Epigenomics

(PrimeAll, Health Care)

WARBURG RESEARCH

Buy

EUR 3.80

Price	EUR 1.45
Upside	162.1 %

Value Indicators:	EUR
DCF:	3.80

Share data:	
Bloomberg:	ECX GR
Reuters:	ECXN.DE
ISIN:	DE000A11QW50

Description:

Development and distribution of diagnostic products

Market Snapshot:	EUR m
Market cap:	52.2
No. of shares (m):	36.0
EV:	50.1
Freefloat MC:	52.2
Ø Trad. Vol. (30d):	43.89 th

Shareholders:	
Freefloat	100.0 %
Deutsche Balaton AG	*13.6 %*
Can Reach International Ltd.	*5.5 %*
Cathay Fortune Intern. Ltd.	*4.8 %*
683 Capital	*3.8 %*

Risk Profile (WRe):	2019e
Beta:	2.1
Price / Book:	11.4 x
Equity Ratio:	37 %

Protecting lives with convenient cancer detection test; Initiation with Buy

Epigenomics is developing and marketing liquid biopsy tests for the early detection of different types of cancer. Its leading product, Epi proColon for the detection of Colorectal Cancer (CRC), is based on Septin9, a DNA methylation biomarker. The blood-based test is approved in the European Union and received FDA approval in the US in April 2016.

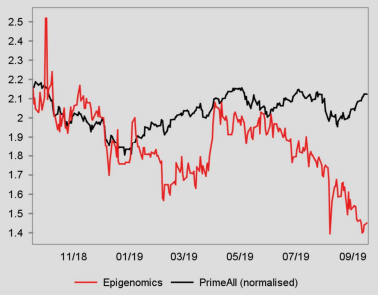
The company applied for a National Coverage Determination (NCD) in the US by the Center of Medicare Services (CMS) in early 2019. However, CMS has not yet started the determination process, to our knowledge due to resource limitations. Once started, a decision should be available within at least nine months. If a NCD is achieved, Medicare will pay for the costs involved. The company is also exploring the legislative path to secure national coverage. However, the legislation timeline and potential outcome is subject to uncertainty. Currently Epi proColon is not included in the treatment guidelines of the American Cancer Society as it represents a new technique.

In the case of a positive CMS decision, we expect sales of the Epigenomics test kit to increase significantly. There is a high need for a convenient and easy method to handle cancer screening tests in the US. Despite efforts to improve screening rates, more than 30 million patients have not yet been screened for CRC, one of the cancers with the highest mortality rates worldwide. In view of this, a quick market uptake and market share gains are to be expected.

Nevertheless, from a financial standpoint, the company will have to invest heavily in marketing and sales to spur growth immediately. This will initially result in continued operating losses and capital need. We expect the company to break even at operational level in 2022 when approaching a market share of approx. 3% of the currently unscreened patient population. Based on our assumptions that the company will receive an NCD and the test kit will subsequently enjoy a quick sales uptake, we derive a DCF-based fair value of EUR 3.80 per share.

Risks include the reliance on distributors, the potential entry of competitors to the market or an unsuccessful NCD process. In our view it is obvious that Epigenomics needs to achieve an NCD to guarantee the economic and financial success of its test kit in the US. Otherwise, it is unlikely that a sufficiently high number of tests will be sold in an economical and cost-effective manner, and revenues recognised will be rather meaningless.

We initiate coverage of Epigenomics with a Buy rating and a DCF-based PT of EUR 3.80.



Rel. Performance vs PrimeAll:

1 month:	-15.6 %
6 months:	-19.9 %
Year to date:	-33.7 %
Trailing 12 months:	-28.1 %

Company events:

06.11.19	Q3
27.03.20	Prelims 2019
14.05.20	AGM

FY End: 31.12. in EUR m	CAGR (18-21e)	2015	2016	2017	2018	2019e	2020e	2021e
Sales	132.7 %	2.1	4.2	1.9	1.5	2.0	9.4	19.3
Change Sales yoy		n.a.	101.8 %	-55.6 %	-17.8 %	30.1 %	372.1 %	105.2 %
Gross profit margin		*43.6 %*	*61.1 %*	*86.8 %*	*71.3 %*	*76.2 %*	*82.1 %*	*83.1 %*
EBITDA	-	-8.6	-12.0	-9.9	-12.6	-14.0	-15.5	-14.3
Margin		*-412.9 %*	*-284.6 %*	*-533.6 %*	*-821.1 %*	*-704.2 %*	*-164.7 %*	*-73.9 %*
EBIT	-	-9.3	-12.3	-10.3	-12.9	-14.5	-16.0	-14.8
Margin		*-445.0 %*	*-293.1 %*	*-552.0 %*	*-841.2 %*	*-728.3 %*	*-169.8 %*	*-76.4 %*
Net income	-	-9.0	-11.2	-10.2	-12.7	-14.0	-16.0	-14.8
EPS	-	-0.52	-0.55	-0.44	-0.47	-0.39	-0.44	-0.41
EPS adj.	-	-0.52	-0.55	-0.42	-0.49	-0.39	-0.44	-0.41
DPS	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dividend Yield		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FCFPS		-0.47	-0.67	-0.44	-0.36	-0.41	-0.50	-0.51
FCF / Market cap		-10.8 %	-14.9 %	-8.8 %	-14.0 %	-28.6 %	-34.7 %	-35.4 %
EV / Sales		33.6 x	18.9 x	55.8 x	37.5 x	25.1 x	7.2 x	4.5 x
EV / EBITDA		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EV / EBIT		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
P / E		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
P / E adj.		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FCF Potential Yield		-11.9 %	-13.6 %	-9.4 %	-20.6 %	-27.1 %	-22.7 %	-16.5 %
Net Debt		-7.3	-12.2	-7.2	-17.1	-2.1	16.0	34.4
ROCE (NOPAT)		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Guidance:		Revenue of between EUR 2.0-4.0m, adj. EBITDA of between EUR -12.5m to -14.0m						

Analyst

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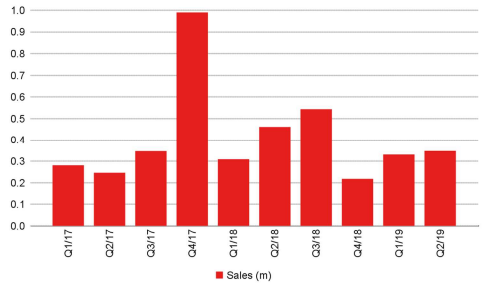
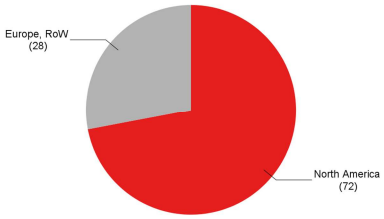
Sales development
in EUR m



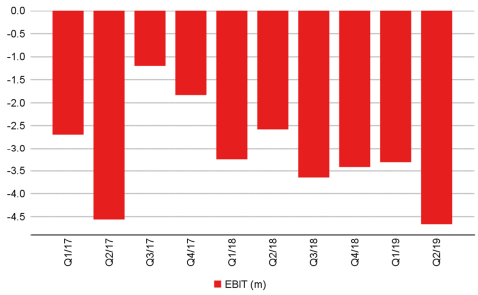
Source: Warburg Research

Sales by regions
2020e; in %



Source: Warburg Research

EBIT development
in EUR m



Source: Warburg Research

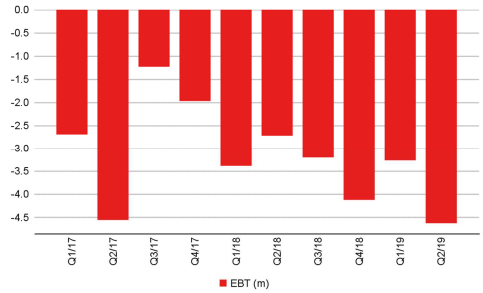
Company Background

- Epigenomics was founded in Berlin in 1998.
- Epigenomics is the innovator of the Septin9 test for the detection of different cancer types.
- The company received FDA-approval for its Septin9 colorectal cancer (CRC) test Epi proColon in April 2016.
- The patent-protected test kit is distributed directly by Epigenomics in Europe and Germany and by partners in North America.
- Following a patent challenge by a Chinese firm and an unfavourable decision by the Chinese Patent Office the product is currently not distributed in China.

Competitive Quality

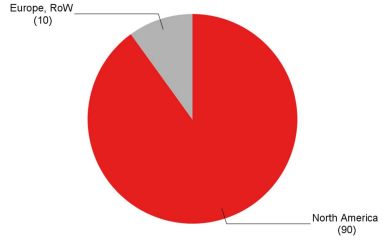
- Epi proColon is a convenient and innovative blood test for the early detection of cancer.
- Epigenomics has an early-mover advantage with its blood-based cancer test, which should help raise awareness of Epi proColon and secure high market share once it is included in the national reimbursement list in the US.
- The current available tests are less convenient (stool-test) and more time-consuming (colonoscopy) than blood-tests. Surveys show a high acceptance rate for tests that are easy to perform, like Epi proColon.

EBT development
in EUR m



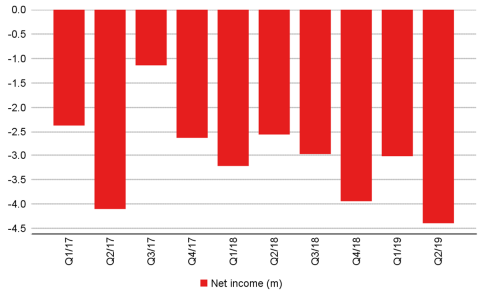
Source: Warburg Research

Sales by regions
2023e; in %



Source: Warburg Research

Net income development
in EUR m



Source: Warburg Research

Summary of Investment Case

Investment triggers

- Epigenomics has developed a CE-certified and FDA-approved blood-based test, Epi proColon, to detect colorectal cancer (CRC), the second deadliest cancer type in the US.
- The official aim in the US is to detect developing cancer at an early stage to prevent late-stage CRC and related costs. To achieve this target, 80% of the pre-defined patient population should undergo cancer screening on a regular basis. However, by using the current available tests, this target was not achieved. Approx. 35% of the target group remains unscreened.
- The current available tests are less convenient (stool-test) and more time-consuming (colonoscopy) than blood tests like Epi proColon. In view of this, surveys show a high acceptance rate for such easy-to-perform tests, which would result in a high market share of Epi proColon.
- Due to the growing need to detect cancer early, also from a cost perspective, and the greater willingness of patients to undergo a convenient method of screening, we expect high sales growth once national coverage in the US is received (group sales CAGR 2020-2023: 98%).
- The successful development and launch of new test kits for further cancer types could add additional volume growth.

Valuation

- DCF model suggests a fair value of EUR 3.80 per share, which is taken as our initial price target, assuming national coverage in the US. In a worst-case scenario, no national coverage, we derive a value of only EUR 0.14 per share.
- A peer group comparison is not meaningful given the current low sales level of Epigenomics and as losses will be recorded for several years given the high level of marketing spending necessary. We assume breakeven at net-profit level in 2023.

Growth

- We assume Epi proColon will be used in approx. 3% of the currently unscreened US patient population (more than 30m people) by 2023, and will expand to 5% by 2025. This should secure ongoing double-digit percentage sales growth over the time period.
- We expect the company to break even at operating level in 2022 driven by high revenue growth. However, the breakeven point is subject to the required marketing expenditure to guarantee a high share in the US CRC screening market.

Competitive quality

- Epigenomics has an early-mover advantage with its innovative cancer blood test, which should raise the awareness of Epi proColon and ensure it gains a high market share.
- The convenience of a blood-based test should result in a high acceptance rate among the addressed target group.
- Patent protection is secured for the main markets, North America and Europe. In China, a patent dispute is ongoing and is currently before the courts. A decision is not expected in the short term.

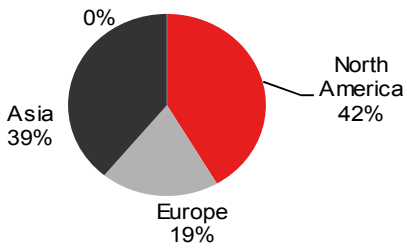
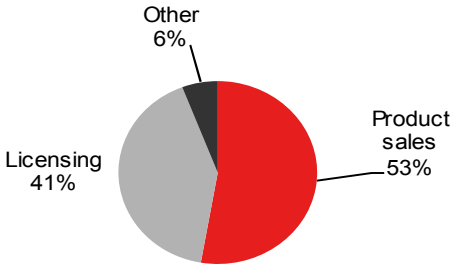
Risk

- Epigenomics needs to achieve an NCD to guarantee economic and financial success of its test kit. Otherwise there is the risk that realised revenues will be negligible.

Warburg versus consensus

- In regard to the current fiscal year, our estimates are somewhat below consensus expectations.
- Despite the wide variety of estimates it is to observe that breakeven at net-income level is expected in 2023.
- The stock is covered by two other analysts.

