**Rare Disease Day**

**The G Word transcript**

**Julia**: Welcome to the G Word

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My name is Julia Vitarello, and I’m your host for today’s episode. Today joining me in conversation is Rich Scott, Interim CEO for Genomics England, and Ana Lisa Tavares, Clinical Lead for Rare Disease Research, also at Genomics England. Today we’ll be discussing challenges for those living with a rare condition and the work being carried out across the genomics ecosystem to support them. If you enjoy today’s episode, please like, share and rate the G Word on wherever you listen to your podcasts.

The 29th of February marks rare disease day. This day is an opportunity for the rare community to come together to raise awareness of the common issues affecting those living with rare conditions. A rare condition is a condition that affects less than one in 2,000 in the population, and although rare conditions are individually rare they are collectively common. It is estimated that there are over 7,000 rare conditions. Around 80% of rare conditions have an identified genetic origin.

Before I get into speaking with Rich and Ana Lisa, I wanted to share my story and my daughter, Mila’s, story. My life as a mother started really like anyone else’s, my daughter was perfectly healthy, her name is Mila. For the first three or four years of her life she was like any other kid. I live in Colorado in the United States, my daughter was a skier, she was a hiker, she was rock climbing, she was incredibly active and singing songs and swimming and riding bikes. But around four years’ old she started tripping and falling, she started pulling books and toys up closely to her face; she started being covered in bruises, getting stuck on words and repeating her sentences and I brought her to about 100 different doctors and therapists around the United States to try to figure out what was going on with her.

Around four years’ old I started speaking with orthopaedic surgeons, with ophthalmologists, with neurologists, with speech therapists and each one of them, you know, told me pretty much that I was a crazy mom and that my daughter was typical and normal and that she would grow out of these sort of strange symptoms that she was having.

By the time that she was six years’ old, I had had enough and I was crying on a regular basis, no doctor could help me and I was tired of lugging my daughter, who was now covered in bruises and tripping and falling and stuttering, together with my newborn son at the time, kind of around the country only to be told that I was crazy. And at that point at six years’ old I brought her into the emergency room in the Children’s Hospital Colorado, near where I live. She was in there for about a week and underwent a battery of tests and at the end of that week I was told that my daughter had a rare genetic condition called Batten Disease and that she would lose all of her abilities and die in the next few years. So my life at that point, first four years of my life seemed to just disappear in that moment, all the things that had mattered to me were gone. I knew there was something wrong with my daughter but I had absolutely no idea that a typical child who was outgoing and active and verbal and had friends could suddenly lose all of her abilities and die.

After crying on my closet floor pretty much most of the day for a few weeks I picked myself up. I started to read white papers, I started to go online and learn about other rare conditions. I started to speak with parents that had fought for their children with physicians, with researchers, and did everything I could to kind of figure out if there was even a glimmer of hope. And what I was told at the time at the end of 2016 was that there is almost nothing that could be done and very little was known about my daughter’s form of Batten Disease. But that there was a tiny glimmer of hope that we could maybe stop genetic disease, and that’s all I needed. I started Mila’s Miracle Foundation, which is a non-profit organization. I started telling Mila’s story and taking care of my kids by day and trying to fight and learn and raise money by night and I started a gene replacement therapy because it was the only option that I could take on as we didn’t know much at all about the disease, and by replacing it, it was kind of the only thing that I could do, but it was going to take many years and millions and millions of dollars and I knew that it wouldn’t be in time for my daughter.

Along the way, there was something a little bit unusual which was that my daughter had an auto recessive disease which meant that she needed to have a mutation in the same Batten causing gene from her mom, myself, and her father, and they could only find one of these two. That led me to learn about whole genome sequencing, which was kind of the most extensive way of looking at Mila’s genome to figure out where this missing mutation was. And in that search I crossed paths with a Dr Timothy Yu at Boston Children’s Hospital, and he volunteered with his lab to help me find this missing mutation that no other lab could possibly find. And within a few months and a lot of work, a lot of late nights and weekends and staring at screens, through whole genome sequencing, the team was able to find Mila’s missing mutation and finally diagnose her fully with this rare form of an already rare Batten disease.

