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**

Zolgensma $2 \times 10^{13}$ vector genomes/mL solution for infusion

2. **QUALITATIVE AND QUANTITATIVE COMPOSITION**

2.1 **General description**

Onasemnogene abeparvovec is a gene therapy medicinal product that expresses the human survival motor neuron (SMN) protein. It is a non-replicating recombinant adeno-associated virus serotype 9 (AAV9) based vector containing the cDNA of the human SMN gene under the control of the cytomegalovirus enhancer/chicken-β-actin-hybrid promoter.

Onasemnogene abeparvovec is produced in human embryonic kidney cells by recombinant DNA technology.

2.2 **Qualitative and quantitative composition**

Each mL contains onasemnogene abeparvovec with a nominal concentration of $2 \times 10^{13}$ vector genomes (vg). Vials will contain an extractable volume of not less than either 5.5 mL or 8.3 mL. The total number of vials and combination of fill volumes in each finished pack will be customised to meet dosing requirements for individual patients depending on their weight (see sections 4.2 and 6.5).

Excipient with known effect
This medicinal product contains 0.2 mmol sodium per mL.

For the full list of excipients, see section 6.1.

3. **PHARMACEUTICAL FORM**

Solution for infusion.
A clear to slightly opaque, colourless to faint white solution.
4. CLINICAL PARTICULARS

4.1 Therapeutic indications

Zolgensma is indicated for the treatment of:
- patients with 5q spinal muscular atrophy (SMA) with a bi-allelic mutation in the \textit{SMN1} gene and a clinical diagnosis of SMA Type 1, or
- patients with 5q SMA with a bi-allelic mutation in the \textit{SMN1} gene and up to 3 copies of the \textit{SMN2} gene.

4.2 Posology and method of administration

Treatment should be initiated and administered in clinical centres and supervised by a physician experienced in the management of patients with SMA.

Before administration of onasemnogene abeparvovec, baseline laboratory testing is required, including:
- AAV9 antibody testing using an appropriately validated assay,
- liver function: alanine aminotransferase (ALT), aspartate aminotransferase (AST), and total bilirubin,
- creatinine,
- complete blood count (including haemoglobin and platelet count), and
- troponin-I.

The need for close monitoring of liver function, platelet count and troponin-I after administration and the need for corticosteroid treatment are to be considered when establishing the timing of onasemnogene abeparvovec treatment (see section 4.4).

In case of acute or chronic uncontrolled active infections, treatment should be postponed until the infection has resolved or is controlled (see sub-sections 4.2 and 4.4 immunomodulatory regimen).

Posology

For single-dose intravenous infusion only.

Patients will receive a dose of nominal \(1.1 \times 10^{14}\) vg/kg onasemnogene abeparvovec. The total volume is determined by patient body weight.

Table 1 gives the recommended dosing for patients who weigh 2.6 kg to 21.0 kg.
<table>
<thead>
<tr>
<th>Patient weight range (kg)</th>
<th>Dose (vg)</th>
<th>Total volume of dose (^a) (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6 – 3.0</td>
<td>3.3 × 10(^{14})</td>
<td>16.5</td>
</tr>
<tr>
<td>3.1 – 3.5</td>
<td>3.9 × 10(^{14})</td>
<td>19.3</td>
</tr>
<tr>
<td>3.6 – 4.0</td>
<td>4.4 × 10(^{14})</td>
<td>22.0</td>
</tr>
<tr>
<td>4.1 – 4.5</td>
<td>5.0 × 10(^{14})</td>
<td>24.8</td>
</tr>
<tr>
<td>4.6 – 5.0</td>
<td>5.5 × 10(^{14})</td>
<td>27.5</td>
</tr>
<tr>
<td>5.1 – 5.5</td>
<td>6.1 × 10(^{14})</td>
<td>30.3</td>
</tr>
<tr>
<td>5.6 – 6.0</td>
<td>6.6 × 10(^{14})</td>
<td>33.0</td>
</tr>
<tr>
<td>6.1 – 6.5</td>
<td>7.2 × 10(^{14})</td>
<td>35.8</td>
</tr>
<tr>
<td>6.6 – 7.0</td>
<td>7.7 × 10(^{14})</td>
<td>38.5</td>
</tr>
<tr>
<td>7.1 – 7.5</td>
<td>8.3 × 10(^{14})</td>
<td>41.3</td>
</tr>
<tr>
<td>7.6 – 8.0</td>
<td>8.8 × 10(^{14})</td>
<td>44.0</td>
</tr>
<tr>
<td>8.1 – 8.5</td>
<td>9.4 × 10(^{14})</td>
<td>46.8</td>
</tr>
<tr>
<td>8.6 – 9.0</td>
<td>9.9 × 10(^{14})</td>
<td>49.5</td>
</tr>
<tr>
<td>9.1 – 9.5</td>
<td>1.05 × 10(^{15})</td>
<td>52.3</td>
</tr>
<tr>
<td>9.6 – 10.0</td>
<td>1.10 × 10(^{15})</td>
<td>55.0</td>
</tr>
<tr>
<td>10.1 – 10.5</td>
<td>1.16 × 10(^{15})</td>
<td>57.8</td>
</tr>
<tr>
<td>10.6 – 11.0</td>
<td>1.21 × 10(^{15})</td>
<td>60.5</td>
</tr>
<tr>
<td>11.1 – 11.5</td>
<td>1.27 × 10(^{15})</td>
<td>63.3</td>
</tr>
<tr>
<td>11.6 – 12.0</td>
<td>1.32 × 10(^{15})</td>
<td>66.0</td>
</tr>
<tr>
<td>12.1 – 12.5</td>
<td>1.38 × 10(^{15})</td>
<td>68.8</td>
</tr>
<tr>
<td>12.6 – 13.0</td>
<td>1.43 × 10(^{15})</td>
<td>71.5</td>
</tr>
<tr>
<td>13.1 – 13.5</td>
<td>1.49 × 10(^{15})</td>
<td>74.3</td>
</tr>
<tr>
<td>13.6 – 14.0</td>
<td>1.54 × 10(^{15})</td>
<td>77.0</td>
</tr>
<tr>
<td>14.1 – 14.5</td>
<td>1.60 × 10(^{15})</td>
<td>79.8</td>
</tr>
<tr>
<td>14.6 – 15.0</td>
<td>1.65 × 10(^{15})</td>
<td>82.5</td>
</tr>
<tr>
<td>15.1 – 15.5</td>
<td>1.71 × 10(^{15})</td>
<td>85.3</td>
</tr>
<tr>
<td>15.6 – 16.0</td>
<td>1.76 × 10(^{15})</td>
<td>88.0</td>
</tr>
<tr>
<td>16.1 – 16.5</td>
<td>1.82 × 10(^{15})</td>
<td>90.8</td>
</tr>
<tr>
<td>16.6 – 17.0</td>
<td>1.87 × 10(^{15})</td>
<td>93.5</td>
</tr>
<tr>
<td>17.1 – 17.5</td>
<td>1.93 × 10(^{15})</td>
<td>96.3</td>
</tr>
<tr>
<td>17.6 – 18.0</td>
<td>1.98 × 10(^{15})</td>
<td>99.0</td>
</tr>
<tr>
<td>18.1 – 18.5</td>
<td>2.04 × 10(^{15})</td>
<td>101.8</td>
</tr>
<tr>
<td>18.6 – 19.0</td>
<td>2.09 × 10(^{15})</td>
<td>104.5</td>
</tr>
<tr>
<td>19.1 – 19.5</td>
<td>2.15 × 10(^{15})</td>
<td>107.3</td>
</tr>
<tr>
<td>19.6 – 20.0</td>
<td>2.20 × 10(^{15})</td>
<td>110.0</td>
</tr>
<tr>
<td>20.1 – 20.5</td>
<td>2.26 × 10(^{15})</td>
<td>112.8</td>
</tr>
<tr>
<td>20.6 – 21.0</td>
<td>2.31 × 10(^{15})</td>
<td>115.5</td>
</tr>
</tbody>
</table>

\(^a\) NOTE: Number of vials per kit and required number of kits is weight-dependent. Dose volume is calculated using the upper limit of the patient weight range.

**Immunomodulatory regimen**

An immune response to the AAV9 capsid will occur after administration of onasemnogene abeparvovec (see section 4.4). This can lead to elevations in liver aminotransferases, elevations of troponin I, or decreased platelet counts (see sections 4.4 and 4.8). To dampen the immune response immunomodulation with corticosteroids is recommended. Where feasible, the patient’s vaccination schedule should be adjusted to accommodate concomitant corticosteroid administration prior to and following onasemnogene abeparvovec infusion (see section 4.5).

Prior to initiation of the immunomodulatory regimen and prior to administration of onasemnogene abeparvovec, the patient must be checked for symptoms of active infectious disease of any nature.

