

ANNEX I
SUMMARY OF PRODUCT CHARACTERISTICS

▼ This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse reactions. See section 4.8 for how to report adverse reactions.

1. NAME OF THE MEDICINAL PRODUCT

Libmeldy 2-10 x 10⁶ cells/mL dispersion for infusion

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

2.1 General description

Libmeldy (atidarsagene autotemcel) is a gene therapy containing an autologous CD34⁺ cell enriched population that contains haematopoietic stem and progenitor cells (HSPC) transduced *ex vivo* using a lentiviral vector encoding the human arylsulfatase A (ARSA) gene.

2.2 Qualitative and quantitative composition

The medicinal product is composed of one or more infusion bags containing a dispersion of 2-10 x10⁶ cells/mL suspended in cryopreservative solution. Each infusion bag contains 10 to 20 mL of Libmeldy.

Since the total number of cells and concentration of CD34⁺ cells vary between individual patient batches, the quantitative information regarding strength (total viable cell concentration), volume of dispersion and total number of CD34⁺ cells per bag, and supplied dose of the medicinal product are provided in the Lot Information Sheet. The Lot Information Sheet is included with the cryoshipper used to transport Libmeldy.

Excipients with known effect

This medicinal product contains 3.5 mg sodium per mL and 55 mg dimethylsulfoxide (DMSO) per mL.

For the full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Dispersion for infusion.

A clear to slightly cloudy, colourless to yellow or pink dispersion.

4. CLINICAL PARTICULARS

4.1 Therapeutic indication

Libmeldy is indicated for the treatment of metachromatic leukodystrophy (MLD) characterized by biallelic mutations in the arylsulfatase A (ARSA) gene leading to a reduction of the ARSA enzymatic activity:

- in children with late infantile or early juvenile forms, without clinical manifestations of the disease,
- in children with the early juvenile form, with early clinical manifestations of the disease, who still have the ability to walk independently and before the onset of cognitive decline (see section 5.1).

4.2 Posology and method of administration

Libmeldy must be administered in a qualified treatment centre with experience in Haematopoietic Stem Cell Transplantation (HSCT).

Patients are expected to enrol and be followed in a long-term follow-up study in order to better understand the long-term safety and efficacy of Libmeldy.

Posology

The dose of Libmeldy to be administered is defined based on the patient's weight at the time of infusion.

The minimum recommended dose of Libmeldy is 3×10^6 CD34⁺ cells/kg. In clinical studies, doses up to 30×10^6 CD34⁺ cells/kg have been administered.

The maximum volume of Libmeldy to be administered should remain < 20% of the patient's estimated plasma volume (see section 4.4 and section 6.6).

Libmeldy is intended for autologous use (see section 4.4) and should only be administered once.

Bone marrow harvest or peripheral blood mobilisation and apheresis

The autologous CD34⁺ cells are isolated from bone marrow (BM) harvest or mobilised peripheral blood (mPB). In the case CD34⁺ cells are isolated from mPB, apheresis procedure(s) will be performed after peripheral blood mobilisation.

The decision to use BM or mPB as the source material for isolation of CD34⁺ cells is at the discretion of the treating physician, taking into consideration the patient's age and weight, clinical condition and suitability of venous access.

In general, mPB is the preferred cellular source for the manufacture of Libmeldy as it is less invasive for the patient.

BM would nonetheless be the cellular source of choice in infants and children with a body weight less than 7 kg, in case of contraindication to use growth factors/mobilizing agents, and when venous access is deemed unsuitable for apheresis catheter placement.

Depending on the cellular source material, the patient must be able to donate a minimum of $8-10 \times 10^6$ CD34⁺ cells/kg, required for manufacture of Libmeldy (see Table 1).

If CD34⁺ cells are isolated from BM, when possible, the minimum CD34⁺ cell quantity should be collected in a single BM harvest procedure. Prior to this procedure, an initial bone marrow aspirate is generally used in order to perform a test cell count, which allows to estimate the total volume of BM that will be required to obtain sufficient cell numbers for medicinal product manufacturing (see section 5.1).

If CD34⁺ cells are isolated from mPB, the minimum CD34⁺ cell quantity may be achieved using one or more cycles of apheresis.

Table 1 Quantity of CD34⁺ cells required for the manufacture of Libmeldy depending on the cellular source (number of cells expressed as 10^6 CD34⁺ cells/kg)

Cellular source	Minimum number	Optimal range
BM	10	20-40
mPB	8	20-30

If, after medicinal product manufacturing, the minimum dose of Libmeldy of 3×10^6 CD34⁺ cells/kg is not achieved, the patient may undergo a further bone marrow harvest or a further mobilisation protocol with one or more cycles of apheresis, in order to obtain more cells for additional manufacture (see *Mobilisation and apheresis* in section 5.1).

A back-up collection of HSPC containing at least 2×10^6 CD34⁺ cells/kg is also required for use as rescue treatment should the quality of Libmeldy be compromised after initiation of myeloablative conditioning and before Libmeldy infusion, failure of primary engraftment, or prolonged bone marrow aplasia after treatment with Libmeldy (see section 4.4).

These cells must be collected from the patient at time of BM harvest or mPB apheresis and be cryopreserved according to institutional procedures prior to myeloablative conditioning.

Peripheral blood mobilisation

When a decision is made to use mPB as the source material, patients are required to undergo HSPC mobilisation with Granulocyte colony-stimulating factor (G-CSF) with or without plerixafor followed by apheresis to obtain CD34⁺ stem cells for medicinal product manufacturing (see section 5.1 for a description of the mobilisation regimen used in clinical studies).

Recommended pre-treatment conditioning

The treating physician should confirm that autologous HSPC gene therapy administration is clinically appropriate for the patient before myeloablative conditioning is initiated (see section 4.4).

A myeloablative conditioning is required before infusion of Libmeldy to promote efficient engraftment of the genetically modified autologous CD34⁺ cells (see section 5.1 for a description of the myeloablative regimen used in clinical studies).

Busulfan is the recommended conditioning medicinal product.

Myeloablative conditioning should not begin until the complete set of infusion bag(s) constituting the dose of Libmeldy has been received and stored at the qualified treatment centre, and the availability of the back-up collection is confirmed.

Concurrently with the conditioning regimen, and prior to treatment with Libmeldy, it is recommended that patients receive prophylaxis for veno-occlusive disease (VOD) and related endothelial injury complications i.e. transplant-associated thrombotic microangiopathy (TA-TMA) or atypical haemolytic uremic syndrome (aHUS), in line with local guidelines.

Depending on the myeloablative conditioning regimen administered, prophylaxis for seizures should also be considered. Phenytoin is not recommended as it may increase busulfan clearance.

Prophylactic and empiric use of anti-infectives (bacterial, fungal, viral) should be considered for the prevention and management of infections especially during the neutropenic period following conditioning. Routine monitoring of most common viruses subject to re-activation is recommended as per local guidelines. Infection control measures and isolation procedures should be employed during the hospitalization according to local standards.

Pre-medication

It is recommended that pre-medication with intravenous chlorpheniramine (0.25 mg/kg, max. dose 10 mg), or an equivalent medicinal product be administered 15-30 minutes before the infusion of Libmeldy to reduce the possibility of an allergic reaction to the infusion.

Special populations

Elderly

Libmeldy has not been studied in patients >65 years of age.

Renal impairment

Libmeldy has not been studied in patients with renal impairment. Patients should be assessed for renal impairment to ensure autologous HSPC gene therapy administration is appropriate. No dose adjustment is required.

Hepatic impairment

Libmeldy has not been studied in patients with hepatic impairment. Patients should be assessed for hepatic impairment to ensure autologous HSPC gene therapy administration is appropriate. No dose adjustment is required.

Paediatric population

The safety and efficacy of Libmeldy have not yet been established in patients with the late juvenile form of the disease (i.e. with a typical onset after 7 years of age). No data are available.

Method of administration

Libmeldy is for intravenous infusion only (see section 6.6 for full details on the administration process).

Precautions to be taken before handling or administering the medicinal product

This medicinal product contains genetically modified human cells. Healthcare professionals should therefore take appropriate precautions (wearing gloves and glasses) to avoid potential transmission of infectious diseases when handling the product.

For instructions on preparation, accidental exposure and disposal of Libmeldy, see section 6.6.

Preparation for infusion

Prior to Libmeldy infusion, it must be confirmed that the patient's identity matches the essential unique patient information on the infusion bag(s) labels and the accompanying lot information sheet. The timing of thaw and infusion of Libmeldy should be coordinated. The infusion start time should be confirmed in advance and adjusted for thaw so that Libmeldy is available for infusion when the patient is ready. To maintain product viability, as soon as thawing is complete, it is recommended that Libmeldy be administered immediately. Administration must be completed within 2 hours from the time of thawing.

Administration

Administer the product as an intravenous infusion via a central venous catheter. When more than one bag of Libmeldy is needed, only one bag of medicinal product should be infused per hour. Each bag should be infused at an infusion rate which does not exceed 5 mL/kg/h, within approximately 30 minutes. The recommended administration set consists of a blood transfusion set equipped with a 200µm filter (see section 6.6).

4.3 Contraindications

Hypersensitivity to the active substance or to any of the excipients listed in section 6.1.

Previous treatment with haematopoietic stem cells gene therapy.

Contraindications to the mobilisation and the myeloablative medicinal products must be considered.

4.4 Special warnings and precautions for use

Traceability

The traceability requirements of cell-based advanced therapy medicinal products must apply. To ensure traceability, the name of the product, the batch number and the name of the treated patient should be kept for a period of 30 years.

Autologous use

Libmeldy is intended solely for autologous use and should under no circumstances be administered to other patients. Do not infuse Libmeldy if the information on the product labels and lot information sheet do not match the patient's identity.

Rapidly progressive phase of the disease

Treatment with Libmeldy should be performed before the disease enters its rapidly progressive phase.

Eligibility to treatment with Libmeldy should initially be assessed by the treating physician via full neurological examination, motor function assessment and neurocognitive assessment, as appropriate for the patients' age.

Prior to the commencement of cellular harvest, the treating physician should ensure that the patient has not clinically deteriorated. Thereafter, prior to the commencement of conditioning, the treating physician should ensure that autologous HSPC gene therapy administration remains clinically appropriate for the patient, and that treatment with Libmeldy is still indicated.

Mobilisation and myeloablative conditioning medicinal products

Warnings and precautions of the mobilisation and myeloablative conditioning medicinal products must be considered.

Central venous catheter (CVC) complications including infections and thromboses

Infections related to the use of CVCs have been reported in clinical studies and there is a risk of thrombosis associated with the CVC. Patients should be closely monitored for potential infections and catheter-related events.

Hypersensitivity and infusion-related reactions

Dimethylsulfoxide (DMSO), one of the excipients of Libmeldy, is known to possibly cause anaphylactic reactions following parenteral administration. Patients not previously exposed to DMSO should be observed closely. Vital signs (blood pressure, heart rate, and oxygen saturation) and the occurrence of any symptom should be monitored prior to the start of the infusion, approximately every ten minutes during the infusion and every hour, for 3 hours, after the infusion.

When more than one bag of Libmeldy is needed, it should be ensured prior to infusion that the volume of medicinal product to be infused is compatible with the recommended limit of DMSO, i.e. the total volume of DMSO administered should remain <1% of the patient's estimated plasma volume. The maximum volume of Libmeldy to be administered should therefore remain < 20% of the patient's estimated plasma volume (see section 6.6).

Also, when more than one bag of Libmeldy is needed, only one bag of medicinal product should be infused per hour.

Engraftment failure

In clinical studies, no patients failed to engraft bone marrow, as measured by neutrophil count in peripheral blood. Failure of neutrophil engraftment is a short-term but potentially important risk, defined as failure to reach an absolute neutrophil count (ANC) >500 cells/ μ L associated with no evidence of bone marrow recovery (i.e. hypocellular marrow) by day 60 after Libmeldy infusion. In case of engraftment failure, the non-transduced back-up stem cells should be infused according to local standards (see section 4.2).

