with spironolactone (see section 4.5)

4.4 Special warnings and precautions for use

Before the initiation of the treatment: Large metastatic masses should be surgically removed as far as possible before starting mitotane treatment, in order to minimise the risk of infarction and haemorrhage in the tumour due to a rapid cytotoxic effect of mitotane.

Risk of adrenal insufficiency: All patients with non functional tumour and 75% of patients with functional tumour show signs of adrenal insufficiency. Therefore, steroid replacement may be necessary in these patients. Since mitotane increases plasma levels of steroid binding proteins, free cortisol and corticotropin (ACTH) determinations are necessary for optimal dosing of steroid substitution (see section 4.8).

Shock, severe trauma or infection: Mitotane should be temporarily discontinued immediately following shock, severe trauma or infection, since adrenal suppression is its prime action. Exogenous steroids should be administered in such circumstances, since the depressed adrenal gland may not immediately start to secrete steroids. Because of an increased risk of acute adrenocortical insufficiency, patients should be instructed to contact their physician immediately if injury, infection, or any other concomitant illness occurs. Patients should carry with them the Lysodren Patient Card provided with the package leaflet indicating that they are prone to adrenal insufficiency and that, in case of emergency care, adequate precautionary measures should be taken.

Monitoring of plasma levels: Mitotane plasma levels should be monitored in order to adjust the mitotane dose, particularly if high starting doses are considered necessary. Dose adjustments may be necessary to achieve the desired therapeutic levels in the window between 14 - 20 mg/L and avoid specific adverse reactions (see section 4.2). For further information on the sample testing please contact the Marketing Authorisation Holder or its local representative (see section 7).

Hepatic or renal impairment: There are insufficient data to support the use of mitotane in patients with severe hepatic or renal impairment. In patients with mild or moderate hepatic or renal impairment, caution should be exercised and monitoring of mitotane plasma levels is particularly recommended (see section 4.2).

Hepatotoxicity has been observed in patients treated with mitotane. Cases of liver damage (hepatocellular, cholestatic and mixed) and autoimmune hepatitis were observed. Liver function tests (alanine transaminase [ALT], aspartate transaminase [AST], bilirubin levels) should be periodically monitored, especially during the first months of treatment or when it is necessary to increase the dose.

Mitotane tissue accumulation: Fat tissue can act as a reservoir for mitotane, resulting in a prolonged half-life and potential accumulation of mitotane. Consequently, despite a constant dose, mitotane levels may increase. Therefore, monitoring of mitotane plasma levels (e.g. every two months) is also necessary after interruption of treatment, as prolonged release of mitotane can occur. Caution and close monitoring of mitotane plasma levels are highly recommended when treating overweight patients.

Central nervous system disorders: Long-term continuous administration of high doses of mitotane may lead to reversible brain damage and impairment of function. Behavioural and neurological assessments should be made at regular intervals, especially when mitotane plasma levels exceed 20 mg/L (see section 4.8).

Blood and lymphatic system disorders: All blood cells can be affected with mitotane treatment. Leucopenia (including neutropenia), anemia and thrombocytopenia have been reported frequently during mitotane treatment (see section 4.8). Red blood cell, white blood cell and platelet counts should be monitored during mitotane treatment.

Bleeding time: Prolonged bleeding time has been reported in patients treated with mitotane and this should be taken into account when surgery is considered (see section 4.8).

Warfarin and coumarin-like anticoagulants: When administering mitotane to patients on coumarin-like anticoagulants, patients should be closely monitored for a change in anticoagulant dose requirements (see section 4.5).

Substances metabolised through cytochrome P450 and particularly cytochrome 3A4: Mitotane is a hepatic enzyme inducer and it should be used with caution in case of concomitant use of medicinal products influenced by hepatic metabolism (see section 4.5).

Women of childbearing potential: Women of childbearing potential must use effective contraception during treatment with mitotane (see section 4.6).

Premenopausal women: Ovarian macrocysts have been observed with higher incidence in this population. Isolated cases of complicated cysts have been reported (adnexal torsion and haemorrhagic cyst rupture). Improvement after mitotane discontinuation has been observed. Women should be urged to seek medical advice if they experience gynaecological symptoms such as bleeding and/or pelvic pain.

Paediatric population: In children and adolescents, neuro-psychological retardation can be observed during mitotane treatment. In such cases, thyroid function should be investigated in order to identify a possible thyroid impairment linked to mitotane treatment.

4.5 Interaction with other medicinal products and other forms of interaction

Spironolactone: Mitotane must not be given in combination with spironolactone, since this active substance may block the action of mitotane (see section 4.3).