That is where Mila’s story changed and turned direction. At that point, a recently approved drug for spinal muscular atrophy was on all neurologists’ minds at that moment because it had just been approved in the US by the FDA and in other countries, and it was a game changer, these children were dying and on respirators and in wheelchairs you know at the age of two and with this new drug they were actually living, many of them were living long lives and were active and happy and healthy and going to school. And Mila looking her whole genome sequence was able to kind of fit that same criteria, and so the doctors, including Dr Yu said, “What if we did the same thing for these children? What if we made a drug like this for Mila?” This drug called Antisense Oligonucleotides, or ASO seemed to be a good fit for Mila’s mutation. And so a drug was made for Mila and named after her called Milasen and it was a race against time for an entire a year with a team of honestly hundreds of people across academics and industry, I was fighting to try to raise the money and awareness and working with a scientific team. And one year after Mila was diagnosed when she turned seven years’ old, we moved to Boston and Mila began receiving Milasen, which was named after her, and only in that moment in time did I realise not only what a big deal this was for me as her mother, but what a big deal this was for science.

She was the first person in the world to receive a medicine that was tailored just to one person and it was named after her because there was no-one else in the world they could find that shared that same mutation.

When Mila began this, you know, I didn’t know what to expect but I knew that she was going to lose all her abilities and die if she didn’t receive this. And so once she started receiving this within just a few months, her 30 seizures a day went down to nothing; she had occasional small tiny seizures that were barely visible but her quality of life was incredibly you know improved, not to mention our family’s because she was no longer thrashing and smashing her arms and legs up against walls and tables.

She had been slumped and could no longer sit up. She could no longer hold her body up and take steps with my support from behind and after Milasen she started being able to do that even walk up the stairs with alternating feet with me supporting her from behind. She also had received a G-tube and was receiving all of her nutrition through the G-tube and after Milasen she started eating by mouth, it wasn’t perfect, but she was eating pureed foods, and being able to swallow better and probably most importantly she was able to smile and laugh at the funny parts in the books and the stories that I had been reading and singing to her and that she had kind of really not been responding to as much before Milasen and some of that came back.

So, a year into this everyone was quite shocked that Mila had done so incredibly well in this first year despite how progressed she was, progressed her condition was. Unfortunately in the second year it was during COVID and it was unclear whether or not Mila’s disease had kind of stopped or whether it was slowly progressing and in the third year Mila started having problems associated with her rare condition and I was faced as a mother with the most horrible decisions anyone should ever, never, never, never have to face to decide what Mila would want if she were able to talk and tell me whether or not this was a life that she felt like she would want to live. And after three years on Milasen, which was three years ago almost this week, Mila died and in many ways my life as I knew it was kind of over. I’m a very positive happy person and I have a son and I continue getting up every day and pushing through the day but I’m not sure how any parent makes it through days, weeks, months and their whole life without their child physically there with them.

**Ana Lisa**: We can really hear the perseverance that you had to get a diagnosis through whole genome sequencing eventually for Mila. Can you tell us a little bit more about that process and what that diagnosis, what did it mean for Mila and for your family?

**Julia**: When Mila was first diagnosed with Batten Disease, one of the missing mutations could not be found by any lab. I did research and found out that whole genome sequencing which at the time was very, very hard to find a lab that would do it or anyone that would do it in the United States, I did learn that that was really what was needed in order to try to really get down to find the underlying genetic cause of Mila’s disease and give her a full diagnosis. So once we managed to have Dr Yu’s lab at Boston Children's Hospital carry out the whole genome sequence, obviously we were able to then find exactly where the broken, underlying broken kind of genetic mutation was and why that was important was for two reasons: 1) was so that we could actually have a diagnosis and even though it was the worst diagnosis we could have ever asked for, at least there was an answer and for so many years I didn’t have an answer and there is nothing worse than seeing your child, you know, having all of these different symptoms and problems and having you know tens, if not hundreds, of different doctors and therapists tell you that they don’t know and maybe you’re just a little bit over-worked and over-worried about things, and having no answer and no idea what’s wrong is like living in this limbo that’s just terrible.

And so whole genome sequencing allowed for us to have a full diagnosis for Mila, and it also allowed us to use that data since it was truly the precise place where, you know, we could find the precise plan where her gene was broken. It allowed the researchers to then also think about what could be done about it as well, which is the second thing a parent thinks about after they have the kind of relief in some ways, which is a strange word to use but it’s true, of knowing what is wrong and then thinking, “What could I do about it now?” And so for me I would say that’s how, Ana Lisa, that’s how I reacted to that, is there was enormous relief initially, which is just the weirdest word ever to use for that but at least I felt like I wasn’t crazy and that there was an actual reason and that it allowed us, allowed me and others to think what kind of action can we take now.

