



# **Summary of the Risk Management Plan for Orladeyo<sup>®</sup>**

**Orladeyo (berotralstat)**

**Marketing Authorisation Holder:**

**BioCryst Schweiz GmbH**

**RMP Summary Version 1.0**

**Date: 27 July 2022**

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## Disclaimer

The Risk Management Plan (RMP) is a comprehensive document submitted as part of the application dossier for market approval of a medicine. The RMP summary contains information on the medicine's safety profile and explains the measures that are taken in order to further investigate and follow the risks as well as to prevent or minimise them.

The RMP summary of ORLADEYO is a concise document and does not claim to be exhaustive. As the RMP is an international document, the summary might differ from the "Arzneimittelinformation / Information sur le médicament" approved and published in Switzerland, e.g., by mentioning risks occurring in populations or indications not included in the Swiss authorization.

Please note that the reference document which is valid and relevant for the effective and safe use of ORLADEYO in Switzerland is the "Arzneimittelinformation / Information sur le médicament" (see [www.swissmedic.ch](http://www.swissmedic.ch)) approved and authorized by Swissmedic.

BioCryst Schweiz GmbH is fully responsible for the accuracy and correctness of the content of the published summary RMP of ORLADEYO.



## ***I. The medicine and what it is used for***

Orladeyo is indicated for routine prevention of recurrent attacks of hereditary angioedema (HAE) in adult and adolescent patients aged 12 years and older. It contains berotralstat as the active substance and it is taken orally once a day.

## ***II. Risks associated with the medicine and activities to minimise or further characterise the risks***

Important risks of Orladeyo, together with measures to minimise such risks and the proposed studies for learning more about Orladeyo's risks, are outlined below.

Measures to minimise the risks identified for medicinal products can be:

- Specific information, such as warnings, precautions, and advice on correct use, in the package leaflet and SmPC addressed to patients and healthcare professionals.
- Important advice on the medicine's packaging.
- The authorised pack size - the amount of medicine in a pack is chosen to ensure that the medicine is used correctly.
- The medicine's legal status - the way a medicine is supplied to the patient (e.g., with or without prescription) can help to minimise its risks.

Together, these measures constitute routine risk minimisation measures.

In addition to these measures, information about adverse reactions is collected continuously and regularly analysed so that immediate action can be taken as necessary.

These measures constitute routine pharmacovigilance activities.

If important information that may affect the safe use of berotralstat is not yet available, it is listed under 'missing information' below.

### ***a. List of important risks and missing information***

Important risks of berotralstat are risks that need special risk management activities to further investigate or minimise the risk, so that the medicinal product can be safely administered. Important risks can be regarded as identified or potential. Identified risks are concerns for which there is sufficient proof of a link with the use of berotralstat. Potential risks are concerns for which an association with the use of this medicine is possible based on available data, but this association has



not been established yet and needs further evaluation. Missing information refers to information on the safety of the medicinal product that is currently missing and needs to be collected (e.g., on the long-term use of the medicine).

**Table 1: List of Important Risks and Missing Information**

<b>Important identified risks</b>	none
<b>Important potential risks</b>	<p>Hypersensitivity</p> <p>Hepatotoxicity</p> <p>QT Prolongation</p> <p>Carcinogenicity</p> <p>Phospholipidosis</p> <p>Drug-drug interaction with narrow therapeutic index drugs metabolised by CYP2D6 and CYP3A4</p>
<b>Missing information</b>	<p>Safety profile in pregnancy and lactation</p> <p>Long-term safety in paediatric patients</p>



*b. Summary of important risks*

**Table 2: Important Potential Risk: Hypersensitivity**

<p>Evidence for linking the risk to the medicine</p>	<p>During nonclinical development, no hypersensitivity or skin rashes were noted in any animal species dosed. Delayed type hypersensitivity rash was identified as an event of special interest (EOSI) during initial Phase 1 studies in healthy subjects, but few events have been reported in patients with HAE, and these were mild to moderate, self-limited, and not dose-dependent. The rashes resolved in all subjects. Most subjects continued dosing with berotralstat without interruption, and the rashes did not reoccur with continued dosing, or in cases where dosing was interrupted, when berotralstat was restarted.</p>
<p>Risk factors and risk groups</p>	<p>Patients with hypersensitivity to the active substance or any of the excipients in berotralstat. Human leukocyte antigen (HLA) genotyping data indicate that occurrence of drug-induced rash after administration of berotralstat, which clinically manifested in almost all cases as benign self-limited maculopapular rash, was not associated with known HLA risk alleles for drug-induced rash. In addition, the allele frequencies in subjects with drug-induced rash did not indicate increased frequency of any particular HLA alleles in affected subjects.</p>
<p>Risk minimisation measures</p>	<p>Routine risk minimisation measures:</p> <p style="padding-left: 40px;">SmPC Sections 4.3, 4.8</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p> <p style="padding-left: 40px;">None</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p style="padding-left: 40px;">Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>
<p>Additional pharmacovigilance activities</p>	<p>Studies 204, 302, and Post-authorization Study 401 (see Section II.C)</p>