Warfarin and coumarin-like anticoagulants: Mitotane has been reported to accelerate the metabolism of warfarin through hepatic microsomal enzyme induction, leading to an increase in dose requirements for warfarin. Therefore, patients should be closely monitored for a change in anticoagulant dose requirements when mitotane is administered to patients on coumarin-like anticoagulants.

Substances metabolised through cytochrome P450: Mitotane has been shown to have an inductive effect on cytochrome P450 enzymes. Therefore, the plasma concentrations of the substances metabolised via cytochrome P450 may be modified. In the absence of information on the specific P450 isoenzymes involved, caution should be taken when co-prescribing active substances metabolised by this route such as, among others, anticonvulsants, rifabutin, rifampicin, griseofulvin and St. John's wort (*Hypericum perforatum*). Particularly, mitotane has been shown to have an inductive effect on cytochrome 3A4. Therefore, the plasma concentrations of the substances metabolised via cytochrome 3A4 may be modified. Caution should be taken when co-prescribing active substances metabolised by this pathway such as, among others, sunitinib, etoposide and midazolam.

Medicinal products active on central nervous system: Mitotane can cause central nervous system undesirable effects at high concentrations (see section 4.8). Although no specific information on pharmacodynamic interactions in the central nervous system is available, this should be borne in mind when co-prescribing medicinal products with central nervous system depressant action.

Fat-rich food: Data with various mitotane formulations suggest that administration with fat-rich food

enhances absorption of mitotane.

Hormone binding protein: Mitotane has been shown to increase plasma levels of hormone binding proteins (e.g. sex hormone-binding globulin (SHBG) and corticosteroid-binding globulin (CBG). This should be taken into account when interpreting the results of hormonal assays and may result in gynaecomastia.

4.6 Fertility, pregnancy and lactation

Pregnancy
Data on a limited number of exposed pregnancies indicate abnormalities on the adrenals of the foetus after exposure to mitotane. Animal reproduction studies have not been conducted with mitotane. Animal studies with similar substances have shown reproductive toxicity (see section 5.3). Lysodren should be given to pregnant women only if clearly needed and if the clinical benefit clearly outweighs any potential risk to the foetus.

Women of childbearing potential must use an effective contraception during treatment and after discontinuation of treatment as long as mitotane plasma levels are detectable. The prolonged elimination of mitotane from the body after discontinuation of Lysodren should be considered.

Breast-feeding
Due to the lipophilic nature of mitotane, it is likely to be excreted in breast milk. Breast-feeding is contraindicated while taking mitotane (see section 4.3) and after treatment discontinuation as long as mitotane plasma levels are detectable.

4.7 Effects on ability to drive and use machines

Lysodren has a major influence on the ability to drive and use machines. Ambulatory patients should be warned not to drive or use machines.

4.8 Undesirable effects

Safety data are based on literature (mainly retrospective studies). More than 80 % of patients treated with mitotane have shown at least one type of undesirable effect. Adverse reactions listed below are classified according to frequency and system organ class. Frequency groupings are defined according to the following convention: Very common (≥1/10), Common (≥1/100 to <1/10), Uncommon (≥1/1,000 to <1/100), Rare (≥1/10,000 to <1/1,000), Very rare (<1/10,000), Not known (cannot be estimated from the available data). Within each frequency grouping, undesirable effects are presented in order of decreasing seriousness.

Table 1: Frequency of adverse reactions identified from literature data

System Organ Class	**Adverse reaction**		
	Very common	**Common**	**Not Known**
Infections and infestations			Opportunistic mycosis
Blood and lymphatic system disorders	Leucopoenia Bleeding time prolonged	Anaemia Thrombocytopenia	
Immune system disorders			Hypersensitivity reactions
Endocrine disorders	Adrenal insufficiency		Thyroid impairment Hypogonadism (in males)
Metabolism and nutrition disorders	Anorexia Hypercholesterolemia Hypertriglyceridaemia		Hypouricaemia

Psychiatric disorders	Confusion		
Nervous system disorders	Ataxia Paresthesia Vertigo Sleepiness	Mental impairment Polyneuropathy Movement disorder Dizziness Headache	Balance disorders
Eye disorders			Maculopathy Retinal toxicity Diplopia Lens opacity Visual impairment Vision blurred
Vascular disorders			Hypertension Orthostatic hypotension Flushing
Gastrointestinal disorders	Mucositis Vomiting Diarrhoea Nausea Epigastric discomfort		Salivary hypersecretion Dysgeusia Dyspepsia
Hepatobiliary disorders		Autoimmune hepatitis	Liver damage (hepatocellular/cholestatic /mixed)
Skin and subcutaneous tissue disorders	Skin rash		Pruritus
Muscoloskeletal and connective tissue disorders	Myasthenia		
Renal and urinary disorders			Haemorrhagic cystitis Haematuria Proteinuria
Reproductive system and breast disorders	Gynaecomastia		Ovarian macrocysts
General disorders and administration site conditions	Asthenia		Hyperpyrexia Generalised aching
Investigations	Elevated liver enzymes Plasma cholesterol increased Plasma triglycerides increased		Blood uric acid decreased Blood androstenedione decreased (in females) Blood testosterone decreased (in females) Sex hormone binding globulin increased Blood free testosterone decreased (in males)

Description of selected adverse reactions

Gastrointestinal disorders are the most frequently reported (10 to 100 % of patients) and are reversible when the dose is reduced. Some of these effects (anorexia) may constitute the hallmark of initial central nervous system impairment.