Prolonged cytopenia

Patients may exhibit severe cytopenias, including severe neutropenia [defined as Absolute Neutrophil Count (ANC) <500/ μ L] and prolonged thrombocytopenia, for several weeks following myeloablative conditioning and Libmeldy infusion. In clinical studies, haematological recovery after conditioning with busulfan was typically seen four to five weeks from the day of infusion of Libmeldy. In the clinical study with the cryopreserved (commercial) formulation, neutrophil engraftment occurred after a median (min, max) of 36.5 (31-40) days after gene-therapy. Patients should, therefore, be monitored for signs and symptoms of cytopenia for at least 6 weeks after infusion.

Red blood cells should be monitored according to medical judgment until engraftment of these cells and recovery are achieved. Supportive transfusion of red cells and platelets should be given according to medical judgement and institutional practice. Blood cell count determination and other appropriate testing should be promptly considered whenever clinical symptoms suggestive of anaemia arise.

If cytopenia persists beyond six to seven weeks, despite the use of granulocyte mobilising medicinal products, the non-transduced back up stem cells should be infused. If cytopenia persists despite infusion of non-transduced back-up stem cells, alternative treatments should be considered.

Delayed platelet engraftment

Platelet engraftment is defined as the first of 3 consecutive days with platelet values $\geq 20 \times 10^9/L$ obtained on different days after Libmeldy infusion, with no platelet transfusion administered for 7 days immediately preceding and during the evaluation period (up to 60 days post gene therapy). During the clinical development, 4/35 patients (11.4%) reported delayed platelet engraftment (median: 73.5 days, range 65-109 days) which was not correlated with an increased incidence of bleeding. As part of the standard of care/prophylaxis, all patients in the integrated safety set (N=29) received transfusion support with platelets. Platelets counts should be monitored according to medical judgment until engraftment of these cells and recovery is achieved. Supportive transfusion of platelets should be given according to medical judgement and institutional practice.

Metabolic acidosis

Prior to a treatment with Libmeldy, the presence of renal tubular acidosis should be evaluated alongside risks of the conditioning medicinal product and risks of the gene therapy procedure, which may contribute to the development of metabolic acidosis. Acid-base status should be monitored throughout conditioning and until the patient is no longer under metabolic stress. The treating physician should consider sodium bicarbonate replacement alongside any other required treatment and should aim to correct any concurrent adverse reaction(s) that might contribute to metabolic acidosis.

Transmission of an infectious agent

Although Libmeldy is tested for sterility and mycoplasma at release, a small risk of transmission of infectious agents exists. Healthcare professionals administering Libmeldy should therefore monitor patients for signs and symptoms of infections after treatment and treat appropriately, if needed.

Thyroid monitoring

Transient increases in thyroid stimulating hormone (TSH), free T4 (FT4; thyroxine) and free T3 (FT3; tri-iodothyronine) were observed in some patients during clinical studies. Considering that thyroid disorders could potentially be masked by critical illness or induced by concomitant medication, patients should be assessed for thyroid function and structure prior to treatment with Libmeldy. Thyroid function and structure should also be monitored in the short term after treatment, and as necessary thereafter.

Risk of insertional oncogenesis

There is a theoretical risk of leukaemia or lymphoma after treatment with Libmeldy. In the event that leukaemia or lymphoma is detected in any patient who received Libmeldy, blood samples should be collected for integration site analysis.

Anti-ARSA antibodies

During clinical development, anti-ARSA antibodies (AAA) were reported in 5 patients. Titers were generally low and resolved spontaneously or after treatment with rituximab (see section 4.8). No impacts on the clinical efficacy or safety outcomes were observed. Monitoring of AAA is recommended prior to treatment, between 1 and 2 months after gene therapy, and then at 6 months, 1 year, 3 years, 5 years, 7 years, 9 years, 12 years, 15 years post treatment. In a case of disease onset or significant disease progression, additional AAA monitoring is recommended.

Serological testing

Libmeldy has not been studied in patients with HIV-1, HIV-2, HTLV-1, HTLV-2, HBV, HCV or mycoplasma infection.

All patients should be tested for HIV-1/2, HTLV-1/2, HBV, HCV and mycoplasma prior to mobilisation or bone marrow harvest to ensure acceptance of the cellular source material for Libmeldy manufacturing.

Anti-retroviral use

Patients should not take anti-retroviral medicinal products from at least one month prior to mobilisation and/or bone marrow harvest until at least 7 days after Libmeldy infusion (see section 4.5). If a patient requires anti-retrovirals following exposure to HIV/HTLV, initiation of Libmeldy treatment should be delayed until an HIV/HTLV western blot and viral load assay have been performed at 6 months post-exposure.

Interference with HIV testing

Patients who have received Libmeldy are likely to test positive by polymerase chain reaction (PCR) assays for HIV due to LVV provirus insertion, resulting in a false positive test for HIV. Therefore, patients who have received Libmeldy should not be screened for HIV infection using a PCR-based assay.

Blood, organ, tissue and cell donation

Patients treated with Libmeldy should not donate blood, organs, tissues and cells for transplantation at any time in the future. This information is provided in the Patient Alert Card which should be given to the patient after treatment.

After Libmeldy administration

After the infusion, standard procedures for patient management after HSPC transplantation should be followed.

Immunoglobulin G should be maintained above 5g/l to prevent potential late infections (occurring later than 100 days post therapy) associated with severe hypogammaglobinaemia, resulting from apheresis/bone marrow harvest and conditioning.

Any blood products required within the first 3 months after Libmeldy infusion should be irradiated.

Sodium content

This medicinal product contains 35 – 560 mg sodium per dose, which is equivalent to 2 to 28% of the WHO recommended maximum daily intake of 2 g sodium for an adult.

4.5 Interaction with other medicinal products and other forms of interaction

The nature of Libmeldy is such that no pharmacokinetic interactions are expected with other medicinal products.

Patients should not take anti-retroviral medicinal products from at least one month prior to mobilisation and/or bone marrow harvest until at least 7 days after Libmeldy infusion (see section 4.4).

Live vaccines

The safety of immunisation with live viral vaccines during or following Libmeldy treatment has not been studied. Vaccination with live virus vaccines is not recommended during the 6 weeks preceding

the start of myeloablative conditioning, and until haematological recovery following treatment with Libmeldy.

4.6 Fertility, pregnancy and lactation

As Libmeldy is not intended for use in adults, human data on use during pregnancy or lactation and animal reproduction studies are not available.

With regard to fertility, consult the SmPC of the myeloablative conditioning medicinal product. It should be noted that the treating physician should inform the patient's parents/carers about options for cryopreservation of spermatogonial stem cells or ovarian tissue.

4.7 Effects on ability to drive and use machines

Libmeldy has no influence on the ability to drive and use machines.

The effect of the mobilisation agents and the myeloablative conditioning agent on the ability to drive or use machines must be considered.

4.8 Undesirable effects

Summary of the safety profile

The safety of Libmeldy was evaluated in 35 patients with MLD.

The median duration of follow-up in the integrated safety data set, which included 29 patients treated with the fresh (investigational) formulation was 4.51 years (range: 0.64 to 8.85 years). Three patients died and a total of 26 patients remained in the follow-up phase.

The median duration of follow-up in the 6 patients treated with the cryopreserved (commercial) formulation was 0.87 years (range: 0.0 to 1.47 years). All of them remained in the follow-up phase (see section 5.1).

Given the small patient population, adverse reactions in the table below do not provide a complete perspective on the nature and frequency of these events.

Treatment with Libmeldy is preceded by medical interventions, namely haematopoietic stem cell collection through bone marrow harvest or peripheral blood mobilisation with G-CSF with or without plerixafor followed by apheresis, and myeloablative conditioning (preferably using busulfan), which carry their own risks. When assessing the safety of a treatment with Libmeldy, the safety profile and product information of the medicinal products used for peripheral blood mobilisation and myeloablative conditioning should be considered, in addition to the risks linked to the gene therapy.

Tabulated list of adverse reactions

Adverse reactions are listed by MedDRA body system organ class and by frequency. Frequencies are defined as: very common ($\geq 1/10$), and common ($\geq 1/100$ and $< 1/10$).

Table 2 Adverse reactions attributed to Libmeldy

System Organ Class	Very Common	Common
Immune system disorders	Antibody Test Positive (Anti ARSA Antibody)	

Table 3 Adverse reactions potentially attributed to myeloablative conditioning*

System Organ Class	Very Common	Common
Infections and infestations		Cytomegalovirus viraemia, Pneumonia, Staphylococcal infection, Urinary tract infection, Viral infection
Blood and lymphatic system disorders	Febrile neutropenia, Neutropenia	Anaemia, Thrombocytopenia
Metabolism and nutrition disorders	Metabolic acidosis	Fluid overload
Psychiatric disorders		Insomnia
Nervous system disorders		Headache
Respiratory, thoracic and mediastinal disorders		Epistaxis, Oropharyngeal pain
Gastrointestinal disorders	Stomatitis, Vomiting	Ascites, Diarrhoea, Gastrointestinal haemorrhage, Nausea
Hepatobiliary disorders	Hepatomegaly, Veno-occlusive liver disease	Hypertransaminasaemia
Skin and subcutaneous tissue disorders		Skin exfoliation
Musculoskeletal and connective tissue disorders		Back pain, Bone pain
Renal and urinary disorders		Oliguria
Reproductive system and breast disorders	Ovarian failure	
General disorders and administration site conditions		Pyrexia
Investigations		Alanine aminotransferase increased, Aspartate aminotransferase increased, Aspergillus test positive

* Based on 29 patients who have undergone myeloablative conditioning by busulfan in the integrated data set.

Description of selected adverse reactions

Presence of Anti ARSA Antibodies

Five out of 35 patients tested positive for anti-ARSA antibodies (AAA) at various post-treatment time points and had the event “Antibody test positive / Presence of antibodies against arylsulfatase A” reported by the Investigator.

Antibody titres were generally low and resolved either spontaneously or after a short course of rituximab.

In all patients with positive AAA test results, no negative effects were observed in the post-treatment ARSA activity of peripheral blood or bone marrow cellular subpopulations nor in the ARSA activity within the cerebrospinal fluid.

Patients treated with Libmeldy should be regularly monitored for AAA (see section 4.4).

Bone marrow harvest and peripheral blood mobilisation and apheresis

During the clinical studies, the safety profile of BM harvest and mobilisation/apheresis were consistent with the known safety and tolerability of both procedures and the SmPC of mobilisation agents (G-CSF and plerixafor).

No serious adverse events were reported as potentially attributable to BM harvest within the range of BM volumes harvested (median volume was 35.5 mL/kg; range: 15.1-56.4 mL/kg). In the Integrated Safety Set (n=29), one patient experienced bone pain, which was qualified as a grade 2 adverse event and deemed related to the BM harvest procedure, but unrelated to the volume harvested.

No serious adverse events were reported as potentially attributable to mobilisation and apheresis and none of the patients who underwent mobilisation experienced any adverse events in the pre-treatment phase which could have been attributed to the mobilising agents.

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

No data from clinical studies are available regarding overdose of Libmeldy.

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Other haematological agents, ATC code: A16AB21.

Mechanism of action

Libmeldy is an *ex vivo* genetically modified autologous CD34⁺ hematopoietic stem and progenitor cell (HSPC) gene therapy. Autologous CD34⁺ HSPCs are collected from patient bone marrow (BM) harvest or from mobilised peripheral blood (mPB) and transduced with a lentiviral vector (ARSA LVV), which inserts one or more copies of the human ARSA complementary deoxyribonucleic acid (cDNA) into the cell's genome, so that genetically modified cells become capable of expressing the functional ARSA enzyme. When administered to the patient following the administration of a myeloablative conditioning regimen, the genetically modified cells engraft and are able to repopulate the haematopoietic compartment. A subpopulation of the infused HSPCs and/or their myeloid progeny is able to migrate across the blood brain barrier to the brain and engraft as central nervous system (CNS) resident microglia and perivascular CNS macrophages as well as endoneural macrophages in the peripheral nervous system (PNS). These genetically modified cells can produce and secrete the functional ARSA enzyme, which can be taken up by surrounding cells, a process known as cross-correction, and used to break down, or prevent the build-up, of harmful sulfatides. Following successful and stable engraftment in the patient, the effects of the product are expected to be persistent.

