April 6, 2020

LIFE SCIENCE TOOLS AND DIAGNOSTICS

COVID-19 Dx Update #4: The Current State of Testing in the U.S.

• **Bottom Line:** COVID-19 testing in the U.S. has continued to increase dramatically, surpassing 1.7M cumulative tests so far. Despite the increasing number of tests, the daily growth of testing has stepped down as we had anticipated, though continues to add over 100,000 molecular tests per day. We anticipate another strong week ahead through Thursday, though additional capacity increases might be hard to come by at the pace seen over last few weeks. Daily testing volume currently nears 100k – 120k tests per day range, with some labs reaching capacity and while others are still expanding. We believe the COVID-19 testing conversation will increasingly shift towards serological testing to address the growing need of identifying those exposed to SARS-CoV-2 and can return back to work and gaining insights into the population exposure of COVID-19 as the pandemic expands across the U.S.

• **After a slow start, the U.S. continues to ramp testing volumes.** After multiple speed bumps with the initial roll out of testing, the FDA’s loosened EUA restrictions have resulted in significant testing ramp in the United States, as the country continues to add 100k+ tests per day. With the increase in testing, however, positive cases have continued to rise significantly, driven by hot spot areas including NY where positive rate is now 40%, and hospital system continues to get constrained. We have continued seeing new cases expand, with daily new cases over 30,000, but broadening of testing criteria is bound to demand more testing volumes at a time when capacity increases are limited.

• **The conversation continues to shift to serological testing, with MEDACorp KOLs highlighting four use-cases moving forward.** We believe the conversation will increasingly shift to serological immunoassays as the demand for a “cleared to go back to work” assay grows. Our KOL conversations this past week highlighted several key uses for serology testing moving forward, including identifying patients who have been exposed, patients who can donate convalescent plasma, population based screening, and vaccine efficacy confirmation. We see significant potential for high performing (95%+ sensitivity and specificity) serology assays (likely central lab vs lateral flow), with early developmental efforts from DHR's Beckman Coulter assay looking most promising. We expect winners to be large, well established assay manufacturers that are able to scale and deliver consistent performance over time and meet significant volume demands in millions of tests.

• **Expect testing algorithm to include serological testing but diagnosis gold std will continue to be molecular RT-PCR assay.** While there are near-term concerns over the performance and quality of the number of rapid strip-based or lateral flow immunoassays (LFIs) for COVID-19 that are appearing on the market, our MEDACorp KOLs agreed that immunoassays will ultimately play a role in the overall COVID-19 testing algorithm – which remains to be refined. But these KOLs expect the initial diagnosis to continue with the gold std RT-PCR.

---

S&P 500 Health Care Index: 1,010.87

Companies Highlighted: ABT, BDX, HOLX, TECH, TMO

Please refer to pages 18 - 25 for Important Disclosures, Price Charts and Analyst Certification.
Completion: April 06, 2020; 06:15 AM, EDT; Distribution: April 06, 2020; 06:15 AM, EDT

COVID-19 testing in the U.S. has continued to increase dramatically, surpassing 1.7M cumulative tests so far. Despite the increasing number of tests, the daily growth of testing has stepped down dramatically, as we had anticipated, though continues to add over 100,000 tests per day. We anticipate another strong week ahead through Thursday, though getting additional capacity in the molecular RT-PCR might be challenging at the reference labs. LabCorp (NC) is currently running 20k – 30k COVID-19 tests per day and holds potential to reach 40k/day in a week. But significant growth in testing volumes could take time and might involve more fully automated instruments (Roche, HOLX [MP], ABT [MP]) coming online or reference labs expanding their capacities for their own approved EUA (Emergency Use Authorization) assays and semiautomated assays that utilize kits from TMO (OP) and QGEN (NC). Over the next few weeks, testing capacity should continue to increase as rationing of tests from fully automated assay manufacturers improves and we see a theoretical capacity of close to 10M tests cumulatively by the end of April, but whether testing capacity would still be enough depends on the turn-around time, collection (swabs, etc.) limitations, and overall strict criteria that only those who are symptomatic can be tested. We continue to see an inflection point in testing should the criteria to be tested broaden, though we believe the overall testing infrastructure would very likely be incapable of serving the broader patient population, which could be asymptomatic. Still, the ultimate line of defense continues to be significant volumes from large reference national labs using fully automated systems from Roche, HOLX and ABT.

We continue to investigate the current state of COVID-19 testing across the U.S. with an eye for total capacity, utilization, ramp-up of assays, and ongoing feedback from KOLs. Daily testing volume currently nears 100k – 120k tests per day range, as expected, with some labs reaching capacity and while others are expanding, and though inefficiencies of logistics, collections (swabs), turn-around time, and rationing of tests are still very likely to continue in the near term, we remain optimistic that more capacity is coming online for in-patient and symptomatic patients. Key drivers, in our view, have been significant broadening of the testing criteria at the FDA, announced scale-up of testing reagents and cartridges for fully automated systems, and recent additions of point-of-care assays beyond the already EUA-approved assays from the national reference labs.

We Anticipate Focus Will Increasingly Shift to Serological Testing and Immunoassays, With Specific Attention on Performance and Scalability

With relaxed FDA approval restrictions (marketing without approval), we see that numerous smaller companies and OEM test providers (generally outside of U.S.) have introduced strip based/lateral flow serology tests via U.S. distributors, and those test numbers are only likely
to rise. We believe scalability and performance is a significant overhang for these lateral flow assays moving forward. We expect larger diagnostic instrument providers to continue working towards developing immunoassays – most likely in a central lab setting. Such central lab assays could provide titer information which is not available in essentially qualitative lateral flow (strip based) immunoassays. So far DHR (NC) holds most promise with its recent announcement that its Beckman Coulter division is developing assays to identify IgM and IgG antibodies to SARS-CoV-2, which will be run on its ACcess 2 and Dxl instruments.

We also recently hosted an investor call on this topic (Link) with three KOL lab directors and pathologists who were familiar with these assays. Given the KOLs’ feedback, we anticipate that larger manufacturers and instrument providers will “win” in the long term as it relates to broad-based serological testing for COVID-19, including the likes of Danaher (DHR, Not Rated), Roche (ROG-SWX, Not Rated), Siemens (SIE-ETR, Not Rated) and Abbott (ABT, MP, covered by our colleague Danielle Antalffy), though we do see the value that smaller companies, like DiaSorin (DIA-MI, Not Rated), can bring to immunoassays on automated systems.

