ERIK PENSER BANK

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Immunovia

A new era in pancreatic cancer

Large medical need

Pancreatic cancer is a serious disease. The wide-ranging symptoms of the disease and the lack of a simple diagnostic test (you essentially need a CT scan to make a diagnosis) means the diagnosis is made late and that the majority of patients (>80%) have an incurable disease at diagnosis.
This means the prognosis for pancreatic cancer is generally poor, with a 5-year survival rate of less than 5% for the patient group.

US launch started

Launch began in the US market this August. Immunovia's US subsidiary was authorized to start testing patients with IMMray PanCan-d, the first and only test on the market designed for early detection of pancreatic cancer.
This is initially for people who are at high risk of the disease due to a family history or genetic changes. Some 350,000 patients in the United States. The total market for the company is >2 m patients in the US.

Substantial upside

In our estimates, Immunovia takes a market share of 15–20% of the North American volume by the end of 2026. During the period 2026-2034, we expect annual growth of 21% in this market. We also expect the company to start its European launch in 2025.
Our DCF model with a discount rate of 16% provides a fair value of SEK 330-340 per share.

Estimate Changes (SEK)

	Now	Before	
EPS, adj 21e	-6.97	-6.97	0.0%
EPS, adj 22e	-6.32	-6.32	0.0%
EPS, adj 23e	-8.16	-8.16	0.0%

Calendar Events

Interim report Q3'21	2021-11-11
Full Year report	2022-02-17

Key Figures (mkr)

Number of Shares	22.6m
Market cap	2,668
Net Debt	(346)
EV	2,323
Free Float	91.00%
Avg. No. of Daily Traded Sh.	56.0(k)

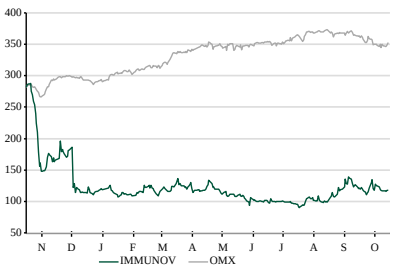
Estimates (SEK)

	20	21e	22e	23e
Sales,m	1	3	65	123
Sales Growth	21.1%	228.2%	1,893.2%	90.5%
EBITDA, m	(124.6)	(138.0)	(120.6)	(151.1)
EBIT, m	(134.3)	(156.4)	(141.7)	(175.1)
EPS, adj	(6.84)	(6.97)	(6.32)	(8.16)
EPS Growth	-%	-%	-%	-%
Equity/Share	26.5	19.5	13.2	5.0
Dividend	0.00	0.00	0.00	0.00
EBIT Marginal	-%	-%	-%	-%
ROE (%)	(30.5)%	(30.3)%	(38.7)%	(89.8)%
ROCE	(25.0)%	(28.2)%	(35.1)%	(51.6)%
EV/Sales	nmf	717.75x	36.01x	18.91x
EV/EBITDA	(18.6)x	(16.8)x	(19.3)x	(15.4)x
EV/EBIT	(17.3)x	(14.9)x	(16.4)x	(13.3)x
P/E, adj	(17.2)x	(16.9)x	(18.6)x	(14.5)x
P/Equity	4.5x	6.0x	8.9x	23.5x
Dividend yield	0.0%	0.0%	0.0%	0.0%
FCF yield	(6.6)%	(7.0)%	(6.6)%	(8.1)%
Net Debt/EBITDA	3.5g	1.8g	0.6g	(0.9)g

Risk and Potential

Motivated value	330.00 - 340.00
Current price	SEK117.90
Risk level	High

One Year Performance Chart



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Overview

A new era in pancreatic cancer

Investment Case

Pancreatic cancer is a serious disease. The wide-ranging symptoms of the disease and the lack of a simple diagnostic test (you essentially need a computed tomography scan to make a diagnosis) mean that the diagnosis is made late and that the majority of patients (> 80%) have an incurable disease at diagnosis. This means that the prognosis for pancreatic cancer is generally very poor, with a 5-year survival rate of less than 5% for the patient group as a whole.

