

Enhancing the quality of life for people with special needs caused by rare genetic disorders.

Understanding Genetics When a Genetic Disease Isn't Inherited

By Dr. Vincent Cruz

Spring is a time for renewal and hope. And fittingly, this article is about new beginnings.

New beginnings for families at DDC Clinic often begin with a diagnosis. Telling families what might be affecting their children is something we work hard to do here every day. But the question "Who else has this?" is often the first question I'm asked when delivering a diagnosis to a family. And it's often the most difficult to answer.

Having been a physician at DDC Clinic for nearly two years full-time, I'm constantly humbled by the trust families put into our whole team in caring for their children. We strive to take care of our patients as best we can from the first day we meet and every visit or phone call afterwards.

I thought getting "an answer" for families – or telling them what disease their child has – would be the most difficult part of my work. And sometimes it is. But answering "Who else has this disease?" can be surprisingly difficult to answer, too.

De Novo Changes

Not all of your genetics are inherited from your parents. You get a copy of all your genes from both parents (with rare exceptions). But you may be surprised to know that every one of us has slight changes in our DNA – or genes – that were not inherited from either parent.



Spring-Summer 202

I often tell parents that they pass on genes to their children like teachers pass on words to students. The teacher writes words on the chalkboard for children to copy. Each child will try to copy them word-for-word. For the most part, the copied words look very similar to the original, but there may be a change or mistake here and there.

> PAGE 6





DDC Clinic – Center for Special Needs Children is a non-profit primary care and research facility serving patients with complex medical needs. Located in Middlefield, Ohio, we have been recognized internationally for our state-of-theart genetic research impacting broad-based health concerns such as heart disease, cancer and neurological disorders.

Our mission is to enhance the quality of life for people with special needs caused by rare genetic disorders. Founded in 1998 by five local Amish families committed to helping tomorrow's special children, we now serve over 1,600 patient families in 35 states and several foreign countries.

Our clinic is a unique collaboration of the Amish and non-Amish communities, dedicated doctors and researchers all working together to find answers for parents and treatments for children. The clinic was built on the 'medical home' concept defined by the American Academy of Pediatrics. We provide comprehensive and personalized medical care for special children with over 160 different rare conditions.

Our in-house certified clinical genetics laboratory provides rapid, high quality and affordable testing. We conduct patient centered research – always seeking faster diagnoses, better understanding and improved treatments for our children.

We offer personalized education and support services for patient families. No family is ever turned away based on ability to pay.

DDC Clinic is a gathering place; a place of love, compassion and caring; a place where people take the time to listen and share; a place of faith and hope.

Executive Director's Corner

Our Bright Future

"For I know the plans I have for you, declares the Lord, plans to prosper you and not to harm you, to give you a future and a hope." — **Jeremiah 29:1**

In 2022, we celebrated our past – DDC Clinic's first 20 years. As we look toward the next 20 years, we have great hope. Hope for the children, hope for treatments and cures, and hope for our clinic's future.

Our physicians, nurses and staff have been very busy this year. We now have almost 1,600 patients. New patients are coming from near and far. This past January, a family flew here all the way from Alaska with their two children to see Dr. Wang and Dr. Cruz.

Some of you may have already heard of our plans for the near future. By the end of this year, we hope to open a small office near the Spartansburg Pennsylvania Amish community. We haven't secured a location yet, but we want it to be geographically located to serve patients from western Pennsylvania and New York and surrounding communities. Currently, these families travel all the way to Middlefield to see our doctors. We'll share more information about our new location at a later date.

Another expansion we're planning is for more services for genetic heart conditions. DDC Clinic will become the first cardiogenetics center in the region. Using what we've learned during the last 20 years from conditions such as hypertrophic cardiomyopathy, long QT and dilated cardiomyopathy, we will partner with cardiologists and other experts to bring more testing, research and treatments to DDC Clinic. Potential cures for some of these conditions look very promising in the near future.

Lastly, thank you to our community, funders, volunteers, donors, board and staff. You are all greatly needed and appreciated. Each of you have been a blessing to DDC Clinic and the special children, and people, we serve.