**Increased Access to Testing Continues Significant Case Ramp for Molecular RT-PCR Assays**

With a number of key FDA approvals in the past weeks for COVID-19 (SARS-CoV-2) assays, including those from Danaher’s (DHR), Hologic (HOLX), Abbott (ABT), Genmark (GNMK), Quest (DGX), LabCorp (LH), Quidel (QDEL), Diasorin, Roche and TMO, we have continued to see a significant step up in cases, adding between 10k to 20k confirmed patients per day over the last week. We believe this prolonged ramp was largely expected given the early testing hiccups and severity of the virus spread in other countries throughout the world, as well as White House commentary last week suggesting a “rough” two weeks ahead. We expect to begin seeing a flattening of the curve over the next week or two, though caution on the impact of the Easter holiday. While social distancing measures remain in place, it is unclear how the general public will react to a holiday that typically sees larger family gatherings. While the holiday might result in fewer volumes for a few days, we recognize that any sizeable gatherings may be putting more people at risk and could result in a return to infection growth in the broader U.S.

While testing volumes have expanded significantly over the past few weeks, from under 1k a day on March 10 to a steady 100k-120k tests performed from March 27 – April 5, daily volumes are reaching a plateau and subsequent significant increases might be hard to come by given the availability of a limited number of instruments on the market. We do see upside from additional instrument placements that come through in the coming weeks; however, the ability to ship, install, and validate these instruments during the severe workflow disruptions remains to be seen. We also expect incremental upside from national labs such as LabCorp,
Quest and Opko Bioreference that are looking to expand their own EUA automated assays and semiautomated assays.

**The Conversation Should Increasingly Shift to Serological Testing to Address the Growing Testing Demand and Gain Insights Into the Population Exposure to SARS-Cov-2**

It appears that both among the investment community and among the frontline lab directors overseeing COVID-19 testing (including multiple KOLs we have spoken with), the conversation continues to shift to hospitalization of confirmed patients and to a rapid serology testing or immuno-assay based approaches to broaden the testing into a number of “indications.”

The KOLs we spoke with suggested four use-cases for serology testing in the longer term, including:

1. identifying those already recovered after being exposed to the virus, and can now return to work
2. identifying recovered patients who can donate convalescent plasma
3. a population-based screening effort to determine penetration of the virus into the population
4. potential confirmation of vaccine efficacy in the longer term.

As we discussed in our update last week, the performance of such assays remains a key factor at question as high sensitivity is desired in a screening assay, and though such assays hold promise in alleviating the current capacity constraints (as more immunoassays systems are available to run such assays), we have not seen announcements from major U.S. assay manufacturers on serological testing launches. We believe manufacturing scale will be required from any company that can provide a serological assay as likely millions would be needed.

**Please see our earlier COVID-19 testing updates:**

- Update #3 The Current State of COVID-19 Testing in the U.S (Link) Monday, March 30, 2020

**Additional COVID-19 from the Life Science Tools and Diagnostics Team:**

- Research and Core Lab Orders Poised to Snap Back as Academic Labs Resume Work (Link) Wednesday, March 18, 2020
KOL Call Highlights Importance of Serology Testing in the Long Term

Last week, we hosted a MEDACorp KOL call with three specialists to cover the potential of serology testing and immunoassays as they relate to COVID-19. We had a number of key takeaways from our conversation, including: (1) serology testing will play an important role in the COVID-19 testing including determining who is safe to go back to work, identifying patients who can donate convalescent plasma, broad population screening, and potential confirmation of vaccination efficacy; (2) though a number of questions still remain unanswered about the immune response to COVID-19, the KOLs expect a large market for serological assays, and based on immuno-analyzers capacities, see plenty of testing capacity being available at least in the central lab setting if robust assays are readily available; (3) the KOLs favor larger and more scalable manufacturers that can generate reproducible, high quality central lab assays vs the strip-based lateral flow immunoassays that are emerging on the market; (4) the optimal algorithm for COVID-19 testing, including immunoassay, comes down to the four key use-case indications, and (5) IgG antibodies in the KOLs’ view are likely to perform better compared to IgM and IgA, given their non-specific response.

We expect serological testing to play an important role in the testing algorithm for COVID-19 across a number of different “indications” highlighted above. Testing to identify previously sick patients who have had a strong immune response with high levels of antibodies is likely the first use case of serology testing as the focus on convalescent plasma transfusions grows to aid the sickest patients. We expect significant interest and development efforts in “go back to work” assays among larger manufacturers given their established facilities and proven ability to scale, compared to smaller manufacturers without a proven track record or ability to scale production, who our KOLs were more skeptical of. Ultimately, we expect serology testing will play a role in more broad-based population screening, which will likely require significant scale, quick turnaround times and efficient logistics as we look to identify the true nature of the outbreak in the United States. One KOL also highlighted that an effective serology test could also be used in vaccine development as a tool to determine the efficacy of a vaccination after it has been administered to ensure appropriate immune response, which offers a more long-term opportunity for manufacturers.

Two serology testing methods, lateral flow and central lab, both come with advantages and disadvantages, but are likely to work best in combination. Lateral flow testing can be performed at the point of care, and potentially in the longer term at home, with a quick turnaround time. The strip-based testing method is inexpensive and fast, however likely risks
performance in terms of sensitivity and specificity as a result, and just provides a “yes” or “no” answer for target antibody presence. On the other hand, a central lab testing model is likely to provide more information involving the antibody response, beyond just the presence of the target antibody, however, will ultimately have a longer turnaround time given the necessary logistics and a higher cost. The KOLs we spoke with viewed the central lab testing model more favorably given the titer information that will likely be able to provide more information beyond a qualitative yes/no answer from the lateral flow strip test. This titer information offers information on the degree of antibody response, potentially allowing further triaging of patients who want to return to work. Ultimately, we expect these tests can be used in combination, with a strip based lateral flow assay being used at the point of care and a follow-up central lab test for confirmation and additional information.

A flood of strip-based tests coming to market from loosened FDA restrictions are likely to create a discrepancy between public expectation and actual volumes. The KOLs we spoke with highlighted that while there are many tests coming to the market from small domestic and international companies, they remain skeptical on performance and the ability to scale. One KOL suggested that they would essentially go back to the starting point of test selection and validation should a small company be unable to properly scale their manufacturing after bringing a test to market and starting to ship to customers. This KOL suggested that larger manufacturers such as Roche, Abbott (ABT, MP), and Danaher (DHR, NC) are likely to be viewed much more favorably among lab directors throughout the country given the strong reputation and ability to scale millions of tests. One KOL also highlighted that DiaSorin (DIA-MIL), a immunoanalyzer manufacturer has a strong platform that has shown effectiveness in previous testing, and expects that the company will have a similar test for COVID-19 available within a month. With the FDA not requiring approval for marketing however, many unapproved tests are coming to market without extensively validation to compare performance statistics.

Many early tests are targeting both Immunoglobin G and M (IgG and IgM). One KOL on our call however highlighted that the more abundant IgG is likely to see the most interest in applications that come to market as IgM suffers from more non-specific interactions despite having an earlier immune response than IgG. Given the earlier response of IgM as a “first try” to fight the infection, it is no surprise to see non-specific interactions, making a strip based test that detects IgM presence less useful than IgG, which is more target to specific infections. While many tests are using a combination of IgG and IgM, we expect an IgG focus to drive improved sensitivities, which remain in question given the early nature of the test. For example, the KOLs highlighted the HIV immunoassay which is nearly 100% sensitive and specific, however has had decades of improvements since its initial development. We anticipate a similar approach with COVID-19, though believe current technologies may offer manufacturers a better start with incremental improvements over time moving forward.
COVID-19 Testing Volumes Continue to Rise as U.S. Cases Gap Ahead; Though Testing per Capita Still Lags

Through last Friday, US testing per million grew ~2.4x, and has since expanded even further, though still remains behind Italy. Italy has tested nearly 10k people per million in their population, which has continued to grow significantly following their earlier measures.