Nervous system undesirable effects occur in approximately 40 % of patients. Other undesirable central nervous effects have been reported in literature such as memory defects, aggressiveness, central

vestibular syndrome, dysarthria, or Parkinson syndrome. Serious undesirable effects appear linked to the cumulative exposure to mitotane and are most likely to occur when mitotane plasma levels are at 20 mg/L or above. At high doses and after prolonged utilization, brain function impairment can occur. Nervous system undesirable effects appear reversible after cessation of mitotane treatment and decrease in plasma levels (see section 4.4).

Skin rashes which have been reported in 5 to 25 % of patients do not seem to be dose related.

Leucopoenia has been reported in 8 to 12 % of patients. Prolonged bleeding time appears a frequent finding (90 %): although the exact mechanism of such an effect is unknown and its relation with mitotane or with the underlying disease is uncertain, it should be taken into account when surgery is considered.

The activity of liver enzymes (gamma-GT, aminotransferase, alkaline phosphatase) is commonly increased. Autoimmune hepatitis has been reported in 7 % of patients with no other information on mechanism. Liver enzymes levels normalize when the mitotane dose is decreased. A case of cholestatic hepatitis has been reported. Therefore, the possibility of mitotane-induced liver damage cannot be excluded.

Hypogonadism: Hypogonadism in males (with symptoms such as gynaecomastia, libido decreased, erectile dysfunction, fertility disorders) has been described.

Premenopausal women
Non-malignant ovarian macrocysts (with symptoms such as pelvic pain, bleeding) have been described.

Paediatric population
Neuro-psychological retardation may be observed during mitotane treatment. In such cases, thyroid function should be investigated in order to identify a possible thyroid impairment linked to mitotane treatment. Hypothyroidism and growth retardation may be also observed. One case of encephalopathy has been observed in a paediatric patient five months after initiation of the treatment; this case was considered to be related to an increased mitotane plasma level of 34.5 mg/L. After six months mitotane plasma levels were undetectable and the patient recovered clinically.
Oestrogenic-like effects (such as gynaecomastia in male patients and breast development and/or vaginal bleeding in female patients) have been observed.

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

4.9 Overdose

Mitotane overdose may lead to central nervous system impairment especially if mitotane plasma levels are above 20 mg/L. No proven antidotes have been established for mitotane overdose. The patient should be followed closely, taking into account that impairment is reversible, but given the long half-life and the lipophilic nature of mitotane, it may take weeks to return to normal. Other effects should be treated symptomatically. Because of its lipophilic nature, mitotane is not likely to be dialysable.

It is recommended to increase frequency of mitotane plasma level monitoring (e.g. every two weeks) in patients at risk of overdose (e.g. in case of renal or hepatic impairment, obese patients or patients with a recent weight loss).

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Other antineoplastic agents, ATC code: L01XX23

Mechanism of action
Mitotane is an adrenal cytotoxic active substance, although it can apparently also cause adrenal inhibition without cellular destruction. Its biochemical mechanism of action is unknown. Available data suggest that mitotane modifies the peripheral metabolism of steroids and that it also directly suppresses the adrenal cortex. The administration of mitotane alters the extra-adrenal metabolism of cortisol in humans, leading to a reduction in measurable 17-hydroxy corticosteroids, even though plasma levels of corticosteroids do not fall. Mitotane apparently causes increased formation of 6-beta-hydroxy cholesterol.

Clinical efficacy
Mitotane has not been studied in a comprehensive clinical development program. Available clinical information comes mainly from published data in patients with inoperable or metastatic adrenal carcinoma. In terms of overall survival, four studies conclude that mitotane treatment does not increase the survival rate whereas five find an increase in the survival rate. Among the latter, three studies find such an increase only in patients in whom mitotane plasma is above 14 mg/L.