Starting 24 hours prior to infusion of onasemnogene abeparvovec it is recommended to initiate an immunomodulatory regimen following the schedule below (see Table 2). Deviations from these recommendations are at the discretion of the treating physician (see section 4.4).
Table 2  Pre- and post-infusion immunomodulatory regimen

<table>
<thead>
<tr>
<th>Pre-infusion</th>
<th>24 hours prior to onasemnogene abeparvovec</th>
<th>Prednisolone orally 1 mg/kg/day (or equivalent if another corticosteroid is used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-infusion</td>
<td>30 days (including the day of administration of onasemnogene abeparvovec)</td>
<td>Prednisolone orally 1 mg/kg/day (or equivalent if another corticosteroid is used)</td>
</tr>
<tr>
<td>Followed by 28 days:</td>
<td></td>
<td>Systemic corticosteroids should be tapered gradually.</td>
</tr>
<tr>
<td>For patients with unremarkable findings (normal clinical exam, total bilirubin, and whose ALT and AST values are both below 2 × upper limit of normal (ULN) at the end of the 30 days period:</td>
<td></td>
<td>Tapering of prednisolone (or equivalent if another corticosteroid is used), e.g. 2 weeks at 0.5 mg/kg/day and then 2 weeks at 0.25 mg/kg/day oral prednisolone</td>
</tr>
<tr>
<td>or</td>
<td></td>
<td>Systemic corticosteroids (equivalent to oral prednisolone 1 mg/kg/day)</td>
</tr>
<tr>
<td>For patients with liver function abnormalities at the end of the 30 days period: continuing until the AST and ALT values are below 2 × ULN and all other assessments return to normal range, followed by tapering over 28 days or longer if needed.</td>
<td></td>
<td>Systemic corticosteroids should be tapered gradually.</td>
</tr>
</tbody>
</table>

Liver function should be monitored for at least 3 months following onasemnogene abeparvovec infusion (see section 4.4)

A paediatric gastroenterologist or hepatologist should be consulted if patients do not respond adequately to the equivalent of 1 mg/kg/day oral prednisolone (see section 4.4). If oral corticosteroid therapy is not tolerated intravenous corticosteroid may be considered as clinically indicated.

If another corticosteroid is used by the physician in place of prednisolone, similar considerations and approach to taper the dose after 30 days should be taken as appropriate.

Special populations

Renal impairment
The safety and efficacy of onasemnogene abeparvovec have not been established in patients with renal impairment and onasemnogene abeparvovec therapy should be carefully considered. A dose adjustment should not be considered.

Hepatic impairment
Patients with ALT, AST, or total bilirubin levels (except due to neonatal jaundice) ≥2 × ULN have not been studied in clinical studies with onasemnogene abeparvovec. Onasemnogene abeparvovec therapy should be carefully considered in patients with hepatic impairment (see sections 4.4 and 4.8). A dose adjustment should not be considered.

0SMN1/1SMN2 genotype
No dose adjustment should be considered in patients with a bi-allelic mutation of the SMNI gene and only one copy of SMN2 (see section 5.1).

Anti-AAV9 antibodies
No dose adjustment should be considered in patients with baseline anti-AAV9 antibody titres above 1:50 (see section 4.4).
Paediatric population
The safety and efficacy of onasemnogene abeparvovec in premature neonates before reaching full-term gestational age have not been established. No data are available. Administration of onasemnogene abeparvovec should be carefully considered because concomitant treatment with corticosteroids may adversely affect neurological development.

There is limited experience in patients 2 years of age and older or with body weight above 13.5 kg. The safety and efficacy of onasemnogene abeparvovec in these patients have not been established. Currently available data are described in section 5.1. A dose adjustment should not be considered (see Table 1).

Method of administration
For intravenous use,

Onasemnogene abeparvovec is administered as a single-dose intravenous infusion. It should be administered with a syringe pump as a single intravenous infusion with a slow infusion of approximately 60 minutes. It must not be administered as an intravenous push or bolus.

Insertion of a secondary ('back-up') catheter is recommended in case of blockage in the primary catheter. Following completion of infusion, the line should be flushed with sodium chloride 9 mg/mL (0.9%) solution for injection.

Precautions to be taken before handling or administering the medicinal product
This medicinal product contains a genetically-modified organism. Healthcare professionals should therefore take appropriate precautions (use of gloves, safety goggles, laboratory coat and sleeves) when handling or administering the product (see section 6.6).

For detailed instructions on the preparation, handling, accidental exposure and disposal (including proper handling of bodily waste) of onasemnogene abeparvovec, see section 6.6.

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

4.4 Special warnings and precautions for use

Traceability
In order to improve the traceability of biological medicinal products, the name and the batch number of the administered product should be clearly recorded.

Pre-existing immunity against AAV9
Anti-AAV9 antibody formation can take place after natural exposure. There have been several studies on the prevalence of AAV9 antibodies in the general population that show low rates of prior exposure to AAV9 in the paediatric population. Patients should be tested for the presence of AAV9 antibodies prior to infusion with onasemnogene abeparvovec. Re-testing may be performed if AAV9 antibody titres are reported as above 1:50. It is not yet known whether or under what conditions onasemnogene abeparvovec can be safely and effectively administered in the presence of anti-AAV9 antibodies above 1:50 (see sections 4.2 and 5.1).
Advanced SMA
Since SMA results in progressive and non-reversible damage to motor neurons, the benefit of onasemnogene abeparvovec in symptomatic patients depends on the degree of disease burden at the time of treatment, with earlier treatment resulting in potential higher benefit. While advanced symptomatic SMA patients will not achieve the same gross motor development as unaffected healthy peers they may clinically benefit from gene replacement therapy, dependent on the advancement of disease at the time of treatment (see section 5.1).

The treating physician should consider that the benefit is seriously reduced in patients with profound muscle weakness and respiratory failure, patients on permanent ventilation, and patients not able to swallow.

The benefit/risk profile of onasemnogene abeparvovec in patients with advanced SMA, kept alive through permanent ventilation and without the ability to thrive, is not established.

Immunogenicity
An immune response to the AAV9 capsid will occur after infusion of onasemnogene abeparvovec, including antibody formation against the AAV9 capsid despite the immunomodulatory regimen recommended in section 4.2, and T-cell mediated immune response.

Systemic immune response, including immune-mediated hepatotoxicity, generally manifested as elevated ALT and/or AST levels and at times as acute serious liver injury or acute liver failure, has been reported with onasemnogene abeparvovec use. Immune-mediated hepatotoxicity may require adjustment of the immunomodulatory regimen including longer duration, increased dose, or prolongation of the corticosteroid taper. Refer to section 4.2 for immunomodulatory regimen, and to the sub-sections ‘Hepatotoxicity’ and ‘Immunomodulatory regimen’ below for details.

Hepatotoxicity
- Administration of AAV vector may result in aminotransferase elevations, which may be serious.
- Acute serious liver injury and acute liver failure have occurred (see section 4.8).
- Patients with pre-existing hepatic impairment or acute hepatic viral infection may be at higher risk of acute serious liver injury (see section 4.2).
- Prior to infusion, liver function of all patients should be assessed by clinical examination and laboratory testing (e.g. hepatic aminotransferases AST and ALT, and total bilirubin (see section 4.2)).
- In order to mitigate potential aminotransferase elevations, a systemic corticosteroid should be administered to all patients before and after onasemnogene abeparvovec infusion (see section 4.2).
- Liver function should be monitored for at least 3 months after infusion.
- The risks and benefits of infusion with onasemnogene abeparvovec in patients with pre-existing hepatic impairment should be weighed carefully against the risks of not treating the patient.

AST/ALT/total bilirubin should be assessed weekly for 30 days and every two weeks for an additional 60 days post administration of onasemnogene abeparvovec through to the end of the corticosteroid taper period, or longer if needed. Tapering of prednisolone should not be considered until AST/ALT levels are less than 2 × ULN.

Thrombocytopenia
Transient decreases in platelet counts, some of which met the criteria for thrombocytopenia, were observed in onasemnogene abeparvovec clinical studies. In most cases, the lowest platelet value occurred the first week following onasemnogene abeparvovec infusion. Platelet counts should be obtained before onasemnogene abeparvovec infusion and should be closely monitored in the week following infusion and on a regular basis afterwards, weekly for the first month and every other week for the second and third months until platelet counts return to baseline.
Thrombotic microangiopathy
Cases of thrombotic microangiopathy (TMA) have been reported to occur approximately one week after onasemnogene abeparvovec infusion in the post-marketing setting (see section 4.8). TMA is an acute and life-threatening condition, which is characterised by thrombocytopenia and microangiopathic haemolytic anaemia. Acute kidney injury has also been observed. In some cases, concurrent immune system activation (e.g. infections, vaccinations) has been reported (see sections 4.2 and 4.5 for information on administration of vaccinations).

Thrombocytopenia is a key feature of TMA, therefore platelet counts should be closely monitored in the week following infusion and on a regular basis afterwards (see sub-section ‘Thrombocytopenia’). In case of thrombocytopenia, further evaluation including diagnostic testing for haemolytic anaemia and renal dysfunction should be undertaken. If patients show clinical signs, symptoms or laboratory findings consistent with TMA, a specialist should be consulted immediately to manage TMA as clinically indicated. Caregivers should be informed about signs and symptoms of TMA and should be advised to seek urgent medical care if such symptoms occur.

Elevated troponin-I
Increases in cardiac troponin-I levels following infusion with onasemnogene abeparvovec were observed (see section 4.8). Elevated troponin-I levels found in some patients may indicate potential myocardial tissue injury. Based on these findings and the observed cardiac toxicity in mice, troponin-I levels should be obtained before onasemnogene abeparvovec infusion and monitored for at least 3 months following onasemnogene abeparvovec infusion or until levels return to within normal reference range for SMA patients. Consider consultation with a cardiac expert as needed.

Immunomodulatory regimen
Immunomodulatory treatment should not be initiated concurrently to active infections, either acute (such as acute respiratory infections or acute hepatitis) or uncontrolled chronic (such as chronic active hepatitis B) (see sections 4.2 and 4.4).

The immunomodulatory regimen (see section 4.2) might also impact the immune response to concurrent infections (e.g. respiratory), potentially resulting in more severe clinical courses of the concurrent infection. Added caution is advised regarding the timing of onasemnogene abeparvovec dosing in the presence of prodrome or resolving infection. Increased vigilance in the diagnosis and active management of infection is recommended. Seasonal prophylactic treatments, that prevent respiratory syncytial virus (RSV) infections, are recommended and should be up to date. Where feasible, the patient’s vaccination schedule should be adjusted to accommodate concomitant corticosteroid administration prior to and following onasemnogene abeparvovec infusion (see section 4.5).

If the duration of corticosteroid treatment is prolonged or the dose is increased, the treating physician should be aware of the possibility of adrenal insufficiency.

