

# CHEMICAL PATHOLOGY IN THE MOVIES: 'LORENZO'S OIL'

MICHELLE MUSCAT

**Director:** George Miller  
**Writer:** George Miller & Nick Enright  
**Stars:** Nick Nolte, Susan Sarandon, Peter Ustinov  
**Runtime:** 129 min  
**Release date:** 1992

The 1992 medical drama 'Lorenzo's Oil', directed by George Miller, is at the same time a tragic and uplifting movie which deals with one of the lesser known diseases, adrenoleukodystrophy (ALD), which forms part of a subset of diseases of interest to the chemical pathologist. The movie follows the quest and struggle of Michaela and Augusto Odone to save their very own child, Lorenzo, who is found to have this rare condition. The events narrated in this movie are based on a true story, albeit with some alterations made for a movie adaptation.

Adrenoleukodystrophy is an X-linked disorder, hence primarily affecting males, due to a mutation in the ABCD1 gene. This gene encodes a protein in the peroxisomal membrane which is responsible for very long chain fatty acid (VLCFAs) transmembrane transport. In this condition we find elevated levels of VLCFAs. Over the years this disease has also been referred to as Siemerling-Creutzfeld disease,

bronzed Schilder's disease, encephalitis periaxialis diffusa, melanodermic type of leukodystrophy, as well as other nomenclature variations that were historically applied. The clinical spectrum may vary significantly, hence making diagnosis more difficult. Males may range from having just adrenocortical insufficiency, adrenomyeloneuropathy, or the childhood cerebral form, for example.<sup>1-7</sup> This last form of the disease is the one illustrated in the film.

Lorenzo is initially depicted in the movie as a bright and vivacious young boy. The very first indication in the film that something is amiss is when the teacher points out to his mother that he is throwing tantrums at school and having 'disturbed behavior'. One of the teachers even recommends he receives special education classes, which his mother insists will be provided at home. In later incidents he falls off his bike, and also falls when reaching out for a decoration on the Christmas tree. The constellation of events leads his parents to seek medical advice. Initial investigations revealed a normal CT scan and EEG and no gross visible neurological abnormality. Later on his mother finds him listening to very loud music and it is discovered that he has hearing impairment. Again, after referral to the appropriate medical specialist, an auditory processing difficulty is confirmed. Further inpatient investigations included tuning fork testing for conductive and sensorineural hearing loss, funduscopy and further





imaging amongst others. The escalating sense of his parents' desperation is depicted, and climaxes when the diagnosis is provided without equivocation. This is especially so given they were told it is a progressive and relentless disease with a bleak prognosis, and there was no known treatment whatsoever that could be provided to their son at the time. Lorenzo had significantly elevated VLCFAs in his blood. In the movie it is stated that there is a defective enzyme for metabolizing these fats, however this is no longer entirely correct since it is the peroxisomal membrane protein that is defective in ALD patients. The parents are told what 'myelin' is, and are also explained briefly the concept of demyelination. Distraught and in search for answers the father is seen reading literature on the pathology of adrenoleukodystrophy as well as individual case studies. Numerous medical terms were enlarged on screen. Dysphagia, seizures, spasticity, deafness, coma and death were amongst the words highlighted to the viewer on the screen.

The search for a world expert on the leukodystrophies leads them to Professor Gus Nikolais, who was working on a diet for the disease. He suggests enrolling Lorenzo in a trial, and explains to his mother the nature of the genetic transmission of an X-linked disease. It was afterwards noted however that his VLCFAs were increasing rather than decreasing on the initially prescribed diet. Later during the film we see Lorenzo confined to a wheelchair and his family consenting for his case to be used as illustrative example for medical learning. This included his speech impairment, the visual field defects such as hemianopia with transient horizontal nystagmus [without optic atrophy as yet] as well as his characteristic gait which was illustrated when he was asked to walk. The Odone family was also in contact with the ALD Foundation where they met other families with members afflicted with the same disease. Later we are shown the Odone family going through biochemistry textbooks and journals and drawing diagrams on their board. Michaela Odone even goes through Polish rat experiments on long chain fatty acid dietary manipulation. The first symposium on ALD was convened through their efforts. Loading the diet with a particular fat to decrease the biosynthesis of another emerged as a leading possibility. After administration of oleic acid, a significant drop in VLCFAs was noted, which eventually plateaued and did

not seem to improve any further. The boy's clinical condition later takes an acute turn for the worse, but he miraculously survives the acute episode and the family look further into the literature, and even make a model using different paper clips as carbon atoms. They determine that erucic acid would be a better candidate therapy, however there were challenges in sub-fractionating this from rapeseed oil and getting it approved for human consumption. Finally, after obtaining the desired substance, they tested it out on Michaela's sister, termed jokingly, 'the family rat', and subsequently gave it to Lorenzo. The treatment consisted of an oil containing specific combinations of the triacylglycerol forms of both oleic and erucic acid [hence the name of the movie, Lorenzo's oil]. Upon blood sampling and testing, they were contacted by the laboratory querying possible mislabeling of the specimen, given that the levels of the VLCFAs C24 and C26 were assayed twice and were within normal limits. This held great scientific potential, however in the setting of neurological damage that had already occurred. The movie ends on the note that the father was meeting a group of specialists who were looking into methods to re-myelinate 'the shaking puppy dogs', and the mother tells her child 'if they ever give you back your myelin, you will be able to tell your brain to tell your toes ... to do what you want them to do...'. The real life Lorenzo Odone lived up to age 30, which was significantly longer than originally predicted.

Persistence and desperation leads the Odone family to fabricate their very own miracle. The family writes a paper to this effect which was described in the movie as 'a beautiful piece of biochemistry'. This is another movie which shows a personal journey to a medical breakthrough. The author personally highly recommends this movie to those practicing within her medical discipline of chemical pathology or clinical biochemistry as well as those interested in the more research-based pure biochemistry. ❄️

#### REFERENCES

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