Company Overview

	Epigenomics			
				Group
Products	Epi proColon	HCC BloodTest	Epi proLung	
Product description	blood-based colorectal cancer test, minimal-invasive	blood-based test for cirrhosis; liver cirrhosis is a major risk for developing liver cancer (HCC)	blood-based test for detecting tw o genes that serve as an indicator for lung cancer	
Competitors	Colonoscopy in general, stool-tests (for example: Exact Sciences' Cologuard)	Ultrasound, computed tomography (CT)	Low -dose computed tomography (LDCT)	
Sales FY 2018 (tsd EUR)				1,533
EBIT 2018 (tsd EUR)				-12,895
Sales 2018 by regions/ by type				

Source: Warburg Research

Competitive Quality

- Convenient and innovative liquid biopsy test for the early detection of cancer
- Early-mover advantage for the blood-based colorectal cancer (CRC) test, which should help raise awareness of Epi proColon and secure a high market share once it is included in the national reimbursement list in the US
- Epigenomics requires a National Coverage Determination to guarantee economic and financial success of its test
- Low sensitivity of Epi proColon compared to other CRC tests may be seen as a problem. However, recent studies show that interval is critical.
- Microsimulation model will highlight positive impact of blood-based tests on screening rates

Detecting cancer with a few drops of blood

Epigenomics, the cancer detection company

Innovative blood-based cancer test

Epigenomics operates in the field of liquid biopsy cancer molecular diagnostics with a focus on the US market. The products are based on the technologies platform of the detection of DNA methylation changes which have been found occurring in cancer cells. Only a small amount of blood has to be taken to perform the test. This could be done in the course of an annual check-up at the general practitioner. Overall the test kits are designed to enable the early and accurate detection of different types of cancer to reduce mortality rates and lower the overall healthcare costs.

So far Epigenomics has launched three products on the market in the fields of colorectal cancer ("Epi proColon"), liver cancer ("HCCBloodTest") and lung cancer ("Epi proLung"). Epi ProColon has been approved for use in the US since April 2016 and within the European Union. HCCBloodTest and EPI proLung are currently approved for the European market only. The company's aim is to initiate a prospective US trial for the FDA submission of the HCCBloodTest at the end of 2019.

Epi proColon could help to achieve the official screening target rate for CRC in the US

The official target in the US is to screen 80% of the average-risk patients aged between 50 and 75 years for colorectal cancer (CRC). The problem is that many of the patients offered a colonoscopy, which is an invasive and time-consuming method, or a stool-based fecal immunochemical test (FIT) decline to participate. Currently approx. 35% of the addressed patient population is unscreened, meaning more than 30 million people. A study published in the American Health Drug Benefits Journal has shown that due to the generally positive sentiment towards colorectal cancer blood-tests compared to the other invasive and non-invasive options, the official cancer screening rate goal of 80% could be achieved.

Microsimulation model

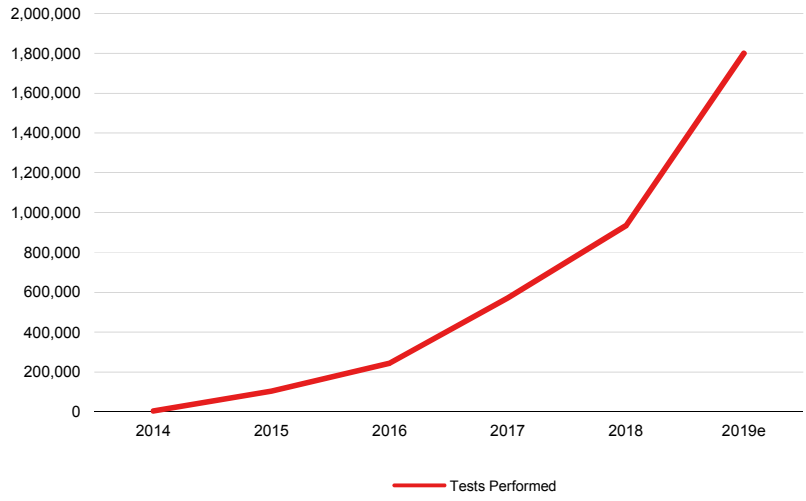
In view of this, the aim of the company is to show that a screening with a blood-based test like Epi proColon with a sensitivity of 68% will also result in a high detection rate of potential colorectal cancer patients if conducted on an annual basis. The outcome of the company-sponsored study, the so-called microsimulation model, will be published in a scientific magazine most likely in autumn. The model was completed by academic experts at Harvard with the input received from key opinion leaders. The model includes a comparison between blood-based tests like Epi proColon and other screening methods to highlight the importance of patient adherence to the effectiveness of screening tests on life years gained. The study results should show Epi proColon in a favourable light if

the test is used as a screening tool by patients in an annual interval over a certain time period of for example three years, as CRC is a slow-growing cancer. In view of this, the study results may help to obtain a positive decision from CMS.

US National Coverage Determination is decisive

Epigenomics is currently employing two channels in order to obtain the approval of the Centers for Medicare & Medicaid Services' (CMS) for Epi proColon coverage. If a so-called National Coverage Determination (NCD) can be achieved, Medicare will pay for the costs involved. In view of this, it becomes clear that Epigenomics needs to achieve an NCD to guarantee economic and financial success of its test kit. Otherwise it is unlikely that a high number of tests will be sold in an economical and cost-effective manner. To achieve an NCD, Epigenomics has requested such a decision process by CMS. However, at the same time the company is exploring the legislative path, which could also result in an NCD. Currently the decision process has not yet been initiated by CMS owing to limited resources at the US Federal Agency. On the political side, a draft bill was introduced but the timeline is unclear and, in our view, not predictable.

Exact Science's Cologuard stool test received NCD in late 2014



Source: Exact Science, Warburg Research

The graph above shows the impact of a positive NCD decision on product sales: Exact Science is a company based in the US, which developed a stool-based DNA test, called Cologuard, for the detection of colorectal cancer. The advantages of the test kit are directly comparable to Epigenomics' test: non-invasive and easy-to-use. In late 2014 Exact Sciences received the positive coverage decision (NCD) for Cologuard for the detection of colorectal cancer in adults aged 50 years or older and at average risk. As shown above, the sales of Cologuard soared in the following years. Important to know is that the company invested heavily in marketing and selling to raise awareness among patients and doctors in order to guarantee a successful sales uptake.

Regular channel: National Coverage Determination by CMS

In May 2019, Epigenomics announced that its application for a National Coverage Determination (NCD) review for Epi proColon had been accepted by the Centers for Medicare & Medicaid Services (CMS). CMS has not yet started the determination process due resource limitations but we expect the company will make an announcement once the process has started.

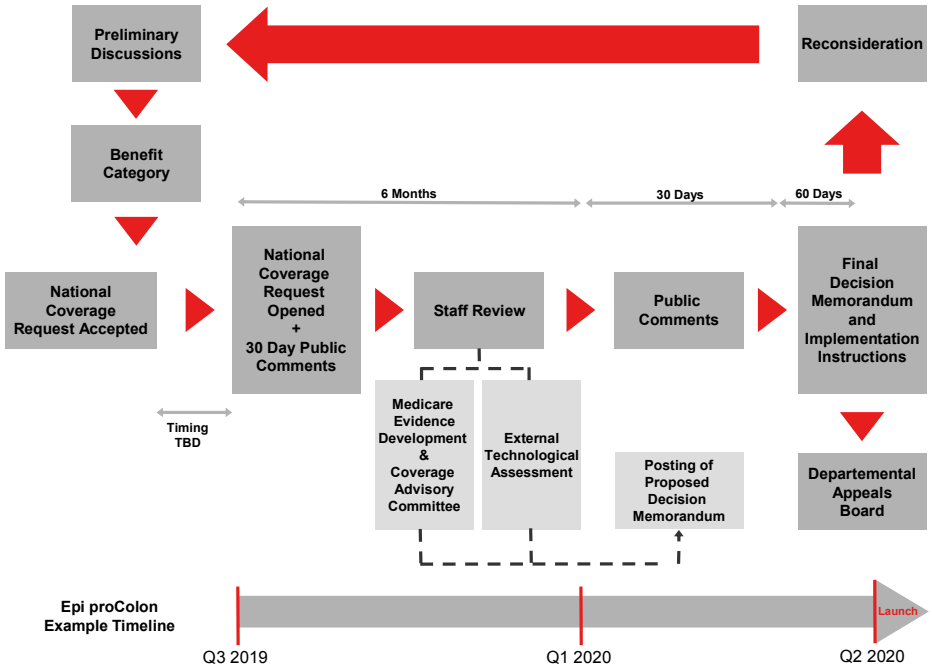
Medicare covers only certain services or items that are deemed to be "reasonable and necessary" for treatment or diagnosis of the disease or injury in question. In the course

of the NCD process, the CMS will determine whether Epi proColon fulfils the reimbursement requirements. In April 2016, Epi proColon received FDA approval, which implies that the benefits of the test are greater than the apparent risk involved when utilized for the intended purpose. Moreover CMS set the final price for Epi proColon at USD 192 per blood test, which was welcomed by Epigenomics as it was in line with regional Medicare insurance carriers and adequately reflected the value of the test.

Prior to the Final NCD Memorandum, CMS will release a Proposed Decision Memorandum. Due to ongoing resource constraints, this process is not initiated immediately after the application acceptance. The memorandum is initiated by a 30-day public comment period, which includes public hearings by relevant stakeholders. Then it is determined whether Epi proColon is within the scope of a Medicare benefit category meaning that it is "reasonable and necessary" for the diagnosis of colorectal cancer. A National Coverage Request will be issued and reviewed by CMS staff. Subsequently, the CMS drafts a decision and posts the Memorandum, within six months of its initiation. In case of a positive decision regarding coverage, an additional 30-day public comment period follows. The Final Decision Memorandum is published within 90 days of the initial drafted decision and comprises implementation instructions, which will become effective immediately.

Path to achieving national coverage

Medicare National Coverage Determination Process



Source: Company, Warburg Research

The back door: the legislative path

In March 2018 the "Colorectal Cancer Detection Act of 2018" was introduced in the US Senate in a bi-partisan way, meaning that it was supported by members of both political parties, Democrats and Republicans, thus increasing the chance of success. This Senate Bill was parallel to the "H.R. 6275: Donald Payne Sr. Colorectal Cancer Detection Act of 2016", which was reintroduced in the US House of Representatives in 2017 and in 2018 as "H.R. 6062". Its primary goal is the coverage and reimbursement under the Medicare program of FDA-approved colorectal cancer screening blood tests, such as Epigenomic's leading product Epi proColon. The company worked with the Congressional Budget Office providing it with information to prepare a cost estimate of how much it would cost the Medicare system once it passed a full committee of either the House or Senate.

In March 2019 bill "H.R. 6062" was reintroduced in the House as "H.R. 1765" and the bill is currently at the first stage of the legislative process. After the introduction of the Bill in the House of Representatives, it has to be voted on by the representatives and will be subsequently passed on to the Senate if it secures a majority. The US President will have the chance to veto the Bill or pass it into law, conditional on whether the Senate has reached a majority. A veto can be overridden by a subsequent two-thirds majority vote in the Senate. Furthermore a revised version of the bi-partisan "S.2523: Colorectal Cancer Detection Act of 2018" is expected to be introduced shortly in the Senate. This would also be put to a vote by the House and Senate before being approved by the President.

Another option that is being considered is to include the amendment into a larger Bill, which would then proceed to a vote. Due to the bi-partisan support for the legislation, the board of management sees a realistic chance that the bill will be enacted in 2019.

Preventing colorectal cancer: How efficient is Epi proColon?

While the FDA approval implies that the benefits of the Epi proColon test are greater than the apparent risk involved when utilised for the intended purpose, the test kit will only make it onto the national reimbursement list if it represents a clinical advance, resulting in a significant health benefit if made available to more patients.

Here the key measures of diagnostic test kits, sensitivity and specificity, come into play. In the following paragraph we introduce these key measures. The following critical analysis will show that the relatively low sensitivity of Epi proColon could be seen as a problem of the test. It becomes apparent that it lags behind other already marketed CRC tests like Exact Science's stool-test "Cologuard", which received national coverage at the end of 2014. However, as interval is crucial, acceptance rates seemed to be of high importance. Epi proColon was not included in the treatment guidelines for CRC, published by the American Cancer Society (ACS) in spring 2019, which was a clear disappointment. As the treatment guidelines are not updated on a regular basis, it is not foreseeable when the next guidance update will be published or if Epi proColon will be included in it. In view of this, the intention of the Epigenomics management is to improve the prospects of having the test reimbursed by CMS or by other means.

Scientific background: Sensitivity versus specificity

Diagnostic statistics can be broken down into the principles of sensitivity and specificity. The sensitivity of a diagnostic is the probability of identifying a condition, given that the patient actually has the condition, whereas the specificity of a diagnostic is the probability that the condition is falsely identified, given that the patient doesn't have it. The implications of these metrics are as follows: having a high sensitivity is crucial to the significance of a diagnostic, as otherwise affected patients would be left untreated, which could obviously result in detrimental outcomes; having a high specificity is also important, otherwise patients without a condition are diagnosed with having a condition. Even though it can be argued that a high sensitivity is the more important metric, it is fundamental for a diagnostic to have both a high sensitivity and specificity, in order to ensure that correct and non-redundant treatment plans are assigned to patients.