May you all be blessed,

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Eli Miller, Executive Director DDC Clinic



Our Amish Partnership

Before our clinic was established, Amish families in our area were a very underserved community. Their unique medical needs were not adequately addressed because most physicians had no experience with the rare genetic diseases that affect these families.

Since our clinic began serving Amish families more than 20 years ago, we have helped to "close the gap" between their community and the healthcare system. Amish families in our area entrust us with their children's specialized care. Throughout the years, these families have seen how our clinic has dramatically improved patient care within their community, and they willingly work with us to help our research efforts.

Our long-standing partnership with the Amish has provided us with the opportunity to study some of the world's rarest diseases. As a closed community, the Amish have less genetic variation than the general population and greater susceptibility to genetic diseases.

Our close ties with the Amish have helped us to better understand disorders such as Cohen syndrome which affects both Amish and non-Amish individuals. There are approximately 1,000 diagnosed cases of Cohen syndrome throughout the world; we see more than 100 Cohen syndrome patients routinely in our clinic.

Our research on Cohen syndrome and other disorders that affect the Amish have greatly contributed to our knowledge and understanding, enabling us to share information in scientific journals that reach physicians and researchers all over the world.

Although many disorders that we study are found in our Amish community, they are not exclusive to the Amish. Many rare genetic disorders share biological and metabolic similarities with more common diseases, such as obesity and cardiovascular diseases. What we learn from studying these rare diseases can benefit the general population, leading to more effective approaches to addressing broader health concerns.

GAP Testing

Our Amish partnership led to the creation of a groundbreaking diagnostic tool, the Genetic Awareness Panel (GAP).

Developed by our molecular diagnostics laboratory, GAP can simultaneously test for 220 rare conditions found in the

"We're thankful to our Amish community. They are true collaborative partners, working with our clinic to find answers that will ultimately benefit people everywhere. This is their gift to the world." – Dr. Wang, DDC Clinic medical director



Amish population. GAP has significantly improved early diagnosis, helping to prevent the progression of devastating genetic diseases and life-threatening health complications.

Through GAP, we can determine if a child is at increased risk for developing a blood clot, heart condition or other issue as an adult. When used for genetic testing in Amish adults, GAP reveals an individual's predisposition to genetic disorders and identifies if they're a carrier for diseases which could get passed on to their children.

GAP is also used as a supplement to standard newborn screenings which don't test for many diseases commonly found in the Amish. Through GAP, early detection leads to earlier treatments and better outcomes for affected babies.

At DDC Clinic, we're committed to furthering personalized medicine and creating greater awareness of genetic diseases. GAP is one important way that we have "closed the gap" between the Amish community and access to specialized healthcare. COMING SOON -Community Benefit Auctions

Mark your calendars! Our friends in the Amish and Mennonite communities are holding three benefit auctions this summer to raise money to support DDC Clinic's mission.

Don't miss the fun of a live country auction. Bid on a wide array of items including handmade quilts, local maple syrup, handcrafted furniture, tools, horses, buggies and so much more.

Your support matters. Proceeds from each community auction help special needs children get the specialized medical care they need.

We hope to see you, your family and friends this summer at these upcoming auctions.

Shiloh Community Auction Saturday, July 8 Blooming Grove Auction Barn Shiloh, OH

Spartansburg Community Auction Friday, August 4 Spartansburg Fairgrounds Spartansburg, PA

Geauga Benefit Auction Friday, August 25 John Buster Miller Farm Middlefield, OH

For more auction information, visit ddcclinic.org/events.

Auction Donations Welcome

Do you have an item you'd like to donate to one of our auctions? Call Eli Miller at **440-632-1668**.



Purchase Your Tickets Today

It's not too late to purchase your tickets to our annual Patchwork Benefit on Saturday, June 17 at Meadow Ridge Events in Windsor, Ohio.

Please join us for a wonderful evening as we celebrate our past, rejoice in the present and look forward to our future.

Enjoy appetizers, drinks, dinner, music, auctions, bake sale and a special presentation by Dr. Wang who will share real-life stories of hope and healing.

Purchase your tickets by Friday, June 9. Buy online through PayPal at ddcclinic.org/ events or call 440-632-1668.