**Rich**: One of the things that often strikes me, I’m a clinical geneticist by background, just like Ana Lisa, is how often particularly several years ago when we were in a different situation, it depended on families and parents pushing and pushing and pushing and asking, that’s something I think in the UK we’re really lucky that there have been changes in terms of availability of testing. Julia, as you know, we were set up ten years ago initially to run a project, a research project in partnership with the NHS called ‘The 100,000 Genome Project’ asking the question about whether whole genome sequencing could be used in a diagnostic setting. Whole genome sequencing had just emerged as a thing that could even be conceived of as affordable in a healthcare system back then, and we worked with the NHS and tens of thousands of families with rare conditions and people with cancer to ask that question and again, we’re really proud of what that work and our partnership with the NHS has led to, which is now in the UK.

There is the availability nationally of whole genome sequencing to test in certain settings including in rare conditions that are hard to solve in this sort of way and it’s one of the things which has really changed the way we can go about this, but we also know that there’s still, it’s still hard often to identify who should be seen by a specialist who might do a test and so on. But it has really changed things and I think it’s hearing from families like yours about how challenging it is and thinking about how we turn, looking across all of the story that you told us of everything you went through, how we can make that be something where we can make it be more systematically available and work for many more people, and I know your phrase from Mila to millions really strikes a chord with me, and I know with the NHS mind-set here in the UK where it’s about equity of access and I think that mind-set that you bring is so important.

**Julia**: Yes, Rich, I think it’s a really good point you know, because a lot of parents like myself, we’re talking about probably millions around the world and tens of thousands just in the UK alone, spend so much time going from one physician to another and to a therapist and it takes an enormous amount of energy and time in a family that’s already dealing with pain and confusion and not understanding what’s going on, not to mention usually that child, in my case, Mila, is having problems that it’s not easy to leave the house and get in the car and go to all these appointments. And the more we can push towards whole genome sequencing as one of the first places to go, if not the first place to go, the more it’s going to cut that sort of diagnostic odyssey down to the very bare minimal.

And so of course a dream would be is that any child that has, I like to think of it as soon as you kind of have more than one symptom that shouldn’t normally go together, that sort of has a little red flag that goes off and in most parts of the world right now no physician wants to scare a parent like me, it’s happened a number of times to me where a physician has said, “Well, you know, there is this rare condition but I’m not going to bring that up because it’s so rare that the likelihood that your daughter has that, I wouldn’t want to scare you.” But the more we can move towards whole genome sequencing right away to help with that answer that could cut months and very often years from that odyssey, and that is where we need to be, we can’t have the tapping on the knee and stacking up blocks and running down the hall for months and years just to figure out what’s going on.

**Ana Lisa**: And I think Rich also there said a power of having a national healthcare service where patients who are having whole genome sequencing can also decide whether they wish to consent to be part of research and combining that with a national genomic research library and then the ability to work so closely with the NHS and go back to patients if there is a new diagnosis that could benefit them is really powerful I think, and that’s definitely one thing that we’ve also learnt from these big whole genome sequencing efforts is that our knowledge is continuing to develop and some people will get a diagnosis from that immediately and we’ve got amazing colleagues working on diagnostic discovery looking at whole cohorts of patients now who are having whole genome sequencing and that’s also been really informative and allowed a lot of new diagnoses identified also through research and through these efforts to be found.

**Julia**: Absolutely and I think that the UK is incredibly well suited to have such widespread sort of country-wide whole genome sequencing project like what Genomics England has done because you have one system where all of the clinical and genetic data can all come in and kind of be analysed both for like you said diagnostics but also it could be, if families and patients are interested, right, in contributing to the research which then comes full circle and helps the entire system benefit from better treatments you know and better understanding of diseases.

**Rich**: And that point of sort of thinking about how to move things forward, so the NHS has a service based in Exeter which is addressing the question where children are on intensive care, where often intervention is needed really rapidly to make a difference, so that’s one of the examples where sort of thinking about making sure that service is available early and rapidly is being set up and that’s been really successful and identifying a cause where that really changes the care of that child on intensive care.