Sensitivity and specificity of CRC tests

Test	Sensitivity	Specificity	Cost (USD)	interval (a)
Epi proColon	68%	80%	192	1
Cologuard	92%	87%	649	3
Colonoscopy	94%	98%	approx. 1,000	10
FIT (InSure ONE)	74%	95%	59	1

Source: CMS, Companies, Warburg Research

Sensitivity of Epi proColon a point of discussion, but interval is crucial

Epi proColon exhibits a sensitivity of 68%, which means statistically that the blood test will not detect colorectal cancer in 32/100 people who have the condition. On the other hand it assures a specificity of 80%, which falsely indicates the presence of colorectal cancer in a statistical 20 in 100 individuals.

Stool tests also have a low sensitivity (74%) but a higher specificity. Generally speaking, stool tests are thus comparable in terms of sensitivity.

Colonoscopy, however, exhibits 94% sensitivity and a specificity of 98%, which makes it the most reliable colorectal detection procedure. Furthermore a positive yielding non-invasive test like Epi proColon blood-test will have to be followed by a colonoscopy, due to its high accuracy. Another advantage of colonoscopy is that if cancer precursors are detected, they can be removed during the colonoscopy procedure without the need for further surgery. However colonoscopy is perceived by many as highly distressing and uncomfortable.

Surveys have shown that currently only one in seven patients that have discussed the benefits of colorectal cancer prevention test regularly undertake such measures. As a consequence 60% of colorectal cancer patients are only diagnosed once the cancer has already spread to other organs, making treatment increasingly difficult. When detected early, the five-year survival rate for colorectal cancer is 90%, but if detected at a later stage and the cancer has spread to other organs, the survival rate is only 19%.

Blood tests: highly convenient, not time-consuming and cost-effective

In an adherence study, 172 individuals that had to undergo some form of preventive colorectal cancer test were given the option of undergoing a colonoscopy. Nevertheless 63% declined. These participants were requested to take a non-invasive test such as a blood-test or a stool-test. 83% chose the blood-test compared to only 15% who opted for the stool-test, which shows not only the demand for non-invasive alternative tests in general but also the preference for blood-tests, like Epi proColon.

A non-invasive blood-test is likely to increase participation in preventive cancer measures, as it is likely to encounter less reluctance than alternatives like colonoscopy or a stool test. This is the clear advantage of Epi proColon. This higher participation leads to lower death rates and lower costs for healthcare providers covering expensive late cancer treatments. This is especially true considering that early-stage colorectal cancer is relatively easy to treat. Hence if Epi proColon was more widely available, it would drive down treatment costs, as patients would be more likely to participate in a test, which causes less distress for the patient. In return, healthcare providers would have to cover a greater number of early cancer treatments than late-stage cancer treatments, which would enhance profitability on the basis of the comparatively lower costs of early-stage treatments.

A study in the American Health Drug Benefits Journal has shown that the generally positive sentiment towards blood-based tests for colorectal cancer compared to the other invasive and non-invasive testing options could support the achievement of the official cancer screening rate goal of 80% in the US. A higher screening rate also comes with positive knock-on socio-economic effects such as minimising the time of absence from work or reducing transfer payments granted to individuals unable to work.

Despite the advantages, the Epi proColon blood test is not yet covered by the CMS and patients pay for the tests from their own pockets. However the management board is confident, that approval either by legislation or the NCD process will lead to coverage shortly.

In contrast, colonoscopy is already covered by the CMS once every 36 to 120 months, depending on the findings of the test and the individual risk level for colorectal cancer. Based on the health plan held by the individual patient, deductibles can range from USD 0 to 1,000, which would make Epi proColon a significantly less expensive alternative at USD 192, which is also based on the higher accuracy and complexity of the test.

In Germany, colonoscopy is covered by public statutory health insurance in Germany for individuals over the age of 55 without an enhanced risk of developing cancer. Epi proColon is not covered by statutory health insurance in Germany and patients face costs of between EUR 99 and EUR 161.

Analysis of Return on Capital

- Low capital intensity as focus is on development and marketing of cancer test kits
- High capital need to secure successful market launch in the US and development of tests for additional cancer types
- Dynamic top-line growth should drive profitability
- We expect breakeven at operating level by 2022
- ROCE to remain negative for the time being

Low capital intensity, high marketing investment

Capital employed

Epigenomics has no own production sites and the Epi proColon test is produced by a contract manufacturer. The company employs approx. 40 people and its main operations are conducted in a rented office space in Berlin. As a consequence capital intensity is low. Tangible assets amounted to less than EUR 1m or 3% of total assets in 2018. The same is true for intangible assets, which amount to approx. 2% of total assets. This is because R&D expenditure is not capitalised and there were no major M&A activities to cause high goodwill positions.

Working capital

Working capital requirements are currently low due to the rather limited operating activity. In our view, the working capital ratio will, in future, be mainly determined by days sales outstanding (DSO). In this context, we regard the company's business focus on North America, rather than emerging markets, as an advantage. However, we take a conservative approach and calculate with a DSO period of around 50 days.

CAPEX and FCF

Due to its low capital intensity we have incorporated only minor capital expenditure requirements. We expect free cash flow to remain negative for the period 2019-2021, considering the high requirements for sales and marketing. If business development is positive we would also expect the company to initially invest in further diagnostic kits to cover additional cancer types like HCC.

Financing

To finance the US market launch and corresponding marketing measures, the company will depend on external financing. Given the delayed CMS decision regarding the inclusion of Epi proColon on the national reimbursement list, we assume that additional financing needs to be secured shortly. A successful capital increase in late 2018 secured the company a cash inflow of approx. EUR 22m.

ROCE to remain negative until 2022

Despite the high growth the initial need for high sales and marketing expenditure will remain a drag on operating margins. Additionally, we would expect the company to intensify its R&D initiatives, following a positive CMS decision, to broaden its product base. In view of this, we calculate that breakeven at operating level will be achieved in 2022 at the earliest.

Growth / Financials

- A positive National Coverage Determination by CMS would be the breakthrough and would drive top-line growth
- We calculate with a top-line CAGR of 98% for the time period 2020-2023
- High sales and marketing requirements will delay breakeven at operating level until 2022
- In a worst-case scenario, NCD is not granted and sales and earnings will remain at an unsatisfying level

High sales growth expected if NCD is granted

Revenue growth

North America will be the key market

We assume revenues will mainly be generated in North America, once reimbursement for Epi proColon is secured by CMS. Europe will initially continue to contribute a rather minor revenue stream as the company's focus will be on commercialisation in the US In this profitable market, Epi proColon would cover an unmet medical need, providing a convenient and reliable CRC test. We assume a launch in North America in 2020. We do not include any revenue contribution from China in our model given the current unfavourable patent situation in the region.

The sales uptake in NA will depend on the amount spend for advertising and the response of the addressed target group. According to the company there are a sufficient number of laboratories available to perform the test, as the payment they receive to perform the test is high (approx. USD 92). We expect the company to exceed the 100,000-mark in terms of the number of tests sold in the first full year of marketing, which would be 2021 according to our planning.

Revenues by regions

in EUR m	2020	2021	2022	2023	2024	2025	2026
Revenues	9.4	19.3	40.5	73.0	114.4	143.3	168.4
- y-o-y	372%	105%	110%	80%	57%	25%	18%
North America	6.7	15.6	35.7	67.0	107.1	135.0	159.3
- y-o-y	--	133%	129%	88%	60%	26%	18%
Europe	2.7	3.7	4.8	6.0	7.2	8.3	9.1
- y-o-y	--	36%	30%	25%	20%	15%	10%
China, RoW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- y-o-y	--	--	--	--	--	--	--

Source: Warburg Research

European market too fragmented to explore for now

The fragmented European market makes cost-efficient marketing of the test kit difficult. The build-up of a European-wide distribution network would require lengthy and cost-intensive state-by-state negotiations regarding potential reimbursement. In view of this the roll-out would be time-consuming and without a guarantee of success. Nor is partnering an easy way as several examples in the industry have shown.

Patent dispute puts activities in China on hold

China is an interesting market for Epigenomics due to the high occurrence rates of colorectal cancer. However Epigenomics is facing some patent issues following a patent infringement by a Chinese firm detected in 2017 and the following unfavourable decision by the Chinese patent office CNIPA, announced on July 15, 2019. CNIPA decided that the patent does not cover blood-based samples. Epigenomics has appealed the

decision. However, a court decision is not expected in the short term.

For the time being Epigenomics is not in a position to discuss (new) distribution partnership agreements and will therefore not be able to realise the full value of its test kit in the Chinese market. The collaboration with the Chinese firm BioChain was terminated by Epigenomics in March 2019. The partnership was established in 2016. As the outcome of the patent dispute is uncertain, licensing revenues are not included in the FY guidance of Epigenomics or in our estimates.

Worst-case scenario: No national coverage granted in the US

In view of the strategic position in China and the fragmented European market, it becomes apparent that a positive CMS decision will be decisive to achieve satisfying top-line growth. Or, as mentioned above, an NCD is necessary to guarantee the economic and financial success of the company's test kit.

In a worst-case scenario simulation, we would assume only minor sales of up to EUR 4m in 2021 and EUR 10m by 2027. With only minor investments in R&D, breakeven at operating level could be achieved in 2023 and at net level, potentially in 2024. A DCF-model simulation would derive a fair value of EUR 0.14 per share.

Earnings growth

High sales and marketing costs expected initially

Our model includes only a small payment to Epigenomics' contract manufacturing partners for the test (~USD 15). Additionally, a low double-digit amount has to be paid to its non-exclusive US distribution partner Polymedco. Less the fee paid to labs to perform the test, an attractive profit remains for Epigenomics. This will help to cover the general administration costs and necessary R&D expenditure. We expect development costs to remain high to fulfil necessary post-approval requirements for Epi proColon but also for the development of further tests like the HCC kit. However, a main cost component will be advertising expenditure. As seen for other companies releasing CRC test kits, high amounts have to be spent to motivate patients to request the test from their GPs and to include it in their annual medical check-ups. The exact amount necessary is subject to high uncertainty. The initial response and sales uptake will determine the amount required. Based on our assumptions, we expect the company to break even at operating level on sales of approx. EUR 40m, which is likely to be achieved in 2022. At net level, we would expect the company to become profitable at least one year later.

Epi proColon – underlying assumptions North America

North America	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Patient population US, in	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0
- thereof unscreened	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5
- market share ECX	0.2%	0.6%	1.3%	2.5%	3.9%	5.0%	5.9%	6.7%	7.3%	7.8%	8.1%	8.3%
Tests sold	75,000	175,000	400,000	750,000	1,200,000	1,512,000	1,784,160	2,033,942	2,237,337	2,371,577	2,466,440	2,540,433
grow th y-o-y		133%	129%	88%	60%	26%	18%	12%	8%	6%	4%	3%
Reimbursement p. unit	192	192	192	192	192	192	192	192	192	192	192	192
inflation/sequstration p.a.												
Price per unit sold	100	100	100	100	100	100	100	100	100	100	100	100
Revenue, USD m	7.5	17.5	40.0	75.0	120.0	151.2	178.4	203.4	223.7	237.2	246.6	254.0
USD/EUR rate	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
Revenue, in EUR m	**6.7**	**15.6**	**35.7**	**67.0**	**107.1**	**135.0**	**159.3**	**181.6**	**199.8**	**211.7**	**220.2**	**226.8**
grow th y-o-y		133.3%	128.6%	87.5%	60.0%	26.0%	18.0%	14.0%	10.0%	6.0%	4.0%	3.0%

Source: Warburg Research

Cash requirements

It becomes obvious that the company will be dependent on external funding for a longer period of time, even after a successful launch in North America. Following a capital increase in late 2018, which raised gross proceeds of EUR 22.3m, we expect the next step in 2019. Initially the assumption was that, based on the cash raised in 2018, the

company would be financed well into 2020. However, the CMS process to review Epi proColon's inclusion in the national reimbursement list has still not started, which is delaying the realisation of its sales potential in the North American region. This, in combination with the current stand in China, has taken its toll. Current FY guidance calls for a cash burn of between EUR 13.5 and EUR 15.0m, somewhat higher than the usual cash burn rate of EUR 1m per month, owing to some special effects at the start of the year. We calculate that the company is in need of a cash inflow of at least EUR 5m to proceed well into 2020. As described above, we would expect the next capital measure to finance marketing expenditure, once a positive national coverage determination is received. We assume a positive CMS decision in H1 2020. However, if there is a successful reimbursement decision, the equity story should gain momentum, which should also be reflected in the share price. In view of this, it is difficult to calculate the potential dilution of further capital measures. We have decided to include the financial requirements by assuming an increase in net debt at this point in time.