When you support Patchwork, you help to provide life-changing diagnoses and care to special needs children affected by rare genetic disorders.

Patchwork Then and Now

Our first Patchwork Benefit was held more than 20 years ago, shortly after our clinic's founding and two years before we served our first patient. Our founders and supporters at that event had ambitious goals – envisioning our clinic as a center of excellence, a medical home that would serve local families and whose work would someday benefit all the world's special children.

Today, our Patchwork Benefit is a celebration of the fulfillment of our founders' dreams of creating a community clinic with global impact, a place of faith and hope for families and a medical center providing life-changing research, diagnoses and medical care.

Thanks to all of our many friends who have believed in us and supported our Patchwork Benefit over these many years.

Staff Spotlight

At the heart of DDC Clinic is a dedicated team of compassionate, caring and talented people. For them, working at our clinic is more than a job; it's a true calling that brings meaning and a sense of purpose to their lives. Meet Julia and Oliver, two members of our laboratory staff.

Meet Julia Szekely

Senior Laboratory Technologist



For the last nine years, I have proudly been a member of the DDC Clinic laboratory staff. I started as a laboratory technician and was promoted to

senior technologist in 2022.

As the senior technologist, I have many responsibilities. I'm in charge of our next generation sequencing and microarray assays. This includes our Amish Genetic Awareness Panel. I perform a large portion of the lab's administrative tasks including reagent inventory tracking and ordering, preparing for audits, conducting and monitoring daily quality control, and inputting patient information into our system. On top of that, I also train interns and new technicians, take part in validating new assays, and just make sure that things are running smoothly on a day-to-day basis.

When I joined the team in June 2014, I was drawn to the clinic and laboratory because of the opportunity I saw to build my scientific knowledge and skills while being able to combine that with my passion for helping others.

Nevertheless, over the last nine years, I have come to love it for so many reasons. What we do here changes lives and we can see the positive impact we have on our patients. It's nice to know that what I spend my days doing really makes an impact, and that makes me feel fulfilled.

To me, one of the most important aspects about DDC Clinic is that we work so hard to find answers for everyone who walks through our doors. I understand firsthand what it's like to experience a mysterious health issue, so I know how frustrating it is when you don't feel heard or when no one knows how to help you. It's so important to me to be a part of a team that will actually provide help and answers to people suffering, and keep searching as long as it takes to find those answers. I'm so proud to continue my career at DDC Clinic as we enter a new chapter, knowing that my time is spent in a very meaningful way.

Meet Oliver McCourt

Laboratory Technician



I began my career with DDC Clinic in November 2020. As a trained laboratory technologist, my daily responsibilities involve receiving and extracting DNA from whole blood samples.

I perform Sanger sequencing, which includes targeted mutation analysis, as well as patching and confirmation for our next generation sequencing assays. I also collaborate on various research projects, and assist with product inventory and equipment maintenance.

Growing up, I was an aide for special needs students in physical education

classes. After high school, I went on to work as a direct support professional in a long-term care facility for those with developmental disabilities. The most rewarding experience I have had in life is seeing the positive impact I have made in someone else's life.

During that time, I decided to pursue my scientific interests and started the biotechnology program at Lakeland Community College. When I heard about the laboratory technician opening at DDC Clinic, I jumped at the chance. I know how important early intervention can be for those in need, and the clinic's mission really resonated with me.

DDC Clinic has provided a unique opportunity for me to combine two fields that I am very passionate about. In the two and a half years I have worked here, I have grown so much. I attribute this to the compassion and dedication of our staff and the trust and generosity of families we serve. I hope to continue empowering those with special needs and contributing to genetic breakthroughs.

Pediatric Resident at DDC Clinic



We recently welcomed Dr. Amy Kim, a pediatric resident at Rainbow Babies and Children's Hospital, who spent the month of April at our clinic as part of her rotation. During her time here, she had the opportunity to observe our physicians and learn about common genetic diseases in the Amish community and how best to manage and support patients with special needs.

"I saw a wide variety of conditions and learned so much from the physicians and staff at DDC Clinic," says Dr. Kim. "All the families were lovely and knowledgeable as well, always willing to teach me about their experiences and the care their children receive. I am so thankful to have had this opportunity."