The other area where we’re working really closely with the NHS at the moment, as you know, Julia, and in fact I think this was probably one of the reasons we first came to talk to you was thinking about our newborn genomes programme where if you like, the big question there is saying we know that there are a few hundred conditions that are within that longer list of rare conditions where there is a treatment available routinely if the diagnosis is made, and saying could we use whole genome sequencing alongside existing newborn heel prick testing which in the UK currently looks for nine, shortly to be ten, conditions. So we’re just about to launch that programme and that will sequence the genomes of 100,000 babies born at maternity hospitals, not selected for children where there’s something, a concern, raised, but any baby at that hospital would be eligible for the family to choose to join that research programme and really to ask that question about whether this is something that we should offer to all babies developing the scientific evidence around it, learning about how you might implement it in practice, and also having conversations about how one might do that, what public attitudes are to it and so forth, developing evidence that can move us forward in that area too.

And back to Ana Lisa’s point about improving knowledge, we know that today there are a certain number of conditions that one might think are comparable to those nine that are currently looked for in the UK on the heel prick that we could use genetics as a way in. We also know that through the sort of innovation and the new knowledge that you mentioned that was relevant to Mila, that list might grow quite considerably in the coming years, so it’s thinking about how we set ourselves up to make sure that we’re able to take advantage of that to its full.

**Julia**: Yeah, and I think it’s a great, I’m glad you brought this up Rich because the UK really is leading the world in this, there is no-one else that is doing whole genome sequencing at birth, and ultimately, that’s where we need to be. You know it’s not going to happen overnight and like you said, the purpose of this is really to learn a lot about how and if to roll this out maybe in a larger scale way across the UK. But ultimately, you know, as Mila’s mom, I think all the time about you know how incredible what I saw at a very progressed state for Mila with this treatment and the only way to actually really truly help Mila and other Milas is to get to these children early enough so that they’re diagnosed before they have symptoms and they’re treated before they have symptoms. And the way to move towards that is to at least have efforts like the project, you know, the newborn screening project so that we can get to children, find them before they have symptoms, treat them before that and from what I saw from Mila I feel pretty strongly that if Mila had received Milasen at birth she might never know the effects of Batten Disease, and we as a family might never know what it’s like living with a rare condition, and this is a step in that direction to help.

**Effie Parks: Hi there, I’m Effie Parks, mom to Ford, who lives with a rare neurodevelopmental disorder called CTNNB1 and the host of the Once Upon a Gene podcast. Our show connects families facing rare diseases, offering stories from parents, insights from experts and discussions on everything from navigating grief to exploring genetic advances. It’s a space for understanding, connection and empowerment. For support and inspiration on your rare disease journey, subscribe to the Once Upon a Gene podcast on your favourite podcast app and let’s navigate this path together.**

**Ana Lisa**: Julia, I’m interested to hear what you think the development of individualised medicines like the N1 treatment Mila had what that means for the sort of collaboration that’s required across the genomics ecosystem to achieve that.

**Julia**: Yeah, that’s a really good question. It’s been seven years that I’ve been thinking about this kind of individualised medicine concept, you know, as Mila kind of became the pioneer in this field and I’m not a scientist, I’m not a physician, but I’ve learned a lot because I’ve been fortunate enough to be part of thousands and thousands of conversations, including with all of you and others, Genomics England, and around the world and I think what I learned and what I’ve learned so far is that when you have a genetic condition most genetic conditions are individually rare and unfortunately that doesn’t make them very suited to have anyone go after a treatment for them because really the only way to connect a patient, a child like Mila, to a science or technology is if they’re lucky enough, and I hate to use the word ‘lucky’ but they’re lucky enough to be part of a large kind of cohort of people, and that allows them to be, you know, commercially viable, so a company will be maybe develop if they’re lucky, a treatment for that, for those people.

The only other option is this sort of like Herculean effort of which myself and Dr Yu and others went through, we had to raise millions of dollars and get hundreds of people to get on board and develop a novel medicine for one person – now how scalable is that? How many times can we do that, right? And so the only people that really have access to medicines today with genetic conditions are those that are fortunate to be part of one of these two groups, but what about everyone else which is 95% of the people?

