

The Genomic Age of Medicine Comes to Market

Featuring: **Brett Winton**, Head of Research at ARK Invest

Adam Bass:

This is MSCI Perspectives, your source for weekly research insights as investors respond to the COVID-19 pandemic. I'm your host Adam Bass and today is July 16th, 2020. This week, while some investment strategies revolve around sectors, factors, or ESG, thematic investing is about identifying potential investment opportunities that stem from macro economic geopolitical, or technological trends that may upend or transform the way people live and do business. Today, we explore the theme of genomic technologies and how they're set to disrupt the healthcare sector and beyond. To do so, we spoke with Brett Winton, director of research at ARK Invest.

Adam Bass:

Okay, so first Brett, thank you very much for joining us on the program.

Brett Winton:

My pleasure.

Adam Bass:

Now on Perspectives, we've been taking the opportunity to learn, of course, about the insights that researchers and analysts have found throughout the crisis, but we also have been gaining insight into the researchers themselves and like all of us you've had to deal with a new reality. What's been the biggest adjustment you've had to make?

Brett Winton:

Well, I have two children age three and six, so certainly them being at home has been a change, figuring out how to basically turn them loose into nature safely and let them get stung by bees and discover various things has been a little bit of a challenge, but relative to many others, we're extremely lucky.

Adam Bass:

And it's something that we're certainly all learning on the fly.

Brett Winton:

No, exactly. And it's, one of the things that we've seen within business is if you expand that to which companies have been most agile and responsive to this crisis, you'll note it's really the newer companies that have done better in terms of both changing the way that they're interacting with customers and just keeping the nuts and bolts of business going. We could hit a huge choppy patch where you have massive uncertainty, you don't know what people are going to be buying, you don't know how you're even going to be able to sell. And if you have modern tools, you can very quickly adapt those into those new condition sets. Whereas if you don't, it takes you a couple of weeks. A couple of weeks of sales is a big, big deal for a major company.

Adam Bass:

And those companies that are so focused and have that forward-looking technology baked into who they are, they're certainly at the crux of the research that you do. We'd love to talk about what you refer to as the genomic age of medicine. What does this phrase mean?

Brett Winton:

Sure. The reason we call it the genomic age is because it seems like we are on the verge of a discontinuous change in our ability to address biological systems that will impact everybody's lives and will be extremely commercially interesting from the companies pursuing it. To just back up a second, the two major technologies that are driving transformation in the health space are gene sequencing, which is the ability to read the genome inside your body, and gene editing and particularly CRISPR gene editing. The first is genome sequencing, so we all have inside our bodies, basically a recipe for how your entire body is constructed. It's your DNA. It tells you why your eyes are brown or green, it tells you why you have five fingers on each hand. And there's a copy of that in every cell in your body, we've known since the 1950s, the structure of what that DNA molecule looked like, we just didn't know anybody specific in particular recipe set until the early 2000s.

Brett Winton:

We sequenced the first human genome, meaning we constructed the entire set of letters that encode a human and it cost just under \$3 billion and took about a decade to put the whole thing together. Since then, the cost have declined. And actually now today you can go to a vendor and you can get your own personal genome sequenced for roughly \$600 in the US. The ability to actually understand how the body is constructed is really profoundly important to understanding how to fix the body.

Adam Bass:

The rapid drop in cost and time certainly speaks to more people being able to afford it and more companies and service providers being able to offer and learn from it. But is there a threshold up price point, if you will, that's important to cross?

Brett Winton:

There are certain price points that are more important than others. And if you look at the healthcare landscape and the landscape of diagnostics that exist today, things that we pay for today to understand what's going on inside our body, for instance, an x-ray or any kind of imaging study, blood tests, or a colonoscopy, or anything where we need to understand if there's something wrong in our body, those price points are in the thousand dollar and less category for the most part. So as gene sequencing has crossed that thousand dollar price point, suddenly a lot of diagnostic procedures that were available with old technology are suddenly under, call it threat of being displaced by a more modern technology that can tell you more about what's going on inside the body on a direct measurement basis.

Adam Bass:

All right, so that's gene sequencing. The second one you mentioned was gene editing.

Brett Winton:

The most well known example is CRISPR, which a specific molecule, so they can go along the DNA, they can latch on to a certain spot on that molecule, and then you can attach what's called a nuclease on the end of it, which could be, you can think of it as molecular scissors, but the key idea is that it can be directed to a specific part of your DNA, and then it can manipulate what happens right at that spot. And so between those two technologies, you have an unprecedented ability to understand what the body is doing, and then to directly manipulate what it's doing at that source.