Current business development

Guidance 2019

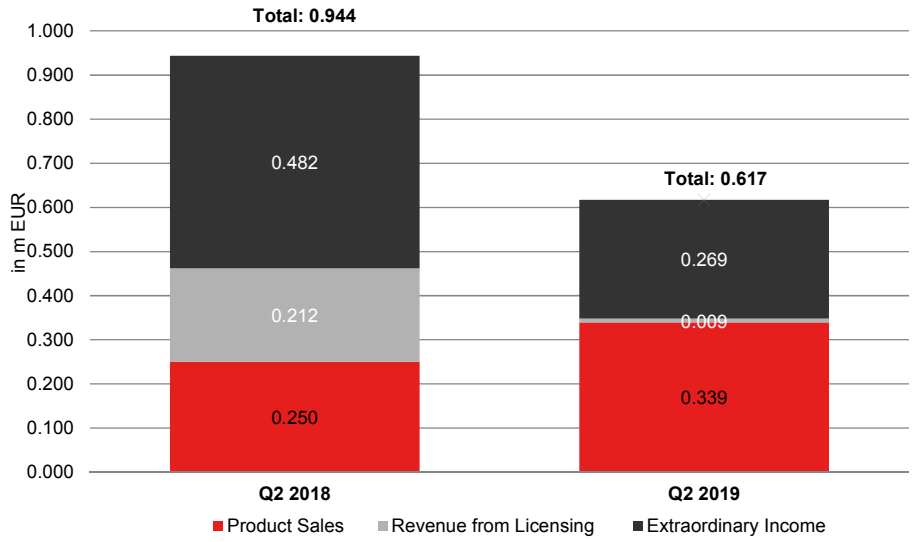
After the first half of 2019, the full-year sales guidance was revised downward from EUR 3-6m to EUR 2-4m. The guidance for adjusted EBITDA was narrowed and is now estimated to be between minus EUR 12.5m and minus EUR 14.0m (previously: minus EUR 11.5-14.0m).

With a loss of EUR 7.4m in H1 2019, Epigenomics expects to require new funding for 2020 in H2 2019 as liquidity levels have decreased to EUR 9.1m. Previously, the wording was “well financed into 2020”, a statement that was given under the assumption of faster entry to the decisive US market following a positive decision regarding national coverage. The cash burn is currently somewhat more than EUR 1m per month. However, FY cash consumption is expected to range between EUR 13.5m and EUR 15.0m due to payments in Q1 2019 with corresponding expenses already incurred in 2018.

Financial development in H1 2019

Compared to Q2 2018, total revenue decreased from EUR 0.462m to EUR 0.348m, which was primarily owing to a fundamental decrease in licensing income resulting from the termination of the Chinese partnership and commitment to the licensing agreement, which had a similar effect on the previous quarter, Q1 2019. Moreover, extraordinary income has significantly decreased resulting from the elimination of income from reversing provisions and a slight decrease in income from currency fluctuations in Q2 2019 to EUR 0.210m compared to EUR 0.247m in Q2 2018.

Revenue comparison: Q2 2018 vs. Q2 2019



Source: Company, Warburg Research

Compared to Q2 2018, there was a y-o-y increase of 52.3% in R&D costs and a y-o-y increase of 19.1% in selling, general & administrative costs in Q2 2019. Operating expenses for Q2 2019 thus totalled EUR 5.28m, a y-o-y increase of 50%. This, paired with a decrease in revenue, increased cash burn by 103% compared to Q2 2018, bringing the total to EUR 3.56m. This reduced cash reserves to EUR 8.44m at the end of Q2 2019.

Gross margins improved in Q2 2019 compared to Q2 2018, from 72.3% to 79.3%, resulting from a significant decrease in the cost of sales in Q2 2019.

DCF model

	Detailed forecast period			Transitional period										Term. Value
Figures in EUR m	2019e	2020e	2021e	2022e	2023e	2024e	2025e	2026e	2027e	2028e	2029e	2030e	2031e	
Sales	2.0	9.4	19.3	40.5	73.0	114.4	143.3	168.4	191.5	210.2	222.6	231.4	238.2	
Sales change	*30.1 %*	*372.1 %*	*105.2 %*	*109.7 %*	*80.1 %*	*56.7 %*	*25.3 %*	*17.5 %*	*13.7 %*	*9.8 %*	*5.9 %*	*4.0 %*	*3.0 %*	*3.0 %*
EBIT	-14.5	-16.0	-14.8	-0.4	27.9	39.5	44.9	51.9	55.8	57.5	58.9	58.3	58.1	
EBIT-margin	*-728.3 %*	*-169.8 %*	*-76.4 %*	*-0.9 %*	*38.3 %*	*34.6 %*	*31.3 %*	*30.8 %*	*29.1 %*	*27.4 %*	*26.5 %*	*25.2 %*	*24.4 %*	
Tax rate (EBT)	*3.3 %*	*0.0 %*	*0.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	
NOPAT	-14.0	-16.0	-14.8	-0.3	21.0	29.6	33.7	38.9	41.8	43.1	44.2	43.7	43.6	
Depreciation	0.5	0.5	0.5	0.8	1.3	1.8	1.9	1.9	1.9	2.1	2.2	2.3	2.4	
in % of Sales	*24.1 %*	*5.1 %*	*2.5 %*	*2.0 %*	*1.8 %*	*1.6 %*	*1.3 %*	*1.1 %*	*1.0 %*	*1.0 %*	*1.0 %*	*1.0 %*	*1.0 %*	
Changes in provisions	0.0	0.0	0.0	0.8	0.6	0.8	0.6	0.5	0.5	0.4	0.2	0.2	0.1	
Change in Liquidity from														
- Working Capital	0.4	1.6	2.2	4.8	10.1	10.3	7.2	6.3	5.8	4.7	3.1	2.2	1.7	
- Capex	1.0	1.0	2.0	4.1	6.6	8.0	7.2	6.7	7.3	7.6	7.6	6.9	4.8	
Capex in % of Sales	*50.1 %*	*10.6 %*	*10.3 %*	*10.0 %*	*9.0 %*	*7.0 %*	*5.0 %*	*4.0 %*	*3.8 %*	*3.6 %*	*3.4 %*	*3.0 %*	*2.0 %*	
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Free Cash Flow (WACC Model)	-14.9	-18.1	-18.5	-7.5	6.2	13.9	21.7	28.3	31.2	33.3	36.0	37.1	39.7	26
PV of FCF	-14.5	-15.8	-14.4	-5.3	3.9	7.8	10.9	12.7	12.5	12.0	11.6	10.7	10.3	77
share of PVs	**-37.34 %**			**72.73 %**										**64.60 %**

Model parameter

Derivation of WACC:		Derivation of Beta:	
Debt ratio	15.00 %	Financial Strength	3.00
Cost of debt (after tax)	4.5 %	Liquidity (share)	1.40
Market return	7.00 %	Cyclicality	1.00
Risk free rate	1.50 %	Transparency	2.00
		Others	3.00
WACC	**11.67 %**	**Beta**	**2.08**

Valuation (m)

Present values 2031e	42		
Terminal Value	77		
Financial liabilities	0		
Pension liabilities	0		
Hybrid capital	0		
Minority interest	0		
Market val. of investments	0		
Liquidity	17	No. of shares (m)	36.0
Equity Value	**137**	**Value per share (EUR)**	**3.80**

Sensitivity Value per Share (EUR)

		Terminal Growth						
Beta	WACC	2.25 %	2.50 %	2.75 %	**3.00 %**	3.25 %	3.50 %	3.75 %
2.29	12.7 %	3.08	3.12	3.16	3.21	3.25	3.30	3.35
2.19	12.2 %	3.34	3.39	3.44	3.49	3.54	3.60	3.66
2.13	11.9 %	3.48	3.53	3.58	3.64	3.70	3.76	3.83
2.08	11.7 %	3.63	3.68	3.74	**3.80**	3.86	3.93	4.00
2.03	11.4 %	3.79	3.84	3.91	3.97	4.04	4.11	4.19
1.97	11.2 %	3.95	4.01	4.08	4.15	4.23	4.31	4.40
1.87	10.7 %	4.31	4.39	4.47	4.55	4.64	4.74	4.85

		Delta EBIT-margin						
Beta	WACC	-1.5 pp	-1.0 pp	-0.5 pp	**+0.0 pp**	+0.5 pp	+1.0 pp	+1.5 pp
2.29	12.7 %	2.83	2.95	3.08	3.21	3.33	3.46	3.59
2.19	12.2 %	3.08	3.22	3.35	3.49	3.62	3.76	3.89
2.13	11.9 %	3.22	3.36	3.50	3.64	3.78	3.92	4.06
2.08	11.7 %	3.36	3.51	3.65	**3.80**	3.95	4.09	4.24
2.03	11.4 %	3.52	3.67	3.82	3.97	4.12	4.27	4.43
1.97	11.2 %	3.68	3.84	3.99	4.15	4.31	4.47	4.63
1.87	10.7 %	4.04	4.21	4.38	4.55	4.72	4.89	5.07

- Sales growth assumption of 3% from 2030 onwards reflects potential entry of new techniques or competitors
- Sales level in 2030ff reflects market share of approx. 8% of unscreened CRC population
- EBIT margin of 15% in terminal year in-line with margin level of established healthcare product companies
- Margin expectation also based on assumed higher necessary marketing efforts and spending

Convenient, easily-performed, life-saving cancer test

Company & Products

ECX operates in the field of liquid biopsy cancer molecular diagnostics with focus on the US market. The products are based on the technologies platform of the detection of **DNA methylation** changes which have been found occurring in cancer cells.

DNA methylation means that one of the four building blocks of the DNA, the nucleotide cytosine, is modified by adding a methyl group, which may affect the gene´s original function. This multiple methylation of the DNA pattern can be cell-type specific and often manifest in diseases, especially cancer. This serves as biomarkers for screening, diagnostic, prognostic and predictive purposes of diseases. The detection of DNA methylation changes can be carried out with commonly available instruments such as the polymerase chain reaction and Next Generation Sequencing all over the world. ECX has a broad patent portfolio for the DNA methylation in cancer.

So far, Epigenomics has three products on the market in the fields of colorectal cancer (Epi proColon), liver cancer (HCC BloodTest) and lung cancer (Epi proLung). Epi ProColon has been approved for use in US and European market whereas currently the HCC Blood test and EPI proLung only have approval for the European market.

Overall the products are designed to enable the early and accurate detection of cancer to reduce mortality rates and lower the overall healthcare costs.

Epi proColon – test for colorectal cancer (CRC)

The Epi proColon is the pioneer brand of ECX and is used as blood-based screening test for colorectal cancer and based on the detection of Septin9 DNA methylation in a blood sample. The Septin9 DNA is a biomarker that is highly correlated to the presence of colorectal cancer (CRC) in the population in the age of 50 to 85. Therefore, Epi proColon represents a straightforward, minimally-invasive method for the detection of CRC throughout all stages of the disease. Colorectal cancer is curable in about 90% of cases if detected early and Epi proColon can make an effective contribution to reducing mortality rates and healthcare costs related to colon cancer.

The amount of DNA extracted from a 10ml blood sample is enough to detect even a small amount of methylated Septin9 for the indication of CRC. Afterwards the sample is separated into three portions and each is tested independently. The result is deemed positive, according to the instructions of the FDA-approved test, if at least one portion is positive. A positive / negative test result indicates the presence / absence of methylated Septin9 in the sample which means there is an increased / a reduced likelihood of the presence of CRC.

The Epi proColon test received FDA approval in April 2016 for use in the USA. ECX also developed a Septin9-based test for the European market called Epi proColon 2.0 CE which is CE-certified since 2012. The result algorithm differs from the FDA-approved instructions by finding the Septin9 DNA in two out of three portions to have a positive testing result.

Currently ECX is working on receiving Medicare coverage for Epi proColon in the US which is possible with a National Coverage Decision (NCD) by the centers for Medicare and Medicaid Services (CMS) or legislation.

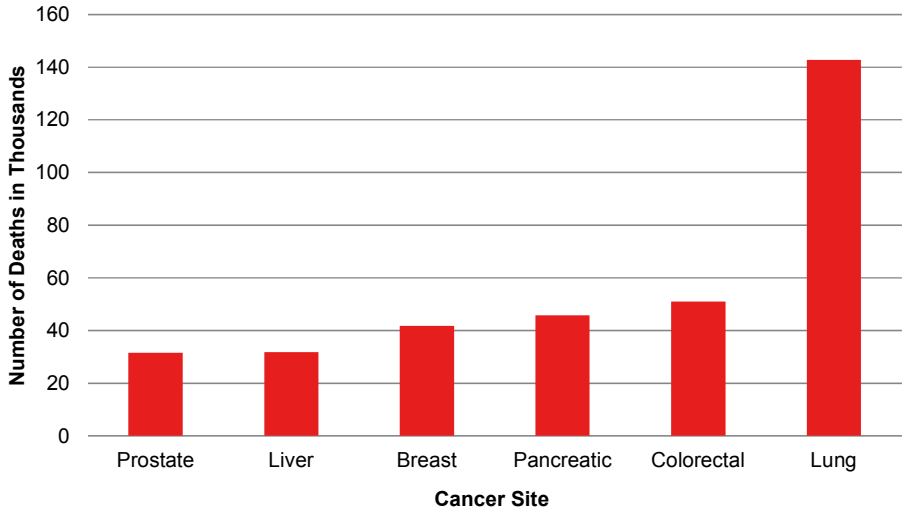
HCC BloodTest – test for liver cancer

The HCC BloodTest is a modification of the EPI proColon 2.0 CE for the detection of liver cancer in cirrhosis patients. According to the World Health Organization (WHO), liver cancer is among the world's leading causes of death from cancer and the most common primary malignancy of the liver is hepatocellular carcinoma (HCC). Liver cirrhosis is a major risk for developing HCC. Like the Epi proColon test the HCC BloodTest detects the presence of Septin9 DNA methylation in a blood sample. Septin9 DNA is also highly correlated to the presence of HCC and a patient with cirrhosis is 30

times more likely to develop HCC than CRC.