Pharmacodynamic effects

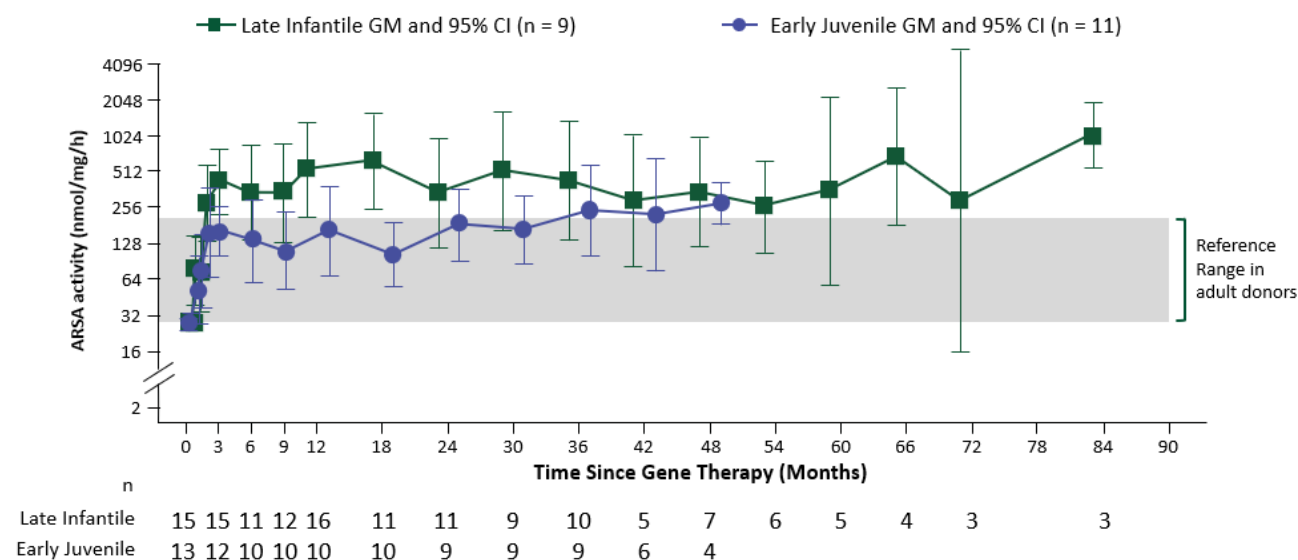
Durable and stable peripheral engraftment of genetically modified cells was observed from 1-month post Libmeldy administration in all evaluable patients. A persistent vector copy number (VCN) was also observed in CD34⁺ cells isolated from the bone marrow throughout the follow-up period. These biological findings demonstrate a sustained multilineage engraftment of gene-corrected cells, which is essential for supporting the long-term production of ARSA and resulting long-term clinical benefit.

At Year 1 post-treatment, the proportion of BM-derived colonies harbouring the LVV genome (%LV⁺) in the overall treated population was 54.8% (range: 20.0% to 100%, [N=23]). The proportion of BM-derived colonies harbouring the LVV genome (%LV⁺) at Year 5 was 45.0% (range: 18.8% to 90.6% [n=6, 4 Late infantile (LI) and 2 Early Juvenile (EJ)]), indicative of stable engraftment over time in the treated population.

Reconstitution of ARSA activity in the hematopoietic system was observed in all MLD patients treated, with a progressive reconstitution of ARSA levels in Peripheral Blood Mononuclear Cells (PBMCs) which reached values within the normal reference range by 3 months post-treatment and

remained stable within or above the normal range throughout the duration of the follow-up (see Figure 1).

Figure 1 ARSA activity in PBMCs over time (geometric mean and 95% CIs), by disease subtype (integrated efficacy set; N=29)



Note: Values < LLQ are imputed at LLQ. LLQ is 25.79 nmol/mg/h. GMs and 95% CIs are presented where there are at least 3 patients with non-missing data. ARSA: arylsulfatase A; CI: confidence interval; GM: geometric mean; LLQ: lower limit of quantification; PBMCs: peripheral blood mononuclear cells.

ARSA activity was also measured in cerebrospinal fluid (CSF) as a surrogate compartment of metabolic correction in the brain. The ARSA activity in CSF went from undetectable at Baseline to detectable in all evaluable patients by Month 6 post-treatment and reached reference range levels at Year 1 post-treatment. Thereafter, central reconstitution of ARSA enzymatic activity remained stable within the reference range.

Clinical efficacy

Clinical efficacy was based on the integrated analysis of results from 29 early-onset MLD patients treated with Libmeldy prepared as a fresh (non-cryopreserved) formulation. These results were generated in twenty (20) patients treated in the Registrational Study (Study 201222 - an open-label, non-randomized, single-arm safety and efficacy clinical trial) with a median duration of post-treatment follow-up of 4.0 years (range: 0.6 to 7.5 years) and nine (9) patients treated in the context of 3 expanded access programs with a median follow-up of 1.5 years (range: 0.99 years to 2.72 years). In addition, initial results from 9 patients treated in a further study with the commercial (cryopreserved) formulation of Libmeldy (Study 205756) are summarised below.

The MLD disease spectrum can present in a variety of clinical forms, primarily based on the age of onset of the first symptoms of the disease. Pre-symptomatic Late Infantile (LI) or Early Juvenile (EJ) MLD patients and early symptomatic EJ MLD patients with biallelic mutations in the ARSA gene leading to a reduction of the ARSA enzymatic activity were included in the clinical development of Libmeldy. ‘Biallelic mutations leading to a reduction of the ARSA enzymatic activity’ refers to mutations leading to partial or total disruption of the ARSA enzymatic activity and resulting in accumulation of sulfatides. These biallelic mutations exclude common neutral mutations described in association with ARSA pseudo-deficiency alleles.

Patients and disease characteristics

The MLD forms (variants) were defined by the presence of the following criteria during the clinical development:

- Late infantile (LI): age at onset of symptoms in the older sibling(s) ≤ 30 months and/or 2 null (0) mutant ARSA alleles and/or peripheral neuropathy at electroneurography (ENG) study.
- Early juvenile (EJ): age at onset of symptoms (in the patient or in the older sibling) between 30 months and before 7 years, and/or 1 null (0) and 1 residual (R) mutant ARSA allele(s) and/or peripheral neuropathy at ENG study.

In the above definition, null (0) or residual (R) alleles refer to either known or novel mutations.

The symptomatic status of the patients was defined as follows:

- Pre-symptomatic: at time of inclusion into the clinical studies, LI or EJ patients were without neurological impairment (disease-related symptoms), with or without signs of the disease revealed by instrumental evaluations i.e. electroneurographic study (ENG) and brain magnetic resonance imaging (MRI).

Based on an analysis of the baseline characteristics of pre-symptomatic LI and EJ patients treated during the clinical development program, the definition of pre-symptomatic status was further refined to maximise the treatment benefit.

Taking the results of this analysis into account, treatment with Libmeldy of a pre-symptomatic patient should be considered:

- For a patient with the LI form of the disease, in the absence of a delay in achievement of independent standing, or a delay in achievement of independent walking, associated with abnormal signs at neurological evaluation.

- For a patient with the EJ form of the disease, in the absence of neurological signs or symptoms of the disease resulting in cognitive, motor, or behavioural functional impairment or regression (substantiated by neurological examination, gross motor function evaluation and/or age appropriate neuropsychological tests).

- Early symptomatic: at time of inclusion into the clinical studies, early symptomatic EJ patients met the following 2 criteria: intelligence quotient (IQ) ≥ 70 and the ability to walk independently for ≥ 10 steps.

Based on the analysis of clinically relevant benefits on the motor and cognitive functions, efficacy was only demonstrated in patients treated before the onset of cognitive deterioration at a time when they were still able to walk independently.

Taking these results into consideration, treatment with Libmeldy of a patient with an early-symptomatic EJ form of the disease should be considered:

- If this patient is able to walk independently, which means that the patient's GMFC-MLD score is ≤ 1 , and

- If the patient's cognitive function has not started declining, which means that the patient's IQ is ≥ 85 .

At time of inclusion in the clinical studies, out of the 29 early-onset MLD patients, 20 were pre-symptomatic and 9 were early symptomatic, 16 had a diagnosis of LI MLD and 13 had a diagnosis of EJ MLD. All LI study patients and some EJ patients were identified after an older sibling had developed symptoms and received an MLD diagnosis, prompting testing in other family members.

Table 4 Summary of demographic characteristics by symptomatic status at time of gene therapy and by disease subtype (Integrated efficacy set)

	Pre-symptomatic patients		Early symptomatic patients	
	Late Infantile subgroup (N=15)	Early Juvenile subgroup (N=5)	Late Infantile subgroup (N=1)	Early Juvenile subgroup (N=8)
Sex, n (%)				
Female	5 (33)	2 (40)	1 (100)	5 (63)
Male	10 (67)	3 (60)	0	3 (38)
Age at GT, in months				
Median	13.1	48.9	23.3	77.9
Min	7.6	11.4	23.3	38.8
Max	17.8	66.8	23.3	139.9

Bone marrow harvest

During the clinical development, the volume of collected BM was adjusted for each patient. The median BM volume collected was 35 mL/kg (range 15 - 56 ml/kg), without any related safety events.

Mobilisation and apheresis

During the clinical development, all (ten) patients for whom the decision was made to use mPB as the source material were administered G-CSF (10-12.5 µg/kg/day) to mobilise CD34⁺ cells prior to the apheresis procedure. Starting from day 3 of G-CSF administration, an additional mobilising agent, plerixafor, was given once daily (0.24 mg/kg, subcutaneous) if clinically indicated depending on the white blood cells and CD34⁺ cell count in the patient's peripheral blood. Apheresis was performed as soon as the CD34⁺ cell count reached an adequate level, according to standard procedures.

If the target number of collected CD34⁺ cells to manufacture Libmeldy and to provide the back-up transplant were not reached with a single apheresis, a second procedure was performed. For all patients, the minimum number of CD34⁺ cells to manufacture Libmeldy (8 x 10⁶ CD34⁺ cells/kg) was collected with 1 cycle of mobilisation and 1 or 2 apheresis.

Pre-treatment conditioning

All patients received systemic conditioning with busulfan prior to treatment with Libmeldy.

Thirteen patients (45%) were treated with a sub-myeloablative conditioning (SMAC) regimen, defined as a target cumulative AUC of 67,200 µg*h/L. Sixteen patients (55%) were treated with a myeloablative (MAC) conditioning regimen, defined as a target cumulative AUC of 85,000 µg*h/L.

For the SMAC conditioning regimen, patients received a total of 14 doses of busulfan (according to patient's weight), as a 2-hour IV infusion administered every 6 hours from Day -4 to Day -1. Busulfan plasma levels were monitored by serial pharmacokinetic sampling and adjusted using a target dose AUC of 4800 µg*h/L (range: 4200 to 5600 µg*h/L), which corresponds to an expected total cumulative AUC of 67,200 µg*h/L (range 58,800 to 78,400 µg*h/L). The average, cumulative AUC in patients who received a SMAC regimen was higher than expected but remained within the target range (geometric mean 71,923.53 [95% CI: 68,751.04, 75,242.41]).

For the MAC conditioning regimen, patients received body-surface area-based dosing of busulfan according to the patients age (80 mg/m²/dose if ≤ 1 year; 120 mg/m²/dose if >1 year) for a total of 4 doses, administered as a 3 hour IV infusion every 20 to 24 hours from Day -4 to Day -1. Busulfan plasma levels were monitored by serial pharmacokinetic sampling and adjusted using a target total cumulative AUC of 85,000 µg*h/L (range: 76,500 to 93,500 µg*h/L).

Subgroup analyses by conditioning regimen i.e. comparison of the subgroups of patients who received the MAC vs. the SMAC regimen, didn't show noticeable differences in the level of transduced cell engraftment nor in ARSA enzyme activity (in total PBMCs and BM-derived mononuclear cells). Moreover, the safety profiles of both regimens were shown to be comparable.

Therefore, the decision to use the MAC or SMAC regimen for pre-treatment conditioning is at the discretion of the treating physician, taking into consideration the patient's clinical characteristics such as, but not limited to, age, hepatic function, prematurity and thrombophilia.