Shedding
Temporary onasemnogene abeparvovec shedding occurs, primarily through bodily waste. Caregivers and patient families should be advised on the following instructions for the proper handling of patient stools:
• good hand-hygiene is required when coming into direct contact with patient bodily waste for a minimum of 1 month after onasemnogene abeparvovec treatment.
• Disposable nappies can be sealed in double plastic bags and disposed of in household waste.

Blood, organ, tissue and cell donation
Patients treated with Zolgensma should not donate blood, organs, tissues or cells for transplantation.

Sodium content
This medicinal product contains 4.6 mg sodium per mL, equivalent to 0.23% of the WHO recommended maximum daily intake of 2 g sodium for an adult. Each 5.5 mL vial contains 25.3 mg sodium, and each 8.3 mL vial contains 38.2 mg sodium.
4.5 Interaction with other medicinal products and other forms of interaction

No interaction studies have been performed.

Experience with use of onasemnogene abeparvovec in patients receiving hepatotoxic medicinal products or using hepatotoxic substances is limited. Safety of onasemnogene abeparvovec in these patients have not been established.

Experience with use of concomitant 5q SMA targeting agents is limited.

**Vaccinations**
Where feasible, the patient’s vaccination schedule should be adjusted to accommodate concomitant corticosteroid administration prior to and following onasemnogene abeparvovec infusion (see sections 4.2 and 4.4). Seasonal RSV prophylaxis is recommended (see section 4.4). Live vaccines, such as MMR and varicella, should not be administered to patients on an immunosuppressive steroid dose (i.e., ≥2 weeks of daily receipt of 20 mg or 2 mg/kg body weight of prednisolone or equivalent).

4.6 Fertility, pregnancy and lactation

Human data on use during pregnancy or lactation are not available and animal fertility or reproduction studies have not been performed.

4.7 Effects on ability to drive and use machines

Onasemnogene abeparvovec has no or negligible influence on the ability to drive and use machines.

4.8 Undesirable effects

**Summary of the safety profile**
The safety of onasemnogene abeparvovec was evaluated in 99 patients who received onasemnogene abeparvovec at the recommended dose (1.1 x 10^{14} vg/kg) in 5 open-label clinical studies. The most frequently reported adverse reactions following administration were hepatic enzyme increased (24.2%), hepatotoxicity (9.1%), vomiting (8.1%), and pyrexia (5.1%) (see section 4.4).

**Tabulated list of adverse reactions**
The adverse reactions identified with onasemnogene abeparvovec in all patients treated with intravenous infusion at the recommended dose with a causal association to treatment are presented in Table 3. Adverse reactions are classified according to MedDRA system organ classification and frequency. Frequency categories are derived according to the following conventions: very common (≥1/10); common (≥1/100 to <1/10); uncommon (≥1/1,000 to <1/100); rare (≥1/10,000 to <1/1,000); very rare (<1/10,000); not known (cannot be estimated from the available data). Within each frequency grouping, adverse reactions are presented in order of decreasing seriousness.
Table 3  Tabulated list of adverse reactions to onasemnogene abeparvovec

<table>
<thead>
<tr>
<th>Adverse Reactions by MedDRA SOC/PT and Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood and lymphatic system disorders</strong></td>
</tr>
<tr>
<td>Common</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
</tr>
<tr>
<td>Not known</td>
</tr>
<tr>
<td>Thrombotic microangiopathy&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Gastrointestinal disorders</strong></td>
</tr>
<tr>
<td>Common</td>
</tr>
<tr>
<td>Vomiting</td>
</tr>
<tr>
<td><strong>Hepatobiliary disorders</strong></td>
</tr>
<tr>
<td>Common</td>
</tr>
<tr>
<td>Hepatotoxicity&lt;sup&gt;2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Not known</td>
</tr>
<tr>
<td>Acute liver failure&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Not known</td>
</tr>
<tr>
<td>Acute liver injury&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>General disorders and administration site conditions</strong></td>
</tr>
<tr>
<td>Common</td>
</tr>
<tr>
<td>Pyrexia</td>
</tr>
<tr>
<td><strong>Investigations</strong></td>
</tr>
<tr>
<td>Very common</td>
</tr>
<tr>
<td>Hepatic enzyme increased&lt;sup&gt;3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Common</td>
</tr>
<tr>
<td>Troponin increased&lt;sup&gt;4)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Common</td>
</tr>
<tr>
<td>Troponin T increased</td>
</tr>
<tr>
<td>Common</td>
</tr>
<tr>
<td>Platelet count decreased</td>
</tr>
</tbody>
</table>

<sup>1)</sup>Treatment-related adverse reactions reported outside of clinical studies, including in the post-marketing setting.

<sup>2)</sup>Hepatotoxicity includes hepatic steatosis and hypertransaminasaemia.

<sup>3)</sup>Hepatic enzyme increased includes: alanine aminotransferase increased, ammonia increased, aspartate aminotransferase increased, gamma-glutamyltransferase increased, hepatic enzyme increased, liver function test increased and transaminases increased.

<sup>4)</sup>Troponin increased includes troponin increased and troponin-I increased.

Description of selected adverse reactions

**Hepatobiliary disorders**

In clinical studies, elevated transaminases > 2 × ULN (and in some cases > 20 × ULN) were observed in 31% of patients treated at the recommended dose. These patients were clinically asymptomatic and none of them had clinically significant elevations of bilirubin. Serum transaminase elevations usually resolved with prednisolone treatment and patients recovered without clinical sequelae (see sections 4.2 and 4.4).

Outside of clinical studies, including in the post-marketing setting, there have been reports of children developing signs and symptoms of acute liver failure (e.g. jaundice, coagulopathy, encephalopathy) within 2 months of treatment with onasemnogene abeparvovec, despite receiving corticosteroids before and after infusion. According to the case reports, a modified treatment regimen with corticosteroids was given when liver failure was diagnosed. These children recovered.

**Transient thrombocytopenia**

In clinical studies, transient decreases from baseline in mean platelet counts (4.0%) were observed at multiple time points post-dose and normally resolved within two weeks. Decreases in platelet counts were more prominent during the first week of treatment (see section 4.4).

**Increases in troponin-I levels**

Increases in cardiac troponin-I levels (3.0%) up to 0.2 mcg/L following onasemnogene abeparvovec infusion were observed. In the clinical study program, there were no clinically apparent cardiac findings observed following administration of onasemnogene abeparvovec (see section 4.4).
**Immunogenicity**

Pre- and post-gene therapy titres of anti-AAV9 antibodies were measured in the clinical studies (see section 4.4). All patients that received onasemnogene abeparvovec had anti-AAV9 titres at or below 1:50 before treatment. Mean increases from baseline in AAV9 titre were observed in all patients at all but 1 time-point for antibody titre levels to AAV9 peptide, reflecting normal response to non-self viral antigen. Some patients experienced AAV9 titres exceeding the level of quantification, however most of these patients did not have potentially clinically significant adverse reactions. Thus, no relationship has been established between high anti-AAV9 antibody titres and the potential for adverse reactions or efficacy parameters.

In the AVXS-101-CL-101 clinical study, 16 patients were screened for anti-AAV9 antibody titre: 13 had titres less than 1:50 and were enrolled in the study; three patients had titres greater than 1:50, two of whom were retested following cessation of breast-feeding and their titres were measured at less than 1:50 and both were enrolled in the study. There is no information on whether breastfeeding should be restricted in mothers who may be seropositive for anti-AAV9 antibodies. Patients all had less than or equal to 1:50 AAV9 antibody titre prior to treatment with onasemnogene abeparvovec and subsequently demonstrated an increase in anti-AAV9 antibody titres to at least 1:102,400 and up to greater than 1:819,200.

The detection of antibody formation is highly dependent on the sensitivity and specificity of the assay. In addition, the observed incidence of antibody (including neutralising antibody) positivity in an assay may be influenced by several factors including assay methodology, sample handling, timing of sample collection, concomitant medicinal products and underlying disease.

No onasemnogene abeparvovec-treated patient demonstrated an immune response to the transgene.

**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 onasemnogene abeparvovec. Adjustment of the dose of prednisolone, close clinical observation and monitoring of laboratory parameters (including clinical chemistry and haematology) for systemic immune response are recommended (see section 4.4).
5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Other drugs for disorders of the musculo-skeletal system, ATC code: M09AX09

Mechanism of action
Onasemnogene abeparvovec is a gene therapy designed to introduce a functional copy of the survival motor neuron gene (SMN1) in the transduced cells to address the monogenic root cause of the disease. By providing an alternative source of SMN protein expression in motor neurons, it is expected to promote the survival and function of transduced motor neurons.

Onasemnogene abeparvovec is a non-replicating recombinant AAV vector that utilizes AAV9 capsid to deliver a stable, fully functional human SMN transgene. The ability of the AAV9 capsid to cross the blood brain barrier and transduce motor neurons has been demonstrated. The SMN1 gene present in onasemnogene abeparvovec is designed to reside as episomal DNA in the nucleus of transduced cells and is expected to be stably expressed for an extended period of time in post-mitotic cells. The AAV9 virus is not known to cause disease in humans. The transgene is introduced to target cells as a self-complementary double-stranded molecule. Expression of the transgene is driven by a constitutive promoter (cytomegalovirus enhanced chicken-β-actin-hybrid), which results in continuous and sustained SMN protein expression. Proof of the mechanism of action has been supported by non-clinical studies and by human biodistribution data.

Clinical efficacy and safety

AVXS-101-CL-303 Phase 3 study in patients with Type 1 SMA

AVXS-101-CL-303 (Study CL-303) is a Phase 3 open-label, single-arm, single-dose study of intravenous administration of onasemnogene abeparvovec at the therapeutic dose (1.1 × 10^{14} vg/kg). Twenty-two patients were enrolled with Type 1 SMA and 2 copies of SMN2. Before treatment with onasemnogene abeparvovec, none of the 22 patients required non-invasive ventilator (NIV) support, and all patients could exclusively feed orally (i.e., did not need non-oral nutrition). The mean Children’s Hospital of Philadelphia Infant Test of Neuromuscular Disorders (CHOP-INTEND) score at baseline was 32.0 (range, 18 to 52). The mean age of the 22 patients at the time of treatment was 3.7 months (0.5 to 5.9 months).