The United States has seen continued growth in testing as capacity expands, with testing per million of nearly 5,000 as of April 5, 2020, at 12pm, up even more since last Friday’s data highlighted below. The past few weeks have been significant for the U.S. as testing volumes have continued ramping, cumulatively up over 10x in two weeks, and we expect the country will continue to close the gap on Italy, though remain unsure if rapid serology type tests will be counted in the reported totals. Other countries that we have been tracking have seen strong increases over the past month as well, including South Korea, where they were significantly ahead of other countries when we began tracking tests per million, and has continued to grow despite being surpassed by Italy. South Korea has also seen significant stabilization in cases over the past month, suggesting they were able to control the outbreak with the measures that were taken.

Figure 1. Testing volumes per million people continue to expand in US

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>8-Mar</td>
<td>5</td>
<td>314</td>
<td>63x</td>
<td>1,588</td>
<td>5.1x</td>
<td>3,877</td>
<td>2.4x</td>
</tr>
<tr>
<td>Italy</td>
<td>8-Mar</td>
<td>826</td>
<td>3,499</td>
<td>4x</td>
<td>5,968</td>
<td>1.7x</td>
<td>9,607</td>
<td>1.6x</td>
</tr>
<tr>
<td>UK</td>
<td>8-Mar</td>
<td>347</td>
<td>960</td>
<td>3x</td>
<td>1,578</td>
<td>1.6x</td>
<td>2,456</td>
<td>1.6x</td>
</tr>
<tr>
<td>Japan</td>
<td>4-Mar</td>
<td>66</td>
<td>118</td>
<td>2x</td>
<td>213</td>
<td>1.8x</td>
<td>289</td>
<td>1.4x</td>
</tr>
<tr>
<td>South Korea</td>
<td>8-Mar</td>
<td>3,692</td>
<td>6,148</td>
<td>2x</td>
<td>7,348</td>
<td>1.2x</td>
<td>8,076</td>
<td>1.1x</td>
</tr>
</tbody>
</table>

Source: Our World in Data, Business Insider, the COVID Tracking Project, Individual Country Ministry of Health Websites, SVB Leerink

Moving forward, we expect the United States to continue to see significant testing capacity with a narrowing gap to Italy’s; however we note the relative difference in population sizes, with 327M in the United States compared to only 60.5M in Italy. With a denominator over 5x larger, the significant expansion the United States has seen in per capita testing highlights that much of the headwinds have been overcome.

Despite an increasing number of cases and deaths, the United States remains behind other major countries in mortality percentages. While this occurrence may be due to our increasing testing capacity creating a larger denominator faster than a patient succumbs to their symptoms, we believe the strength of our healthcare system and significant testing actions taken in major and dense cities such as New York City play a role as well. While the United States has seen a rise in deaths, the total still remains below Italy and Spain, where there are fewer confirmed cases, creating higher mortality rates. Ultimately, the continued
The rollout of testing capacity expansion will be crucial in keeping mortality rates low, despite a likely continued increase in total positive cases.

**Figure 2. U.S. mortality rates remain relatively low despite significant ramp in cases and deaths**

The United States has seen a massive ramp in daily testing capacity. While the country ran into multiple early hiccups that delayed the rollout of more widely available testing, the daily tests completed significantly outpaces other countries that have seen similar spread of the virus, including Italy which appears to have peaked around ~40k completed tests per days vs the United States’ 100k+. In our initial capacity model, highlighted later in this note, we assumed a maximum daily testing capacity of ~110k based on our research and estimates from central lab capacity as well as research and hospital labs ability to run samples.

California was a big contributor to the recent spike in tests on April 4, 2020, as it resolved a data issue and saw relief in backlog. Given a number of different reporting methods by county and state, we believe the available data aggregators offer the most visibility into total volumes. Over the weekend, California saw a significant jump in tests completed, leading to the visible spike in total tests as well as step down in positivity rates.
highlighted below. Over time, we expect trends to flatten out as reporting quality and consistency improve throughout the country.

Figure 3. U.S. daily testing capacity ramp significantly outpaces rest of world

![Image of graph showing COVID-19 tests per day]

As the significant testing ramp continues, the U.S. continues expanding the gap in confirmed cases. After passing Italy in late March (March 25-26), the United States has seen significant and continued growth in daily new cases while Italy has begun to decline. Another hotspot seeing a rise in cases, and has recently passed Italy as well is Spain; however Spain also appears to be showing a stabilization in daily cases as well. Given the “S-curve” expectations, we anticipate numbers in the United States will continue to grow, though eventual stabilization in daily new cases could still suggest we are confirming 20k-40k or more cases per day. We believe this is inevitable as social distancing measures in hot spot cities and throughout the country are likely starting to have an impact on the overall spread of the virus. Even with these measures in place for weeks now however, certain areas like New York City are continuing to see rising cases, hospital admission, and deaths from the virus, which we believe suggest the ease of spread and potential lethality in other cities throughout the country that were slower to react.
Figure 4. Daily new cases in US continue rising, potential for plateau likely in sight

Source: https://www.worldometers.info/coronavirus/, SVB Leerink

New York State Continues to Be a Lead Driver of US Numbers

Positivity rates in the United States have continued climbing into the high teens driven by New York rates reaching 40%. The overall US positivity rate climbed dramatically through the second half of March as we were able to test more patients already showing symptoms, though continues to be driven by numbers coming out of New York, where positivity rates have doubled from ~20% in mid-March to 40% as of April 4. While the most recent data appear to be impacted by a one-time jump in competed tests in California as they resolved a data reporting issue, we ultimately continue to believe the testing positivity rates will inflect to a down trend as more testing becomes available for less symptomatic patients, and eventually the general public. Excluding the impact from New York, where they alone now have over 100k cases on under 300k tests, the positivity rate for the country reached 15% before the impact from the California testing numbers.
Figure 5. High positivity rates in U.S. driven by New York State

U.S. COVID-19 Testing Ramp and Positivity Rate

New York State COVID-19 Testing Volume Ramp
National Hospitalization Rates Appear to Be Stabilizing Despite Continued Increases in New York

New York continues to see increasing hospitalization rates among COVID-19 patients, potentially reaching hospital capacity. The number of hospitalized patients in New York as of April 4 has doubled to ~26k from March 30, with nearly one quarter of all COVID-19 patients in the state being hospitalized for their symptoms at some point. While these are cumulative numbers, still nearly 16,000 people in the state are currently hospitalized, with over a quarter of them in ICU at this time. New York has also seen a rising mortality rate, increasing from 2% on March 31 to over 3% this past weekend, as deaths continue rising faster than new cases.
Figure 6. New York State COVID-19 hospitalization rate as of April 5th