During clinical development, prophylaxis for veno-occlusive disease (VOD) and related endothelial injury complications was required per institutional practice with ursodeoxycholic acid or defibrotide.

Libmeldy administration

All patients (N=29) were administered the medicinal product with a mean (min, max) cell dose of 10.81 x 10⁶ (4.2, 25.9) CD34⁺ cells/kg as an intravenous infusion.

Integrated efficacy results (N=29)

The co-primary efficacy endpoints were:

- Gross Motor Function Measure (GMFM): An improvement of >10% of the total GMFM score in treated patients, when compared to the GMFM scores in the age-matched, untreated historical control MLD population (i.e., TIGET natural history [NHx] Study), evaluated at Year 2 after treatment (see Table 5), and
- ARSA activity: A significant (≥2 SD) increase in residual ARSA activity as compared to pre-treatment values, measured in peripheral blood mononuclear cells (PBMC) at Year 2 after treatment (see Pharmacodynamic Effects, Figure 1 and Table 6).

Early-onset MLD patients treated before the onset of overt symptoms showed normal motor development, stabilisation, or delay in the rate of progression of motor dysfunction as measured by GMFM total score (%) (see Table 5).

Using an ANCOVA model adjusted for age at GMFM assessment and treatment, the mean difference between treated pre-symptomatic LI patients and age matched untreated LI patients from the NHx study was 71.0% at Year 2 and 79.8% at Year 3. Similarly, the mean difference between treated pre-symptomatic EJ patients and aged matched untreated EJ patients was 52.4% at Year 2 and 74.9% at Year 3. These treatment differences were statistically significant (p≤0.008) in favour of Libmeldy. Although not statistically significant, a clear difference in GMFM total score was also noted between treated early symptomatic EJ patients and aged matched untreated EJ patients (28.7% at Year 2; p=0.350 and 43.9% at Year 3; p=0.054).

Table 5 GMFM total score (%) at Year 2 and Year 3 in pre-symptomatic and early-symptomatic patients (late infantile and early juvenile subgroups) with comparison to age-matched natural history data (integrated efficacy set).

	Adjusted mean GMFM total score		Mean treatment difference in GMFM total score between treated patients and age-matched untreated natural history patients	
	Treated patients	Untreated natural history patients		
Pre-symptomatic patients	Late infantile			
	Year 2 *	79.5% (n=10)	8.4% (n=8)	71.0% (95% CI: 60.4 – 81.7) ; p<0.001
	Year 3	82.6% (n=9)	2.8% (n=9)	79.8% (95% CI: 66.2 – 93.3) ; p<0.001
	Early juvenile			
	Year 2 *	96.7% (n=4)	44.3% (n=8)	52.4% (95% CI: 25.1 – 79.6) ; p=0.008
	Year 3	93.2% (n=4)	18.2% (n=9)	74.9% (95% CI: 50.8 – 99.1) ; p<0.001
Early Symptomatic patients	Early juvenile			
	Year 2 *	60.7% (n=6)	31.9% (n=10)	28.7% (95% CI: -14.1 – 71.5) ; p=0.350
	Year 3	59.8% (n=6)	15.9% (n=10)	43.9% (95% CI: 9.2 – 78.5) ; p=0.054

* The Gross Motor Function Measure at two years after treatment was a co-primary endpoint of the registrational clinical study. Note: Analysis of covariance adjusting for treatment and age. P-values are from a two-sided 5% hypothesis test with null hypothesis of 10% difference. CI: confidence interval; EJ: early juvenile; GMFM: gross motor function measurement; LI: late infantile; MLD: metachromatic leukodystrophy.

Deterioration of gross motor function was assessed from disease onset in EJ patients who were early-symptomatic at the time of gene therapy. By four years post disease onset, the estimated proportion of patients who survived and maintained locomotion and ability to sit without support (GMFC-MLD level 5 or higher) was 62.5% in the treated group compared to 26.3% in the untreated group, representing a delay in disease progression following treatment with Libmeldy.

A statistically significant increase in ARSA activity in PBMCs was also observed at Year 2 post-treatment compared to pre-treatment baseline in both pre-symptomatic patients (20.0-fold increase; p<0.001) and early symptomatic patients (4.2-fold increase; p=0.004)(See Table 6).

Table 6 ARSA activity measured in PBMCs (geometric mean) at Baseline and Year 2 after treatment in pre-symptomatic and early-symptomatic patients (integrated efficacy set).

	Geometric mean (%CVb) ARSA Activity in PBMCs		Fold Increase from Baseline to Year 2 *
	Baseline	Year 2	
Pre-symptomatic	26.923 (6.72) (n=19)	339.736 (270.85) (n=14)	20.0 (95% CI: 9.0, 44.0) p<0.001
Early-symptomatic	26.025 (2.72) (n=9)	134.056 (55.94) (n=6)	4.2 (95% CI: 1.6, 11.2) p=0.004

* Ratio in adjusted means from a mixed model repeated measures of data on the log scale, adjusting for visit, baseline, baseline*visit, disease subtype and disease subtype*visit

A secondary efficacy endpoint of the integrated efficacy analysis was measurement of IQ above 55 post-treatment with Libmeldy, the threshold for moderate mental retardation (DSM-IV), using neuropsychological tests. Intelligence Quotient/Development Quotient (IQ/DQ) measures, i.e. cognitive and language abilities, complement results from the GMFM and provide further evidence

that the high levels of engraftment and enzymatic reconstitution translate into relevant treatment effects on key symptomatic domains in MLD patients.

In the LI subgroup (all pre-symptomatic at time of treatment except one), 12 out of 15 assessed patients had a fairly constant IQ/DQ, within the normal range (IQ/DQ score of 100 +/- SD of 15) throughout follow-up. All but 2 of these patients (one pre-symptomatic, one early-symptomatic) remained above the threshold of severe mental disability (IQ/DQ >55) at chronological ages at which all 14 untreated NHx patients with neuropsychological assessments showed evidence of severe cognitive impairment (i.e. IQ/DQ below 55 and close to 0).

Of the 10 surviving EJ patients, all 4 pre-symptomatic patients and 4 out of 6 early-symptomatic patients showed normal IQ/DQ throughout follow-up. In contrast, 11 out of 12 NHx patients with neuropsychological assessments showed evidence of severe cognitive impairment during follow-up.

At the time of the integrated data analysis, i.e. at a median follow-up time of 3.035 years post-treatment (range 0.99 to 7.51), none of the 16 patients in the treated LI subgroup, all pre-symptomatic at time of treatment except one, had died (100% overall survival). Four pre-symptomatic LI patients were alive 6 or more years after treatment and 2 pre-symptomatic LI patients were alive 7 or more years after treatment. In comparison, 12 out of 19 (63.2%) untreated LI patients in the NHx study had died at the time of the analysis.

Comparable overall survival was observed in the treated and untreated EJ groups with a median follow-up time of 3.49 years post-treatment (range 0.64 to 6.55). One out of 5 (20%) EJ patients treated at pre-symptomatic stage died, due to cerebral ischemic infarction, not deemed related to Libmeldy. There were 2 deaths among the 8 (25.0%) EJ patients treated at early-symptomatic stage, both due to disease progression, and also not considered to be related to Libmeldy treatment. Similarly, 3 of the 12 (25%) untreated EJ patients in the NHx study had died at the time of the analysis.

A sensitivity analysis conducted to identify clinical factors, which could have influenced the level of treatment benefit with Libmeldy and optimize the recommended use of the treatment, identified 4 treatment failures:

- One LI patient experienced onset of disease-related symptoms between screening and administration of Libmeldy and was considered symptomatic at the time of treatment. The progression of this patient post-treatment was comparable to untreated NHx patients in both cognitive function and motor development.
- Three early symptomatic EJ patients treated with Libmeldy showed deterioration in both motor and cognitive functions comparable to that observed in untreated NHx patients and progression of the disease led to death in two of them. Two out of the three patients showed IQ < 85 (82 and 58) at the time of treatment. Two out of the three patients showed deterioration between screening and baseline (onset of conditioning regimen) assessments.

Study 205756 (cryopreserved commercial formulation)

Study 205756 is an open-label, single-arm study to evaluate the cryopreserved (commercial) formulation of Libmeldy in the treatment of pre-symptomatic LI and pre-symptomatic and early symptomatic EJ MLD patients. The cell dose range used in the first 9 patients in Study 205756 ($10.45\text{-}30.0 \times 10^6$ CD34⁺ cells/kg) is close to the range used in patients treated with the fresh (investigational) formulation of the medicinal product ($4.2\text{-}25.9 \times 10^6$ CD34⁺ cells/kg).

At the time of data cut, 6 patients (3LIs, 3EJs), all pre-symptomatic at the time of treatment, have been treated, with a median follow-up post-treatment of 0.87 year (range: 0.0 to 1.47 years). Preliminary efficacy data show levels of engraftment, Vector Copy Number, ARSA activity in PBMCs and CSF at different timepoints post-gene therapy within the range observed in the integrated data analysis of the patients treated with the fresh formulation of Libmeldy.

Preliminary safety data indicate that Libmeldy was well tolerated. The safety profile observed in this study with the cryopreserved formulation is consistent with the profile established in patients treated with the fresh formulation in terms of nature, time of onset and frequency of reported adverse events.

Paediatric population

Libmeldy has been studied in infants and children with an age range between 7.6 months and 11.6 years.

The European Medicines Agency has deferred the obligation to submit the results of studies with Libmeldy in the late juvenile subset of the paediatric population with metachromatic leukodystrophy (i.e. MLD patients aged between 7 and less than 17 years at time of disease onset) (see section 4.2 for information on paediatric use).

5.2 Pharmacokinetic properties

Libmeldy is a gene therapy medicinal product consisting of autologous cells that have been genetically modified *ex vivo*. The nature of Libmeldy is such that conventional studies on pharmacokinetics, absorption, metabolism, and elimination are not applicable. The biodistribution of Libmeldy was nonetheless studied and distribution to hematopoietic tissues and disease target organs (including the brain) was demonstrated.

5.3 Preclinical safety data

Due to the nature of Libmeldy, a standard toxicological assessment was not applicable and conventional mutagenicity, carcinogenicity and reproductive and developmental toxicity studies have not been conducted.

The pharmacology, toxicology and genotoxicity of Libmeldy were evaluated *in vitro* and *in vivo*. Integration site analysis (ISA) of mouse Lin- bone marrow cells and human CD34⁺ cells transduced with ARSA LVV was conducted pre- and post-transplantation into mice and showed no enrichment for insertion in or near cancer-related genes, or clonal dominance. A prototype lentiviral vector related to ARSA LVV did not induce *in vitro* transformation and sustained growth of transduced wild type mouse Lin- bone marrow cells due to insertional transformation. Lin- bone marrow cells from *Cdkn2a*^{-/-} mice, a strain prone to cancer triggered by gamma-retroviral insertional mutagenesis, transduced with the same prototype lentiviral vector did not show genotoxic potential when transplanted into wild type mice.

Toxicity and oncogenesis (tumorigenicity) studies were performed in the mouse model of MLD. No evidence of toxicity due to ARSA overexpression and no abnormal or malignant growth of transplanted cells or hematopoietic tumours related to the integration of ARSA LVV were observed. ARSA overexpression in human HSPCs and in ARSA Tg mice did not impair the activation of other sulfatases dependent on the sulfatase activator SUMF-1, did not affect the proliferation and differentiation capacities of transduced cells and did not induce toxicity or functional impairment in ARSA Tg mice.

Additional studies with human CD34⁺ cells transduced with ARSA LVV administered to immunodeficient, myeloablated mice demonstrated no toxicity, no vector mobilisation and bystander transduction of male gonads.

Molecular monitoring did not detect replication competent lentivirus (RCL).

6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Dimethylsulfoxide
Sodium chloride
Human albumin

6.2 Incompatibilities

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products.

6.3 Shelf life

6 months.

Once thawed: maximum 2 hours at room temperature (20 °C-25 °C).

6.4 Special precautions for storage

Libmeldy infusion bags must be stored in the vapour phase of liquid nitrogen (< -130 °C) until ready for thaw and administration.

Keep the infusion bag(s) in the metal cassette(s). Do not re-freeze after thawing.

For storage conditions after thawing of the medicinal product, see section 6.3.