**Table 3: Important Potential Risk: Hepatotoxicity**

<p>Evidence for linking the risk to the medicine</p>	<p>The liver was considered a target organ in toxicology studies due to reversible, non-adverse transaminase elevations seen in monkeys dosed for 39 weeks, along with hepatocellular hypertrophy. In rats, there were no enzyme elevations but there was extrahepatic and liver bile duct hyperplasia and phospholipidosis (PLD). In humans, alanine transaminase (ALT) elevations and, to a lesser degree, aspartate transaminase (AST) elevations &gt; 3 × upper limit of normal (ULN) have been seen in clinical trials of subjects with HAE, but no clinical signs of jaundice, synthetic liver dysfunction, or liver injury have been reported and no subject met the criteria for Hy’s Law. The association is not clear because transaminase elevations were not seen in the absence of prior androgen exposure, particularly very recently exposure.</p>
<p>Risk factors and risk groups</p>	<p>An association between prior androgen use and asymptomatic elevations in ALT was identified. More important than life-time exposure was recent abrupt discontinuation of androgens. Prior androgen use is high in patients with HAE. In the long-term safety trials, 63.2% of subjects had prior androgen use.</p>
<p>Risk minimisation measures</p>	<p>Routine risk minimisation measures:</p> <p style="padding-left: 40px;">Summary of product characteristics (SmPC) Section 4.8</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p> <p style="padding-left: 40px;">None</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p style="padding-left: 40px;">Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>
<p>Additional pharmacovigilance activities</p>	<p>Studies 204, 302, and Post-authorization Study 401 (see Section II.C)</p>



**Table 4: Important Potential Risk: QT Prolongation**

<p>Evidence for linking the risk to the medicine</p>	<p>Studies in nonhuman primate (NHP) showed quantitatively small drug-related prolongation of the QT interval.</p> <p>A thorough QT study was conducted and showed that at steady state, the maximum observed plasma concentration (<math>C_{max}</math>) of berotralstat at the recommended dose of 150 mg once daily resulted in a mean corrected QT (QTc) increase of 3.4 msec (90% confidence interval upper bound [UB] of 6.8 msec), which is below the 10 msec threshold for regulatory concern. Exposures 4-fold higher than achieved at the recommended dose increased the QTc by 21.9 msec (mean).</p> <p>Based on exposure-response modelling, at the highest anticipated clinically relevant exposure in a worst-case scenario of geometric mean <math>C_{max}</math> of 240 ng/mL, in the setting of hepatic impairment (moderate and severe hepatic failure, Pugh-Child class B and C), the estimated <math>\Delta\Delta QTcF</math> was 7.0 msec (2-sided 90% UB 10.9 msec). These values exceed the ICH E14 threshold for potential clinical significance. It should be noted that in Study BCX7353-108, conducted in subjects who had varying degrees of hepatic failure including moderate and severe, no clinically significant ECG changes were observed, no subject had a change from baseline in QTcF &gt; 30 msec, and no subject had a QTcF &gt; 500 msec. The study was single dose so the risk cannot be confirmed. Subjects with moderate to severe hepatic failure were not enrolled in the long-term prophylactic clinical trials and this potential effect is based only on modelling.</p> <p>Additionally, low body weight could increase berotralstat exposures. Adolescents and adults weighing &lt; 40 kg were excluded from the development program. As weight is the primary covariate affecting pharmacokinetics (PK) in the population PK model, modelling indicates that at lower weights, berotralstat exposure is higher than at higher weights. Exposures in patients weighing 40 kg do not exceed concentrations at which there is a concern for prolonged QT. Modelling indicates that at lower weights, around 35 kg, patients are simulated to have <math>C_{max}</math> exposure of approximately 222</p>
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	<p>ng/mL, the concentration at which the 2-sided 90% UB for <math>\Delta\Delta\text{QTcF}</math> is 10 msec. There are no clinical data in subjects weighing &lt; 40 kg, and it is appropriate to restrict use of berotralstat in these subjects. No dose adjustment is required for patients weighing at least 40 kg. An additional analysis of the QT sub-intervals revealed that multiple supratherapeutic daily doses of berotralstat prolonged the QTc interval but had little effect on the J to T peak sub-interval, which suggests that the QT prolongation reported with berotralstat can be categorized as “benign” and unlikely to be associated with proarrhythmic risk, similar to marketed drugs ranolazine or verapamil.</p> <p>No subject in the 3 long-term prophylaxis studies (204, 301 and 302), experienced clinically significant QT prolongation.</p>
<p>Risk factors and risk groups</p>	<p>Patients with moderate or severe (Child-Pugh Class B and C) liver failure</p> <p>Patients with weight &lt; 40 kg</p> <p>Patients with independent risk factors for QT prolongation</p> <p>Extrinsic:</p> <ul style="list-style-type: none"> <li>• electrolyte disturbances</li> <li>• concomitant use of other drugs known to either prolong the QTc or increase berotralstat drug levels (e.g., cyclosporine).</li> </ul> <p>Intrinsic:</p> <ul style="list-style-type: none"> <li>• congenital QT prolongation</li> <li>• acquired QT prolongation</li> <li>• advanced age</li> </ul>
<p>Risk minimisation measures</p>	<p>Routine risk minimisation measures:</p> <p style="text-align: center;">SmPC Sections 4.2, 4.4, 5.3</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p>