<table>
<thead>
<tr>
<th></th>
<th>Positive Pts.</th>
<th>Hospitalized</th>
<th>Deaths</th>
<th>Hosp. Rate</th>
<th>Mort. Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-Mar</td>
<td>10,356</td>
<td>1,603</td>
<td>44</td>
<td>15.5%</td>
<td>0.4%</td>
</tr>
<tr>
<td>22-Mar</td>
<td>15,168</td>
<td>1,974</td>
<td>114</td>
<td>13.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>23-Mar</td>
<td>20,875</td>
<td>2,635</td>
<td>114</td>
<td>12.6%</td>
<td>0.5%</td>
</tr>
<tr>
<td>24-Mar</td>
<td>25,665</td>
<td>3,234</td>
<td>210</td>
<td>12.6%</td>
<td>0.8%</td>
</tr>
<tr>
<td>25-Mar</td>
<td>30,811</td>
<td>3,805</td>
<td>285</td>
<td>12.3%</td>
<td>0.9%</td>
</tr>
<tr>
<td>26-Mar</td>
<td>37,258</td>
<td>6,844</td>
<td>385</td>
<td>18.4%</td>
<td>1.0%</td>
</tr>
<tr>
<td>27-Mar</td>
<td>44,635</td>
<td>8,526</td>
<td>519</td>
<td>19.1%</td>
<td>1.2%</td>
</tr>
<tr>
<td>28-Mar</td>
<td>52,318</td>
<td>10,054</td>
<td>728</td>
<td>19.2%</td>
<td>1.4%</td>
</tr>
<tr>
<td>29-Mar</td>
<td>59,513</td>
<td>12,075</td>
<td>965</td>
<td>20.3%</td>
<td>1.6%</td>
</tr>
<tr>
<td>30-Mar</td>
<td>66,497</td>
<td>13,721</td>
<td>1,218</td>
<td>20.6%</td>
<td>1.8%</td>
</tr>
<tr>
<td>31-Mar</td>
<td>75,795</td>
<td>15,904</td>
<td>1,550</td>
<td>21.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>1-Apr</td>
<td>83,712</td>
<td>18,368</td>
<td>1,941</td>
<td>21.9%</td>
<td>2.3%</td>
</tr>
<tr>
<td>2-Apr</td>
<td>92,381</td>
<td>20,817</td>
<td>2,373</td>
<td>22.5%</td>
<td>2.6%</td>
</tr>
<tr>
<td>3-Apr</td>
<td>102,863</td>
<td>23,696</td>
<td>2,935</td>
<td>23.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>4-Apr</td>
<td>113,704</td>
<td>26,383</td>
<td>3,565</td>
<td>23.2%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Source: The COVID Tracking Project, SVB Leerink

Looking at the United States as a whole, hospitalization rates have continued to decline with more confirmed cases; however mortality rates yet to stabilize. The country as a whole, inclusive of New York State, has seen nearly 40,000 patients be hospitalized to treat their symptoms. Of this, over 22,000 remained hospitalized this past weekend. With expanded testing capacity and improved efficiencies of diagnosis that we expect to continue ramping in the coming weeks, hospitalization rates have already started coming down from a peak just below 15% to current levels of ~12.6%. Despite declining hospitalization rates, mortality has continued to tick up, with now over 8,000 people having died from their symptoms (April 4), up from ~2,000 a week prior. In our view, it is clear that while our growth of daily confirmed cases and testing is slowing with day over day new cases likely approaching a peak in the near term, the end results continue to suggest increasing mortalities. Ultimately, however, with loosened testing restrictions, we anticipate both total completed tests and confirmed positives to continue ramping as we look to include fewer and non-symptomatic patients, which in our view will naturally suppress hospitality and mortality rates.
Testing Volume Ramp Continues, Though Likely Reaching Daily Capacity

Total reported testing remains slightly ahead of our initial estimates, with the recent California driven “catch up” driving uptick in daily growth. Ultimately, we do not see any capacity constraints from test kit manufacturers at this time, as we had previously anticipated nearly 5M cumulative test kit capacity by Sunday April 5, compared to ~1.6M in total completed tests by April 4. The biggest bottleneck for testing moving forward, in our view, is actual instrument availability, as delivery of new instruments that can come online is likely impacted by the pandemic, as well as labs needing to deliver results on other assays. We expect restrictions on access to testing to continue loosen[ing], enabling more people to be tested, though believe a broad-based screening test is still down the road. Additionally, based on the needed requirements for rapid turnaround time and scale of these assays, it is unlikely they will be molecular tests run on RT-PCR instruments; thus the current testing volume ramp and our prior capacity projections have not incorporated expectations of expanding to the general population. At this time, with initial focus on getting approved tests out the door and running on existing instrument install bases, we expect a relative stabilization in day over day test growth given total potential capacity in labs, and expect upside to be driven from newly validated instruments coming online in labs throughout the country.
Timeline Updates Suggest Continued Shift to Rapid Point of Care Testing

While the frequency of diagnostic updates has slowed, our timeline tracker now highlights a focus on rapid point of care testing. Following the FDA’s first relaxation of the EUA standards on March 3, we saw a flurry of updates from companies developing and introducing COVID-19 molecular diagnostic tests. Over the past week, updates appear to suggest the focus among manufacturers has now shifted to rapid serology-based testing that enables broader population testing, and ultimately an assay class to warrant return to work and normal economic activity. Key updates in the past week include:

Danaher’s Beckman Coulter announced the development of an IgM and IgG antibody test to be run on their high throughput Access systems (Beckman Coulter)
**Becton Dickinson (BDX, MP) and BioMedomics** announced a new point-of-care antibody test that can provide results within 15 minutes. The test, which is manufactured by BioMedomics, is available through BDX’s catalogue and distributed by Henry Schein.

**ThermoGenesis** announced that they have notified the FDA of their intent to distribute a rapid COVID-19 point-of-care assay with a 10-minute turnaround that is currently in validation for pre-screening and immunity testing.

**Trxade Group** files for EUA for a rapid point-of-care test, with 20k units to be available by April 10 and 1M units “over time.”

**Biomerica and Mount Sinai Medical School** announced their agreement to scale up a lab version of a serological test. The collaboration expects to manufacture 1M ELISA microplate tests per month for as low as $10 per patient.