Mitotane plasma levels and the possible relationship with its efficacy were studied in the FIRM ACT trial, a randomized, prospective, controlled, open–label, multicenter, parallel-group study to compare the efficacy of etoposide, doxorubicin and cisplatin plus mitotane (EDP/M) to that of streptozotocin plus mitotane (Sz/M) as first-line treatment in 304 patients. The analysis of patients who achieved mitotane levels ≥ 14 mg/L at least once in 6 six months versus patients who mitotane levels were < 14 mg/L could suggest that patients with mitotane plasma levels ≥ 14 mg/L could have an improvement in disease control rate (62.9% versus 33.5%; p< 0. 0001). However, this result should be cautiously taken since the examination of the mitotane effects was not the primary endpoint of the study.

In addition, mitotane induces a state of adrenal insufficiency which leads to the disappearance of Cushing syndrome in patients with secreting adrenal carcinoma and necessitates substitution hormonotherapy.

Paediatric population
Clinical information comes mainly from a prospective trial (n= 24 patients) in children and adolescents aged at diagnosis from 5 months to 16 years (median age: 4 years) who had an unresectable primary tumour or who presented a tumour recurrence or a metastasic disease; most of the children (75%) presented with endocrine symptoms. Mitotane was given alone or combined with chemotherapy with various agents. Overall, the disease-free interval was 7 months (2 to 16 months). There were recurrences in 40% of children; the survival rate at 5 years was 49%.

5.2 Pharmacokinetic properties

Absorption
In a study performed in 8 patients with adrenal carcinoma treated with 2 to 3 g daily of mitotane, a highly significant correlation was found between plasma mitotane concentration and the total mitotane dose. The target plasma mitotane concentration (14 mg/L) was reached in all patients within 3 to 5 months and the total mitotane dose ranged between 283 and 387 g (median value: 363 g). The threshold of 20 mg/L was reached for cumulative amounts of mitotane of approximately 500 g. In another study, 3 patients with adrenal carcinoma received Lysodren according to a precise protocol allowing fast introduction of a high dose if the product was well tolerated: 3 g (as 3 intakes) on day 1, 4.5 g on day 2, 6 g on day 3, 7.5 g on day 4 and 9 g on day 5. This dose of Lysodren was continued or decreased in function of side effects and plasma mitotane levels. There was a positive linear correlation between the cumulative dose of Lysodren and the plasma levels of mitotane. In two of the

3 patients, plasma levels of more than 14 mg/L were achieved within 15 days and in one of them levels above 20 mg/L were achieved within approximately 30 days. In addition, in both studies, in some patients, the plasma mitotane levels continued to rise despite maintenance or a decrease of the daily dose of mitotane.

Distribution
Autopsy data from patients show that mitotane is found in most tissues of the body, with fat as the primary site of storage.

Biotransformation
Metabolism studies in man have identified the corresponding acid, 1,1-(o,p'-dichlorodiphenyl) acetic acid (o,p'-DDA), as the major circulating metabolite, together with smaller quantities of the 1,1-(o,p'-dichlorodiphenyl)-2,2 dichloroethene (o,p'-DDE) analogue of mitotane. No unchanged mitotane has been found in bile or in urine, where o,p'-DDA predominates, together with several of its hydroxylated metabolites. For induction with cytochrome P450, see section 4.5.

Elimination
After intravenous administration, 25% of the dose was excreted as metabolites within 24 hours. Following discontinuation of mitotane treatment, it is slowly released from storage sites in fat, leading to reported terminal plasma half-lives ranging from 18 to 159 days.

5.3 Preclinical safety data

Non-clinical data on the general toxicity of mitotane is limited.

Reproductive toxicity studies have not been performed with mitotane. However, dichlorodiphenyltrichlorethane (DDT) and other polychlorinated biphenyl analogues are known to have deleterious effects on fertility, pregnancy and development, and mitotane could be expected to share these properties.

The genotoxic and carcinogenic potential of mitotane has not been investigated.

6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Maize starch
Microcrystalline cellulose (E 460)
Macrogol 3350
Silica colloidal anhydrous

6.2 Incompatibilities

Not applicable.

6.3 Shelf life

3 years.

After opening: 1 year.

6.4 Special precautions for storage

Store in the original packaging.

6.5 Nature and contents of container

Square opaque white HDPE bottle having a thread on the mouth containing 100 tablets.
Pack size of 1 bottle.

6.6 Special precautions for disposal and other handling

This medicinal product should not be handled by persons other than the patient and his/her caregivers, and especially not by pregnant women. Caregivers should wear disposable gloves when handling the tablets.

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

7. MARKETING AUTHORISATION HOLDER

HRA Pharma Rare Diseases
200 avenue de Paris
92320 CHATILLON
France

8. MARKETING AUTHORISATION NUMBER(S)

EU/1/04/273/001

9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

Date of first authorisation: 28 April 2004
Date of last renewal: 28 April 2009

10. DATE OF REVISION OF THE TEXT

12/2022

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