Of the 22 enrolled patients, 21 patients survived without permanent ventilation (i.e., event-free survival) to ≥10.5 months of age, 20 patients survived to ≥14 months of age (co-primary efficacy endpoint), and 20 patients survived event-free to 18 months of age.

Three patients did not complete the study, of which 2 patients had an event (death or permanent ventilation) leading to 90.9% (95% CI: 79.7%, 100.0%) event-free survival (alive without permanent ventilation) at 14 months of age, see Figure 1.
PNCR = Pediatric Neuromuscular Clinical Research natural history cohort
NeuroNext = Network for Excellence in Neuroscience Clinical Trials natural history cohort

For the 14 patients in Study CL-303 that achieved the milestone of independent sitting for at least 30 seconds at any visit during the study, the median age when this milestone was first demonstrated was 12.6 months (range: 9.2 to 18.6 months). Thirteen patients (59.1%) confirmed the milestone of independent sitting for at least 30 seconds at the 18-month visit (co-primary endpoint, p<0.0001). One patient achieved the milestone of sitting independently for 30 seconds at 16 months of age, but this milestone was not confirmed at the Month 18 visit. The video-confirmed developmental milestones for patients in Study CL-303 are summarised in Table 4. Three patients did not achieve any motor milestones (13.6%) and another 3 patients (13.6%) achieved head control as the maximum motor milestone before the 18 months of age final study visit.

Table 4  Median time to video documented achievement of motor milestones Study CL-303

<table>
<thead>
<tr>
<th>Video documented milestone</th>
<th>Number of patients achieving milestone n/N (%)</th>
<th>Median age to the milestone achievement (months)</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head control</td>
<td>17/20* (85.0)</td>
<td>6.8</td>
<td>(4.77, 7.57)</td>
</tr>
<tr>
<td>Rolls from back to sides</td>
<td>13/22 (59.1)</td>
<td>11.5</td>
<td>(7.77, 14.53)</td>
</tr>
<tr>
<td>Sits without support for 30 seconds (Bayley)</td>
<td>14/22 (63.6)</td>
<td>12.5</td>
<td>(10.17, 15.20)</td>
</tr>
<tr>
<td>Sitting without support for at least 10 seconds (WHO)</td>
<td>14/22 (63.6)</td>
<td>13.9</td>
<td>(11.00, 16.17)</td>
</tr>
</tbody>
</table>

* 2 patients were reported to have Head Control by clinician assessment at baseline.
One patient (4.5%) could also walk with assistance at 12.9 months. Based on the natural history of the disease, patients who met the study entry criteria would not be expected to attain the ability to sit without support. In addition, 18 of the 22 patients were independent of ventilatory support at 18 months of age.

Motor function improvements were also observed as measured by the CHOP-INTEND, see Figure 2. Twenty-one patients (95.5%) achieved a CHOP-INTEND score ≥ 40, 14 patients (63.6%) had achieved a CHOP-INTEND score ≥ 50, and 9 patients (40.9%) had achieved a CHOP-INTEND score ≥ 58. Patients with untreated SMA Type 1 almost never achieve a CHOP-INTEND score ≥ 40. Motor milestone achievement was observed in some patients despite plateauing of CHOP-INTEND. No clear correlation was observed between CHOP-INTEND scores and motor milestone achievement.

**Figure 2  CHOP-INTEND motor function scores - Study CL-303 (N=22)**

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**AVXS-101-CL-302 Phase 3 study in patients with Type 1 SMA**

AVXS-101-CL-302 (Study CL-302) is a Phase 3, open-label, single-arm, single-dose study of intravenous administration of onasemnogene abeparvovec at the therapeutic dose (1.1 × 10^{14} vg/kg). Thirty-three patients were enrolled with Type 1 SMA and 2 copies of SMN2. Before treatment with onasemnogene abeparvovec, 9 patients (27.3%) reported ventilatory support and 9 patients (27.3%) reported feeding support. The mean CHOP-INTEND score of the 33 patients at baseline was 27.9 (range, 14 to 55). The mean age of the 33 patients at the time of treatment was 4.1 months (range, 1.8 to 6.0 months).

Of the 33 enrolled patients (Efficacy Completers population), one patient (3%) was dosed outside of protocol age range and was therefore not included in the intent-to-treat (ITT) population. Of the 32 patients in the ITT population, one patient (3%) died during the study, due to disease progression.

Of the 32 patients in the ITT population, 14 patients (43.8%) achieved the milestone of sitting without support for at least 10 seconds at any visit up to and including the 18 month visit (primary efficacy endpoint). The median age when this milestone was first achieved was 15.9 months (range, 7.7 to 18.6 months). Thirty-one patients (96.9%) in the ITT population survived without permanent ventilation (i.e., event-free survival) to ≥ 14 months of age (secondary efficacy endpoint).

The additional video-confirmed developmental milestones for patients in the Efficacy Completers population in Study CL-302 at any visit up to and including the 18 month visit are summarised in Table 5.
Table 5  Median time to video documented achievement of motor milestones in Study CL-302 (Efficacy Completers population)

<table>
<thead>
<tr>
<th>Video documented milestone</th>
<th>Number of patients achieving milestone n/N (%)</th>
<th>Median age to the milestone achievement (months)</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head control</td>
<td>23/30* (76.7)</td>
<td>8.0</td>
<td>(5.8, 9.2)</td>
</tr>
<tr>
<td>Rolls from back to sides</td>
<td>19/33 (57.6)</td>
<td>15.3</td>
<td>(12.5, 17.4)</td>
</tr>
<tr>
<td>Sits without support for at least 30 seconds</td>
<td>16/33 (48.5)</td>
<td>14.3</td>
<td>(8.3, 18.3)</td>
</tr>
</tbody>
</table>

* 3 patients were reported to have head control by clinician assessment at baseline.

One patient (3%) achieved the motor milestones of crawling, standing with assistance, stands alone, walking with assistance, and walking alone all by the age of 18 months.

Of the 33 enrolled patients, 24 patients (72.7%) achieved a CHOP-INTEND score ≥ 40, 14 patients (42.4%) achieved a CHOP-INTEND score ≥ 50, and 3 patients (9.1%) achieved a CHOP-INTEND score ≥ 58 (see Figure 3). Patients with untreated SMA Type 1 almost never achieve a CHOP-INTEND score ≥ 40.

Figure 3  CHOP-INTEND motor function scores in Study CL-302 (Efficacy Completers population; N=33)*

*Note: The total score programmatically calculated for one patient (--- - - -) at Month 7 (total score=3) is considered invalid. All items were not scored and the total score should have been set to Missing (i.e. not calculated).

AVXS-101-CL-101 Phase 1 study in patients with Type 1 SMA

The results seen in Study CL-303 are supported by study AVXS-101-CL-101 (Study CL-101) a phase 1 study in patients with Type 1 SMA, in which onasemnogene abeparvovec was administered as a single intravenous infusion in 12 patients from 3.6 kg to 8.4 kg (0.9 to 7.9 months of age). At 14 months of age, all treated patients were event-free; i.e. survived without permanent ventilation, compared to 25% in the natural history cohort. At the end of the study (24 months post-dose), all treated patients were event-free, compared to less than 8% in the natural history, see Figure 1.
At 24 months of follow up post-dose, 10 out of 12 patients were able to sit without support for ≥ 10 seconds, 9 patients were able to sit without support for ≥ 30 seconds and 2 patients were able to stand and walk without assistance. One out of 12 patients did not achieve head control as the maximum motor milestone before the age of 24 months. Ten of 12 patients from Study CL-101 continue to be followed in a long-term study (for up to 5.5 years after dosing) and all have either maintained previously attained milestones or gained new milestones such as sitting with support, standing with assistance and walking alone. Four of the 10 patients received concomitant nusinersen treatment at some point during the long-term study. Maintenance of efficacy and achievement of milestones can therefore not be solely attributed to onasemnogene abeparvovec in all patients. The milestone of standing with assistance was newly acquired by 2 patients who were not receiving nusinersen.

**AVXS-101-CL-304 Phase 3 study in patients with pre-symptomatic SMA**

Study CL-304 is an ongoing, global, Phase 3, open-label, single-arm, single-dose, multicenter study of IV AVXS-101 in pre-symptomatic newborn patients up to 6 weeks of age with 2 (cohort 1, n=14) or 3 (cohort 2, n=15) copies of SMN2.

**Cohort 1**
At the time of the last study visit prior to 11 June 2020, the 14 treated patients with 2 copies of SMN2 had a median age of 15.6 months (range: 8.8 to 18.8 months) and had been in the study for a median of 14.9 months (range: 8.0 to 18.4 months). All patients were alive and free of permanent ventilation as of their last study visit prior to 11 June 2020.

Eleven patients achieved independent sitting for at least 30 seconds, at ages ranging from 5.7 to 11.8 months, with 10 of the 11 patients achieving independent sitting at or before 9.2 months of age, the 99th percentile for development of this milestone. Four patients achieved the milestone of walking alone (28.6%). Thirteen patients (92.9%) achieved a CHOP-INTEND score ≥ 58 as of the 11 June 2020 data cut-off.

**Cohort 2**
At the time of the last study visit prior to 11 June 2020, the 15 treated patients with 3 copies of SMN2 had a median age of 15.2 months (range: 3.3 to 21.1 months) and had been in the study for a median of 14.5 months (range: 2.0 to 19.9 months). All patients were alive and free of permanent ventilation as of their last study visit prior to 11 June 2020.