The HCC BloodTest received the CE certification in October 2018 for usage in Europe. Further steps in the US are (i) enrolling a cross-sectional study, (ii) a pre-submission meeting with the FDA and (iii) the initiation of longitudinal prospective clinical trial.

Cancer types and related deaths



Source: Warburg Research

Epi proLung – test for lung cancer

The traditional radiological screening approach suffers from high rates of false-positives. Therefore confirmatory diagnostic methods are urgently needed. The Epi proLung test is an aid for the diagnosis of lung cancer in the blood plasma which, according to Epigenomics, could lead to greater benefit for patients and healthcare providers. The diagnosis would be faster and more reliable, and determine which patients need follow-up diagnostic procedures.

The first generation test for lung cancer determines the methylation status of the genes Short Stature Homeobox 2 (SHOX2) and prostaglandin E receptor 4 (PTGER4) at the same time in the plasma. Both genes serve as an indicator for lung cancer and the plasma can be easily collected during a routine medical check-up. Epigenomics obtained the patent rights for both indicators and received the CE-IVD mark at the end of 2017 for the usage in Europe.

In June 2018, ECX developed the EpiBiSKit for the preparation of purified, bisulfite-converted DNA which can be used for the application of Epi proColon test or other tests. It is an automated process for the production of bisulfate DNA which is labour-intensive.

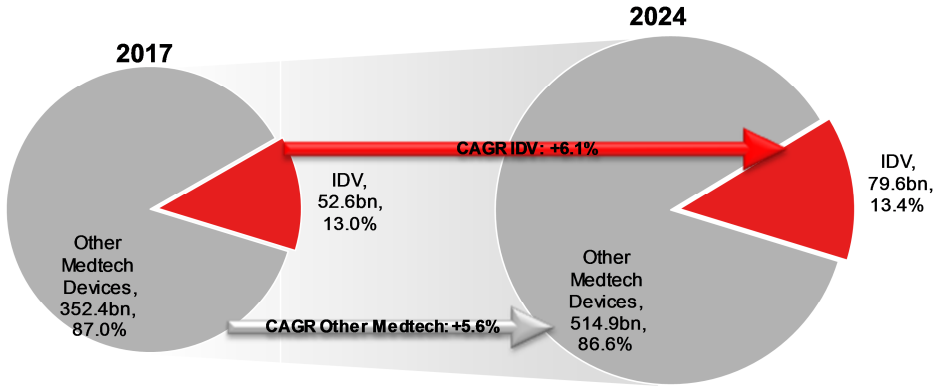
Apart from colon, liver and lung cancer ECX uses its proprietary technology platform of DNA methylation biomarkers for diagnostic products used for screening, diagnostic, prognostic or predictive purposes for the detection of other solid tumours such as prostate, bladder, liver, gastric, head and neck. An example is a multiplexed methylation-based biomarker panals for the analysis and detection of multiple cancers from a single blood specimen using Next Generation Sequencing (NGS). ECX has already developed several prototypes and proprietary NGS cancers panels. These markers need to be validated further by testing in clinical samples to confirm their benefits of use.

Molecular market

Molecular IDV market

The molecular in vitro diagnostics (IDV) area is a subpart of the IDV field which belongs to the medical device industry. According to the Evaluate MedTech World Preview 2018, Outlook to 2024 the global IVD field accounted for sales of USD 52.6bn in 2017 which represented a 13.0%-share of device area and was the highest-ranked device (Medtech Sales 2017 of USD 405bn). The IDV diagnostic market is estimated to continue to grow between 2017 and 2024 at a CAGR of 6.1% to reach worldwide total sale of USD 76.6bn which represents above-average growth in the Medtech device area (CAGR 5.6% to USD 594.5bn). The high concentration of 74.1 among the top 10 player in 2017 is expected to decrease to 72.5% in 2024. Throughout, Roche is expected to hold the top position in the market with a share of 19.5% in 2017.

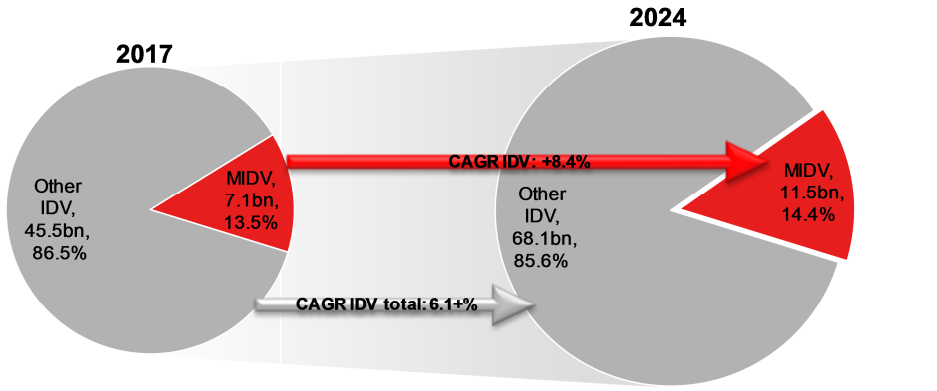
Development MedTech area vs IDV field 2017 to 2024 in bn USD



Source: Evaluate MedTech, Warburg Research

The subpart molecular IDV represents globally roughly 13.5% of the IDV market with USD 7.1bn in 2017 according to Allied Market Research. The global molecular diagnostics market is expect to reach sales of USD 11.5bn by 2023 with superior CAGR of 8.4% which is among the highest growth rates in all Medtech device areas. Important drivers for growth in the area of molecular IDVs are the detection and accurate diagnosis of cancer in the early stages to proceed with tailored cancer management which increases the probability of recovery. To accelerate this process the companies in the Medtech area spent USD 28.6bn on R&D in 2017. The spending is expected to grow at a CAGR of 4.5% to USD 38.9bn in 2024.

IDV Field vs Molecular IDV 2017 to 2024 in bn USD



Source: Allied Market Research, Warburg Research

Cancer tests attract high interest

Molecular diagnostics and cancer-testing market

Essential success factors for companies operating in the field of molecular diagnostics are the regulation and the reimbursement of developing and commercializing diagnostic tools and methods. Given major differences in the national markets, fitting each method of application to regulation and reimbursement landscapes poses a challenge.

The CRC testing market

Colorectal cancer is the third most common type of cancer worldwide with 1.8m diagnosed and 0.88m deaths in 2018. The life-long risk of developing colorectal cancer is 4.49% for men (1 in 22) and 4.15 for women (1 in 25). Given that colorectal cancer typically develops slowly, screening for the disease has proven to be the most effective method to save lives. If the CRC is diagnosed in the early stages I or II, nine out of 10 people survive the next five years while only one in 10 do so if the CRC is diagnosed late in stage IV. The risk of developing CRC rises with age and is significant from the age of 50. Therefore regular medical check-ups are recommended, including screening for CRC.

Given the needs for CRC screening there are three testing methods available in the market: 1. visual-based, 2. stool-based or 3. blood-based testing methods, all of which have their pro and cons.

1. Visual-based testing methods such as colonoscopy and CT-colonography are ambulant tests performed by specialized doctors with suitable equipment. By screening the whole colon these tests can also help to find other diseases, serve a high sensitivity and need to be repeated within longer timeframes if no signs of CRC have been detected. The key limitation of these tests is that the patient needs to take a preparation at home the day before the examination and may miss a day of work to undergo the test. These testing methods are also invasive and the procedural costs are high which generally leads to a low participation rate among the target group for CRC screening.

2. Stool-based testing such as fecal occult blood tests (FOBT), fecal immunochemical test (FIT) or stool DNA tests (FIT DNA) relies on a patient collecting their stool and return it to a clinical laboratory. On the one hand these tests do not pose any risk to the colon without any bowel prep, are fairly inexpensive compared to visual-based tests and the participation rate is generally higher than visual-based tests. On the other hand patients associate an inconvenience with these tests which lead to poor compliance with the product guidelines. Also the test can miss many polyps which led to a false-negative result, resulting in a lower sensitivity and repetition of the tests in a shorter timeframe, normally on an annual basis. In the case of a positive test result, a colonoscopy will also be necessary.

3. The benefits of blood-based testing are that it does not require any further preparation for the usage other than drawing a routine sample of blood as a part of a medical visit. The execution of the test by medically-trained staff ensures superior compliance with the product guidelines at significantly lower costs than other methods. The drawback of this method is the relatively low sensitivity to the other methods which leads to more frequent repetition.

CRC geographically

The most important geographical areas for CRC screening are the US, Europe, and China, which offers a combined target population of 800 million people between the age of 50 and 85 and high current health expenditure (CHE) to GPD. As the markets differ in terms of guidelines for the CRC screening, each market need to be addressed individually in order to receive approval from the relevant authorities.

The risk of developing CRC increases significantly after the age of 50 and only 40% CRC infections are detected in the early stage. Therefore the US Preventive Services Task Force (USPSTF) recommends regular screenings for CRC from the age of 50 and

up to the age of 75. The American Cancer Society (ACS) even recommends that adults aged 45 and older with an average risk of CRC should undergo regular screening. Different screening intervals for the different test are foreseen due to their sensitivity. Via stool-based test the FIT is recommended to be repeated each year while the FIT DNA (Cologuard for example) every three years. The visual-based test of a colonoscopy is recommended every 3 to 10 years, depending on the patient's risk to develop CRC, and a CT colonography every five years. So far, blood-based tests like Epi proColon are not included in the ACS treatment guidelines as it represents a "new technique". We expect that blood-based screening for CRC is a convenient way to detect CRC at a lower cost level and is more pleasant for the patient. Therefore the ACS should take this detection into account for the early detection of CRC and lower the hurdle for regular screening.

The potential of the US market for pre-cancer screening is enormous, consisting of more than 109 million individuals between the ages of 50 and 85 in 2018. Including the population of 45 to 49 year olds, as recommended by the ACS, the CRC screening market would increase by nearly 20 million people to a total of more than 129 million people. Given the large number of people and the high consumer health expenditure to GDP of 17.07% in 2016, the US represents a huge potential market which faces high competition from detection technology. Unfortunately, about one in three people in the USA who should be tested for CRC have never been screened which may be down to lack of awareness of such tests or the costs and healthcare coverage issues. Applied products within the American healthcare system need to be FDA-approved. A key point for medical staff and patients is the reimbursement coverage. This can be achieved by the legislation or the National Coverage Decision.

The market for CRC screening across the entire continent of Europe offers a potential of 271 million people between the ages of 50 and 85. Some 177 million people within this target group are living in the European Union (28 countries). The CHE to GDP continent-wide is 9.93%, peaking in Switzerland (12.25%), France (11.54%) and Germany (11.14%). Products for use in Europe require approval by the European Union to receive the CE-mark.

The Chinese market for CRC screening is characterised by a huge number of people in the 50 to 85 age bracket (422 million) and a low CHE to GDP of 4.98%. While the number of patients would seem to offer high potential, only a limited number have access to the necessary services, owing to imbalances in the healthcare system as seen in the low CHE to GDP. The CFDA is responsible for approving products for the Chinese market.

The market for liver cancer testing

The most common type of primary liver cancer in adults is Hepatocellular carcinoma (HCC), and is the most common cause of death in people with cirrhosis. Approximately 80% of HCC cases are triggered by hepatitis B and/or hepatitis C virus infection, particularly for established cirrhosis or advanced fibrosis. In 2018, 0.78 million people died from liver cancer which ranks it the fourth most common cause of cancer deaths worldwide. Early detection is crucial for recovery but signs and symptoms often do not appear until the late stage.

Using a physical exam to screen for HCC is difficult because the liver is covered by the rib cage. Therefore doctors will ask about the patient's medical history and examine the patient for signs of liver cancer (paying special attention to abdomen, checking the skin and whites of the eyes for jaundice) for patients with an average risk of liver cancer. Subsequent test of the physical exams are image-based tests (ultrasound, CT, MIR) and blood-based tests to examine for liver cancer.

The image-based tests use x-rays, magnetic fields or sound waves and serve a broad overview by creating a picture of the patient's body to detect areas and types of liver and other tumours. Overall it gives the doctor a good overview to investigate suspicious areas with the biopsy needle and a guide for further treatments. The blood-based tests

are specific tests regarding the diagnosis of HCC in the patient's blood. A widely used diagnostic marker for liver cancer in cirrhosis patients is the measurement of the serum biomarker alpha-fetoprotein (AFP). Other biomarkers, like the mSEPT9, receive broader attention because the AFP serves with an insufficient sensitivity for a general screening for liver cancer.

Patients with cirrhosis (from any cause) hereditary hemochromatosis, or chronic hepatitis B infection (even without cirrhosis) have a higher risk of developing HCC and experts recommend repeating the test every six months.

The market for lung cancer testing

Lung cancer is the most common cancer (2.09 million cases) and by far the leading cause of cancer death worldwide in 2018 (1.76 million deaths). The majority of lung cancers are preventable because they are related to smoking, both smokers and people exposed to second-hand smoke. Other risk factors for developing lung cancer are the exposure to radon and asbestos, air pollution, arsenic in drinking water or the medical family history.

Usually symptoms of lung cancer do not appear until the disease is already at an advanced, non-curable stage. Even if lung cancer does cause symptoms, many people may mistake them for other problems, such as an infection or long-term effects from smoking which delays the diagnosis.