Adam Bass:

Sounds expensive.

Brett Winton:

Like next generation sequencing, as we call it, CRISPR gene editing is also extremely accessible, and inexpensive, and provides researchers a lot of ability to run experiments. And so not only in the human

body, for example, they can create mice that have genetic mutations that are identical to the ones that they're trying to study in humans. And so the ability to very quickly be able to create a mouse that is expressing the gene mutation that you're specifically trying to study can then accelerate your ability to understand exactly what will work against that particular disease.

Adam Bass:

And we've seen that very recently, of course, with COVID where you found actually a direct line between, as you mentioned, gene sequencing and gene editing to the ability of scientists to identify the virus, diagnose it, and it's even played a role in the efforts to manage the viruses spread. Can you talk a little bit about that please?

Brett Winton:

Sure. One of the remarkable things about COVID-19 is how quickly we sequenced the disease. So I knew exactly what it looked like at a molecular level within a matter of days, and that ability to quickly and inexpensively sequence the virus actually has helped researchers to understand where and how it is spread, because any RNA virus, it mutates over time and those mutations accrue at a certain rate. And so if you find a virus in New York, you can actually track back and tell whether or not that particular virus that was inside that person's body came through a European traveler since you know what the RNA of the virus looked like in Europe or via direct transmission from China. This can help both retrospectively understand exactly how the virus spread and it can also help in real time with testing and tracing efforts to understand whether or not a virus is being community transmitted or it's coming in from outside in some way.

Brett Winton:

Then on the gene editing side, I described how CRISPR can glom onto a certain of DNA. You could also attach some kind of fluorescent, so it would light off or change color if it gloms onto a certain section of DNA. And so you can actually infuse the CRISPR compound on a paper strip, and then dip that in the saliva solution that you think may contain the virus. And then it'll change color in a very short period of time if enough of those CRISPR molecules actually glom on to RNA that's consistent with the virus. Those paper strips can be very inexpensively produced as you scale them and they store very well, so you could potentially provide these to emerging markets.

Adam Bass:

Absolutely. And right now the implications obviously are how it can help in the search for a vaccine, as you alluded to.

Brett Winton:

Vaccine development is happening on an ultra rapid pace. There are a few entities that claim they're going to be able to demonstrate efficacy and have approval before the end of this year. And part of the reason why is they are actually using DNA and RNA directly to try to trigger the body's immune system response, to then protect against the potential infectious disease. None of that would be possible without A, understanding what the actual construct of COVID-19 is, and then B, having really good tools for doing synthetic DNA and RNA construction to create those vaccine entities sufficient to protect prospective patients against the illness.

Adam Bass:

And what's interesting with CRISPR, Brett, right, is that there are implications and uses even beyond medical ones, beyond the healthcare industry.

Brett Winton:

Exactly. There are applications within the research and development field, for instance, creating those mouse models more quickly. So you can accelerate research and development. And within things like agriculture, being able to create salmon that are able to be more successfully farmed. There's the opportunity to drive a lot of calorie yield for the same dollar spent against fish, which previously were being caught wild. There's probably a lot of juice to squeeze out of that salmon, I guess, in directly editing its gene to make it more amenable to calorie production for human. And if you look across the entire agricultural landscape, we believe that gene editing will actually deliver yield sufficient to keep pace with population growth, meaning we can continue to sustain expected population growth without devoting additional land to crop and agriculture, just with the yields that we expect from gene edited crops, livestock, and aquaculture.

Adam Bass:

Well, Brett, unfortunately we have to end it there. This is fascinating. Truly your passion is, you'll excuse me, contagious, but Brett, thank you so much for joining us. This has been a fantastic, very interesting discussion.

Brett Winton:

My pleasure.

Adam Bass:

That's all for this week. If you have a moment, we hope you'll subscribe to the podcast, leave a comment, or better still, share the podcast with a friend. And for more from MSEI check out the ESG Now podcast each Friday until next week. I'm your host, Adam Bass and this is MSEI Perspectives. Stay safe everyone.

About MSCI

MSCI is a leading provider of critical decision support tools and services for the global investment community. With over 45 years of expertise in research, data and technology, we power better investment decisions by enabling clients to understand and analyze key drivers of risk and return and confidently build more effective portfolios. We create industry-leading research-enhanced solutions that clients use to gain insight into and improve transparency across the investment process. To learn more, please visit www.msci.com.