And so I think what the field is learning is that we kind of have the patients and we’re finding them, especially thanks to Genomics England and others, we’re starting to find them more rapidly earlier, more of them, and we have these technologies to be able to not only find them but to also treat them but we just do not have the infrastructure and the processes to connect them, we have clinical trials and we have these sort of named patient route but we don’t have anything else. And so I think the genomics community, especially in the UK because it’s so well suited with all the efforts that we’ve just brought up, is really well suited to kind of try to work together to allow for access kind of no matter how many people could benefit, it’s not only one, it could be six or 20, or 200 or 500. Right now there is no access for them. So I think that the UK is really well suited, starting with whole genome sequencing, that’s where it begins, it begins by identifying patients early enough and getting the data that’s needed in order to diagnose them and also to help with the treatment you know, and so this is how I think the UK is really leading the world right now, including in the recent announcement of the rare therapies launch pad, which Genomics England is part of, I am part of, others are part of, Oxford Harrington Rare Disease Centre, the MHRA, others are all part of really trying to be dedicated to building the infrastructure and resources and processes that are needed to connect the patients to these technologies that exist today.

Rich: I’ve been really inspired by the conversations and the drive that you, Julia, personally have given to those conversations. And I think what’s really interesting and I think it’s relevant more broadly than just in rare therapies particularly, but I think that challenge of recognising the need for the system to change to be able to respond to evidence and make the response proportionate to the expectations of various people, the patients or the families who are receiving it, the system as a whole, these sorts of therapies and rare conditions as well, are just not the shape that works well with existing paradigms, but I think it’s relevant you know, in other settings as well.

I’m really interested in some of the conversations that I’ve had with you before about balancing risk and understanding how to get that right and the fact that that really needs an open discussion in public to also understand the journey and the situation that families find themselves in. I wonder if you could tell us a bit about your perspective on getting that risk balance right?

**Julia**: Thanks for bringing that up, Rich. I think it’s really, really important because to me the way we think of risk and benefit and the risk tolerance maybe is a better way to put it is the foundation of the house that we’re building. So, you know, the regulatory process and everything behind that are built on top of how we think about risk. And one of the things that I regularly think about is children that have end stage cancer, and that we as a society have accepted an enormous amount of risk for a child at end-stage cancer that has no other options that’s going to die no matter what, probably very rapidly and that if they don’t respond to kind of some of the main line treatments then to turn to an experimental cancer treatment which carries a very high risk is considered very acceptable by our society and that everyone, the clinicians, the families, the regulators, everyone is willing to take that risk for that child because they’re going to die otherwise. And they’re willing to spend money and they’re willing to take the risk and often perhaps to buy that child maybe three or six months of life.

So then if you look at Mila and if I tell you that instead of having a rare condition that she has an end-stage genetic disease, and I use the words from cancer, from oncology, is now suddenly the discussion changes a little bit, so Mila’s going to die no matter what, no child has ever lived with her form of Batten Disease and she’s going to lose all of her ability, so we know the risk of not treating Mila. The risk of treating Mila in this case was an antisense oligonucleotide, which is a modality that’s been around for 30+ years, tested in animals and more frequently in numerous humans across different sort of trials. And the labs that worked on Mila’s medicine felt that it was safe enough and hopefully efficacious enough. And at that point why is the hurdle so exponentially higher than what it would be for a child with end-stage cancer? The way that we are thinking about these children with end-stage genetic disease and end-stage cancer, is drastically different, so we need to first, to your point Rich, we need to start realising we’ve already set that precedent, we don’t need to be having this discussion again. We know the risk we’re willing to take for a dying child when there’s no other therapeutic, no other option and they’re going to die no matter what. So the risk of treating Mila, versus the risk of not treating Mila is black and white and we need to do our best and then we need to not only treat Mila but we need to learn from the treatment of Mila. We need to collect those learnings, they must be iterative learnings so that the next child that’s treated with an individualised different ASO or different medicine that they don’t happen in silos, but that all of this knowledge comes together so that the second and the third and the fourth and the tenth and the twentieth, the process gets better and faster and eventually cheaper so that it’s accessible.

**Rich**: Yes, and that’s very much back to Ana Lisa’s point on the link and for diagnostics too on continuing to learn and creating a system that recognises that that’s crucial to offering the best care today but also in the future and being able to make proactive decisions more confidently if you’re a policymaker, knowing that you’ll continue to learn, you don’t have to pretend you know everything today.