Thirteen of 15 patients were able to sit without support for at least 30 seconds, 8 patients were able to stand alone without support for at least 3 seconds, and 6 patients were able to walk at least five steps independently.

At the time of the 11 June 2020 data cut-off, patients with 3 copies of SMN2 who have not yet achieved the Cohort 2 primary endpoint developmental milestone of standing alone without support for at least 3 seconds were 3.3 to 16.4 months of age as of the last attended visit. Based on the age at the time of the last attended visit, these patients remain within the normal age development window for these milestones. Due to the large heterogeneity in clinical presentation of patients with 3 SMN2 copies, no definitive conclusions about the benefit in this patient population can be drawn based on the interim follow up data.

Onasemnogene abeparvovec has not been studied in patients with a bi-allelic mutation of the SMN1 gene and only one copy of SMN2 in clinical studies.

This medicinal product has been authorised under a so-called ‘conditional approval’ scheme. This means that further evidence on this medicinal product is awaited. The European Medicines Agency will review new information on this medicinal product at least every year and this SmPC will be updated as necessary.
The European Medicines Agency has deferred the obligation to submit the results of studies with onasemnogene abeparvovec in one or more subsets of the paediatric population in spinal muscular atrophy for the granted indication (see section 4.2 for information on paediatric use).

5.2 Pharmacokinetic properties

Onasemnogene abeparvovec vector shedding studies, which assess the amount of vector eliminated from the body through saliva, urine and faeces were performed.

Onasemnogene abeparvovec was detectable in shedding samples post-infusion. Clearance of onasemnogene abeparvovec was primarily via faeces and the majority is cleared within 30 days after dose administration.

Biodistribution was evaluated in 2 patients who died 5.7 months and 1.7 months, respectively, after infusion of onasemnogene abeparvovec at the dose of 1.1 x 10^{14} vg/kg. Both cases showed that the highest levels of vector DNA were found in the liver. Vector DNA was also detected in the spleen, heart, pancreas, inguinal lymph node, skeletal muscles, peripheral nerves, kidney, lung, intestines, gonads, spinal cord, brain, and thymus. Immunostaining for SMN protein showed generalized SMN expression in spinal motor neurons, neuronal and glial cells of the brain, and in the heart, liver, skeletal muscles, and other tissues evaluated.

5.3 Preclinical safety data

Following intravenous administration in neonatal mice, vector and transgene were widely distributed with the highest expression generally observed in heart and liver, and substantial expression in the brain and spinal cord. In pivotal 3-month mouse toxicology studies, the main target organs of toxicity identified were the heart and liver. Onasemnogene abeparvovec-related findings in the ventricles of the heart were comprised of dose-related inflammation, oedema and fibrosis. In the atria of the heart, inflammation, thrombosis, myocardial degeneration/necrosis and fibroplasia were observed. Liver findings were comprised of hepatocellular hypertrophy, Kupffer cell activation, and scattered hepatocellular necrosis. A No Adverse Effect Level (NoAEL) was not identified for onasemnogene abeparvovec in mouse studies as ventricular myocardial inflammation/oedema/fibrosis and atrial inflammation were observed at the lowest dose tested (1.5 x 10^{13} vg/kg). This dose is regarded as the Maximum Tolerated Dose and approximately 1.4-fold the recommended clinical dose. Onasemnogene abeparvovec-related mortality was, in the majority of mice, associated with atrial thrombosis, and observed at 2.4 x 10^{14} vg/kg. The cause of the mortality in the rest of the animals was undetermined, although microscopic degeneration/regeneration in the hearts of these animals was found.

Genotoxicity, carcinogenicity and reproduction toxicity studies have not been conducted with onasemnogene abeparvovec.

In a toxicology study conducted in young adult non-human primates, administration of a single dose of 3 x 10^{13} vg/NHP (median dose 1.08 x 10^{13} vg/kg) onasemnogene abeparvovec intrathecally with Trendelenburg position, without corticosteroid treatment, resulted in minimal to marked mononuclear cell inflammation (primarily lymphocytes) in some dorsal root ganglia from all examined spinal cord levels, with neuronal satellitosis, neuronal necrosis, or complete neuronal loss with rare mineralization. The clinical relevance of this finding is unknown.
6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Tromethamine
Magnesium chloride
Sodium chloride
Poloxamer 188
Hydrochloric acid (for pH adjustment)
Water for injections

6.2 Incompatibilities

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

6.3 Shelf life

1 year

After thawing
Once thawed, the medicinal product should not be re-frozen and may be stored refrigerated at 2°C to 8°C in the original carton for 14 days.

Once the dose volume is drawn into the syringe it must be infused within 8 hours. Discard the vector containing syringe if not infused within the 8-hour timeframe.

6.4 Special precautions for storage

Store and transport frozen (≤ -60°C).
Store in a refrigerator (2°C to 8°C) immediately upon receipt.
Store in the original carton.
For storage conditions after thawing of the medicinal product, see section 6.3.
The date of receipt should be marked on the original carton before the product is stored in the refrigerator.

6.5 Nature and contents of container

Onasemnogene abeparvovec is supplied in a vial (10 mL polymer crystal zenith) with stopper (20 mm chlorobutyl rubber) and seal (aluminum, flip-off) with a coloured cap (plastic), in two different vial fill volume sizes, either 5.5 mL or 8.3 mL.

The dose of onasemnogene abeparvovec and exact number of vials required for each patient is calculated according to the patient’s weight (see section 4.2 and Table 6 below).
### Table 6  Carton/kit configurations

<table>
<thead>
<tr>
<th>Patient weight (kg)</th>
<th>5.5 mL vial(^a)</th>
<th>8.3 mL vial(^b)</th>
<th>Total vials per carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6 – 3.0</td>
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<td>2</td>
</tr>
<tr>
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<tr>
<td>20.6 – 21.0</td>
<td>0</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

\(^a\) Vial nominal concentration is \(2 \times 10^{13}\) vg/mL and contains an extractable volume of not less than 5.5 mL.

\(^b\) Vial nominal concentration is \(2 \times 10^{13}\) vg/mL and contains an extractable volume of not less than 8.3 mL.
6.6 Special precautions for disposal and other handling

Receipt and thawing vials

- Vials will be transported frozen (≤ -60°C). Upon receipt vials should be refrigerated at 2°C to 8°C immediately, and in the original carton. Onasemnogene abeparvovec therapy should be initiated within 14 days of receipt of vials.
- Vials must be thawed before use. Do not use onasemnogene abeparvovec unless thawed.
- For packaging configurations containing up to 9 vials, product will be thawed after approximately 12 hours in the refrigerator. For packaging configurations containing up to 14 vials, product will be thawed after approximately 16 hours in the refrigerator. Alternatively, and for immediate use, thawing may be performed at room temperature.
- For packaging configurations containing up to 9 vials, thawing will occur from frozen state after approximately 4 hours at room temperature (20°C to 25°C). For packaging configurations containing up to 14 vials, thawing will occur from frozen state after approximately 6 hours at room temperature (20°C to 25°C).
- Before drawing the dose volume into the syringe, gently swirl the thawed product. Do NOT shake.
- Do not use this medicine if you notice any particles or discolouration once the frozen product has thawed and prior to administration.
- Once thawed, the medicinal product should not be re-frozen.
- After thawing, onasemnogene abeparvovec should be given as soon as possible. Once the dose volume is drawn into the syringe it must be infused within 8 hours. Discard the vector-containing syringe if not infused within the 8-hour timeframe.

Administration of onasemnogene abeparvovec to the patient

To administer onasemnogene abeparvovec, draw the entire dose volume into the syringe. Remove any air in the syringe before intravenous infusion through a venous catheter.

Precautions to be taken for the handling, disposal and accidental exposure to the medicinal product

This medicinal product contains genetically-modified organisms. Appropriate precautions for the handling, disposal or accidental exposure of onasemnogene abeparvovec should be followed:

- The onasemnogene abeparvovec syringe should be handled aseptically under sterile conditions.
- Personal protective equipment (to include gloves, safety goggles, laboratory coat and sleeves) should be worn while handling or administering onasemnogene abeparvovec. Personnel should not work with onasemnogene abeparvovec if skin is cut or scratched.
- All spills of onasemnogene abeparvovec must be wiped with absorbent gauze pad and the spill area must be disinfected using a bleach solution followed by alcohol wipes. All clean up materials must be double bagged and disposed of per local guidelines for handling of biological waste.
- Any unused medicinal product or waste material should be disposed of in accordance with local guidelines on handling of biological waste.
- All materials that may have come in contact with onasemnogene abeparvovec (e.g. vial, all materials used for injection, including sterile drapes and needles) must be disposed of in accordance with local guidelines on handling of biological waste.
- Accidental exposure to onasemnogene abeparvovec must be avoided. In the event of exposure to skin, the affected area must be thoroughly cleaned with soap and water for at least 15 minutes. In the event of exposure to eyes, the affected area must be thoroughly flushed with water for at least 15 minutes.
Shedding

Temporary onasemnogene abeparvovec shedding may occur, primarily through bodily waste. Caregivers and patient families should be advised on the following instructions for the proper handling of patient bodily fluids and waste:

- Good hand-hygiene (wearing protective gloves and washing hands thoroughly afterwards with soap and warm running water, or an alcohol-based hand sanitiser) is required when coming into direct contact with patient bodily fluids and waste for a minimum of 1 month after onasemnogene abeparvovec treatment.
- Disposable nappies should be sealed in double plastic bags and can be disposed of in household waste.