**Becton Dickinson and BioGx** announce the availability of serology test for use the BD Max instruments that are currently approved under EUA. Expected to add 50k in testing capacity per week for the US.
## Figure 9. Updated Diagnostics Focused Timeline of COVID-19 in the United States

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Tickers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Apr-20</td>
<td>Becton, Dickinson and Co and BioGX announce availability of serology test for BD Max systems approved under EUA</td>
<td>BDX, BMRA</td>
</tr>
<tr>
<td>1-Apr-20</td>
<td>Trade Group Files for EUA for rapid, point-of-care testing kit. First 20k units by April 10, plan to ramp to 1M units over time</td>
<td>BDX, HSIC</td>
</tr>
<tr>
<td>31-Mar-20</td>
<td>ThermoGenesis notifies FDA of intent to distribute Rapid COVID-19 Point-of-Care test kit with 10 minute turn around. Currently in validation for pre-screening and immunity testing.</td>
<td>THMO</td>
</tr>
<tr>
<td>27-Mar-20</td>
<td>Abbott announced EUA and launch of molecular point-of-care test to detect virus in as little as 5 minutes on ID Now platform.</td>
<td>DHR</td>
</tr>
<tr>
<td>26-Mar-20</td>
<td>Henry Schein announces availability of antibody-based rapid blood test Standard Q COVID-19 IgM/IgG Rapid Test for point of care administration, manufactured by BD Biosensor</td>
<td>ABT</td>
</tr>
<tr>
<td>24-Mar-20</td>
<td>QIAGEN releases QIAstat-Dx in U as first syndromic test for COVID-19 detection. Test can differentiate COVID-19 from 20 other resp. infection in one hour.</td>
<td>QGEN</td>
</tr>
<tr>
<td>20-Mar-20</td>
<td>Perkin Elmer receives EUA for RT-PCR test for immediate testing in CLIA labs. Test marketed as IVD device and available in 30 countries worldwide</td>
<td>PKI</td>
</tr>
<tr>
<td>19-Mar-20</td>
<td>LabCorp announces expectation to perform 20k tests/day by Friday March 20, ahead of initial 10k/day by end of week and 20k/day by end of month. 3-4 day TAT</td>
<td>LHO</td>
</tr>
<tr>
<td>18-Mar-20</td>
<td>Abbott announces EUA for m2000 based assay, immediately shipping 150k tests with plan to ramp to 1M/week by end of March</td>
<td>ABT</td>
</tr>
<tr>
<td>17-Mar-20</td>
<td>QIAGEN announces intentions to ramp RNA extraction kits to support 10M+ tests/month by the end of June 2020 and 20M+ test/month by the end of 2020</td>
<td>QGEN</td>
</tr>
<tr>
<td>16-Mar-20</td>
<td>Thermo Fisher suggests current 1.5M tests available to ship, with 2M per week, and 5M per week by April.</td>
<td>TMO</td>
</tr>
<tr>
<td>15-Mar-20</td>
<td>Roche announces 400k kits began shipping 03/13 for completion this week with 3.5 hr TAT once started. Plans to ship additional 400k/week moving forward.</td>
<td>ROG-CH</td>
</tr>
<tr>
<td>15-Mar-20</td>
<td>FDA issues EUA for Hologic’s Panther Fusion Assay and LabCorp’s RT-PCR test</td>
<td>HOLX, LH</td>
</tr>
<tr>
<td>15-Mar-20</td>
<td>FDA loosens EUA restrictions, allow all states the authority to approve tests developed in their state, and enables comm. Manufacturers to distribute prior to EUA</td>
<td></td>
</tr>
<tr>
<td>13-Mar-20</td>
<td>FDA gives flexibility to NY State Dept. of Health to authorize certain labs before testing after validation and notification in lieu of EUA</td>
<td></td>
</tr>
<tr>
<td>12-Mar-20</td>
<td>Eurofins announces two labs in US now offer COVID-19 testing through RT-PCR. Plans for TEM-PCR Vral Panels next week</td>
<td>ERF-FR</td>
</tr>
<tr>
<td>11-Mar-20</td>
<td>Bio-Rad launches standard with synthetic COVID-19 RNA transcripts and human genomic DNA, allowing labs to test a molecular assays’s entire process</td>
<td>BIO</td>
</tr>
<tr>
<td>10-Mar-20</td>
<td>GNMK announces submission of EUA for ePlex RUO assay</td>
<td>GNMK</td>
</tr>
<tr>
<td>10-Mar-20</td>
<td>Alphatect (Google) launches Verily site to triage patients in the Bay Area with expectations to expand over time.</td>
<td></td>
</tr>
<tr>
<td>9-Mar-20</td>
<td>FDA Commissioner Stephen Han suggest 4M additional tests to be shipped by end of next week</td>
<td>ROG-CH</td>
</tr>
<tr>
<td>8-Mar-20</td>
<td>LumineX announces four independent labs have validated LDTs using ARIES System, enabling immediate COVID-19 menu additions</td>
<td>LMXN</td>
</tr>
<tr>
<td>5-Mar-20</td>
<td>Thermo Fisher receives EUA from FDA for SARS-CoV-2 test optimized for TMO’s Applied Biosystems 7500 Fast Dx RT-PCR instrument</td>
<td>TMO</td>
</tr>
<tr>
<td>3-Mar-20</td>
<td>Virusch Eurofins Launches test with same day results (12-18 hours) targeting March 13 start</td>
<td>ERF-FR</td>
</tr>
<tr>
<td>3-Mar-20</td>
<td>CDC confirms testing available in all 50 states with 78 state and local public health labs, with 75k distributed kits</td>
<td>DEX</td>
</tr>
<tr>
<td>3-Mar-20</td>
<td>Quest Diagnostics launches COVID-19 testing service to start testing March 9, 2020</td>
<td>DGX</td>
</tr>
<tr>
<td>3-Mar-20</td>
<td>LabCorp makes test available for ordering by physicians or authorized healthcare providers</td>
<td>LH</td>
</tr>
<tr>
<td>3-Mar-20</td>
<td>LumineX announces promising early results on NtTAG CoV Expanded Panel and successful validation from two European reference labs using single-target test on ARIES System</td>
<td>LMXN</td>
</tr>
</tbody>
</table>

*Source: Company reports, CDC, FDA, New York Times, Politico, SVB Leerink*
Disclosures Appendix

Analyst Certification

I, Puneet Souda, certify that the views expressed in this report accurately reflect my views and that no part of my compensation was, is, or will be directly related to the specific recommendation or views contained in this report.

Rating and Price Target History for: Abbott Laboratories (ABT) as of 04-03-2020

Leerink placed a Market Perform rating on ABT on September 18, 2012.

OP = Outperform MP = Market Perform UP = Underperform D = Drop Coverage I = Initiate SC = Suspended Coverage

Valuation

We expect ABT shares to trade to $102. This applies a ~25.5x multiple to our $4.00 2021E EPS estimate, which assumes a stable multiple from the current level at ~25.5x PE on 2020E EPS, and also in line with the large-cap MedTech group (JNJ, ABT, BAX, MDT, ZBH, SYK, BDX, BSX) average at ~25x-26x. While ABT is clearly poised to drive above-market sales growth in 2020, we believe the current valuation already reflects that, and we don't have high conviction that ABT is a consistent "beat and raise" story. And with potential execution risk around new product launches -- on which ABT is heavily dependent, notably FreeStyle Libre, Mitraclip, and Alinity -- we see more opportunity for potential downside vs. meaningful clear-cut upside.