After her graduation in June, Dr. Kim will move to Florida to start practicing as a general pediatrician. We wish her all the best.

Helping Families Everywhere

Across the country and around the world, physicians often reach out to our clinic to help them with their complex cases.

Rachel and her family live in Canada. When she was diagnosed with SAMS association (or Aicardi-Goutieres syndrome-5), a disorder identified and named by our clinic, her doctors and her family turned to DDC Clinic.

Dr. Wang and nurse Valerie Sency didn't hesitate to "answer the call," working behind the scenes to help in any way they could. Dr. Wang shared his expertise with Rachel's doctors and spoke with her family multiple times. He and Valerie helped coordinate care for Rachel and provided support for the family in their time of need. Working with a pharmaceutical company, our clinic secured the medication Rachel needed at no cost to her family.

Rachel's parents were grateful for DDC Clinic's care and compassion and wrote this letter.

Dear Friends at DDC Clinic,

I wanted to write a few lines your way regarding my daughter, Rachel who has SAMS association and Williams syndrome.

Rachel has had great success with her medication, Actemra. Although she is very handicapped, she is a very happy little girl when she's feeling good. Lots of smiles!

It is my understanding that some of you have put a lot of effort into helping us get Actemra, and also Dr. Wang has been exceedingly helpful just answering my many questions. We are very, very grateful for

this. A lot of the information you provided does not exist in Canada, so you have had a very positive impact on Rachel's life and welfare.

Many thanks, The Miller Family

DDC Clinic's mission doesn't stop at our country's border. We're committed to improving the lives of special needs children everywhere. We collaborate with physicians around the world, sharing our knowledge and helping them to provide the best possible care to their patients. The Miller family's story is just one example of how our clinic has made a real difference in the lives of special needs children around the globe.

Understanding Genetics > from page 1

The medical term for these kinds of changes in genetics is "de novo" – or "anew" or "from the beginning" – which loosely means "It starts here." Once a de novo change is in the genes, it will remain there for the life of the child. And since that child will pass on their genes to their own children, it can be inherited by that child's own children and grandchildren.

The more we understand about genetics, the more we realize that *de novo* changes are not rare events, but quite common. Recent studies show that in the roughly 20,000 genes that we inherit from our parents, we each have around 100 changes that didn't come from either of our parents.

Fortunately, *de novo* changes in genetics usually don't cause disease. For the most part, these small changes don't mean anything for our health and well-being. Much like you can read the copied words from the chalkboard in school even if there are slight mistakes.

However, if a small change is made to an important part of one or more genes – it may unfortunately cause a genetic disease in a child that wasn't inherited.

When parents ask "Who else has this?" I sometimes have to explain that their child may be the first and only one with a particular genetic condition in the Plain Community. Being told that nobody else has the same condition can be difficult to understand in a community who knows genetic disease better than most communities. Often, we can connect our Amish families with English families who also have similar *de novo* changes causing the same genetic condition, but even then it may be very rare.

Why Did This Happen?

"Why did this happen?" and "How did this happen?" are not easy questions to answer either.

We don't know why these changes occur. There is some relation between older parents and a higher risk for *de novo* changes, but this isn't totally understood or set in stone. However, what we do know is that these changes aren't caused by a missing vitamin or supplement. They're also not caused by something that was done (or not done) before, during or after pregnancy. *De novo* changes in a gene aren't solely an "Amish" problem because they can happen to anyone's children, and they do.

While a child may be the only one in their family with a *de novo* condition, the total number of DDC families affected by *de novo* conditions is not insignificant. As a group, they represent a very large portion of our special needs community. We work hard to provide tailored care to each and every one of these patients through highly personalized medicine.

Spring is indeed a time of renewal and new hope – and I'm hopeful we will find more answers through our onsite state-of-the-art testing. We continue to look for *de novo* diseases because every one of our families with undiagnosed children deserves answers.

We thank you for your trust and patience in the work we do to diagnose and care for all of these children with complex cases.

Our Recent Publications

Our doctors have recently contributed to publications in these important medical journals. Over the years, we've contributed to more than 80 published research papers. By sharing the knowledge we gain from our research, diagnoses and treatments, we help physicians and families around the world.