7. MARKETING AUTHORISATION HOLDER

Novartis Gene Therapies EU Limited
Block B, The Crescent Building
Northwood, Santry
Dublin 9
D09 C6X8
Ireland

8. MARKETING AUTHORISATION NUMBER(S)

EU/1/20/1443/001
EU/1/20/1443/002
EU/1/20/1443/003
EU/1/20/1443/004
EU/1/20/1443/005
EU/1/20/1443/006
EU/1/20/1443/007
EU/1/20/1443/008
EU/1/20/1443/009
EU/1/20/1443/010
EU/1/20/1443/011
EU/1/20/1443/012
EU/1/20/1443/013
EU/1/20/1443/014
EU/1/20/1443/015
EU/1/20/1443/016
EU/1/20/1443/017
EU/1/20/1443/018
EU/1/20/1443/019
EU/1/20/1443/020
EU/1/20/1443/021
EU/1/20/1443/022
EU/1/20/1443/023
EU/1/20/1443/024
EU/1/20/1443/025
EU/1/20/1443/026
EU/1/20/1443/027
EU/1/20/1443/028
EU/1/20/1443/029
9. **DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION**

Date of first authorisation: 18 May 2020  
Date of latest renewal: 18 May 2021

10. **DATE OF REVISION OF THE TEXT**

ANNEX II

A. MANUFACTURER(S) OF THE BIOLOGICAL ACTIVE SUBSTANCE AND MANUFACTURER 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

E. SPECIFIC OBLIGATION TO COMPLETE POST-AUTHORISATION MEASURES FOR THE CONDITIONAL MARKETING AUTHORISATION
A. MANUFACTURER OF THE BIOLOGICAL ACTIVE SUBSTANCE AND MANUFACTURER RESPONSIBLE FOR BATCH RELEASE

Name and address of the manufacturer(s) of the biological active substance(s)
Novartis Gene Therapies, Inc.
1940 USG Drive
Libertyville
IL 60048
United States

Name and address of the manufacturer(s) responsible for batch release
Almac Pharma Services (Ireland) Limited
Finnabair Industrial Estate
Dundalk
Co. Louth
A91 P9KD
Ireland

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.

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.
- **Obligation to conduct post-authorisation measures**

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Due date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-interventional post-authorisation efficacy study (PAES):</td>
<td>Interim reports to be submitted with annual renewal. Final study report 2038.</td>
</tr>
<tr>
<td>In order to further characterise and contextualise the outcomes of patients with a diagnosis of SMA, including long-term safety and efficacy of Zolgensma, the MAH should conduct and submit the results of a prospective observational registry AVXS-101-RG-001 according to an agreed protocol.</td>
<td></td>
</tr>
<tr>
<td>The applicant should perform a further evaluation of the finished product specifications when primary and key secondary endpoint data from additional patients with 2 copies of SMN2 are available (i.e. completion of CL-302 and CL-304 cohort 1). Based on this evaluation, it should be determined whether tightening of the release specification limits is needed to improve consistency of the batches and ensure optimal clinical outcome.</td>
<td>Dec 2021 with completion of Study CL-302 and Cohort 1 in Study CL-304</td>
</tr>
</tbody>
</table>

**E. SPECIFIC OBLIGATION TO COMPLETE POST-AUTHORISATION MEASURES FOR THE CONDITIONAL MARKETING AUTHORISATION**

This being a conditional marketing authorisation and pursuant to Article 14a(4) of Regulation (EC) No 726/2004, the MAH shall complete, within the stated timeframe, the following measures:

<table>
<thead>
<tr>
<th>Description</th>
<th>Due date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-authorisation efficacy study (PAES):</td>
<td>Interim results: at each annual renewal</td>
</tr>
<tr>
<td>In order to confirm the efficacy and safety and tolerability of a single dose of Zolgensma in genetically diagnosed and pre-symptomatic patients equal or younger than 6 weeks of age at time of treatment with SMA with bi-allelic deletion of SMN1 with 2 or 3 copies of SMN2, the MAH should submit interim and final data on Study AVXS-101-CL-304</td>
<td>Final results: Aug 2026</td>
</tr>
</tbody>
</table>
ANNEX III

LABELLING AND PACKAGE LEAFLET
A. LABELLING
### PARTICULARS TO APPEAR ON THE OUTER PACKAGING

#### OUTER CARTON – GENERIC LABELLING

<table>
<thead>
<tr>
<th>1. NAME OF THE MEDICINAL PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zolgensma 2 ( \times 10^{13} ) vector genomes/mL solution for infusion onasemnogene abeparvovec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. STATEMENT OF ACTIVE SUBSTANCE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each vial contains onasemnogene abeparvovec equivalent to ( 2 \times 10^{13} ) vector genomes/mL.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. LIST OF EXCIPIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Also contains tromethamine, magnesium chloride, sodium chloride, poloxamer 188, hydrochloric acid and water for injections.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. PHARMACEUTICAL FORM AND CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution for infusion</td>
</tr>
<tr>
<td>8.3 mL vial x 2</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 1</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 2</td>
</tr>
<tr>
<td>8.3 mL vial x 3</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 2</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 3</td>
</tr>
<tr>
<td>8.3 mL vial x 4</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 3</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 4</td>
</tr>
<tr>
<td>8.3 mL vial x 5</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 4</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 5</td>
</tr>
<tr>
<td>8.3 mL vial x 6</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 5</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 6</td>
</tr>
<tr>
<td>8.3 mL vial x 7</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 6</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 7</td>
</tr>
<tr>
<td>8.3 mL vial x 8</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 7</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 8</td>
</tr>
<tr>
<td>8.3 mL vial x 9</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 8</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 9</td>
</tr>
<tr>
<td>8.3 mL vial x 10</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 9</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 10</td>
</tr>
<tr>
<td>8.3 mL vial x 11</td>
</tr>
<tr>
<td>5.5 mL vial x 2, 8.3 mL vial x 10</td>
</tr>
<tr>
<td>5.5 mL vial x 1, 8.3 mL vial x 11</td>
</tr>
</tbody>
</table>
5. **METHOD AND ROUTE(S) OF ADMINISTRATION**

Read the package leaflet before use
For intravenous use
Single use only

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(S), IF NECESSARY**

8. **EXPIRY DATE**

**EXP:**
Must use within 14 days of receipt

9. **SPECIAL STORAGE CONDITIONS**

Store and transport frozen at ≤-60°C.
Store in a refrigerator 2-8°C immediately upon receipt.
Store in the original carton.

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

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

11. **NAME AND ADDRESS OF THE MARKETING AUTHORISATION HOLDER**

Novartis Gene Therapies EU Limited
Block B, The Crescent Building
Northwood, Santry
Dublin 9
D09 C6X8
Ireland
12. **MARKETING AUTHORISATION NUMBER(S)**

EU/1/20/1443/001 – 8.3 mL vial x 2
EU/1/20/1443/002 – 5.5 mL vial x 2, 8.3 mL vial x 1
EU/1/20/1443/003 – 5.5 mL vial x 1, 8.3 mL vial x 2
EU/1/20/1443/004 – 8.3 mL vial x 3
EU/1/20/1443/005 – 5.5 mL vial x 2, 8.3 mL vial x 2
EU/1/20/1443/006 – 5.5 mL vial x 1, 8.3 mL vial x 3
EU/1/20/1443/007 – 8.3 mL vial x 4
EU/1/20/1443/008 – 5.5 mL vial x 2, 8.3 mL vial x 3
EU/1/20/1443/009 – 5.5 mL vial x 1, 8.3 mL vial x 4
EU/1/20/1443/010 – 8.3 mL vial x 5
EU/1/20/1443/011 – 5.5 mL vial x 2, 8.3 mL vial x 4
EU/1/20/1443/012 – 5.5 mL vial x 1, 8.3 mL vial x 5
EU/1/20/1443/013 – 8.3 mL vial x 6
EU/1/20/1443/014 – 5.5 mL vial x 2, 8.3 mL vial x 5
EU/1/20/1443/015 – 5.5 mL vial x 1, 8.3 mL vial x 6
EU/1/20/1443/016 – 8.3 mL vial x 7
EU/1/20/1443/017 – 5.5 mL vial x 2, 8.3 mL vial x 6
EU/1/20/1443/018 – 5.5 mL vial x 1, 8.3 mL vial x 7
EU/1/20/1443/019 – 8.3 mL vial x 8
EU/1/20/1443/020 – 5.5 mL vial x 2, 8.3 mL vial x 7
EU/1/20/1443/021 – 5.5 mL vial x 1, 8.3 mL vial x 8
EU/1/20/1443/022 – 8.3 mL vial x 9
EU/1/20/1443/023 – 5.5 mL vial x 2, 8.3 mL vial x 8
EU/1/20/1443/024 – 5.5 mL vial x 1, 8.3 mL vial x 9
EU/1/20/1443/025 – 8.3 mL vial x 10
EU/1/20/1443/026 – 5.5 mL vial x 2, 8.3 mL vial x 9
EU/1/20/1443/027 – 5.5 mL vial x 1, 8.3 mL vial x 10
EU/1/20/1443/028 – 8.3 mL vial x 11
EU/1/20/1443/029 – 5.5 mL vial x 2, 8.3 mL vial x 10
EU/1/20/1443/030 – 5.5 mL vial x 1, 8.3 mL vial x 11
EU/1/20/1443/031 – 8.3 mL vial x 12
EU/1/20/1443/032 – 5.5 mL vial x 2, 8.3 mL vial x 11
EU/1/20/1443/033 – 5.5 mL vial x 1, 8.3 mL vial x 12
EU/1/20/1443/034 – 8.3 mL vial x 13
EU/1/20/1443/035 – 5.5 mL vial x 2, 8.3 mL vial x 12
EU/1/20/1443/036 – 5.5 mL vial x 1, 8.3 mL vial x 13
EU/1/20/1443/037 – 8.3 mL vial x 14

13. **BATCH NUMBER**

Lot:

14. **GENERAL CLASSIFICATION FOR SUPPLY**

15. **INSTRUCTIONS ON USE**
16. INFORMATION IN BRAILLE

Justification for not including Braille accepted.

17. UNIQUE IDENTIFIER – 2D BARCODE

2D barcode carrying the unique identifier included.