6.5 Nature and contents of container

50 mL ethylene vinyl acetate (EVA) infusion bag(s) with two available spike ports, packed in an EVA overwrap bag placed inside a metal cassette.

Libmeldy is shipped from the manufacturing facility to the treatment centre storage facility in a cryoshipper, which may contain multiple metal cassettes intended for a single patient. Each metal cassette contains one infusion bag of Libmeldy.

6.6 Special precautions for disposal and other handling

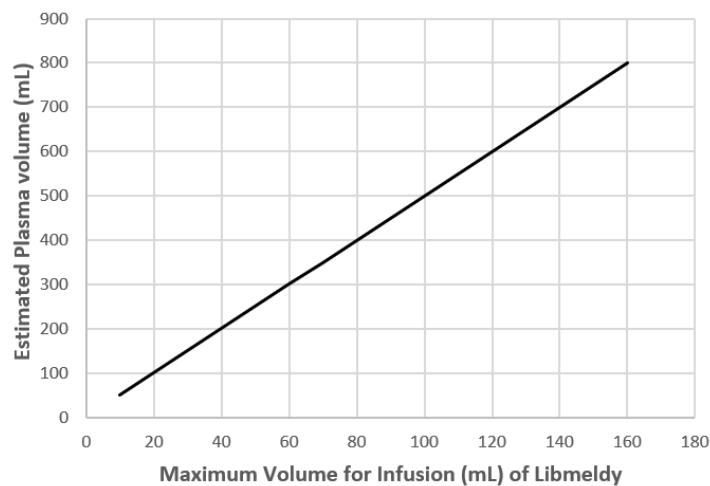
Precautions to be taken before handling or administering the medicinal product

- This medicinal product contains genetically modified human blood cells. Healthcare professionals handling Libmeldy should take appropriate precautions (wearing gloves, protective clothing and eye protection) to avoid potential transmission of infectious diseases.
- Libmeldy must remain at <-130 °C at all times, until the content of the bag is thawed for infusion.

Definition of the dose to be administered

- Considering the posology information provided in section 4.2, the dose to be infused and number of infusion bags to be used should be defined based on the total number of CD34⁺ cells supplied indicated on the Lot Information Sheet (i.e. the 'supplied dose', calculated based on patient's weight at time of cell harvest). The dose of Libmeldy to be administered should also take into account the patient's weight at the time of treatment, and the fact that any bag used should be administered in its entirety.
- Careful consideration must be given to the volume of infusion in relation to age and weight of the patient. When the dose of Libmeldy to be infused represents more than one bag, it should be ensured prior to infusion that the volume of medicinal product to be infused is compatible with the recommended limit of DMSO, i.e. the total volume of DMSO administered should remain <1% of the patient's estimated plasma volume. Therefore, the maximum volume of Libmeldy to be administered should remain < 20% of the patient's estimated plasma volume.
- The following graph is provided as a reference in order to determine the maximum volume of Libmeldy which can be infused to a patient based on their estimated plasma volume.

Figure 2 Guidance on DMSO safety limit: the maximum volume of Libmeldy to be administered should remain < 20% of the patient's estimated plasma volume.



Preparation for the infusion

- A patient may have multiple infusion bags. Each infusion bag is provided inside an overwrap bag, which is contained in a metal cassette.
- The overwrapped infusion bag(s) must be kept inside the metal cassette(s) in the vapour phase of liquid nitrogen at < -130 °C until ready to thaw and infuse.
- Account for all infusion bags and confirm each infusion bag is within the expiry date using the accompanying Lot Information Sheet.
- Sterile sodium chloride 9 mg/mL (0.9%) solution for injection should be available to prime the tubing prior to infusion, and to flush the infusion bag and tubing after infusion.

Checking prior to thawing

- Do not remove the metal cassette from cryogenic storage or thaw Libmeldy until the patient is ready to be infused. The timing of thaw of the infusion bag(s) containing Libmeldy and of the infusion should be coordinated. Confirm the infusion time in advance and adjust the start time for thaw so that the treatment is available for infusion when the patient is ready.
- Open the metal cassette and inspect the overwrap bag and infusion bag for any breaches of integrity before thawing. If an infusion bag is compromised, follow the local guidelines for handling of waste of human-derived material and contact Orchard Therapeutics immediately.
- Prior to thawing Libmeldy, it must be verified that the patient identity matches the unique patient information reported on the packaging labels and on the accompanying Lot Information Sheet. Libmeldy is intended solely for autologous use. Do not thaw or infuse Libmeldy if the information on the patient-specific label on the infusion bag does not match the intended patient.

Thawing

- After careful removal from the metal cassette, thaw the infusion bag in its sealed overwrap bag at 37 °C in a controlled thawing device until there is no visible ice in the infusion bag.
- Once thawing is complete, the bag should be removed immediately from the thawing device.
- The overwrap bag should be carefully opened to remove the infusion bag which should be kept at room temperature (20 °C-25 °C) until infusion.
- Gently massage the infusion bag to resuspend the cells. The content of the infusion bag should be inspected for any remaining visible cellular aggregates. Small clumps of cellular material should disperse with gentle manual mixing. Do not shake the bag.
- The infusion bag should not be washed, spun down, sampled and/or resuspended in new media prior to infusion.

- Libmeldy should not be irradiated as irradiation could lead to inactivation of the product.
- If more than one infusion bag is provided for the patient treatment dose, the next bag should only be thawed after the content of the preceding bag has been fully infused.

Administration

- Libmeldy should be administered as an intravenous infusion via a central venous catheter, per the administration site's standard procedures for cell therapy products.
- The recommended administration set consists of a blood transfusion set equipped with a 200µm filter.
- Each bag should be infused by gravity within 2 hours of thaw, including any interruption during the infusion, to maintain maximum product viability.
- The maximum infusion rate is 5 mL/kg/h, and the content of each bag should be infused within approximately 30 minutes.
- When more than one bag of Libmeldy is needed, only one bag of product should be infused per hour.
- Patients not previously exposed to DMSO should be observed closely. Vital signs (blood pressure, heart rate, and oxygen saturation) and the occurrence of any symptom should be monitored for up to 3 hours following the infusion.
- At the end of the infusion, flush all Libmeldy remaining in the infusion bag and any associated tubing with sodium chloride 9 mg/mL (0.9%) solution for injection to ensure that as many cells as possible are infused into the patient. Careful consideration must be given to the volume of infusion in relation to the age and weight of the patient.

Precautions to be taken for the disposal of the medicinal product

- Libmeldy contains genetically-modified human cells. Local guidelines on handling human-derived material should be followed for unused medicinal products or waste material.
- All material that has been in contact with Libmeldy (solid and liquid waste) should be handled and disposed of as potentially infectious waste in accordance with local guidelines on handling human-derived material.

Accidental exposure

- Accidental exposure to Libmeldy must be avoided. Local guidelines on handling of human derived materials should be followed in case of accidental exposure, which may include washing of the contaminated skin and removal of contaminated clothes. Work surfaces and materials which have potentially been in contact with Libmeldy must be decontaminated with appropriate disinfectant.

7. MARKETING AUTHORISATION HOLDER

Orchard Therapeutics (Netherlands) B.V.
Basisweg 10,
1043AP Amsterdam,
The Netherlands

8. MARKETING AUTHORISATION NUMBER

EU/1/20/1493/001

9. DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

Date of first authorisation: 17 December 2020

10. DATE OF REVISION OF THE TEXT

Detailed information on this medicinal product is available on the website of the European Medicines Agency <http://www.ema.europa.eu>.

ANNEX II

- A. MANUFACTURERS OF THE BIOLOGICAL ACTIVE SUBSTANCE AND MANUFACTURERS RESPONSIBLE FOR BATCH RELEASE**
- B. CONDITIONS OR RESTRICTIONS REGARDING SUPPLY AND USE**
- C. OTHER CONDITIONS AND REQUIREMENTS OF THE MARKETING AUTHORISATION**
- D. CONDITIONS OR RESTRICTIONS WITH REGARD TO THE SAFE AND EFFECTIVE USE OF THE MEDICINAL PRODUCT**

A. MANUFACTURERS OF THE BIOLOGICAL ACTIVE SUBSTANCE AND MANUFACTURERS RESPONSIBLE FOR BATCH RELEASE

Name and address of the manufacturers of the biological active substance

AGC Biologics S.p.A.
Zambon Scientific Park
Via Meucci 3
20091 Bresso (MI)
Italy

AGC Biologics S.p.A.
Via Olgettina 58
20132
Milan
Italy

Name and address of the manufacturers responsible for batch release

AGC Biologics S.p.A.
Zambon Scientific Park
Via Meucci 3
20091 Bresso (MI)
Italy

AGC Biologics S.p.A.
Via Olgettina 58
20132
Milan
Italy

The printed package leaflet of the medicinal product must state the name and address of the manufacturer responsible for the release of the concerned batch.

B. CONDITIONS OR RESTRICTIONS REGARDING SUPPLY AND USE

Medicinal product subject to restricted medical prescription (see Annex I: Summary of Product Characteristics, section 4.2).

C. OTHER CONDITIONS AND REQUIREMENTS OF THE MARKETING AUTHORISATION

- **Periodic safety update reports (PSURs)**

The requirements for submission of PSURs for this medicinal product are set out in the list of Union reference dates (EURD list) provided for under Article 107c (7) of Directive 2001/83/EC and any subsequent updates published on the European medicines web-portal.

The marketing authorisation holder (MAH) shall submit the first PSUR for this product within 6 months following authorisation.

D. CONDITIONS OR RESTRICTIONS WITH REGARD TO THE SAFE AND EFFECTIVE USE OF THE MEDICINAL PRODUCT

• Risk management plan (RMP)

The marketing authorisation holder (MAH) shall perform the required pharmacovigilance activities and interventions detailed in the agreed RMP presented in Module 1.8.2 of the Marketing Authorisation and any agreed subsequent updates of the RMP.

An updated RMP should be submitted:

- At the request of the European Medicines Agency;
- Whenever the risk management system is modified, especially as the result of new information being received that may lead to a significant change to the benefit/risk profile or as the result of an important (pharmacovigilance or risk minimisation) milestone being reached.

• Additional risk minimisation measures

Prior to launch of Libmeldy in each Member State, the MAH will agree about the content and format of the educational and controlled distribution programme with the National Competent Authority. The educational and controlled distribution programme is aimed at providing information on the safe use of Libmeldy.

The MAH shall ensure that in each Member State where Libmeldy is marketed, all healthcare professionals and patients/carers who are expected to prescribe, dispense and/or use Libmeldy have access to/are provided with the following educational package:

- Physician educational material
- Patient information pack.

The physician educational material should contain:

- The Summary of Product Characteristics
- The Guide for healthcare professionals
- The Guide for handling and method of administration.

•The Guide for healthcare professionals shall contain the following key elements:

- Warning that there is a theoretical possibility that the treatment with Libmeldy may be associated with the risk of insertional mutagenesis, potentially leading to development of malignancy. All patients should receive monitoring for signs and symptoms of oncogenic transformation, leukaemia or lymphoma; and must be advised on the symptoms and signs of leukaemia or lymphoma and to seek immediate medical attention if they develop any of the symptoms.
- Warning about delayed platelet engraftment and guidance on its management
- Warning about emergence of anti-ARSA antibodies and guidance on its management
- Warning about the potential risk of engraftment failure and the need to monitor patients
- Information on LongTERM-MLD study and what it will involve
- Recommendation of the important considerations to discuss with patients and/or carers about Libmeldy:
 - Potential risks of a treatment with Libmeldy
 - Signs of any malignancy such as leukaemia/lymphoma and what action to take
 - Content of the patient and parent/carer guide
 - The need to carry the patient alert card and to show it to every healthcare professional
 - The importance of regular monitoring and long-term follow-up.
- Provision of contact details for reporting all suspected adverse reactions and to include the individual medicinal product lot number which can be found within the patient alert card.

•**The Guide to handling and method of administration for healthcare professionals** shall contain the following key elements:

- Guidance that Libmeldy must be administered in a Qualified Treatment Centre with experience in haematopoietic stem cell transplantation (HSCT)
- Instructions on the precautions to be taken before handling or administering Libmeldy
- Instructions for receiving and storing Libmeldy
- Instructions to check Libmeldy prior to administration
- Instructions for the thawing of Libmeldy
- Provision of contact details for reporting all suspected adverse reactions and to include the individual medicinal product lot number which can be found within the patient alert card.