Risks to Valuation

Risks include: (1) potential for slowing end-market growth and/or increasing competition for major products; (2) product recalls or manufacturing warning letters that could push operating costs higher and hinder sales growth; (3) successful pipeline execution, which will be key to Abbott's growth story and product approvability, and timing of approvals has become increasingly uncertain in today's challenging regulatory environment; (4) successful execution on margin expansion opportunities in an environment of increasing price pressure; and (5) potential acquisitions that could be dilutive to shareholders.
Valuation

Our 12-month PT on BDX is ~$269 (vs. $263 prior). We think BDX should be compared to the large diversified MedTech peer group given its exposure across Medical Technology and Life Sciences. This peer group includes JNJ, MDT, BAX, ABT and is trading at ~21.8x/20x ‘20E/’21E EPS. We still think BDX will prove to be a longer-term MSD rev & 10% + EPS grower, but in light of uncertainty around the Alaris recovery and a below group rev/EPS growth profile over the near-to-intermediate term, we think a discount is warranted to peers. Our $269 PT applies a ~20x (~8% discount) to our $13.45 FY21E EPS.

Risks to Valuation

Risks to our valuation include: (1) if accretion estimates for BCR prove to be overly conservative or aggressive; (2) FX volatility; (3) significant exposure to Emerging Markets, where rev growth can be volatile; and (4) if there is slower-than-anticipated uptake of the company’s Diagnostic and Biosciences products.

Valuation

Our ~$57 PT is based on a ~20x multiple applied to our FY21E EPS of $2.85. Given improving underlying org. rev prospects driven by (a) the CYNO divestiture, and (b) momentum in the company’s Diagnostics, GYN, and BH...
businesses, we think the multiple can continue to expand off depressed levels and begin to close the valuation gap with peers currently trading at ~22x on 2021E P/E. However, we still think a discount to the group is appropriate given HOLX's current (slower) top-line profile (~4.5% vs. group's ~6.5%). Applying ~20x to our FY21E $2.85 gets us to $57. While we appreciate the stock is still cheap on a relative basis (~2x P/E discount to peers on 2021E), we also think the shares could remain range-bound given our lower confidence in EPS upside potential, which could limit near-term opportunities for further multiple expansion.

For the peer group we use a blended selection of MedTech capital equipment/imaging and Diagnostic stocks (MedTech: BDX, HRC, SYK, MDT, ABT, VAR, RMD; Diagnostic: BRKR, PKI, QGEN, WAT). This comp group currently trades at an average forward P/E multiple of ~24.5x on '20E and ~22x on '21E. HOLX currently trades at ~20.3x our FY20E & ~19x our FY21E EPS. On an EV/EBITDA basis, HOLX trades at ~14.7x/13.7x CY20E/21E, which is below the peer group avg. of 17.7x/16.2x. Our ~$57 PT would imply ~14.4x our CY21E EBITDA, which is still below the group’s 2020E average.

**Risks to Valuation**

Risks to our valuation include: (1) If US hospital administrators were to pull back on cap-ex investment, this could cause delays in HOLX's capital-exposed businesses within Breast Health (3D Tomo, Affirm); (2) if HOLX's R&D pipeline (and/or potential tuck-ins) across Diagnostics, Breast Health, doesn't produce enough incremental growth tailwinds to offset an eventual slowdown (i.e., in FY19 and beyond) in the 3D Tomo cycle, which could put our out-year estimates at risk.

**Valuation**

We rate Bio-Techne Outperform given its unique high margin business profile that consists of ~90% consumables and only 10% instruments and now an outlook that is diversified across life science tools and also levered to the growing area of diagnostics. Over the next few years into FY2023 TECH hopes to deliver revenue of $1.2B, a number we believe is conservative given the growth drivers that TECH has. We also see:

1) Bio-Techne’s high growth Protein Sciences should deliver mid-teens organic CAGR as it drives Western and SimplePlex technologies deeper with protein reagents into biopharma and even broader academic accounts.

2) TECH is poised to succeed in its plans to grow inorganically in the highly fragmented research tools and diagnostics sector – picking up uniquely differentiated and attractive assets with high gross margins to fill up adjacencies or further
expand its position in consumables. But at the same time we don’t expect the company to lever up beyond 4x debt/EBITDA, and we believe that it can generate ~$1.8B in dry powder over the next 3 years given the current growth rates – above the expectations laid out at the 2018 investor day.

3) We see opportunity in gene and cell therapy workflow where TECH has the potential to deliver a conservative ~$300M longer term as it builds out its GMP facility and scales up capabilities in cell and gene therapy manufacturing. Recall that TECH also acquired B-MoGen – a non-viral vector technology that remains integral to driving growth in the gene and cell therapy portfolio.

4) TECH’s ACD acquisition has already delivered, and we believe should continue to deliver midteens growth longer term. ACD is well entrenched in translational research and biopharma, but we believe the next step up will come from inclusion of ACD in routine pathology diagnostics – a significantly larger market vs the current Research Use Only (RUO) position.

5) TECH’s Exosome Dx acquisition has taken longer to deliver. In Exosome Dx we see a powerful technology and a strong IP that is likely to benefit TECH longer term. Though TECH has delivered lackluster results in FY19 given limited reimbursement for Exosome Dx’s EPI test, we believe that with the finalization of its LCD, Exosome should deliver stronger results in FY20 with both Medicare and commercial reimbursement improving – eventually reaching and likely exceeding the estimates laid out by management.

6) Our confidence is high in the management team led by CEO Charles Kummeth – a key to TECH’s success over the last three years, and we believe it is likely to continue as management executes on its portfolio and long-range plan laid out at its Investor Day.

TECH currently trades at ~27x EV/EBITDA (CY2020E), and we believe the stock should be able to trade to 31.5x EV/EBITDA given its growth profile and consumables-heavy portfolio. Our valuation methodology applies 31.5x to our CY2020 EV/EBITDA estimate, yielding a 12-month $250 price target. Our peer group consists of TMO, DHR, WAT, A, BRKR, PKI, ILMN, QGEN, and MTD.

**Risks to Valuation**

TECH could face a number of risks including:

1) Downturn in biopharma R&D funding if the regulation or changes at the FDA lead to dramatic changes in profitability of the drug companies – driving the company to reduce R&D spending in anticipation of poor returns on R&D investments.

2) Further decline in NIH funding due to change in political leadership or periods of flat or declining allocations into research spending, which could severely curtail the ability of the company to grow despite its high consumables portfolio.

3) Citations including the 483 type citations that restrict the company’s ability to produce its diagnostics reagents for an extended period of time, forcing the diagnostics instrument providers to switch away from Bio-Techne’s reagents, could lead to sustained decline in its diagnostics reagents revenue.