18. UNIQUE IDENTIFIER - HUMAN READABLE DATA

PC
SN
NN
MINIMUM PARTICULARS TO APPEAR ON SMALL IMMEDIATE PACKAGING UNITS

OUTER CARTON – VARIABLE DATA (to be printed directly on the outer carton at time of packaging)

1. NAME OF THE MEDICINAL PRODUCT AND ROUTE(S) OF ADMINISTRATION

Zolgensma 2 x 10^{13} vector genomes/mL solution for infusion
onasemnogene abeparvovec IV

2. METHOD OF ADMINISTRATION

3. EXPIRY DATE

EXP:

4. BATCH NUMBER

Lot:

5. CONTENTS BY WEIGHT, BY VOLUME OR BY UNIT

EU/1/20/1443/001 – 8.3 mL vial x 2
EU/1/20/1443/002 – 5.5 mL vial x 2, 8.3 mL vial x 1
EU/1/20/1443/003 – 5.5 mL vial x 1, 8.3 mL vial x 2
EU/1/20/1443/004 – 8.3 mL vial x 3
EU/1/20/1443/005 – 5.5 mL vial x 2, 8.3 mL vial x 2
EU/1/20/1443/006 – 5.5 mL vial x 1, 8.3 mL vial x 3
EU/1/20/1443/007 – 8.3 mL vial x 4
EU/1/20/1443/008 – 5.5 mL vial x 2, 8.3 mL vial x 3
EU/1/20/1443/009 – 5.5 mL vial x 1, 8.3 mL vial x 4
EU/1/20/1443/010 – 8.3 mL vial x 5
EU/1/20/1443/011 – 5.5 mL vial x 2, 8.3 mL vial x 4
EU/1/20/1443/012 – 5.5 mL vial x 1, 8.3 mL vial x 5
EU/1/20/1443/013 – 8.3 mL vial x 6
EU/1/20/1443/014 – 5.5 mL vial x 2, 8.3 mL vial x 5
EU/1/20/1443/015 – 5.5 mL vial x 1, 8.3 mL vial x 6
EU/1/20/1443/016 – 8.3 mL vial x 7
EU/1/20/1443/017 – 5.5 mL vial x 2, 8.3 mL vial x 6
EU/1/20/1443/018 – 5.5 mL vial x 1, 8.3 mL vial x 7
EU/1/20/1443/019 – 8.3 mL vial x 8
EU/1/20/1443/020 – 5.5 mL vial x 2, 8.3 mL vial x 7
EU/1/20/1443/021 – 5.5 mL vial x 1, 8.3 mL vial x 8
EU/1/20/1443/022 – 8.3 mL vial x 9
EU/1/20/1443/023 – 5.5 mL vial x 2, 8.3 mL vial x 8
EU/1/20/1443/024 – 5.5 mL vial x 1, 8.3 mL vial x 9
EU/1/20/1443/025 – 8.3 mL vial x 10
EU/1/20/1443/026 – 5.5 mL vial x 2, 8.3 mL vial x 9
EU/1/20/1443/027 – 5.5 mL vial x 1, 8.3 mL vial x 10
EU/1/20/1443/028 – 8.3 mL vial x 11
EU/1/20/1443/029 – 5.5 mL vial x 2, 8.3 mL vial x 10
EU/1/20/1443/030 – 5.5 mL vial x 1, 8.3 mL vial x 11
EU/1/20/1443/031 – 8.3 mL vial x 12
EU/1/20/1443/032 – 5.5 mL vial x 2, 8.3 mL vial x 11
EU/1/20/1443/033 – 5.5 mL vial x 1, 8.3 mL vial x 12
EU/1/20/1443/034 – 8.3 mL vial x 13
EU/1/20/1443/035 – 5.5 mL vial x 2, 8.3 mL vial x 12
EU/1/20/1443/036 – 5.5 mL vial x 1, 8.3 mL vial x 13
EU/1/20/1443/037 – 8.3 mL vial x 14

<table>
<thead>
<tr>
<th>Patient Weight</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6 – 3.0 kg</td>
<td></td>
</tr>
<tr>
<td>3.1 – 3.5 kg</td>
<td></td>
</tr>
<tr>
<td>3.6 – 4.0 kg</td>
<td></td>
</tr>
<tr>
<td>4.1 – 4.5 kg</td>
<td></td>
</tr>
<tr>
<td>4.6 – 5.0 kg</td>
<td></td>
</tr>
<tr>
<td>5.1 – 5.5 kg</td>
<td></td>
</tr>
<tr>
<td>5.6 – 6.0 kg</td>
<td></td>
</tr>
<tr>
<td>6.1 – 6.5 kg</td>
<td></td>
</tr>
<tr>
<td>6.6 – 7.0 kg</td>
<td></td>
</tr>
<tr>
<td>7.1 – 7.5 kg</td>
<td></td>
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<tr>
<td>7.6 – 8.0 kg</td>
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<tr>
<td>8.1 – 8.5 kg</td>
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<td>8.6 – 9.0 kg</td>
<td></td>
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<tr>
<td>9.1 – 9.5 kg</td>
<td></td>
</tr>
<tr>
<td>9.6 – 10.0 kg</td>
<td></td>
</tr>
<tr>
<td>10.1 – 10.5 kg</td>
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</tr>
<tr>
<td>10.6 – 11.0 kg</td>
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<tr>
<td>11.1 – 11.5 kg</td>
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<tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>20.1 – 20.5 kg</td>
<td></td>
</tr>
<tr>
<td>20.6 – 21.0 kg</td>
<td></td>
</tr>
</tbody>
</table>
Date of Receipt:

2D barcode carrying the unique identifier included.
PC
SN
NN
### MINIMUM PARTICULARS TO APPEAR ON SMALL IMMEDIATE PACKAGING UNITS

**VIAL LABEL**

<table>
<thead>
<tr>
<th>1. NAME OF THE MEDICINAL PRODUCT AND ROUTE(S) OF ADMINISTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zolgensma 2 x 10^{13} vector genomes/mL solution for infusion onasemnogene abeparvovec Intravenous use</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. METHOD OF ADMINISTRATION</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3. EXPIRY DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. BATCH NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. CONTENTS BY WEIGHT, BY VOLUME OR BY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5 mL</td>
</tr>
<tr>
<td>8.3 mL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. OTHER</th>
</tr>
</thead>
</table>
B. PACKAGE LEAFLET
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.
- 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.

What is in this leaflet
1. What Zolgensma is and what it is used for
2. What you need to know before your child is given Zolgensma
3. How Zolgensma is given
4. Possible side effects
5. How to store Zolgensma
6. Contents of the pack and other information

1. What Zolgensma is and what it is used for

What Zolgensma is
Zolgensma is a type of medicine called a ‘gene therapy’. It contains the active substance onasemnogene abeparvovec, which contains human genetic material.

What Zolgensma is used for
Zolgensma is used to treat spinal muscular atrophy (SMA), a rare, serious inherited disease.

How Zolgensma works
SMA occurs when there is a missing or abnormal version of a gene needed to make an essential protein called ‘Survival Motor Neuron’ (SMN) protein. Lack of SMN protein causes nerves that control muscles (motor neurons) to die. This results in muscles becoming weak and wasting away, with eventual loss of movement.

This medicine works by supplying a fully functioning copy of the SMN gene which then helps the body produce enough SMN protein. The gene is delivered into the cells where it is needed using a modified virus that does not cause disease in humans.
2. **What you need to know before your child is given Zolgensma**

**Do NOT use Zolgensma**
- if your child is allergic to onasemnogene abeparvovec or any of the other ingredients of this medicine (listed in section 6).

**Warnings and precautions**

Your child’s doctor will check for antibodies before treatment to help decide if this medicine is suitable for your child.

**Liver problems**
Talk to your child’s doctor or nurse before this medicine is given if your child has had any liver problems. This medicine can lead to an increase in enzymes (proteins found within the body) produced by the liver or injury to the liver. Possible signs you need to look out for after your child is given this medicine include vomiting, jaundice (yellowing of the skin or of the whites of the eyes), or reduced alertness (see section 4 for more information).

Your child will have a blood test to check how well the liver is working before starting treatment with Zolgensma. Your child will also have regular blood tests for at least 3 months after treatment to monitor for increases in liver enzymes.

**Infection**
An infection (e.g. cold, flu or bronchiolitis) before or after Zolgensma treatment may lead to more serious complications. You need to look out for signs of an infection such as coughing, wheezing, sneezing, runny nose, sore throat or fever. Tell your child’s doctor straightaway if you notice your child develops any of these symptoms.

**Regular blood tests**
This medicine can lower blood-platelet counts (thrombocytopenia). You need to look out for possible signs of a low blood-platelet count after your child is given Zolgensma such as abnormal bruising or bleeding (see section 4 for more information).

Zolgensma can raise levels of a heart protein called troponin-I that may indicate injury to the heart. You need to look out for possible signs of heart problems after your child is given this medicine, such as pale grey or blue skin colour, difficulty in breathing, swelling of the arms and legs or of the belly (see section 4 for more information).

Before starting treatment with Zolgensma, your child will have a blood test to check the amount of blood cells (including red blood cells and platelets), as well as troponin-I level in their body. They will also have a blood test to check their creatinine level, which is an indicator of how the kidneys are working. Your child will also have regular blood tests for a period of time after treatment to monitor for changes in platelets and troponin-I levels.

**Abnormal clotting of blood in small blood vessels (thrombotic microangiopathy)**
There have been reports of patients developing thrombotic microangiopathy approximately one week after Zolgensma treatment. Thrombotic microangiopathy is accompanied by a decrease in red blood cells and cells involved in clotting (platelets). These blood clots could affect your child’s kidneys. Your child’s doctor may want to check your child’s blood (platelet counts) and blood pressure. Possible signs you need to look out for after your child is given Zolgensma include bruising easily, seizures (fits) or decrease in urine output (see section 4 for more information). Seek urgent medical attention if your child develops any of these signs.