This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the "Information") is the property of MSCI Inc. or its subsidiaries (collectively, "MSCI"), or MSCI's licensors, direct or indirect suppliers or any third party involved in making or compiling any Information (collectively, with MSCI, the "Information Providers") and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or disseminated in whole or in part without prior written permission from MSCI.

The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other MSCI data, information, products or services.

The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF THE INFORMATION PROVIDERS MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EACH INFORMATION PROVIDER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.

Without limiting any of the foregoing and to the maximum extent permitted by applicable law, in no event shall any Information Provider have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or willful default of itself, its servants, agents or sub-contractors.

Information containing any historical information, data or analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. Past performance does not guarantee future results.

The Information should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. All Information is impersonal and not tailored to the needs of any person, entity or group of persons.

None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), any security, financial product or other investment vehicle or any trading strategy.

It is not possible to invest directly in an index. Exposure to an asset class or trading strategy or other category represented by an index is only available through third party investable instruments (if any) based on that index. MSCI does not issue, sponsor, endorse, market, offer, review or otherwise express any opinion regarding any fund, ETF, derivative or other security, investment, financial product or trading strategy that is based on, linked to or seeks to provide an investment return related to the performance of any MSCI index (collectively, "Index Linked Investments"). MSCI makes no assurance that any Index Linked Investments will accurately track index performance or provide positive investment returns. MSCI Inc. is not an investment adviser or fiduciary and MSCI makes no representation regarding the advisability of investing in any Index Linked Investments.

Index returns do not represent the results of actual trading of investible assets/securities. MSCI maintains and calculates indexes, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index or Index Linked Investments. The imposition of these fees and charges would cause the performance of an Index Linked Investment to be different than the MSCI index performance.

The Information may contain back tested data. Back-tested performance is not actual performance, but is hypothetical. There are frequently material differences between back tested performance results and actual results subsequently achieved by any investment strategy.

Constituents of MSCI equity indexes are listed companies, which are included in or excluded from the indexes according to the application of the relevant index methodologies. Accordingly, constituents in MSCI equity indexes may include MSCI Inc., clients of MSCI or suppliers to MSCI. Inclusion of a security within an MSCI index is not a recommendation by MSCI to buy, sell, or hold such security, nor is it considered to be investment advice.

Data and information produced by various affiliates of MSCI Inc., including MSCI ESG Research LLC and Barra LLC, may be used in calculating certain MSCI indexes. More information can be found in the relevant index methodologies on www.msci.com.

MSCI receives compensation in connection with licensing its indexes to third parties. MSCI Inc.'s revenue includes fees based on assets in Index Linked Investments. Information can be found in MSCI Inc.'s company filings on the Investor Relations section of www.msci.com.

MSCI ESG Research LLC is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc. Except with respect to any applicable products or services from MSCI ESG Research, neither MSCI nor any of its products or services recommends, endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies and MSCI's products or services are not intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Issuers mentioned or included in any MSCI ESG Research materials may include MSCI Inc., clients of MSCI or suppliers to MSCI, and may also purchase research or other products or services from MSCI ESG Research. MSCI ESG Research materials, including materials utilized in any MSCI ESG Indexes or other products, have not been submitted to, nor received approval from, the United States Securities and Exchange Commission or any other regulatory body.

Any use of or access to products, services or information of MSCI requires a license from MSCI. MSCI, Barra, RiskMetrics, IPD and other MSCI brands and product names are the trademarks, service marks, or registered trademarks of MSCI or its subsidiaries in the United States and other jurisdictions. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and Standard & Poor's. "Global Industry Classification Standard (GICS)" is a service mark of MSCI and Standard & Poor's.

MIFID2/MIFIR notice: MSCI ESG Research LLC does not distribute or act as an intermediary for financial instruments or structured deposits, nor does it deal on its own account, provide execution services for others or manage client accounts. No MSCI ESG Research product or service supports, promotes or is intended to support or promote any such activity. MSCI ESG Research is an independent provider of ESG data, reports and ratings based on published methodologies and available to clients on a subscription basis. We do not provide custom or one-off ratings or recommendations of securities or other financial instruments upon request.

Privacy notice: For information about how MSCI ESG Research LLC collects and uses personal data concerning officers and directors, please refer to our Privacy Notice at <https://www.msci.com/privacy-pledge>.