4) Increasing competition from Merck (Sigma-Aldrich), Bio-Rad, VWR, TMO could also lead to a decline in TECH’s sales. Additionally, increasing competition from AbCam and other antibodies manufacturers on the market could also
impact TECH’s sales. Competition can also arise internationally in China and other key growth markets for TECH as local reagents providers have the potential to supply reagents at a lower price, impacting TECH’s margins.

5) Higher U.S dollar could dampen OUS demand for TECH’s products manufactured in the U.S. or restrictions on trade with certain countries such as China and other Asian countries could also dramatically reduce the need for its products in those countries. Dramatic FX changes including a sudden decline in UK Pound Sterling could impact TECH as the company has 20% revenue exposure to the UK, and its European headquarters are also located in the UK.

Rating and Price Target History for: Thermo Fisher Scientific Inc. (TMO) as of 04-03-2020

<table>
<thead>
<tr>
<th>Date</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/26/17</td>
<td>$187</td>
</tr>
<tr>
<td>07/26/17</td>
<td>$190</td>
</tr>
<tr>
<td>10/06/17</td>
<td>$207</td>
</tr>
<tr>
<td>10/26/17</td>
<td>$216</td>
</tr>
<tr>
<td>12/04/17</td>
<td>$220</td>
</tr>
<tr>
<td>01/31/18</td>
<td>$239</td>
</tr>
<tr>
<td>07/25/18</td>
<td>$255</td>
</tr>
<tr>
<td>10/25/18</td>
<td>$260</td>
</tr>
<tr>
<td>01/30/19</td>
<td>$270</td>
</tr>
<tr>
<td>04/24/19</td>
<td>$300</td>
</tr>
<tr>
<td>07/24/19</td>
<td>$315</td>
</tr>
<tr>
<td>10/23/19</td>
<td>$320</td>
</tr>
<tr>
<td>03/30/20</td>
<td>$355</td>
</tr>
<tr>
<td>03/03/20</td>
<td>$355</td>
</tr>
</tbody>
</table>

Leerink placed an Outperform rating on TMO on November 9, 2016.

OP = Outperform MP = Market Perform UP = Underperform D = Drop Coverage I = Initiate SC = Suspended Coverage

Created by: BlueMatrix

Valuation

TMO shares currently trade at 18.5x our 2021E EV/EBITDA, which is slightly behind the large- and mid-cap tools (A, BRKR, DHR, PKI, QGEN, TECH, WAT) average of 20.2x EV/EBITDA. Given the impressive growth that TMO delivers, its leverage to biologics drugs discovery, development and production, China and emerging markets tailwinds still continuing, we believe TMO should continue to hold its position as the leading lab tools and supplies provider and likely continue to post strong growth. We expect TMO to trade in line with the large- and mid-cap tools average, delivering 20x 2021E EV/EBITDA. We derive our $355 price target when applying the multiple to our 2021 EBITDA estimate of $7.89B.

Risks to Valuation

Primary risks to our TMO price target include:

1) **Slowdown in global budgets in research could cause downside risk to our forecasts.** Tightening of budgets for both government and academic funding could result in lower revenues relative to our estimates. Furthermore, restrictive global budgeting could result in a shift in focus and strategy for growth that could increase operational risks. Declines in governmental spending could be a risk to the downside to our forecasted growth in NIH spending of 0-2.5%.

2) **Biopharma decline poses greatest risk to TMO’s revenues.** Declines in biopharma funding could highly impact TMO revenues given that a third of its revenue is levered to the biopharma industry. Slowdowns in biopharma funding would result in downside risk to our estimates and valuation. Biomolecules are forecasted to ramp to 30% in the drug market from mid-teens, and our estimates are hinged on proliferation that should drive the use of TMO’s bioprocessing equipment, mass spectrometers and other instruments and reagents that characterize these molecules.
(3) **Scale and diversification could backfire.** TMO’s size and diversification which is so advantageous to the company in a consolidating space, poses significant challenges in terms of moving the needle from a growth perspective. Given the size of acquisitions that TMO has already done including the LIFE and PTHN transactions, we would venture to estimate that the deal size has to be at least $1B and growing north of 15% organically to make a significant move in the market. Although such assets might not be visible to the Street given the limited public assets, there are a large number of private assets that could be potentially available. However, that again poses the risk that the Street might not appreciate the capabilities of the asset enough to move the needle for TMO.

(4) **Emerging markets pose a significant risk to TMO’s revenues.** Geopolitical risks in emerging markets could disrupt operations and be a downside risk to our valuation forecast. These risks could be country or region specific and could also impact TMO’s strategy and create higher barriers to entry in existing and future markets if local products and reagents are preferred over those being imported. TMO operates in numerous international markets, including India, China, and Eastern Europe to name a few.

(5) **TMO’s exposure to China could also pose a concentration risk.** China represents ~10% of TMO’s revenues, and macroeconomic impact to the Chinese market could lead to a decline in company revenue. Regulations from Chinese policy could also cause restrictive operations leading to lower activity in China. Questions remain about China’s 5-Year Plan relating to its details, and headwinds could emerge from policy risks.

(6) **M&A and synergies may not go as planned.** TMO’s acquisitions are sizable and may not go as planned, which could result in integration risks and lower-than-expected synergies. Integration requires both cultural and process adaption, and while synergies can be modeled and forecasted, risk to estimates remains when integrating unquantifiable aspects from targets. While we have not forecasted further M&A in our model, margin erosion could occur from future acquisitions.

(7) **Increasing risk that Amazon’s distribution business is likely to impact revenues from TMO’s Laboratory Products and Services (LPS) business.** Customers have shown that they are willing to consider Amazon a vendor for consumable products that do not have an expiration date such as beakers and pipettes. We expect Amazon’s expertise in logistics and supply chain to allow Amazon to offer these products at competitive costs, thus impact LPS revenues and overall business.

### Distribution of Ratings/Investment Banking Services (IB) as of 03/31/20

<table>
<thead>
<tr>
<th>Rating</th>
<th>IB Serv./Past 12 Mos.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
</tr>
<tr>
<td>BUY [OP]</td>
<td>148</td>
</tr>
<tr>
<td>HOLD [MP]</td>
<td>54</td>
</tr>
<tr>
<td>SELL [UP]</td>
<td>0</td>
</tr>
</tbody>
</table>

**Explanation of Ratings**
Outperform (Buy): We expect this stock to outperform its benchmark over the next 12 months.

Market Perform (Hold/Neutral): We expect this stock to perform in line with its benchmark over the next 12 months.

Underperform (Sell): We expect this stock to underperform its benchmark over the next 12 months.

The degree of outperformance or underperformance required to warrant an Outperform or an Underperform rating should be commensurate with the risk profile of the company.