The patient information pack should contain:

- The Package leaflet
- The Patient and parent/carer guide
- The Patient alert card.

•**The patient and parent/carer guide** shall contain the following key messages:

- Warning to monitor the patient for symptoms of leukaemia or lymphoma and to contact the specialist doctor immediately in case of any symptoms as there is a small risk that a patient may develop leukaemia or lymphoma. The specialist doctor will check the patient's blood for any signs of leukaemia or lymphoma during the routine yearly check-ups, which will continue after treatment.
 - Guidance about the need for the patient or their parent/carer to carry the patient alert card to inform any treating healthcare professional that the child was treated with Libmeldy.
 - Guidance on the importance of regular monitoring and to report any symptoms or concerns to the specialist doctor treating the child.
 - Information about the LongTERM-MLD study and the purpose of the study.
 - Provision of contact details for reporting any side effects or symptoms of the patient and what a medicine subject to additional monitoring (▼) means.
- **The patient alert card** shall contain the following key messages:
 - Statement that the patient was treated with Libmeldy, with the medicinal product lot number and treatment date to ensure traceability as per the Guideline on safety and efficacy follow-up and risk management of advanced therapy medicinal products (EMA/149995/2008).
 - Contact details of the treating physician.
 - Information on the possibility of false positivity of certain commercial HIV tests because of Libmeldy.
 - Statement that the patient was treated with gene therapy and should not donate blood, organs, tissues, or cells.
 - Details on reporting of adverse reactions and that Libmeldy is subject to additional monitoring ▼.
 - Contact details where a healthcare professional can receive further information.

The MAH shall ensure that, in each Member State where Libmeldy is marketed, a system aimed to control its distribution beyond the level of control ensured by routine risk minimisation measures is implemented. The following requirements need to be fulfilled before the product is prescribed, manufactured, dispensed and used:

Libmeldy will only be available through treatment centres qualified by the MAH to ensure traceability of the patient's cells and manufactured drug product between the treating hospital and manufacturing site. The selection of the treatment centres will be conducted in collaboration with national health authorities as appropriate. The healthcare professionals will receive training on the physician educational materials as part of the centre qualification process.

•Obligation to conduct post-authorisation measures

The MAH shall complete, within the stated timeframe, the below measures:

Description	Due date
<p>In order to further characterise the long-term efficacy and safety of Libmeldy in children with late infantile or early juvenile forms of MLD, the MAH shall conduct and submit the results of a prospective study based on data from a registry, according to an agreed protocol.</p>	<p>Interim reports to be submitted in accordance with the RMP</p> <p>Final study report: March 2046</p>
<p>The MAH should take measures to reduce the overall time from patient screening to treatment to within the ranges observed during clinical development (median 8.2 weeks; range 6-12.4 weeks). Reduction of the time needed for product testing and release should be part of these measures.</p>	<p>Progress reports: June 2021, June 2022</p> <p>Report on implementation of measures: December 2022</p>

ANNEX III
LABELLING AND PACKAGE LEAFLET

A. LABELLING

PARTICULARS TO APPEAR ON THE OUTER PACKAGING

METAL CASSETTE

1. NAME OF THE MEDICINAL PRODUCT

Libmeldy 2-10 x 10⁶ cells/mL dispersion for infusion
atidarsagene autotemcel

2. STATEMENT OF ACTIVE SUBSTANCE

An autologous CD34⁺ cell enriched population that contains haematopoietic stem and progenitor cells (HSPC) transduced *ex vivo* using a lentiviral vector encoding the human arylsulfatase A (ARSA) gene.

3. LIST OF EXCIPIENTS

Also contains dimethylsulfoxide, human albumin and sodium chloride.

4. PHARMACEUTICAL FORM AND CONTENTS

Dispersion for infusion

10-20 mL

See Lot Information Sheet for number of infusion bags and CD34⁺ cells per bag for this patient.

5. METHOD AND ROUTE OF ADMINISTRATION

Read the package leaflet before use.

For intravenous use

6. SPECIAL WARNING THAT THE MEDICINAL PRODUCT MUST BE STORED OUT OF THE SIGHT AND REACH OF CHILDREN

Keep out of the sight and reach of children.

7. OTHER SPECIAL WARNING, IF NECESSARY

For autologous use only.

8. EXPIRY DATE

EXP:

Shelf life after thawing: 2 hours at room temperature (20 °C-25 °C)

9. SPECIAL STORAGE CONDITIONS

Store and transport frozen (< -130 °C). Keep infusion bag in the metal cassette until ready for thaw and administration. Do not unseal the overwrap bag until after thaw. Once thawed do not re-freeze.

10. SPECIAL PRECAUTIONS FOR DISPOSAL OF UNUSED MEDICINAL PRODUCTS OR WASTE MATERIALS DERIVED FROM SUCH MEDICINAL PRODUCTS, IF APPROPRIATE

This medicine contains genetically-modified cells. Unused medicine or waste material must be disposed of in compliance with the local guidelines on handling of waste of human-derived material.

11. NAME AND ADDRESS OF THE MARKETING AUTHORISATION HOLDER

Orchard Therapeutics (Netherlands) B.V.
Basisweg 10,
1043AP Amsterdam,
The Netherlands

12. MARKETING AUTHORISATION NUMBER

EU/1/20/1493/001

13. BATCH NUMBER, DONATION AND PRODUCT CODES

Last Name:
First Name:
Date of Birth:
DIN:
COI ID:
Lot:
Bag ID:

14. GENERAL CLASSIFICATION FOR SUPPLY**15. INSTRUCTIONS ON USE****16. INFORMATION IN BRAILLE**

Justification for not including Braille accepted.

17. UNIQUE IDENTIFIER – 2D BARCODE**18. UNIQUE IDENTIFIER - HUMAN READABLE DATA**

PARTICULARS TO APPEAR ON THE INTERMEDIATE PACKAGING

OVERWRAPPING BAG

1. NAME OF THE MEDICINAL PRODUCT

Libmeldy 2-10 x 10⁶ cells/mL dispersion for infusion
atidarsagene autotemcel

2. STATEMENT OF ACTIVE SUBSTANCE

An autologous CD34⁺ cell enriched population that contains haematopoietic stem and progenitor cells (HSPC) transduced *ex vivo* using a lentiviral vector encoding the human arylsulfatase A (ARSA) gene.

3. LIST OF EXCIPIENTS

Also contains dimethylsulfoxide, human albumin and sodium chloride.

4. PHARMACEUTICAL FORM AND CONTENTS

Dispersion for infusion

10-20 mL

See Lot Information Sheet for number of infusion bags and CD34⁺ cells per bag for this patient.

5. METHOD AND ROUTE OF ADMINISTRATION

Read the package leaflet before use.

For intravenous use.

6. SPECIAL WARNING THAT THE MEDICINAL PRODUCT MUST BE STORED OUT OF THE SIGHT AND REACH OF CHILDREN

Keep out of the sight and reach of children.

7. OTHER SPECIAL WARNING, IF NECESSARY

For autologous use only.

8. EXPIRY DATE

EXP:

Shelf life after thawing: 2 hours at room temperature (20 °C-25 °C)

9. SPECIAL STORAGE CONDITIONS

Store and transport frozen (< -130 °C). Keep infusion bag in the metal cassette until ready for thaw and administration. Do not unseal the overwrap bag until after thaw. Once thawed do not re-freeze.

10. SPECIAL PRECAUTIONS FOR DISPOSAL OF UNUSED MEDICINAL PRODUCTS OR WASTE MATERIALS DERIVED FROM SUCH MEDICINAL PRODUCTS, IF APPROPRIATE

This medicine contains genetically-modified cells. Unused medicine or waste material must be disposed of in compliance with the local guidelines on handling of waste of human-derived material.

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Basisweg 10,
1043AP Amsterdam,
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12. MARKETING AUTHORISATION NUMBER

EU/1/20/1493/001

13. BATCH NUMBER, DONATION AND PRODUCT CODES

Last Name:
First Name:
Date of Birth:
DIN:
COI ID:
Lot:
Bag ID:

14. GENERAL CLASSIFICATION FOR SUPPLY**15. INSTRUCTIONS ON USE****16. INFORMATION IN BRAILLE**

Justification for not including Braille accepted.

17. UNIQUE IDENTIFIER – 2D BARCODE**18. UNIQUE IDENTIFIER - HUMAN READABLE DATA**

MINIMUM PARTICULARS TO APPEAR ON SMALL IMMEDIATE PACKAGING UNITS

INFUSION BAG

1. NAME OF THE MEDICINAL PRODUCT AND ROUTE OF ADMINISTRATION

Libmeldy 2-10 x 10⁶ cells/mL dispersion for infusion
atidarsagene autotemcel
Intravenous use

2. METHOD OF ADMINISTRATION

Read the package leaflet before use.

3. EXPIRY DATE

EXP:

4. BATCH NUMBER, DONATION AND PRODUCT CODES

Last Name:
First Name:
Date of Birth:
DIN:
COI ID:
Lot:
Bag ID:

5. CONTENTS BY WEIGHT, BY VOLUME OR BY UNIT

10-20 mL of cell dispersion per bag.

See Lot Information Sheet for number of infusion bags and CD34⁺ cells per bag for this patient.

6. OTHER

For autologous use only.

PARTICULARS TO APPEAR ON THE LOT INFORMATION SHEET INCLUDED WITH EACH SHIPMENT FOR ONE PATIENT

1. NAME OF THE MEDICINAL PRODUCT

Libmeldy 2-10 x 10⁶ cells/mL dispersion for infusion
atidarsagene autotemcel

2. STATEMENT OF ACTIVE SUBSTANCE

An autologous CD34⁺ cell enriched population that contains haematopoietic stem and progenitor cells (HSPC) transduced *ex vivo* using a lentiviral vector encoding the human arylsulfatase A (ARSA) gene.

3. DONATION AND PRODUCT CODES

PATIENT INFORMATION

Name (Last, First):
Date of Birth (DD-MMM-YYYY):
Weight at First Collection (kg):
DIN:
COI ID:

4. BATCH NUMBER, CONTENTS BY WEIGHT, BY VOLUME OR BY UNIT, AND EXPIRY DATE

INFORMATION ON SUPPLIED LOT(S)

The following lot(s) is (are) included in the shipment:

Lot number	Cellular source (BM or mPB)	Bag ID	Volume of dispersion for infusion (mL)	Strength (x10 ⁶ cells/mL)	Total CD34 ⁺ cells (x10 ⁶)	Expiry date (DD-MMM-YYYY)

Total number of bags:

Total number of CD34⁺ cells (x10⁶):

BM: bone marrow; mPB: mobilised peripheral blood

5. DOSE OF THE MEDICINAL PRODUCT

The *supplied dose* (calculated based on patient's weight at time of cell harvest) is:

_____ × 10⁶ CD34⁺ cells/kg.

The minimum recommended dose of Libmeldy to be administered is 3 × 10⁶ CD34⁺ cells/kg. In clinical studies doses up to 30 × 10⁶ CD34⁺ cells/kg have been administered.

The *dose to be infused* should be defined by the treating physician based on the total number of CD34⁺ cells supplied, the patient's weight at time of treatment, and the fact that any bag used should be administered in its entirety.

When more than one bag of Libmeldy is needed, it should be ensured prior to infusion that the volume of medicinal product to be infused is compatible with the recommended *limit of DMSO*, i.e. the total volume of DMSO administered should remain <1% of the patient's estimated plasma volume. The maximum volume of Libmeldy to be administered should therefore remain < 20% of the patient's estimated plasma volume.

6. OTHER SPECIAL WARNINGS, IF NECESSARY

SAVE THIS DOCUMENT AND PREPARE TO HAVE IT AVAILABLE AT THE TIME OF LIBMELDY INFUSION

Read the package leaflet before use.

For autologous use only.

7. SPECIAL STORAGE CONDITIONS

INSTRUCTIONS FOR STORAGE AND USE

Store and transport frozen (< -130 °C). Keep infusion bag in the metal cassette until ready for thaw and administration. Do not unseal the overwrap bag until after thaw. Once thawed do not re-freeze.