If the doctor finds symptoms in a physical exam or in the medical history of the patient further tests will be done. Common test for detecting lung cancer are the:

- Sputum cytology: a sample of cough is screened for cancer cells under a microscope
- Chest x-ray: plain x-ray the chest to create an image of the lung for further detection
- Low-dose computed tomography (CT) scan: detailed x-ray combines many images into slices of the part being studied. Can show size, shape and position of any lung tumours

It is common to find small, abnormal areas (called nodules), especially in current or former smokers. Often, these nodules are result of old infections or scar tissue. Repeated tests are required to determine the presence of cancer, which lowers the general sensitivity of these methods. Additional blood-based test after the first CT can assist the determination in further follow-up procedures.

The American Cancer Society recommends yearly low-dose computed tomography scans for people between 55 and 74 years with a 30 pack-year smoking history (current smoker or those who have quit in the past 15 years).

Management

Gregory Hamilton, Chief Executive Officer

Gregory Hamilton has been the Chief Executive Officer and Chairman of the Management Board of Epigenomics AG since July 2016. For more than 20 years he held various leadership positions in US-based molecular diagnostic companies as well as production and services sector businesses. Mr. Hamilton was Chief Executive Officer & Director of AltheaDX Inc., Chief Operating Officer and Chief Financial Officer of Enigma Diagnostics Inc. Prior to that he became Vice President of Operation and Finance of Third Wave Technologies Inc. and Vice President of Operations of Hologic Inc. Mr. Hamilton was responsible for several FDA approved diagnostic products such as for prevention test for human papillomaviruses (HPV) as well as first-time authorisation for HPV-gene typing test. He received a Bachelor of Science in Finance from Purdue University as well as a Master of Business Administration from the University of Chicago.

Jorge Garces. Ph.D., President & Chief Scientific Officer

Jorge Garces, Ph.D. was elected President and Chief Scientific Officer of Epigenomics AG in late 2017. He has been in leadership positions for more than 20 years and gained profound professional expertise in the molecular diagnostics and Life-Science industry. Dr. Jorges held the position of Chief Executive Officer & President of AltheaDx Inc. as well as of Enigma Diagnostics, Inc. Prior to that he joined Hologic, Inc. as Vice President and Operations Manager, where he guided the development and FDA-approval of tests for cystic fibrosis and HPV. Dr. Garces completed his PhD in cell and molecular biology at City University of New York, while he also received a Master of Business Administration from Kellogg Graduate School of Management at Northwestern University.

Albert Weber, Executive Vice President Finance

In early 2018, Albert Weber was elected Executive Vice President Finance of Epigenomics AG. Mr. Weber has more than 25 years of experience in the area of corporate finance and, prior to the appointment as Vice President, was in charge of the firm's finances, accounting and controlling as Senior Vice President. In his earlier career he was Controlling Manager of Pironet AG, an IT start-up based in Cologne as well as Manager Treasury & Corporate Accounting of EMI Group, Germany. Mr. Weber has gained extensive experience in corporate action and initial public offerings in his many leadership roles in finance. He received a business undergraduate degree from the University of Cologne, Germany and holds a certificate in IFRS accounting.

Supervisory Board

Heino von Prondzynski, Chairman of the Supervisory Board

Heino von Prondzynski studied at the University of Münster (WWU) and subsequently held various high-ranking positions at Bayer AG. Subsequently he became CEO of the division Roche Diagnostics at F. Hoffmann-La Roche Ltd., Switzerland and joined the executive committee of Roche. Currently Mr. Prondzynski works as freelance business consultant. His main area of expertise is molecular diagnostics, in which he has an established professional network. Between 2007 and 2010 Mr. Prondzynski was an acting member of the supervisory board and in 2012 he was appointed Chairman of the Board. He is appointed until 2021.

Anne Clare Kessler, Ph.D., Member of the Supervisory Board

Anne Clare Kessler received a Master of Science in Biology from Northwestern University and a PhD in Biochemistry from New York University. For 26 years, she held various leadership positions at Hoffmann-La Roche Inc. in the US including Vice President and head of research as well as Vice President Pharmacology and Chemotherapy. Subsequently she became head of the Global Project Management Group and led the Portfolio-Management at Hoffmann-La Roche in Basel. Dr. Kessler has been member of the Supervisory Board at Epigenomics AG since 2005 and is currently appointed until 2021.

Prof. Dr. Günther Reiter, Member of the Supervisory Board

After receiving a Bachelor's degree from the University of Tübingen, he worked as research assistant at the university's department for industrial economy and received his PhD. In his further career Prof. Dr. Reiter held various leadership positions such as head of the finance department and controlling for the machine manufacturer Trumpf GmbH and Co., Germany. He is also serving on the management board of the court chamber of the House of Württemberg. In the 1990s he helped to establish the European School of Business (ESB) in Reutlingen and now serves as Dean of the university. Prof. Dr. Reiter has been a member of the Supervisory Board of Epigenomics since 2005 and is appointed until 2021.

Dr. Helge Lubenow, Member of the Supervisory Board

Dr. Helge Lubenow received a Masters' of Science in Biology as well as a PhD from the University of Cologne and the Max-Planck-Institut in the area of genetics. After receiving her doctor's degree she joined Qiagen in 1997, where she held various leadership positions such as Senior Vice President of the molecular diagnostic division. She was also in charge of management of newly-acquired companies, coordinating the restructuring and integration process. In 2016, Dr. Lubenow founded a corporate consultancy firm and in 2018 she became CEO of tesa Labtec GmbH. Dr. Lubenow joined the supervisory board in 2016 and she is appointed until 2021.

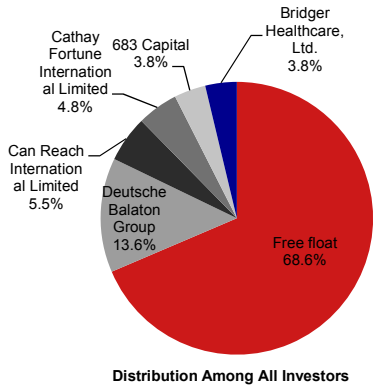
Franz Thomas Walt, Member of the Supervisory Board

Franz Thomas Walt received a Master of Business Administration from City University in Washington State. Subsequently he held various leadership positions at Siemens Healthineers and Roche. Between 1989 and 2011, he held management positions at Roche and was CEO of Roche Diagnostics GmbH, Mannheim, as well as President of Roche Diabetes Care and head of the regions EMEA and Latin America. At Siemens Healthineers, he became President Laboratory Diagnostics. Mr. Walt has been CEO of Quotient Ltd., Switzerland, since 2018. In May 2019 he became a member of the Supervisory Board of Epigenomics AG and is currently appointed until 2021.

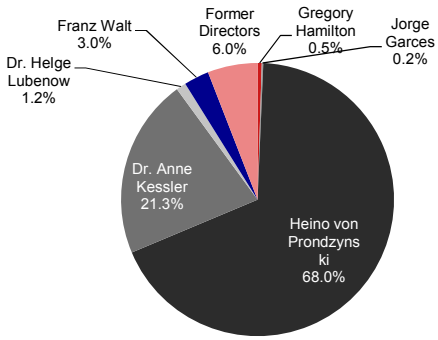
Shareholder structure

More than two-thirds of the company's shares are in free float, which means that most shares are held by smaller sized investing parties. This often leads to greater autonomy in decision-making for the management board, since large shareholder groups with potentially diverging goals are less prevalent. The largest private shareholder group is is the Deutsche Balaton Group, who holds slightly more than 13% of Epigenomics' total shares outstanding. The holding company's investment priorities are small to medium sized, listed or privately-held companies from various industries. The rest of the larger shareholders of Epigenomics are international investment groups and hedge funds. On the other side it is noticeable that in recent years Mr. Prodzynski, the chairman of the supervisory board, has by far purchased the largest part of the shares with 68% of total directors' purchases. He is followed by Dr. Kessler with 21.3% of all purchases.

Shareholder structure



Distribution Among All Investors



Directors' Share Purchases (2017 - 2019)

Source: Company, Warburg Research

Company history

- **1998** Epigenomics was founded in Berlin. ORCA Biosciences was founded in Seattle.
- **2000** Epigenomics and ORCA Biosciences merge and focus on applying DNA methylation based biomarkers to address medical needs.
- **2004** Epigenomics goes public by listing its stock on the Frankfurt Stock Exchange.
- **2007** Epigenomics achieves its first clinical proof of concept for a blood test, which enables lung cancer screening. It successfully optimises and streamlines the assay procedure regarding cancer screening test for routine clinical use and automation.
- **2009** Epigenomics launches CE-certified Epi proColon blood test for early detection of colorectal cancer in Europe. Quest Diagnostics Incorporated enters a non-exclusive licensing agreement regarding Epigenomics' proprietary biomarker mGSTP1 for a US LDT.
- **2010** Epi proColon is now available nationwide in Germany and Switzerland. Epigenomics also introduces Epi proLung, a preventive blood test for lung cancer detection, at the German Cancer Congress and presents clinical study data.
- **2011** Start of Epi proColon's approval procedure for the US market.
- **2012** The CE-certified version of Epi proColon is introduced to further European countries.
- **2013** Epigenomics achieves major steps towards the commercialisation of Epi proColon. There is also positive development for the product's US approval. Access is

gained to new markets such as China by collaborating with local partners who bring extensive knowledge to the partnership.

- **2014** Further process in the Premarket-Approval (PMA) procedure by the FDA regarding Epi proColon. The company's key value driver also receives market approval in China, allowing for the commercialisation of the product in the Chinese market.
- **2015** Epigenomics starts development of Epi proLung and undertakes the first clinical validation study.
- **2016** The FDA grants approval for Epi proColon in April, paving the way for commercial distribution in the US It is the first and only FDA-approved blood test for the early diagnosis of colorectal cancer. Epigenomics also starts a partnership with BioChain, which obtains the development and marketing licenses for China, while Epigenomics receives pre-milestone and yearly minimum payments in return.
- **2017** Epi proLung receives the CE-IVD certification allowing the drug to be commercialised in the EU. Epi pro Lung will be marketed in combination with Epi BiSKit, a pre-analytical tool providing a set of reagents for the preparation of bisulfite converted DNA.
- **2018** HCC Blood-Test receives CE-IVD certification. Epigenomics developed the test for cirrhosis patients, who face a significant risk of developing liver cancer.
- **2019** In March, Epigenomics terminates the cooperation with BioChain, its Chinese licensing partner, which comprises the licensing of its Septin9-Markers and the exclusive distribution rights in China for Epi proColon.
- **2019** In May, Epigenomics announced that its application for a National Coverage Determination (NCD) review for Epi proColon had been accepted by the Centers for Medicare & Medicaid Services (CMS).

DCF model

	Detailed forecast period			Transitional period										Term. Value
Figures in EUR m	2019e	2020e	2021e	2022e	2023e	2024e	2025e	2026e	2027e	2028e	2029e	2030e	2031e	
Sales	2.0	9.4	19.3	40.5	73.0	114.4	143.3	168.4	191.5	210.2	222.6	231.4	238.2	
Sales change	*30.1 %*	*372.1 %*	*105.2 %*	*109.7 %*	*80.1 %*	*56.7 %*	*25.3 %*	*17.5 %*	*13.7 %*	*9.8 %*	*5.9 %*	*4.0 %*	*3.0 %*	*3.0 %*
EBIT	-14.5	-16.0	-14.8	-0.4	27.9	39.5	44.9	51.9	55.8	57.5	58.9	58.3	58.1	
EBIT-margin	*-728.3 %*	*-169.8 %*	*-76.4 %*	*-0.9 %*	*38.3 %*	*34.6 %*	*31.3 %*	*30.8 %*	*29.1 %*	*27.4 %*	*26.5 %*	*25.2 %*	*24.4 %*	
Tax rate (EBT)	*3.3 %*	*0.0 %*	*0.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	*25.0 %*	
NOPAT	-14.0	-16.0	-14.8	-0.3	21.0	29.6	33.7	38.9	41.8	43.1	44.2	43.7	43.6	
Depreciation	0.5	0.5	0.5	0.8	1.3	1.8	1.9	1.9	1.9	2.1	2.2	2.3	2.4	
in % of Sales	*24.1 %*	*5.1 %*	*2.5 %*	*2.0 %*	*1.8 %*	*1.6 %*	*1.3 %*	*1.1 %*	*1.0 %*	*1.0 %*	*1.0 %*	*1.0 %*	*1.0 %*	
Changes in provisions	0.0	0.0	0.0	0.8	0.6	0.8	0.6	0.5	0.5	0.4	0.2	0.2	0.1	
Change in Liquidity from														
- Working Capital	0.4	1.6	2.2	4.8	10.1	10.3	7.2	6.3	5.8	4.7	3.1	2.2	1.7	
- Capex	1.0	1.0	2.0	4.1	6.6	8.0	7.2	6.7	7.3	7.6	7.6	6.9	4.8	
Capex in % of Sales	*50.1 %*	*10.6 %*	*10.3 %*	*10.0 %*	*9.0 %*	*7.0 %*	*5.0 %*	*4.0 %*	*3.8 %*	*3.6 %*	*3.4 %*	*3.0 %*	*2.0 %*	
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Free Cash Flow (WACC Model)	-14.9	-18.1	-18.5	-7.5	6.2	13.9	21.7	28.3	31.2	33.3	36.0	37.1	39.7	26
PV of FCF	-14.5	-15.8	-14.4	-5.3	3.9	7.8	10.9	12.7	12.5	12.0	11.6	10.7	10.3	77
share of PVs	**-37.34 %**			**72.73 %**										**64.60 %**