For the purposes of these definitions the relevant benchmark will be the S&P 600® Health Care Index for issuers with a market capitalization of less than $2 billion and the S&P 500® Health Care Index for issuers with a market capitalization over $2 billion.
Important Disclosures

This information (including, but not limited to, prices, quotes and statistics) has been obtained from sources that we believe reliable, but we do not represent that it is accurate or complete and it should not be relied upon as such. All information is subject to change without notice. The information is intended for Institutional Use Only and is not an offer to sell or a solicitation to buy any product to which this information relates. SVB Leerink LLC (“Firm”), its officers, directors, employees, proprietary accounts and affiliates may have a position, long or short, in the securities referred to in this report, and/or other related securities, and from time to time may increase or decrease the position or express a view that is contrary to that contained in this report. The Firm’s research analysts, salespeople, traders and other professionals may provide oral or written market commentary or trading strategies that are contrary to opinions expressed in this report. The Firm’s asset management group and proprietary accounts may make investment decisions that are inconsistent with the opinions expressed in this document. The past performance of securities does not guarantee or predict future performance. Transaction strategies described herein may not be suitable for all investors. This document may not be reproduced or circulated without SVB Leerink’s written authority. Additional information is available upon request by contacting the Editorial Department, SVB Leerink LLC, One Federal Street, 37th Floor, Boston, MA 02110.

Like all Firm employees, research analysts receive compensation that is impacted by, among other factors, overall firm profitability, which includes revenues from, among other business units, Institutional Equities, Research, and Investment Banking. Research analysts, however, are not compensated for a specific investment banking services transaction. To the extent SVB Leerink research reports are referenced in this material, they are either attached hereto or information about these companies, including prices, rating, market making status, price charts, compensation disclosures, Analyst Certifications, etc. is available on https://svbleerink.bluematrix.com/bluematrix/Disclosure2.

MEDACorp is a network of healthcare professionals, attorneys, physicians, key opinion leaders, and other specialists accessed by SVB Leerink LLC and its clients.


SVB Leerink LLC is willing to sell to, or buy from, clients the common stock of Abbott Laboratories and Thermo Fisher Scientific Inc. on a principal basis.

In the past 12 months, an affiliate of SVB Leerink LLC has received compensation for providing non-securities services to Abbott Laboratories.

In the past 12 months, an affiliate of SVB Leerink LLC has received compensation for providing non-securities services to Hologic, Inc.

In the past 12 months, an affiliate of SVB Leerink LLC has received compensation for providing non-securities services to Bio-Techne Corporation.

This document may not be reproduced or circulated without our written authority.

© 2020 SVB Leerink LLC. All Rights Reserved. Member FINRA/SIPC. SVB Leerink LLC is a member of SVB Financial Group.
EQUITY RESEARCH TEAM

RESEARCH MANAGEMENT
Jim Kelly
Director of Equity Research
(212) 277-6096
jim.kelly@svbleerink.com

Geoffrey C. Porges, MBBS
Director of Therapeutics Research
(212) 277-6092
geoffrey.porges@svbleerink.com

Christian Clark
Vice President
(212) 277-6117
christian.clark@svbleerink.com

DIVERSIFIED BIOTECHNOLOGY
Geoffrey C. Porges, MBBS
(212) 277-6092
geoffrey.porges@svbleerink.com

Bradley Canino, CPA
(212) 277-6158
bradley.canino@svbleerink.com

Neil Puri, M.D., MBA
(212) 277-6139
neil.puri@svbleerink.com

Ke (Andrew) Yuan, CFA, CPA
(212) 277-6147
ke.yuan@svbleerink.com

TARGETED ONCOLOGY
Andrew Berens, M.D.
(212) 277-6108
andrew.berens@svbleerink.com

Thomas J. Smith
(212) 277-6069
thomas.smith@svbleerink.com

Gang Li, Ph.D.
(212) 277-6185
gang.li@svbleerink.com

IMMUNO-ONCOLOGY
Daina M. Graybosch, Ph.D.
(212) 277-6128
daina.graybosch@svbleerink.com

Dilip Joseph
(212) 277-6148
dilip.joseph@svbleerink.com

EMERGING ONCOLOGY
Jonathan Chang, Ph.D., CFA
(617) 918-4015
jonathan.chang@svbleerink.com

John C. Barrett, Ph.D.
(617) 918-4039
john.barrett@svbleerink.com

David Ruch
(617) 918-4817
david.ruch@svbleerink.com

GENETIC MEDICINE
Mani Foroohar, M.D.
(212) 277-6089
mani.foroohar@svbleerink.com

Rick Bienkowski, Ph.D.
(212) 277-6109
rick.bienkowski@svbleerink.com

Aravinda Kuntimaddi, Ph.D.
(212) 277-6148
aravinda.kuntimaddi@svbleerink.com

IMMUNOLOGY & METABOLISM
Thomas J. Smith
(212) 277-6069
thomas.smith@svbleerink.com

Dylan Dupuis, Ph.D.
(212) 277-6151
dylan.dupuis@svbleerink.com

NEUROSCIENCE
Marc Goodman
(212) 277-6137
marc.goodman@svbleerink.com

Roanna Ruiz, Ph.D.
(212) 277-6144
roanna.ruiz@svbleerink.com

Rudy Li, Ph.D.
(212) 277-6127
rudy.li@svbleerink.com

RARE DISEASE
Joseph P. Schwartz
(617) 918-4575
joseph.schwartz@svbleerink.com

Joori Park, Ph.D.
(617) 918-4098
joori.park@svbleerink.com

GENERICS, INFECTIOUS DISEASE, PAIN, WOMEN'S HEALTH, OTHER THERAPEUTICS
Ami Fadia
(212) 277-6047
ami.fadia@svbleerink.com

Eason Lee
(212) 277-6070
eason.lee@svbleerink.com

Sheldon Fan, Ph.D.
(212) 277-6074
sheldon.fan@svbleerink.com

LIFE SCIENCE TOOLS & DIAGNOSTICS
Puneet Souda
(212) 277-6091
puneet.souda@svbleerink.com

Westley Dupray
(617) 918-4549
westley.dupray@svbleerink.com

Scott Mafale
(212) 277-6107
scott.mafale@svbleerink.com

MEDICAL DEVICES, CARDIOLOGY
Danielle Antalffy
(212) 277-6044
danielle.antalffy@svbleerink.com

Rebecca Wang, CFA
(212) 277-6087
rebecca.wang@svbleerink.com

MEDICAL DEVICES, ORTHOPEDICS
Richard Newitter
(212) 277-6073
richard.newitter@svbleerink.com

Jaime L. Morgan
(212) 277-6073
jaime.morgan@svbleerink.com

EMERGING HEALTHCARE TECHNOLOGIES
Daniel Grosslight
(212) 277-6140
daniel.grosslight@svbleerink.com

EDITORIAL
SR. EDITOR/SUPERVISORY ANALYST
Mary Ellen Eagan, CFA
(617) 918-4837
maryellen.eagan@svbleerink.com

SUPERVISORY ANALYSTS
Randy Brougher
randy.brougher@svbleerink.com

Robert Egan
bob.egan@svbleerink.com

Amy N. Sonne
amy.sonne@svbleerink.com

EDITORIAL ASSOCIATE
Emily Singletary
(212) 277-6115
emily.singletary@svbleerink.com