	<p>Use of berotralstat in patients with moderate or severe hepatic impairment (Child-Pugh Class B or C) should be avoided</p> <p>Use of berotralstat in patients weighing &lt; 40 kg should be avoided</p> <p>It is preferable to avoid the use of berotralstat in patient with severe renal impairment</p> <p>Appropriate monitoring for patients with independent risk factors for QT prolongation should be considered</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p>Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>
Additional pharmacovigilance activities	Studies 204, 302, and Post-authorization Study 401 (see Section II.C)





**Table 5: Important Potential Risk: Carcinogenicity**

<p>Evidence for linking the risk to the medicine</p>	<p>Rare stromal sarcomas of the endometrium and undifferentiated sarcomas of the skin were found in a 2-year (lifetime) study in rats administered berotralstat at an exposure that was 4.5 times the exposure achieved (on an AUC basis) at the clinical 150 mg berotralstat dose. These findings are inconclusive, with an incidence slightly higher than in control groups. The clinical relevance of these findings is unknown. Across the berotralstat clinical development program, there was no evidence of carcinogenicity. Nevertheless, carcinogenicity is addressed as an important potential risk.</p>
<p>Risk factors and risk groups</p>	<p>Unknown</p>
<p>Risk minimisation measures</p>	<p>Routine risk minimisation measures:</p> <p style="padding-left: 40px;">SmPC Section 5.3</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p> <p style="padding-left: 40px;">None</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p style="padding-left: 40px;">Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>
<p>Additional pharmacovigilance activities</p>	<p>Studies 204, 302, and Post-authorization Study 401</p>



**Table 6: Important Potential Risk: Phospholipidosis**

Evidence for linking the risk to the medicine	Toxicity studies of berotralstat in rats and monkeys demonstrated the presence of foamy and/or vacuolated macrophages in several tissues and organs of both rats and monkeys, including liver, lung, small intestine, spleen and lymph nodes.
Risk factors and risk groups	Unknown
Risk minimisation measures	<p>Routine risk minimisation measures:</p> <p>SmPC Section 5.3</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p> <p>None</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p>Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>
Additional pharmacovigilance activities	Studies 204, 302, and Post-authorization Study 401



**Table 7: Important Potential Risk: Drug-Drug Interaction with Narrow Therapeutic Index Drugs Metabolized by CYP2D6 and CYP3A4**