Shelf life: 6 months at < -130 °C. Shelf life after thawing: 2 hours at room temperature (20 °C-25 °C).

8. SPECIAL PRECAUTIONS FOR DISPOSAL OF UNUSED MEDICINAL PRODUCTS OR WASTE MATERIALS DERIVED FROM SUCH MEDICINAL PRODUCTS, IF APPROPRIATE

This medicine contains genetically-modified cells. Unused medicine or waste material must be disposed of in compliance with the local guidelines on handling of waste of human-derived material.

9. NAME AND ADDRESS OF THE MARKETING AUTHORISATION HOLDER

Orchard Therapeutics (Netherlands) B.V.
Basisweg 10,
1043AP Amsterdam,
The Netherlands

10. MARKETING AUTHORISATION NUMBER

EU/1/20/1493/001

B. PACKAGE LEAFLET

Package leaflet: Information for the patient or carer

Libmeldy 2-10 × 10⁶ cells/mL dispersion for infusion atidarsagene autotemcel

▼ This medicine is subject to additional monitoring. This will allow quick identification of new safety information. You can help by reporting any side effects your child may get. See the end of section 4 for how to report side effects.

Read all of this leaflet carefully before your child is given this medicine because it contains important information for you.

- Keep this leaflet. You may need to read it again.
- If you have any further questions, ask your child's doctor or nurse.
- If your child gets any side effects, talk to your child's doctor or nurse. This includes any possible side effects not listed in this leaflet. See section 4.
- Your child's doctor or nurse will give you a Patient Alert Card which contains important safety information about your child's treatment with Libmeldy. Read it carefully and follow the instructions on it.
- Carry the Patient Alert Card with you at all times and always show it to the doctor or nurse when your child sees them or if your child goes to the hospital.

What is in this leaflet

1. What Libmeldy is and what it is used for
2. What you need to know before your child is given Libmeldy
3. How Libmeldy is made and given
4. Possible side effects
 - Side effects of the conditioning medicine
 - Side effects of Libmeldy
5. How to store Libmeldy
6. Contents of the pack and other information

1. What Libmeldy is and what it is used for

What Libmeldy is

Libmeldy is a type of medicine called **gene therapy**. It is made specially for your child from your child's own bone marrow or blood cells.

What Libmeldy is used for

Libmeldy is used to treat a serious condition called metachromatic leukodystrophy (MLD):

- in children with the 'late infantile' or 'early juvenile' forms of the disease who have not yet developed any signs or symptoms,
- in children with the 'early juvenile' form of the disease who have started developing symptoms but whose symptoms are not yet worsening rapidly.

People with MLD have a fault in the gene to make an enzyme called arylsulfatase A (ARSA). This leads to a build-up of substances called *sulfatides* in the brain and nervous system, causing damage to the nervous system and progressive loss of physical skills and, later, mental ability, ultimately leading to death.

How does Libmeldy work?

Cells called *stem cells* are collected from your child's bone marrow or blood. They are then modified in a laboratory to insert a working gene for making ARSA. When your child is given Libmeldy, which is made up of these modified cells, the cells will start making ARSA to break down the sulfatides in the nerve cells and other cells of your child's body. This is expected to slow down the progression of the disease and improve your child's quality of life.

Libmeldy is given by a drip (*infusion*) into a vein (*intravenously*). For more information on what happens before and during treatment, see section 3, *How Libmeldy is given*.

If you have any questions about how Libmeldy works or why this medicine has been prescribed to your child, ask your child's doctor.

2. What you need to know before your child is given Libmeldy

Your child should not be given Libmeldy:

- if your child is allergic to any of the ingredients of this medicine (listed in section 6). If you think your child may be allergic, ask your doctor for advice.
- if your child has previously had gene therapy made from his/her blood stem cells.
- if your child is allergic to - or if your doctor thinks your child would get unacceptable side effects from - any of the ingredients in the medicines your child will be given before treatment with Libmeldy (see section 3).

Warnings and precautions

- Information about cell-based medicinal products, like Libmeldy, must be kept for 30 years at the hospital. The information kept about your child will be their name and the batch number of Libmeldy they received.
- Libmeldy is made from your child's own stem cells and should only be given to your child.

Before the treatment with Libmeldy

- Evaluation of your child by their doctor to confirm that they have MLD and assess for symptoms and effects of their disease will take place before decision to use Libmeldy is made. Your child may not be showing any physical signs of the disease at the time of initial evaluation. If your child's MLD has progressed and has worsened before the initiation of the treatment, their doctor may determine that their disease has reached a 'rapidly progressive phase'. If this happens, your child may not gain benefit from the treatment and your child's doctor may decide not to give Libmeldy.
- Your child may be given medicines known as **mobilisation medicine** and **conditioning medicine** (see sections 3 and 4 for more information on these medicines, including possible side effects).
- Central venous catheters are thin, flexible tubes, that are inserted by a doctor into a large vein to access the bloodstream of your child. The risks of these lines are infections and the formation of blood clots. The doctor and nurses will monitor your child for any central venous catheter complications.
- Libmeldy is tested for the presence of infectious microbes before it is administered to your child. There is a small risk of infection. Your child's doctors and nurses will monitor them throughout the infusion for signs of infection and provide treatment if needed.

- The doctor will check your child's thyroid gland. The thyroid gland is in the neck and it makes hormones that are important to help the body function normally. It will also be monitored after treatment if needed.

After the treatment with Libmeldy

- After the treatment, your child may be asked to enrol in a **follow up study** for up to 15 years to better understand the long-term effects of Libmeldy.
- If your child requires a blood transfusion within the first 3 months after they have received Libmeldy, blood products should be irradiated. This means the white blood cells, called lymphocytes, have been reduced to minimise the risk of a reaction to the transfusion. The doctor will monitor your child for any blood transfusion reaction.
- Your child's blood cells will be low for a period of time after the treatment with Libmeldy. This affects infection fighting blood cells called neutrophils that can be measured with a simple blood test. If your child's neutrophils are still low after 60 days, this may be called 'engraftment failure'. In such case, your child's doctor may decide to return the previously collected rescue cells to your child (see section 3). The rescue cells do not have the working ARSA gene added to them and will not produce the ARSA enzyme.
- After receiving the conditioning medicine, your child may have a low number of platelets in their blood. This means that your child's blood may not be able to clot normally and your child may be prone to bleeding for some time after the treatment. The doctor will monitor your child's platelet count with simple blood tests and provide your child with treatment if required. This may include a transfusion of platelets to help increase their platelet count.
- Metabolic acidosis may occur. It is a condition where the level of acid in the blood rises. There can be many different reasons for this, and the condition is more common in patients with MLD. Symptoms of metabolic acidosis include feeling breathless, rapid breathing, nausea (feeling sick) and vomiting. The doctor will monitor your child for signs and symptoms of metabolic acidosis.
- Inserting a new gene into the stem cells could theoretically cause blood cancers (leukaemia and lymphoma). After the treatment, your doctor will monitor your child for any signs of leukaemia or lymphoma.
- During the clinical studies, some patients developed antibodies to the ARSA enzyme, called anti-ARSA antibodies (see side effects of Libmeldy in section 4). This resolved on its own or after treatment with adapted medicines. Your child's doctor will monitor their blood for anti-ARSA antibodies and give treatment if needed.
- After your child has received Libmeldy, they will be monitored with regular blood tests. This will include measurement of antibodies, known as immunoglobulins, in their blood. If their level is low, your child may require immunoglobulin replacement therapy. Your child's doctor will discuss this with you if needed.
- Libmeldy is prepared using parts of the human immunodeficiency virus (HIV), which have been altered so that they cannot cause infection. The altered virus is used to insert the ARSA gene into your child's stem cells. Although this medicine will not give HIV infection to your child, having Libmeldy in their blood may cause a false positive HIV test result with some commercial tests (so-called "PCR-based tests") that recognise a piece of HIV used to make Libmeldy. If your child tests positive for HIV after Libmeldy treatment, please contact your child's doctor or nurse.
- After a treatment with Libmeldy, your child will not be able to donate blood, organs, tissues or cells. This is because Libmeldy is a gene therapy product.

Before your child is given Libmeldy the doctor will:

- Check your child's lungs, heart, kidney, liver, as well as blood pressure.
- Look for signs of infection; any infection will be treated before your child is given Libmeldy.
- Check for hepatitis B, hepatitis C, human T-cell lymphotropic virus (HTLV), HIV or mycoplasma infection.
- Check if your child had a vaccination in the previous 6 weeks or if one is planned in the next few months.

When Libmeldy treatment cannot be completed

Before receiving Libmeldy your child will be given a conditioning medicine to remove cells from their bone marrow.

If Libmeldy cannot be given after your child has had the conditioning medicine, or if the modified stem cells do not take hold (*engraft*) in your child's body, the doctor may decide to return the previously collected rescue cells to your child by infusion (see also section 3, *How Libmeldy is given*). The rescue cells do not have the working ARSA gene added to them and will not produce the ARSA enzyme. For more details, please contact your child's doctor.

Other medicines and Libmeldy

Tell your doctor if your child is taking, has recently taken or might take any other medicines, including medicines obtained without a prescription.

- Your child should not take any **medicines for HIV infection** from at least one month before your child is given the mobilisation medicines or have their bone marrow sample taken, until at least 7 days after Libmeldy infusion (see also section 3, *How Libmeldy is made and given*).
- Your child must not be given vaccines called **live vaccines** for 6 weeks before they are given the conditioning medicine to prepare for Libmeldy treatment, nor after treatment while your child's immune system (the body's defence system) is recovering.

Driving and using machines

Libmeldy has no influence on the ability to drive or use machines. However, the mobilisation and conditioning medicines may cause dizziness and fatigue.

Libmeldy contains sodium and dimethylsulfoxide (DMSO)

This medicine contains 35-560 mg sodium (main component of cooking/table salt) in each dose. This is equivalent to 2 to 28% of recommended maximum daily dietary intake of sodium for an adult.

If your child has not previously come into contact with DMSO (a substance used to preserve frozen cells), the doctor or nurse should watch your child closely for any reactions during the infusion and every hour, for 3 hours, after the infusion.

3. How Libmeldy is made and given

Since Libmeldy is made from your child's own stem cells, your child's bone marrow or blood will be collected to prepare the medicine about 2 months before treatment. Bone marrow can be collected from your child's hip bones and blood can be drawn from your child's vein. For more details please ask your doctor.

If stem cells are collected from your child's bone marrow:

- Your child will be given medicines to relax and prevent pain or make them unconscious before the procedure. The doctor will collect your child's bone marrow using a special syringe.

If stem cells are collected from your child's blood:

- Your child will first be given a mobilisation medicine to move the blood stem cells from your child's bone marrow into their blood stream.
- The blood stem cells can then be collected by a machine that separates blood components (*apheresis machine*). It may take more than 1 day to collect enough blood stem cells to make Libmeldy.

The collected stem cells from the bone marrow or blood will be divided into:

- The **backup sample**, which will be frozen and stored, to be given to your child as replacement stem cells if Libmeldy cannot be given or does not work (see 'When Libmeldy treatment cannot be completed' in section 2).
- The **treatment sample**, which will be sent away to make Libmeldy, by inserting a working copy of the ARSA gene into the stem cells in the sample.

How your child is given Libmeldy

- Libmeldy will be given to your child in a qualified treatment centre and by doctors trained in using this type of medicine.
- The doctors will check that the Libmeldy infusion bags are all identified as being made from your child's own sample.
- Libmeldy is a one-time treatment. It will not be given to your child again.

