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Sjögren-Larsson syndrome (SLS) is an autosomal recessive disorder characterized by ichthyosis, spastic diplegia or tetraplegia and intellectual disability. Ichthyosis largely develops early in life. The neonatal skin has an erythrodermic appearance that gradually evolves into a generalized ichthyosiform hyperkeratosis during infancy, which is most prominent in the flexural areas. Ichthyosis in SLS has a striking pruritic character, resulting in excoriations and scaling (1).

SLS is caused by a deficiency of microsomal fatty aldehyde dehydrogenase (FALDH), resulting in disturbed lipid metabolism (2). Lipid metabolism plays an important role in the normal formation of the water barrier in the stratum corneum. In patients with SLS, lamellar bodies, synthesized in the stratum granulosum and normally containing essential precursor membranes, are misshapen and empty. To restore barrier function, the skin reacts by hyperkeratosis, resulting in ichthyosis (3).

The pruritus may also have another pathophysiological origin. Previously, we showed an association between pruritus and elevation of pro-inflammatory leukotriene B4 (LTB4), which is also FALDH-dependent for its breakdown (4). This association was later confirmed in experimental studies in mice (5). In SLS, elevation of dermal LTB4, by increased production, confirmed in experimental studies in mice (5). In SLS, dent for its breakdown (4). This association was later

METHODS (See Appendix S1)
differences in LTB4 and 20-OH-LTB4 excretion between SLS patients and healthy controls. Biochemical responses to treatment could thus not be confirmed (including the only responding patient). No adverse events related to the study drug were observed.

**DISCUSSION**

This study could only detect convincing clinical effects of zileuton treatment in one patient. Upon parental request, the patient continued zileuton and was monitored closely. Follow-up (~1 year) after the study showed a consistent beneficial therapeutic effect. From the patients studied previously, 2 other patients still use zileuton with lasting beneficial effects. The reason why only a few patients respond to treatment is unknown.

Although genotypes in SLS differ, the corresponding clinical phenotype and degree of enzyme deficiency are usually quite homogeneous, making it impossible to predict responders. The 3 responders from these 2 studies have different genotypes and lack residual FALDH activity. Also, amongst the non-responders in this trial there were patients with the same genotype as the responding patient.

Furthermore, intellectual disability in SLS patients may result in scratching becoming habitual behaviour. Therefore, scratching may continue even when the pruritus is reduced by zileuton treatment, disguising potential beneficial effects. Due to unsuccessful urinary leukotriene analysis, we could not confirm biochemically that exposure to zileuton in this study was sufficient to decrease leukotriene production.

Epidermal LTB4 is produced by keratinocytes upon stimulation of specific receptors (5). Research in mice proved that orally administered zileuton has the ability to inhibit epidermal LTB4 production and decrease pruritus (11). However, correlations between zileuton dosages used in animal research and the dosages used in this study are unclear.

Use of zileuton in SLS is off-label, and no formal dose-finding studies have been performed. Dosages used were based on the treatment of asthma, in which leukotrienes are formed by mast cells that may have different biochemical responses to zileuton than keratinocytes (12). In addition, it is possible that dosages of zileuton in SLS should be higher than used here to sufficiently penetrate epidermal layers or have stronger inhibitory effects on leukotriene formation. Also, it is possible that pharmacogenetics play a part in the heterogeneous inter-individual response to treatment with leukotriene-modifiers (13).

Based on findings from our study it appears that only a few patients with SLS will benefit from zileuton treatment. However, responders can easily be detected clinically and will experience an improvement in quality of life. Therefore, when medical treatment for severe pruritus is warranted in SLS patients ≥ 5 years, a therapeutic trial with zileuton for a period of 4–6 weeks still may be considered. If no clear beneficial response to zileuton is noted, treatment should be discontinued.

**ACKNOWLEDGEMENTS**

The authors would like to thank Ed van der Heeft and Alexandra Versleijen from the Translational Metabolic Laboratory for their thorough work on LTB4 analysis in this study.

**Funding/support.** This study was funded by Metakids; a non-profit foundation. Zileuton was provided by the manufacturer (Cornerstone Therapeutics Inc., USA) free of charge.

**REFERENCES**