Evidence for linking the risk to the medicine	Drug-drug interaction studies with various doses of berotralstat.
Risk factors and risk groups	Patients taking berotralstat concomitantly with drugs metabolized by CYP2D6 or CYP3A4.
Risk minimisation measures	<p>Routine risk minimisation measures:</p> <p style="padding-left: 40px;">SmPC Sections 4.5, 5.2</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p> <p style="padding-left: 40px;">For concomitant medicines that are predominantly metabolised by CYP2D6 (e.g., thioridazine, pimozide) or CYP3A4 (e.g., cyclosporine, fentanyl), particularly those with a narrow therapeutic index, dose adjustments of these medicines may be required (SmPC Section 4.5)</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p style="padding-left: 40px;">Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>



**Table 8: Missing Information: Safety Profile in Pregnancy and Lactation**

<p>Risk minimisation measures</p>	<p>Routine risk minimisation measures:</p> <p>SmPC Sections 4.6, 5.3</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p> <p>Berotrastat is not recommended during pregnancy and use during lactation should take individual benefit-risk into consideration.</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p>Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>
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**Table 9: Missing Information: Long-term Safety in Paediatric Patients**

<p>Risk minimisation measures</p>	<p>Routine risk minimisation measures:</p> <p>SmPC Section 4.8</p> <p>Routine risk minimisation activities recommending specific clinical measures to address the risk:</p> <p>None</p> <p>Other routine risk minimisation measures beyond the Prescribing Information:</p> <p>Legal status: medical prescription</p> <p>Additional risk minimisation measures: none</p>
<p>Additional pharmacovigilance activities</p>	<p>Studies 204, 302, and Post-authorization Study 401</p>



*c. Post-authorisation development plan*

*i. Studies which are conditions of the marketing authorization*

There are no studies which are conditions of the marketing authorisation.

*ii. Other studies in the post-authorisation development plan*

**Table 10: Other Studies in the Post-Authorisation Development Plan**

<b>Study Name</b>	<b>Purpose of the Study</b>
<p>PASS 401: Non-Interventional Post-Authorization Study to Evaluate Safety, Tolerability and Effectiveness of Berotralstat for Patients with Hereditary Angioedema (HAE) in a Real-World Setting</p>	<p>As the long-term safety cannot be addressed during clinical trials, this NI PASS is designed to further characterize the safety profile of berotralstat. The long-term impact of berotralstat administration on the growth of adolescent participants is of particular interest. Study BCX7353-401 will therefore be a prospective, non-interventional PASS to evaluate the long-term safety, tolerability, and effectiveness of berotralstat in HAE patients receiving berotralstat for long-term prophylaxis.</p> <p>Primary objective: To monitor safety and tolerability of berotralstat for routine prevention of attacks of hereditary angioedema in adult and adolescent patients during long-term administration in a real-world setting</p> <p>Secondary objectives:</p> <ul style="list-style-type: none"> <li>• To evaluate the effectiveness of berotralstat for routine prevention of attacks of hereditary angioedema in adult and adolescent patients in a real-world setting</li> <li>• To assess quality of life during long-term administration of berotralstat in a real-world setting</li> <li>• To assess growth and development in adolescent patients 12 to 17 years of age</li> </ul>



<p>BCX7353-204: An open-label study to evaluate the long-term safety of daily oral BCX7353 in subjects with Type I and II hereditary angioedema</p>	<p>Primary objective: To evaluate the long-term safety and tolerability of daily dosing of oral BCX7353 in subjects with hereditary angioedema (HAE)</p> <p>Secondary objectives:</p> <ul style="list-style-type: none"> <li>• To assess the effectiveness (i.e., HAE attack frequency, severity, and disease activity over time) of BCX7353 during long-term administration</li> <li>• To evaluate quality of life (QoL) during long-term administration of BCX7353</li> <li>• To evaluate subject's satisfaction with medication during long-term administration of BCX7353</li> </ul>
<p>BCX7353-302: A Phase 3, randomized, double-blind, placebo-controlled, parallel group study to evaluate the efficacy and safety of two dose levels of BCX7353 as an oral treatment for the prevention of attacks in subjects with hereditary angioedema</p>	<p>Primary objective: To evaluate the long-term safety and tolerability of BCX7353 administered QD over a 48- to up to 240-week administration period in subjects with HAE</p> <p>Secondary objectives:</p> <ul style="list-style-type: none"> <li>• To assess the effectiveness (i.e., HAE attack frequency over time) of BCX7353 over a 48- to up to 240-week administration period</li> <li>• To evaluate QoL and HAE disease activity of BCX7353 over a 48- to up to 240-week administration period</li> <li>• To evaluate subject satisfaction with BCX7353 over a 48- to up to 240-week administration period</li> </ul>