**Julia**: It’s very meaningful for parents. So when parents, children, are diagnosed whether it’s a fatal or life-longing debilitating or difficult disease, if you know that what’s being learned from your child both from just the genomics to the potential treatments that that’s helping the next child, that helps parents like me be able to continue living. And so you know, research is this kind of generic word, I wish there were a better word for it. Really what it is, is it’s learnings and it’s what can be learned from my child that can help the next child?

**Ana Lisa**: And then that learning requires a lot of collaboration, which is the super important part I think of your story.

**Julia**: Yes, it does, it requires a lot of people starting with those diagnosing the children with whole genome sequencing all the way through just to the clinicians who are in the NHS, not to mention the researchers who are then looking at the data and bettering their understanding.

**Ana Lisa**: I think there are also, maybe one can extend some of those parallels as well, in that I think currently we sometimes think of an individualised therapy of NF1 as being something that takes a lot of time and benefits an individual, and actually if we can really collaborate we can really set up processes that work across the ecosystem and keep learning, then I’d love to dream that actually this could help many, many different patients, with many, many different types of rare conditions because actually we’ve learnt how to target a little bit more at source, perhaps a particular type of genetic variant, and so a bit like cancer, we’re not thinking about breast cancer, we’re thinking about what sub-type, what genetic causes there are and targeting those, and if we can apply that one day more broadly across rare conditions then it might be that actually once you’ve learnt a certain amount, that you could scale up and treat many, many different conditions, not dependent on their frequency in the population.

**Julia**: Yeah, that’s a great dream, I share that dream. Rich, what is your, you’ve been in this for many years, what’s your dream for the next five, ten years?

**Rich**: I guess I have, I think there’s two aspects to it. I think there’s two, I think there’s a lot of distance left to run for us improving on the diagnostics and I think thinking back to your conceptualisation of it Julia, of sort of thinking about how we can bring that earlier, whether that is that for example we’re able to sort of more proactively flag when children have you know, more than one visit to a particular type of doctor or something that makes that happen much earlier in the process. So the tooling that we now know works whether it’s whole genome sequencing or something more targeted can be used earlier in the process, or whether for example in our newborn genomes programme we get that evidence that we can look for a broader range of conditions in a screening context right at the beginning of life.

And I think in five to ten years we should be in a substantially different place, we’ll know whether or not we think whole genome sequencing should be there but offered for every baby at birth, and we can be much more proactive also when symptoms arise. I would also hope that on the side of therapies and intervention, we’re in a substantially different position and I think, I’ve been amazed the last five years how my level of hope has increased. I believe we should now be in a position in five to ten years where those with a therapy that is potentially there to benefit them, should at least be able to be aware of it and there will be a clear pathway by which either that is available if it’s proven, or there’s a pathway that we all understand about how that can be trialled. And I think we’re at the beginning of that journey and I now feel it’s a responsibility of ours to work through how we can bring the right pieces into place, we can’t prejudge the science, but we can set up the system that makes us be able to respond to it.

**Julia**: Yeah, I remember Rich when you and I were speaking a number of months ago and maybe you could share the story because you talked about your hope kind of changing over time as a clinician I thought that was really powerful to me.

**Rich**: Yeah, I remember it’s probably now maybe 15 years ago being asked by a family about what my advice would be to them on the likelihood of there being a treatment for their child’s particular condition being available and in fact they asked me to do it in a way that I sort of provided a formal written report to them that I spent a lot of time thinking about and agonising over and was very honestly you know saying it was highly unlikely that something would become available. If I had to write that same report today it would be very different.

**Julia**: That’s so promising to hear that. I don’t know, Ana Lisa, have you had any experiences like that in the past that you feel differently now of how you would approach a family like mine?

**Ana Lisa**: I think it’s a real balance between having that hope ourselves, sharing that hope with other people and not giving false hope and it’s such a balance when right now more than 95% of rare diseases don’t have a treatment and I think that’s such a difficult position to be in right now. And everything we’ve been talking about gives me massive hope for the future and a lot of what we’re pouring our energy and efforts into is both the diagnostics so that we’re not trying to make a puzzle with missing pieces in the dark and that’s mission-critical, and then the real hope that actually this will drive therapies, which is what we really want for everybody who needs a therapy to have a therapy that’s effective, whether they’ve got a common condition, a rare condition and that’s our driving ideal.

So I think I’m full of hope and optimism and I hope that it will accelerate, that’s what I really hope, the momentum will build and we’ll get to a certain level of knowledge, we’re learning the processes, we’re learning the evidence, we’re learning the collaborative models that are needed to really suddenly explode our ability to treat rare conditions.