Model parameter

Derivation of WACC:		Derivation of Beta:	
Debt ratio	15.00 %	Financial Strength	3.00
Cost of debt (after tax)	4.5 %	Liquidity (share)	1.40
Market return	7.00 %	Cyclicality	1.00
Risk free rate	1.50 %	Transparency	2.00
		Others	3.00
WACC	**11.67 %**	**Beta**	**2.08**

Valuation (m)

Present values 2031e	42		
Terminal Value	77		
Financial liabilities	0		
Pension liabilities	0		
Hybrid capital	0		
Minority interest	0		
Market val. of investments	0		
Liquidity	17	No. of shares (m)	36.0
Equity Value	**137**	**Value per share (EUR)**	**3.80**

Sensitivity Value per Share (EUR)

		Terminal Growth						
Beta	WACC	2.25 %	2.50 %	2.75 %	**3.00 %**	3.25 %	3.50 %	3.75 %
2.29	12.7 %	3.08	3.12	3.16	3.21	3.25	3.30	3.35
2.19	12.2 %	3.34	3.39	3.44	3.49	3.54	3.60	3.66
2.13	11.9 %	3.48	3.53	3.58	3.64	3.70	3.76	3.83
2.08	11.7 %	3.63	3.68	3.74	**3.80**	3.86	3.93	4.00
2.03	11.4 %	3.79	3.84	3.91	3.97	4.04	4.11	4.19
1.97	11.2 %	3.95	4.01	4.08	4.15	4.23	4.31	4.40
1.87	10.7 %	4.31	4.39	4.47	4.55	4.64	4.74	4.85

		Delta EBIT-margin						
Beta	WACC	-1.5 pp	-1.0 pp	-0.5 pp	**+0.0 pp**	+0.5 pp	+1.0 pp	+1.5 pp
2.29	12.7 %	2.83	2.95	3.08	3.21	3.33	3.46	3.59
2.19	12.2 %	3.08	3.22	3.35	3.49	3.62	3.76	3.89
2.13	11.9 %	3.22	3.36	3.50	3.64	3.78	3.92	4.06
2.08	11.7 %	3.36	3.51	3.65	**3.80**	3.95	4.09	4.24
2.03	11.4 %	3.52	3.67	3.82	3.97	4.12	4.27	4.43
1.97	11.2 %	3.68	3.84	3.99	4.15	4.31	4.47	4.63
1.87	10.7 %	4.04	4.21	4.38	4.55	4.72	4.89	5.07

- Sales growth assumption of 3% from 2030 onwards reflects potential entry of new techniques or competitors
- Sales level in 2030ff reflects market share of approx. 8% of unscreened CRC population
- EBIT margin of 15% in terminal year in-line with margin level of established healthcare product companies
- Margin expectation also based on assumed higher necessary marketing efforts and spending

Peer Group

Company	LC	Price in LC	P / E 19e	P / E 20e	EV / Sales 19e	EV / Sales 20e	EV / EBITDA 19e	EV / EBITDA 20e	EV / EBIT 19e	EV / EBIT 20e
Abbott Laboratories	USD	84.27	26.0	23.3	5.2	4.8	19.9	18.0	23.2	20.8
bioMerieux	EUR	70.20	29.4	26.3	3.3	3.1	15.7	14.3	22.4	20.1
Diasorin	EUR	102.40	33.4	31.0	7.7	7.2	19.9	18.4	24.9	22.9
Illumina	USD	300.91	49.8	43.1	12.2	10.7	37.3	31.2	43.6	35.7
Sartorius Vz.	EUR	168.90	56.2	48.6	7.4	6.7	27.4	24.0	37.4	32.2
STRATEC Biomedical	EUR	67.60	32.9	26.4	4.0	3.6	19.8	16.6	30.6	23.8
Thermo Fisher	USD	297.65	24.3	21.9	5.4	5.1	20.9	19.3	22.8	20.8
Average			36.0	31.5	6.5	5.9	23.0	20.3	29.3	25.2
Median			32.9	26.4	5.4	5.1	19.9	18.4	24.9	22.9

- A peer group comparison is not meaningful as losses will still be recorded for several years.

Valuation

	2015	2016	2017	2018	2019e	2020e	2021e
Price / Book	10.9 x	6.4 x	10.5 x	4.0 x	11.4 x	n.a.	n.a.
Book value per share ex intangibles	0.37	0.67	0.43	0.67	0.12	-0.32	-0.72
EV / Sales	33.6 x	18.9 x	55.8 x	37.5 x	25.1 x	7.2 x	4.5 x
EV / EBITDA	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EV / EBIT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EV / EBIT adj.*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
P / FCF	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
P / E	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
P / E adj.*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Dividend Yield	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FCF Potential Yield (on market EV)	-11.9 %	-13.6 %	-9.4 %	-20.6 %	-27.1 %	-22.7 %	-16.5 %

*Adjustments made for: EBITDA before share-based payment expenses

Consolidated profit and loss

In EUR m	2015	2016	2017	2018	2019e	2020e	2021e
Sales	**2.1**	**4.2**	**1.9**	**1.5**	**2.0**	**9.4**	**19.3**
Change Sales yoy	n.a.	101.8 %	-55.6 %	-17.8 %	30.1 %	372.1 %	105.2 %
COGS	1.2	1.6	0.2	0.4	0.5	1.7	3.3
Gross profit	**0.9**	**2.6**	**1.6**	**1.1**	**1.5**	**7.7**	**16.1**
Gross margin	*43.6 %*	*61.1 %*	*86.8 %*	*71.3 %*	*76.2 %*	*82.1 %*	*83.1 %*
Research and development	5.8	5.1	4.3	6.4	7.8	8.0	12.0
Sales and marketing	5.1	10.2	8.0	8.7	9.6	2.4	4.8
Administration expenses	0.0	0.0	0.0	0.0	0.0	13.8	15.0
Other operating expenses	0.1	0.3	0.6	0.3	0.6	0.0	0.0
Other operating income	0.9	0.7	1.1	1.4	2.0	0.5	1.0
Unfrequent items	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBITDA	**-8.6**	**-12.0**	**-9.9**	**-12.6**	**-14.0**	**-15.5**	**-14.3**
Margin	*-412.9 %*	*-284.6 %*	*-533.6 %*	*-821.1 %*	*-704.2 %*	*-164.7 %*	*-73.9 %*
Depreciation of fixed assets	0.2	0.1	0.2	0.1	0.3	0.3	0.3
EBITA	**-8.8**	**-12.1**	**-10.1**	**-12.7**	**-14.3**	**-15.8**	**-14.6**
Amortisation of intangible assets	0.5	0.2	0.2	0.2	0.2	0.2	0.2
Goodwill amortisation	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBIT	**-9.3**	**-12.3**	**-10.3**	**-12.9**	**-14.5**	**-16.0**	**-14.8**
Margin	*-445.0 %*	*-293.1 %*	*-552.0 %*	*-841.2 %*	*-728.3 %*	*-169.8 %*	*-76.4 %*
EBIT adj.	**-9.3**	**-12.3**	**-10.3**	**-12.9**	**-14.5**	**-16.0**	**-14.8**
Interest income	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Interest expenses	0.0	0.0	0.2	0.6	0.0	0.0	0.0
Other financial income (loss)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBT	**-9.2**	**-12.3**	**-10.4**	**-13.4**	**-14.4**	**-16.0**	**-14.8**
Margin	*-444.2 %*	*-292.7 %*	*-560.6 %*	*-876.1 %*	*-724.1 %*	*-169.8 %*	*-76.4 %*
Total taxes	-0.3	-1.1	-0.2	-0.7	-0.5	0.0	0.0
Net income from continuing operations	**-9.0**	**-11.2**	**-10.2**	**-12.7**	**-14.0**	**-16.0**	**-14.8**
Income from discontinued operations (net of tax)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net income before minorities	**-9.0**	**-11.2**	**-10.2**	**-12.7**	**-14.0**	**-16.0**	**-14.8**
Minority interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net income	**-9.0**	**-11.2**	**-10.2**	**-12.7**	**-14.0**	**-16.0**	**-14.8**
Margin	*-431.6 %*	*-265.7 %*	*-549.1 %*	*-827.9 %*	*-699.9 %*	*-169.8 %*	*-76.4 %*
Number of shares, average	17.1	20.3	23.2	27.0	36.0	36.0	36.0
EPS	**-0.52**	**-0.55**	**-0.44**	**-0.47**	**-0.39**	**-0.44**	**-0.41**
EPS adj.	-0.52	-0.55	-0.42	-0.49	-0.39	-0.44	-0.41

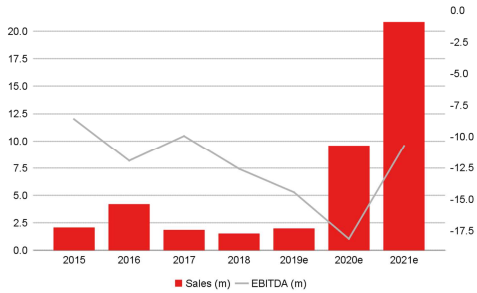
*Adjustments made for: EBITDA before share-based payment expenses

Guidance: Revenue of between EUR 2.0-4.0m, adj. EBITDA of between EUR -12.5m to -14.0m

Financial Ratios

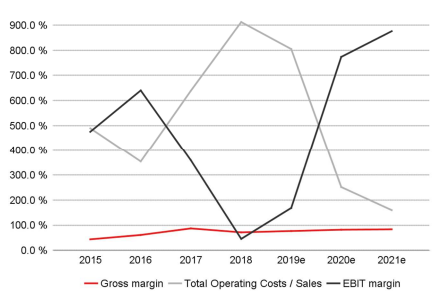
	2015	2016	2017	2018	2019e	2020e	2021e
Total Operating Costs / Sales	488.5 %	354.2 %	638.8 %	912.5 %	804.4 %	251.9 %	159.5 %
Operating Leverage	n.a.	0.3 x	0.3 x	-1.4 x	0.4 x	0.0 x	-0.1 x
EBITDA / Interest expenses	n.m.	n.a.	n.m.	n.m.	n.m.	n.a.	n.a.
Tax rate (EBT)	2.9 %	9.2 %	2.0 %	5.5 %	3.3 %	0.0 %	0.0 %
Dividend Payout Ratio	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
Sales per Employee	54,789	93,356	40,522	34,841	45,328	214,010	439,186

Sales, EBITDA
in EUR m



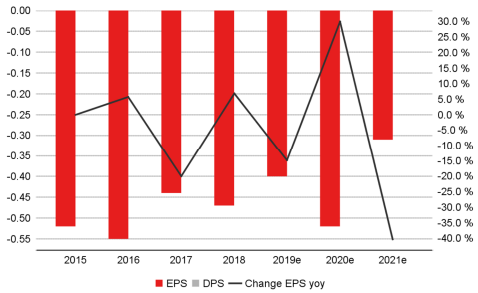
Source: Warburg Research

Operating Performance
in %



Source: Warburg Research

Performance per Share



Source: Warburg Research

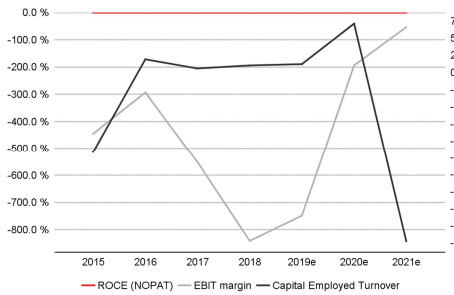
Consolidated balance sheet

In EUR m	2015	2016	2017	2018	2019e	2020e	2021e
Assets							
Goodwill and other intangible assets	0.8	0.8	0.7	0.5	0.3	0.1	-0.1
thereof other intangible assets	0.1	0.2	0.2	0.1	-0.1	-0.3	-0.5
thereof Goodwill	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Property, plant and equipment	0.7	0.7	0.7	0.7	1.4	2.1	3.9
Financial assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other long-term assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fixed assets	**1.5**	**1.5**	**1.4**	**1.2**	**1.7**	**2.2**	**3.7**
Inventories	1.1	0.3	0.3	0.4	0.3	1.3	2.8
Accounts receivable	0.2	2.2	0.9	0.2	0.2	1.3	2.6
Liquid assets	8.6	12.3	13.7	17.1	7.2	9.1	10.6
Other short-term assets	1.3	2.0	3.4	3.0	3.0	3.0	3.0
Current assets	**11.1**	**16.8**	**18.4**	**20.7**	**10.7**	**14.7**	**19.0**
Total Assets	**12.6**	**18.2**	**19.8**	**21.8**	**12.4**	**16.9**	**22.7**
Liabilities and shareholders' equity							
Subscribed capital	18.1	22.7	24.0	36.0	36.0	36.0	36.0
Capital reserve	40.9	54.9	59.5	68.8	68.8	68.8	68.8
Retained earnings	-51.7	-62.9	-73.1	-85.8	-99.9	-115.8	-130.6
Other equity components	-0.2	-0.3	0.2	-0.4	-0.4	-0.4	-0.4
Shareholders' equity	7.1	14.4	10.6	18.6	4.6	-11.4	-26.2
Minority interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total equity	**7.1**	**14.4**	**10.6**	**18.6**	**4.6**	**-11.4**	**-26.2**
Provisions	1.1	1.9	1.1	1.0	1.0	1.0	1.0
thereof provisions for pensions and similar obligations	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Financial liabilities (total)	1.1	0.0	6.5	0.0	5.0	25.0	45.0
thereof short-term financial liabilities	0.0	0.0	0.0	0.0	5.0	25.0	45.0
Accounts payable	1.9	1.1	1.0	1.4	1.0	1.5	2.1
Other liabilities	1.4	0.8	0.6	0.8	0.8	0.8	0.8
Liabilities	**5.5**	**3.8**	**9.2**	**3.2**	**7.8**	**28.3**	**48.9**
Total liabilities and shareholders' equity	**12.6**	**18.2**	**19.8**	**21.8**	**12.4**	**16.9**	**22.7**