When	What happens	Why
About 2 months before Libmeldy infusion	Mobilisation medicine is given if Libmeldy is made from blood stem cells	To move the blood stem cells from your child's bone marrow into the blood stream.
About 2 months before Libmeldy infusion	Blood or bone marrow is collected	To make Libmeldy and to serve as replacement cells if needed.
5 days before Libmeldy infusion	A conditioning medicine is given for 3–4 days in a hospital	To prepare your child's bone marrow for treatment by destroying cells in the bone marrow so they can be replaced with the modified cells in Libmeldy.
15 to 30 minutes before Libmeldy infusion	A medicine called an antihistamine may be given	To help prevent an allergic reaction to the infusion.
Start of Libmeldy infusion	Libmeldy is given by a drip (infusion) into a vein. This will be in a hospital and will take about 30 minutes for each infusion bag. The number of bags will vary by patient.	To add stem cells containing the ARSA gene into your child's bone marrow.
After Libmeldy infusion	Your child will remain in the hospital for about 4–12 weeks	To recover and be monitored to check if your child's treatment is working and help if they have any side effects until the doctor is satisfied that it is safe for your child to leave the hospital.

4. Possible side effects

Like all medicines, this medicine can cause side effects, although not everybody gets them.

Some side effects are related to the conditioning medicine used to prepare your child's bone marrow for treatment with Libmeldy.

Talk with your child's doctor about side effects of the conditioning medicine. You may also read the package leaflets for that medicine.

Side effects of the conditioning medicine

➔ **Tell the doctor or nurse immediately** if your child gets any of the following side effects after receiving the conditioning medicine. They usually happen between the first few days and several weeks after receiving the conditioning medicine but can also develop much later.

Very common side effects (may affect more than 1 in 10 people)

- blood tests showing low level of white blood cells without or with a fever
- metabolic acidosis, a condition where the acid levels in the blood are raised
- inflammation and sores of the mouth and lips
- being sick (*vomiting*)
- enlarged liver
- pain in the right upper abdomen (belly) under the ribs, yellowing of eyes or skin, rapid weight gain, swelling of arms, legs and abdomen, and trouble breathing. These may be signs of a serious liver condition called *veno-occlusive disease*
- loss of function or decreased function of ovaries

Common side effects (may affect up to 1 in 10 people)

- abnormal bleeding or bruising - may be caused by low level of blood platelets, reducing the ability of blood to clot
- infections which may make your child feel hot (feverish), chilly or sweaty
- chest infection (*pneumonia*)
- infection of the organs involved in excretion of urine (such as the bladder and urinary tract)
- low level of red blood cells (*anaemia*)
- excess fluid in body
- build-up of fluid in the abdomen
- trouble sleeping
- headache
- nosebleeds
- pain in the mouth and throat
- diarrhoea
- bleeding in the digestive tract
- feeling sick (*nausea*)
- increase in liver enzymes (transaminases and aminotransferases) seen in blood tests
- itchy skin
- back pain
- bone pain
- decreased urine production
- fever
- positive test for *Aspergillus* (lung disease caused by fungus)

Side effects of Libmeldy

The following side effects have been reported with Libmeldy.

Very common side effects (may affect more than 1 in 10 people)

- positive test for antibodies against ARSA. Antibodies are the body's natural defence against anything that the body thinks is foreign.

Reporting of side effects

If your child gets any side effects, talk to your child's doctor or nurse. This includes any possible side effects not listed in this leaflet. You can also report side effects directly via **the national reporting system listed in Appendix V**. By reporting side effects, you can help provide more information on the safety of this medicine.

5. How to store Libmeldy

This information is intended for doctors only.

As this medicine will be given in a hospital, the hospital is responsible for the correct storage of the medicine before and during its use, as well as for its correct disposal.

Keep this medicine out of the sight and reach of children.

Do not use this medicine after the expiry date which is stated on the outer container and infusion bag labels.

Do not use this medicine if the infusion bag is damaged or leaking.

Store at $< -130\text{ }^{\circ}\text{C}$ for up to 6 months. Do not thaw the product until it is ready to be used. Once thawed, keep at room temperature ($20\text{ }^{\circ}\text{C}$ - $25\text{ }^{\circ}\text{C}$) and use within 2 hours. Do not refreeze.

This medicine contains genetically-modified human cells. Unused medicine or waste material must be disposed of in compliance with the local guidelines on handling human-derived material.

6. Contents of the pack and other information

What Libmeldy contains

The active substance of Libmeldy consists of your child's own stem cells that contain working copies of the ARSA gene. The concentration per bag is $2\text{--}10 \times 10^6$ cells per millilitre.

The other ingredients are a solution used to preserve frozen cells and sodium chloride (*see section 2, Libmeldy contains sodium*).

What Libmeldy looks like and contents of the pack

Libmeldy is a clear to slightly cloudy, colourless to yellow or pink dispersion of cells that is supplied in one or more clear infusion bags, each packed in a pouch inside a closed metal container.

Your child's name and date of birth, as well as coded information identifying your child as the patient, are printed onto each infusion bag and each metal container.

Marketing Authorisation Holder

Orchard Therapeutics (Netherlands) B.V.
Basisweg 10,
1043AP Amsterdam,
The Netherlands

Manufacturer

AGC Biologics S.p.A.
Zambon Scientific Park
Via Meucci 3
200091 Bresso (MI)
Italy

AGC Biologics S.p.A.
Via Olgettina 58
20132
Milan
Italy

This leaflet was last revised in

Other sources of information

Detailed information on this medicine is available on the European Medicines Agency web site:
<http://www.ema.europa.eu>.

<----->

The following information is intended for healthcare professionals only:

It is important that you read the entire content of this procedure prior to administering Libmeldy.

Precautions to be taken before handling or administering the medicinal product

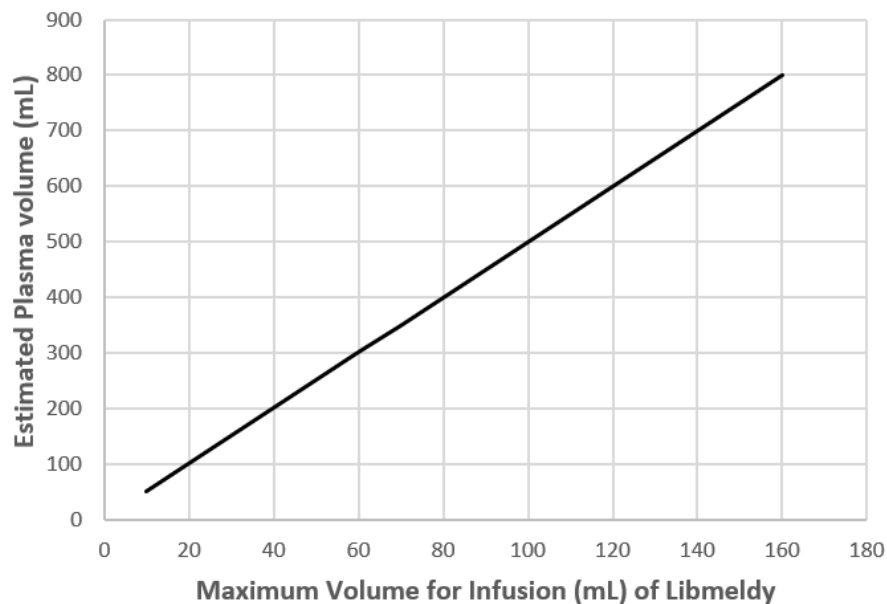
- This medicinal product contains genetically modified human blood cells. Healthcare professionals handling Libmeldy should take appropriate precautions (wearing gloves, protective clothing and eye protection) to avoid potential transmission of infectious diseases.
- Libmeldy must remain at <-130 °C at all times, until the content of the bag is thawed for infusion.

Defining the dose to be administered

- The dose to be infused and number of Libmeldy infusion bags to be used should be defined based on the total number of CD34⁺ cells supplied indicated on the Lot Information Sheet (i.e. the 'supplied dose', calculated based on patient's weight at time of cell harvest). The dose of Libmeldy to be administered should also take into account the patient's weight at the time of treatment, and the fact that any bag used should be administered in its entirety.
- Careful consideration must be given to the volume of infusion in relation to age and weight of the patient. When the dose of Libmeldy to be infused represents more than one bag, it should be ensured prior to infusion that the volume of medicinal product to be infused is compatible with the recommended limit of DMSO, i.e. the total volume of DMSO administered should remain <1% of the patient's estimated plasma volume. Therefore, the maximum volume of Libmeldy to be administered should remain < 20% of the patient's estimated plasma volume.

- The following graph is provided as a reference in order to determine the maximum volume of Libmeldy which can be infused to a patient based on their estimated plasma volume.

Guidance on DMSO safety limit: the maximum volume of Libmeldy to be administered should remain < 20% of the patient’s estimated plasma volume.



Preparation for the infusion

- A patient may have multiple infusion bags. Each infusion bag is provided inside an overwrap bag, which is contained in a metal cassette.
- The overwrapped infusion bag(s) must be kept inside the metal cassette(s) in the vapour phase of liquid nitrogen at < -130 °C until ready to thaw and infuse.
- Account for all infusion bags and confirm each infusion bag is within the expiry date using the accompanying Lot Information Sheet.
- Sterile sodium chloride 9 mg/mL (0.9%) solution for injection should be available to prime the tubing prior to infusion, and to flush the infusion bag and tubing after infusion.

Checking prior to thawing

- Do not remove the metal cassette from cryogenic storage and thaw Libmeldy until the patient is ready to be infused. The timing of thaw of the infusion bag(s) containing Libmeldy and of the infusion should be coordinated. Confirm the infusion time in advance and adjust the start time for thaw so that Libmeldy is available for infusion when the recipient is ready.
- Open the metal cassette and inspect the overwrap bag and infusion bag for any breaches of integrity before thawing. If an infusion bag is compromised, follow the local guidelines on handling of waste of human-derived material and contact Orchard Therapeutics immediately.
- Prior to thawing Libmeldy, it must be verified that the patient identity matches the unique patient information reported on the packaging labels and on the accompanying Lot Information Sheet. Libmeldy is intended solely for autologous use. Do not thaw or infuse Libmeldy if the information on the patient-specific label on the infusion bag does not match the intended patient.

Thawing

- After careful removal from the metal cassette, thaw the infusion bag in its sealed overwrap bag at 37 °C in a controlled thawing device until there is no visible ice in the infusion bag.
- Once thawing is complete, the bag should be removed immediately from the thawing device.

- The overwrap bag should be carefully opened to remove the infusion bag which should be kept at room temperature (20 °C-25 °C) until infusion.
- Gently massage the infusion bag to resuspend the cells. The content of the infusion bag should be inspected for any remaining visible cellular aggregates. Small clumps of cellular material should disperse with gentle manual mixing. Do not shake the bag.
- The infusion bag should not be washed, spun down, sampled and/or resuspended in new media prior to infusion.
- Libmeldy should not be irradiated as irradiation could lead to inactivation of the product.
- If more than one infusion bag is provided for the patient treatment dose, the next bag should only be thawed after the content of the preceding bag has been fully infused.

Administration

- Libmeldy should be administered as an intravenous infusion via a central venous catheter, per the qualified treatment centre's standard procedures for cell therapy products.
- The recommended administration set consists of a blood transfusion set equipped with a 200µm filter.
- Each bag should be infused by gravity within 2 hours of thaw, including any interruption during the infusion, to maintain maximum product viability.
- The maximum infusion rate is 5 mL/kg/h, and the content of each bag should be infused within approximately 30 minutes.
- When more than one bag of Libmeldy is needed, only one bag of product should be infused per hour.
- Patients not previously exposed to DMSO should be observed closely. Vital signs (blood pressure, heart rate, and oxygen saturation) and the occurrence of any symptom should be monitored for up to 3 hours following the infusion.
- At the end of the infusion, flush all Libmeldy remaining in the infusion bag and any associated tubing with sodium chloride 9 mg/mL (0.9%) solution for injection to ensure that as many cells as possible are infused into the patient. Careful consideration must be given to the volume of infusion in relation to the age and weight of the patient.

Precautions to be taken for the disposal of the medicinal product

- Libmeldy contains genetically-modified human cells. Local guidelines on handling human-derived material should be followed for unused medicinal products or waste material.
- All material that has been in contact with Libmeldy (solid and liquid waste) should be handled and disposed of as potentially infectious waste in accordance with local guidelines on handling human-derived material.

Accidental exposure

- Accidental exposure to Libmeldy must be avoided. Local guidelines on handling of human derived materials should be followed in case of accidental exposure, which may include washing of the contaminated skin and removal of contaminated clothes. Work surfaces and materials which have potentially been in contact with Libmeldy must be decontaminated with appropriate disinfectant.