**Julia**: Yeah, you know when Mila was, I guess when I look at newborn screening in the United States and Batten CLN7, which is Mila’s kind of sub-type of her condition is not on newborn screening tests because there is no treatment for it, but the whole genome sequencing that was done for Mila was the data that we got from that was what was needed to create a treatment for her and so it’s an unusual case where she was sequenced and a child and a baby, a newborn in the UK could be sequenced and not only told that they have a disease, so they have time to kind of understand the disease more but also potentially kind of prepare for a treatment that might be in the pipeline, but that data is also going to help scientists and researchers create new treatments that may not be available when that child is born but that’s the data that’s needed to create the treatment.

Right now you guys are you’re really at the forefront of solving both halves of the what I consider like a rare condition, you know, global health crisis with tens and hundreds of millions of people that have you know families like mine, like my story sounds unique, it sounds impossible but there are tens of millions of other people like me, like my story sounds unique, it sounds impossible but there is tens of millions of other people like me and so to have the UK kind of leading this effort to solve both halves of the problem, the diagnostic half, you know, what disease does a child have and find it in time and also kind of the treatments, here’s where we’re headed, and if we don’t solve both of those problems then there is no such as access, you know to a better life, so I’m really grateful for the fact that you’ve set a precedent for other countries because now finally there are other countries that are looking towards you and kind of really trying to do the same thing that you’re doing.

**Rich**: Yeah, well I think we feel we’re uniquely placed; the NHS in the UK and for Genomics England our partnership with the NHS, together with a number of other factors and I think the recognition from government as well as the NHS over a long period that the importance and the power of genomics and the importance of for example, making changes to regulation to get it right mean that it’s something that I think we feel really privileged to be in the position to even be able to ask these big questions.

**Julia**: yeah, I think the UK is really uniquely suited to have hung their hat on genomics so that the topics you’re taking on are very central, they’re not kind of on the sideline, they seem whenever I’m in the UK they say that what Genomics England is doing is at the forefront and in the middle of all the discussions with academics and companies and regulators and government. What do both of you think are the, what are the biggest kind of hurdles we have coming a few years in the newborn programme or you know, any of your other initiatives?

**Rich**: I guess all of these are big questions and I think we need, it’s back to that sort of point from Ana Lisa sort of balancing the hope and expectation, I think we’re uniquely placed to develop the evidence really clearly and one of the things that we again think is so important is having this conversation in the public about it and developing a shared view, almost you know, it drives policy but it’s also something which I think the whole of society needs to sort of think about how we address and what we want to do collectively. I wouldn’t place it as a barrier but I would highlight it as a strength that we’ve had and I think we’re hopeful that we’ll continue is that long-term commitment in terms of government and the NHS and I think that’s really powerful in this space to maintain the UK’s position as being able to ask these questions and to show that leadership.

**Ana Lisa**: And to bring together, we need to work really closely across the ecosystem. So in my mind one of the challenges is if one part is missing then that person is not going to get the treatment and how we keep joining up these really important dots across the whole ecosystem to make sure that most people will one day be able to get a treatment.

**Julia**: And all those dots honestly, those dots can never even start unless you have a diagnosis and it’s in time. And so there are so many people around the world working on each of those dots that connect a child or a patient to a treatment, but if you can’t even be diagnosed or if you’re diagnosed too late, which is what the reality is in the world of rare conditions right, then you know, then it’s a little bit futile to race to a treatment or even think if that’s possible. So I think the very, very first thing is: can we find children and patients, like can we find children like Mila in time? And I love hearing the word ‘hope’ that’s the word that keeps me going and doing what I’m doing because if there isn’t any hope it’s pretty hard to keep fighting, so I’m really glad, thank you both for having hope.

Okay, we’ll wrap up here. Thank you to Ana Lisa and to Rich for joining me in this conversation today as we shed some light on the challenges you know that those with rare conditions are facing. We touched on the work being carried out across the Genomics ecosystem in the UK to support those living with rare conditions. If you’d like to hear more of this, please subscribe to the G Word on your favourite podcast app. And thank you so much for listening. I’ve been your host, Julia Vitarello. This podcast was edited by Mark Kendrick at Ventoux Digital, and produced by Naimah Callachand.