Gene Reviews

"Prolidase Deficiency" (2022)

Journal of Hepatology

"Genotype-phenotype relationships of truncating mutations, p. E297G and p.D482G in bile salt export pump deficiency" (2022)

Blood Advances

"Health-related quality of life and fatigue in children and adults with pyruvate kinase deficiency" (2022)

American Journal of Human Genetics

"Bi-allelic variants in neuronal cell adhesion molecule cause a neurodevelopmental disorder characterized by developmental delay, hypotonia, neuropathy/spasticity" (2022)

Pediatric Blood Cancer

"Pyruvate kinase deficiency in children" (2021)

Journal of Cystic Fibrosis

"Idiopathic chronic pancreatitis treated with ivacaftor in a CFTR carrier with methylmalonic acidemia" (2021)

Hepatology

"Impact of genotype, serum bile acids, and surgical biliary diversion on native liver survival in F1C1 deficiency" (2021)

European Journal of Haematology

"Comorbidities and complications in adults with pyruvate kinase deficiency" (2020)

To view more publications, visit ddcclinic.org/selected-publications.

Seeking Genetic Counselor

DDC Clinic is looking for a qualified candidate to join our staff as a full-time genetic counselor.

In this position, the genetic counselor will collaborate with our team on efforts related to patient care, research and our molecular diagnostics laboratory.

A large portion of the genetic counselor's work will be related to clinical research, particularly cardiogenetic research, and will involve providing genetic counseling to research participants.

The genetic counselor will participate in evaluating new patients, assist physicians with genetic testing decisions, and provide pre-test and post-test genetic counseling services to families. The genetic counselor will also provide genetic counseling services to outside providers for genetic testing performed by our laboratory.

Interested candidates should contact Patti Gallagher at **440-632-1668** or **patti@ddcclinic.org**.



Pictured starting from the bottom left are JoAnn Brace, Jianhui Du, Xiaoli Yu, Dr. Bao Xin, Scott Brace, Tom Stone and Dr. Heng Wang.

Celebration Dinner

Current and former DDC Clinic board members, staff and spouses gathered in our community room for an informal dinner on April 11 to celebrate our clinic's 20th anniversary. Guests enjoyed a buffet dinner and shared memories of DDC Clinic throughout the years.

Among those who spoke to the group and shared their heartfelt stories were JoAnn Brace, former board president and founder; Tom Stone, current board member; Dr. Heng Wang, our clinic's medical director; Joe Weaver, lifetime director; and Eli Miller, our executive director.

Basketball Fundraisers a Success

Many thanks to the 350 supporters who came to our Amish vs. Yankee charity basketball games in March and April. These two events together raised more than \$6,000 for DDC Clinic.

Fans came to the Berkshire High School gym to enjoy the excitement of live basketball and cheer for the two teams as they went head-to-head in a friendly rivalry.

The Amish team defeated the Yankees, 63 to 55, at the first game on March 3. But the Yankee team turned the tables at the second game on April 21, beating the Amish, 69 to 56. A good time was had by all.

Hungry fans enjoyed delicious treats at the bake sales held at each game. Donations from the March bake sale benefitted the Sunny Hope School, and donations from the April bake sale supported the Sunshine Training Center.

Thank you to our charity basketball event sponsors – Middlefield Banking Co., Precision Orthopaedics, Achilles Running, 8th Day Brewing Co., Sirna's Farm Fresh Kitchen, Geauga Credit Union and eXp Realty.



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440-632-1668 *ddcclinic.org*

Enhancing the quality of life for people with special needs caused by rare genetic disorders.

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You Can Change a Child's Life

You can make a difference in the lives of children like Isaac who are affected by rare genetic disorders. Isaac's family is just one of 1,600 families who we've helped, thanks to people like you.

Rare disorders are not as rare as you may think. One in 10 of us will have a family member affected by a rare genetic disorder sometime during our lives.

Working together, we can give children with rare genetic disorders a healthier tomorrow. Thank you for your support.

To make a gift, use the donation envelope inside, visit **ddcclinic.org** or call **440-632-1668**.