Financial Ratios

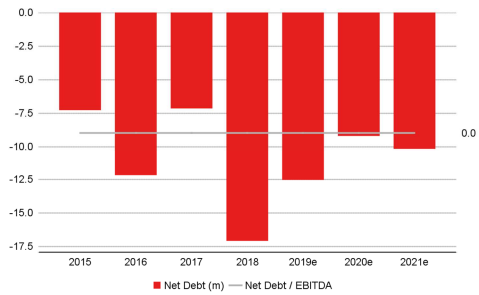
	2015	2016	2017	2018	2019e	2020e	2021e
Efficiency of Capital Employment							
Operating Assets Turnover	138.8 x	2.0 x	1.9 x	-8.4 x	2.2 x	2.9 x	2.7 x
Capital Employed Turnover	-11.7 x	1.9 x	0.5 x	1.0 x	0.8 x	2.1 x	2.3 x
ROA	-608.7 %	-760.3 %	-737.4 %	-1080.2 %	-823.9 %	-722.3 %	-395.5 %
Return on Capital							
ROCE (NOPAT)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ROE	n.a.	-103.7 %	-81.9 %	-87.0 %	-120.4 %	466.9 %	78.5 %
Adj. ROE	n.a.	-104.5 %	-78.1 %	-90.9 %	-120.4 %	466.9 %	78.5 %
Balance sheet quality							
Net Debt	-7.3	-12.2	-7.2	-17.1	-2.1	16.0	34.4
Net Financial Debt	-7.5	-12.3	-7.2	-17.1	-2.2	15.9	34.4
Net Gearing	-102.5 %	-84.6 %	-67.6 %	-91.8 %	-47.0 %	-139.8 %	-131.6 %
Net Fin. Debt / EBITDA	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Book Value / Share	0.4	0.7	0.5	0.7	0.1	-0.3	-0.7
Book value per share ex intangibles	0.4	0.7	0.4	0.7	0.1	-0.3	-0.7

ROCE Development



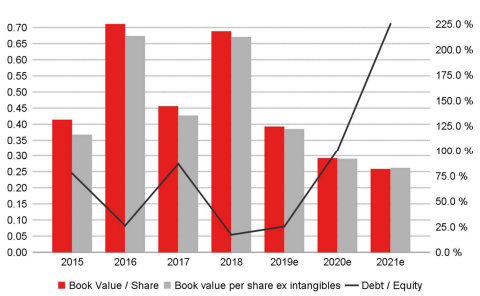
Source: Warburg Research

Net debt
in EUR m



Source: Warburg Research

Book Value per Share
in EUR



Source: Warburg Research

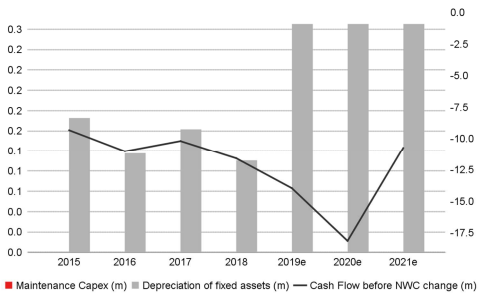
Consolidated cash flow statement

In EUR m	2015	2016	2017	2018	2019e	2020e	2021e
Net income	-9.0	-11.2	-10.2	-12.7	-14.0	-16.0	-14.8
Depreciation of fixed assets	0.2	0.1	0.2	0.1	0.3	0.3	0.3
Amortisation of goodwill	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amortisation of intangible assets	0.5	0.2	0.2	0.2	0.2	0.2	0.2
Increase/decrease in long-term provisions	-0.7	0.8	-0.7	-0.1	0.0	0.0	0.0
Other non-cash income and expenses	-0.3	-1.0	0.4	0.9	0.0	0.0	0.0
Cash Flow before NWC change	**-9.3**	**-11.0**	**-10.2**	**-11.6**	**-13.6**	**-15.5**	**-14.3**
Increase / decrease in inventory	-0.3	0.8	0.0	-0.1	0.1	-1.0	-1.5
Increase / decrease in accounts receivable	0.1	-2.0	1.3	0.8	0.0	-1.1	-1.3
Increase / decrease in accounts payable	1.4	-1.4	0.9	-0.8	-0.4	0.5	0.6
Increase / decrease in other working capital positions	0.0	0.3	-1.5	1.3	0.0	0.0	0.0
Increase / decrease in working capital (total)	1.2	-2.3	0.6	1.2	-0.4	-1.6	-2.2
Net cash provided by operating activities [1]	**-8.1**	**-13.3**	**-9.6**	**-10.4**	**-13.9**	**-17.1**	**-16.5**
Investments in intangible assets	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Investments in property, plant and equipment	-0.2	-0.2	-0.2	-0.1	-1.0	-1.0	-2.0
Payments for acquisitions	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Financial investments	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Income from asset disposals	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net cash provided by investing activities [2]	**0.2**	**-0.4**	**-0.5**	**0.7**	**-1.0**	**-1.0**	**-2.0**
Change in financial liabilities	0.0	0.0	0.0	0.0	5.0	20.0	20.0
Dividends paid	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Purchase of own shares	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital measures	9.0	17.4	11.5	13.3	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net cash provided by financing activities [3]	**9.0**	**17.4**	**11.5**	**13.3**	**5.0**	**20.0**	**20.0**
Change in liquid funds [1]+[2]+[3]	**1.1**	**3.8**	**1.4**	**3.6**	**-9.9**	**1.9**	**1.5**
Effects of exchange-rate changes on cash	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
Cash and cash equivalent at end of period	1.1	11.5	12.8	16.5	6.5	8.4	10.0

Financial Ratios

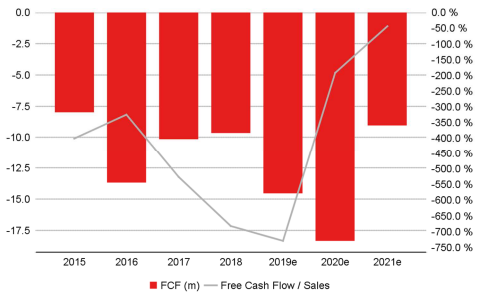
	2015	2016	2017	2018	2019e	2020e	2021e
Cash Flow							
FCF	-8.0	-13.7	-10.1	-9.6	-14.9	-18.1	-18.5
Free Cash Flow / Sales	-400.6 %	-325.1 %	-525.5 %	-682.1 %	-749.4 %	-192.3 %	-95.6 %
Free Cash Flow Potential	-8.3	-10.8	-9.7	-11.8	-13.6	-15.5	-14.3
Free Cash Flow / Net Profit	92.8 %	122.4 %	95.7 %	82.4 %	107.1 %	113.3 %	125.2 %
Interest Received / Avg. Cash	n.a.	0.2 %	0.1 %	0.1 %	0.9 %	0.0 %	0.0 %
Interest Paid / Avg. Debt	n.a.	0.0 %	5.4 %	16.8 %	1.2 %	0.0 %	0.0 %
Management of Funds							
Investment ratio	10.2 %	9.0 %	11.8 %	6.9 %	50.1 %	10.6 %	10.3 %
Maint. Capex / Sales	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
Capex / Dep	31.9 %	105.6 %	64.1 %	34.4 %	208.0 %	208.0 %	416.0 %
Avg. Working Capital / Sales	n.a.	8.9 %	45.4 %	-19.7 %	-34.7 %	3.2 %	11.4 %
Trade Debtors / Trade Creditors	9.2 %	206.4 %	98.4 %	11.6 %	20.0 %	86.7 %	123.8 %
Inventory Turnover	1.1 x	6.4 x	0.8 x	1.2 x	1.6 x	1.3 x	1.2 x
Receivables collection period (days)	31	195	183	39	37	50	49
Payables payment period (days)	597	243	1,413	1,170	767	325	235
Cash conversion cycle (Days)	-232	9	-794	-829	-501	7	127

CAPEX and Cash Flow
in EUR m



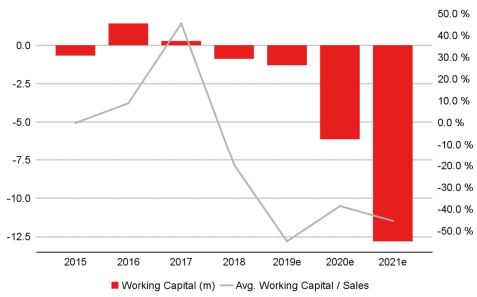
Source: Warburg Research

Free Cash Flow Generation



Source: Warburg Research

Working Capital



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-4- MMWB, Warburg Research, or an affiliated company, reached an agreement with the issuer to provide **investment banking and/or investment services** and the relevant agreement was in force in the last 12 months or there arose for this period, based on the relevant agreement, the obligation to provide or to receive a service or compensation - provided that this disclosure does not result in the disclosure of confidential business information.

-5- The company compiling the analysis or an affiliated company had reached an **agreement on the compilation of the investment recommendation** with the analysed company.

-6- Companies affiliated with Warburg Research **regularly trade** financial instruments of the analysed company or derivatives of these.

-6a- Warburg Research, or an affiliated company, holds a **net long position of more than 0.5%** of the total issued share capital of the analysed company.

-6b- Warburg Research, or an affiliated company, holds a **net short position of more than 0.5%** of the total issued share capital of the analysed company.

-6c- The issuer holds shares of more than 5% of the total issued capital of Warburg Research or an affiliated company.

-7- The company preparing the analysis as well as its affiliated companies and employees have **other important interests** in relation to the analysed company, such as, for example, the exercising of mandates at analysed companies.

This report has been made accessible to the company analysed and was modified thereafter.

Company	Disclosure	Link to the historical price targets and rating changes (last 12 months)
Epigenomics	4, 5	http://www.mmwarburg.com/disclaimer/disclaimer_en/DE000A11QW50.htm

INVESTMENT RECOMMENDATION

Investment recommendation: expected direction of the share price development of the financial instrument up to the given price target in the opinion of the analyst who covers this financial instrument.

-B-	**Buy:**	The price of the analysed financial instrument is expected to rise over the next 12 months.
-H-	**Hold:**	The price of the analysed financial instrument is expected to remain mostly flat over the next 12 months.
-S-	**Sell:**	The price of the analysed financial instrument is expected to fall over the next 12 months.
"-"	**Rating suspended:**	The available information currently does not permit an evaluation of the company.

WARBURG RESEARCH GMBH – ANALYSED RESEARCH UNIVERSE BY RATING

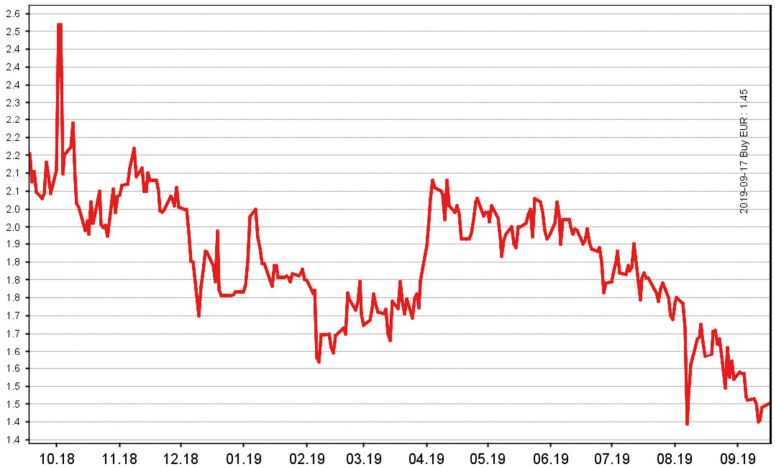
Rating	Number of stocks	% of Universe
Buy	120	60
Hold	67	34
Sell	7	4
Rating suspended	5	3
Total	**199**	**100**

WARBURG RESEARCH GMBH – ANALYSED RESEARCH UNIVERSE BY RATING …

… taking into account only those companies which were provided with major investment services in the last twelve months.

Rating	Number of stocks	% of Universe
Buy	32	78
Hold	7	17
Sell	0	0
Rating suspended	2	5
Total	**41**	**100**

PRICE AND RATING HISTORY EPIGENOMICS AS OF 17.09.2019



Markings in the chart show rating changes by Warburg Research GmbH in the last 12 months. Every marking details the date and closing price on the day of the rating change.

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