**Blood, organ, tissue and cell donation**
After your child has been treated with Zolgensma, they will not be able to donate blood, organs, tissues or cells. This is because Zolgensma is a gene therapy medicine.
Other medicines and Zolgensma
Tell your child’s doctor or nurse if your child is taking, has recently taken or might take any other medicines.

Prednisolone
Your child will also be given a corticosteroid medicine such as prednisolone for about 2 months or longer (see also section 3) as part of Zolgensma treatment. The corticosteroid medicine will help manage any increase in liver enzymes that your child could develop after being given Zolgensma.

Vaccinations
As corticosteroids can affect the body’s immune (defense) system, your child’s doctor may decide to delay giving some vaccinations while your child is receiving corticosteroid treatment. Talk to your child’s doctor or nurse if you have any questions.

Zolgensma contains sodium
This medicine contains 4.6 mg sodium per mL, equivalent to 0.23% of the WHO recommended maximum daily intake of 2 g sodium for an adult. Each 5.5-mL vial contains 25.3 mg sodium, and each 8.3-mL vial contains 38.2 mg sodium.

Additional information for parents/caregiver

Advanced SMA
Zolgensma can rescue living motor neurons, but does not rescue dead motor neurons. Children with less severe symptoms of SMA (such as absent reflexes or reduced muscle tone) may have sufficient living motor neurons to benefit significantly from Zolgensma treatment. Zolgensma may not work as well in children with severe muscle weakness or paralysis, breathing problems or who are not able to swallow, or in children who have significant malformations (such as heart defects), including patients with SMA Type 0, as there may be limited potential improvement after treatment with Zolgensma. Your child’s doctor will decide if your child should be given this medicine.

Hygiene care
The active substance in Zolgensma may temporarily be excreted through your child’s bodily waste; this is called ‘shedding’. Parents and caregivers should follow good hand-hygiene for up to 1 month after your child is given Zolgensma. Wear protective gloves when coming into direct contact with your child’s bodily fluids or waste and wash hands thoroughly afterwards with soap and warm running water, or an alcohol-based hand sanitiser. Double bags should be used to dispose of soiled nappies and other waste. Disposable nappies may still be disposed of in household waste.

You should continue to follow these instructions for at least 1 month after your child’s treatment with Zolgensma. Talk to your child’s doctor or nurse if you have any questions.

3. How Zolgensma is given
Zolgensma will be given by a doctor or nurse trained in the management of your child’s condition.

The doctor will work out the amount of Zolgensma your child will receive according to your child’s weight. Zolgensma is given intravenously (into a vein) by a single infusion (drip) over about 1 hour.

Zolgensma will be given to your child ONCE only.

Your child will also be given prednisolone (or another corticosteroid) by mouth, starting 24 hours before being given Zolgensma. The dose of corticosteroid will also depend on your child’s weight. Your child’s doctor will work out the total dose to give.
Your child will be given corticosteroid treatment daily for about 2 months after the dose of Zolgensma, or until your child’s liver enzymes decrease to an acceptable level. The doctor will slowly reduce the dose of corticosteroid until treatment can be fully stopped.

If you have any further questions ask your child’s doctor or nurse.

4. Possible side effects

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

Seek urgent medical attention if your child develops any of the following serious side effects:

**Common** (may affect up to 1 in 10 people)
- bruising or bleeding for longer than usual if your child has been hurt – these may be signs of a low blood-platelet count;
- pale grey or blue skin colour, difficulty in breathing (e.g. rapid breathing, shortness of breath), swelling of the arms and legs or of the belly – these may be signs of possible problems with the heart.

**Not known** (frequency cannot be estimated from the available data)
- vomiting, jaundice (yellowing of the skin or of the whites of the eyes) or reduced alertness - these may be signs of injury to the liver.
- bruising easily, seizures (fits), decrease in urine output – these may be signs of thrombotic microangiopathy.

Talk to your child’s doctor or nurse if your child develops any other side effects. These can include:

**Very common** (may affect more than 1 in 10 people)
- increases in liver enzymes seen in blood tests.

**Common** (may affect up to 1 in 10 people):
- vomiting;
- fever.

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 Zolgensma

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

The following information is for healthcare professionals who will prepare and give the medicine.

Do not use this medicine after the expiry date which is stated on the vial label and carton after EXP. The expiry date refers to the last day of that month.

Vials will be transported frozen (at or below -60°C).

Upon receipt vials should be refrigerated at 2°C to 8°C immediately, and in the original carton. Zolgensma therapy should be initiated within 14 days of receipt of vials.
This medicine contains genetically-modified organisms. Unused medicine or waste material must be disposed of in compliance with the local guidelines on handling of biological waste. As this medicine will be given by a doctor, the doctor is responsible for the correct disposal of the product. These measures will help protect the environment.

6.   Contents of the pack and other information

What Zolgensma contains
-   The active substance is onasemnogene abeparvovec. Each vial contains onasemnogene abeparvovec with a nominal concentration of $2 \times 10^{13}$ vector genomes/mL.
-   The other ingredients are tromethamine, magnesium chloride, sodium chloride, poloxamer 188, hydrochloric acid (for pH adjustment) and water for injections.

What Zolgensma looks like and contents of the pack
Zolgensma is a clear to slightly opaque, colourless to faint white solution for infusion.

Zolgensma may be supplied in vials containing a nominal fill volume of either of 5.5 mL or 8.3 mL. Each vial is for single use only.

Each carton will contain between 2 to 14 vials.

Marketing Authorisation Holder
Novartis Gene Therapies EU Limited
Block B, The Crescent Building
Northwood, Santry
Dublin 9
D09 C6X8
Ireland
Tel: +353 (1) 566-2364

Manufacturer
Almac Pharma Services Limited
Finnabair Industrial Estate
Dundalk, Co. Louth
A91 P9KD
Ireland

For any information about this medicine, please contact the Marketing Authorisation Holder.

This leaflet was last revised in
This medicine has been given ‘conditional approval’. This means that there is more evidence to come about this medicine. The European Medicines Agency will review new information on this medicine at least every year and this leaflet will be updated as necessary.

Other sources of information
Detailed information on this medicine is available on the European Medicines Agency web site: http://www.ema.europa.eu. There are also links to other websites about rare diseases and treatments.
The following information is intended for healthcare professionals only:

Important: Please refer to the Summary of Product Characteristics (SmPC) before using.

Each vial is for single use only.

This medicinal product contains genetically-modified organisms. Local guidelines on handling of biological waste should be followed.

Handling
- Zolgensma should be handled aseptically under sterile conditions.
- Personal protective equipment (including gloves, safety goggles, laboratory coat and sleeves) should be worn while handling or administering Zolgensma. Personnel should not work with Zolgensma if skin is cut or scratched.
- All spills of Zolgensma must be wiped with absorbent gauze pads and the spill area must be disinfected using a bleach solution followed by alcohol wipes. All clean-up materials must be double bagged and disposed of in accordance with local guidelines on handling of biological waste.
- All materials that may have come in contact with Zolgensma (e.g. vial, all materials used for injection, including sterile drapes and needles) must be disposed of in accordance with local guidelines on handling of biological waste.

Accidental exposure
Accidental exposure to Zolgensma must be avoided.

In case of accidental exposure to skin, the affected area must be thoroughly cleansed with soap and water for at least 15 minutes. In case of accidental exposure to eyes, the affected area must be thoroughly flushed with water for at least 15 minutes.

Storage
Vials will be transported frozen (at or below -60°C). Upon receipt vials should be refrigerated at 2°C to 8°C immediately, and in the original carton. Zolgensma therapy should be initiated within 14 days of receipt of vials. The date of receipt should be marked on the original carton before the product is stored in the refrigerator.

Preparation
Vials should be thawed before use:
- For packs containing up to 9 vials – thaw for approximately 12 hours in the refrigerator (2°C to 8°C) or 4 hours at room temperature (20°C to 25°C).
- For packs containing up to 14 vials – thaw for approximately 16 hours in the refrigerator (2°C to 8°C) or 6 hours at room temperature (20°C to 25°C).

Do not use Zolgensma unless thawed.

Once thawed, the medicinal product should not be re-frozen.

After thawing, gently swirl Zolgensma. Do NOT shake.

Do not use this medicine if you notice any particles or discoloration once the frozen product has thawed and prior to administration.

After thawing, Zolgensma should be given as soon as possible.
Administration
Zolgensma should be given to patients ONCE only.

The dose of Zolgensma and exact number of vials required for each patient is calculated according to the patient’s weight (see SmPC sections 4.2 and 6.5).

To administer Zolgensma, draw the entire dose volume into the syringe. Once the dose volume is drawn into the syringe it must be administered within 8 hours. Remove any air in the syringe before administering to the patient via intravenous infusion through a venous catheter. Insertion of a secondary (‘back-up’) catheter is recommended in case of blockage in the primary catheter.

Zolgensma should be administered with the syringe pump as a single intravenous infusion with a slow infusion of approximately 60 minutes. It should be administered as an intravenous infusion only. It should not be administered as a rapid intravenous injection or bolus. Following completion of infusion, the line should be flushed with sodium chloride 9 mg/mL (0.9%) solution for injection.

Disposal
Any unused medicinal product or waste material should be disposed of in accordance with local guidelines on handling of biological waste.

Temporary Zolgensma shedding may occur, primarily through bodily waste. Caregivers and patient’s families should be advised on the following instructions for the proper handling of patients’ bodily fluids and waste:

- Good hand-hygiene (wearing protective gloves and washing hands thoroughly afterwards with soap and warm running water, or an alcohol-based hand sanitiser) is required when coming into direct contact with patient’s bodily fluids and waste for a minimum of 1 month after Zolgensma treatment.
- Disposable nappies should be sealed in double plastics bags and can be disposed of in household waste.