Since 2016, Immunovia has conducted a comprehensive programme for prospective clinical trials in the three main risk groups for pancreatic cancer: PanFAM-1 is a clinical trial for individuals with familial/hereditary pancreatic cancer, PanSYM-1 for patients with early, non-specific symptoms suggestive of pancreatic cancer, and PanDIA-1 designed for individuals at risk due to the diagnosis of new onset diabetes type II after the age of 50.

On August 4, 2021, Immunovia announced that it had begun a launch in the US market. The company's US subsidiary Immunovia, Inc. in Marlborough, Massachusetts, was authorized to begin testing patients with IMMray PanCan-d, the first and only test on the market for the early detection of pancreatic cancer. The test was launched at a list price of USD 995 per unit.

Company Profile

Immunovia AB was founded in 2007 by researchers from the Department of Immunotechnology at Lund University and CREATE Health (the Center for Translational Cancer Research) in Lund, Sweden. Immunovia's strategy is to decipher the information available in blood and translate it into clinically useful tools to diagnose cancer earlier and more accurately than previously possible. Immunovia's technology platform – IMMray – is an antibody-based multiplex test that is designed to provide a snapshot of the immune system response, based on the information available in a single drop of blood.

Valuation approach

We calculate a fair value for Immunovia by applying a present value of future revenues and expenses. The estimates are adjusted using a discount rate of 16%. The full valuation is summarized on page 18. In total, this generates a fair value of SEK 334 per share, justifying a value in the range SEK 330–340 per share.

Target Price

SEK 330-340

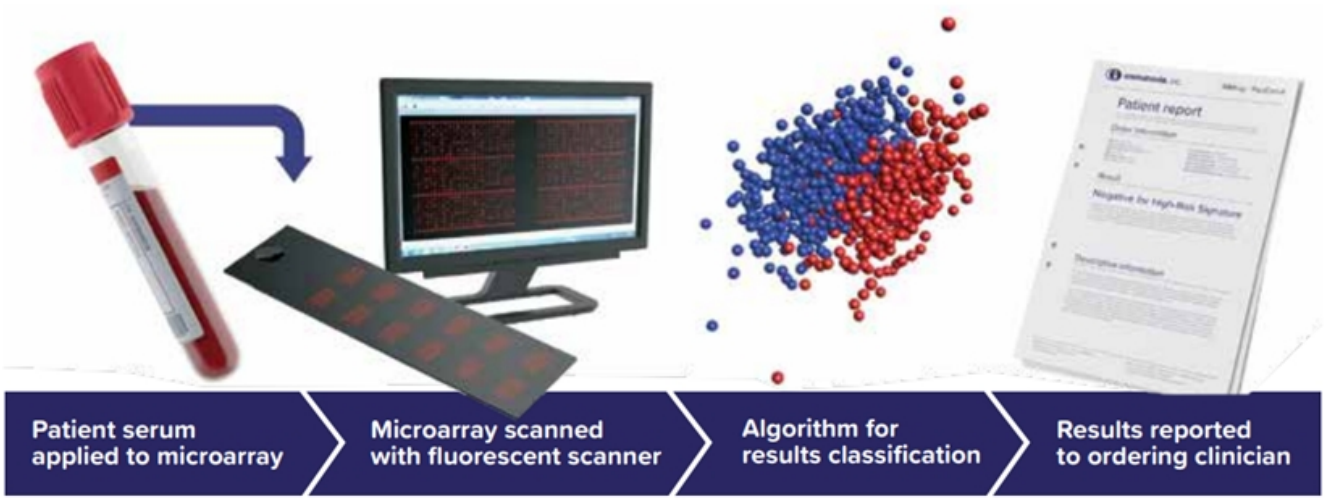
Background

Immunovia AB was founded in 2007 by researchers from the Department of Immunotechnology at Lund University and CREATE Health (the Center for Translational Cancer Research) in Lund, Sweden.

Immunovia's strategy is to decipher the information available in blood and translate it into clinically useful tools to diagnose cancer earlier and more accurately than previously possible.

Immunovia's technology platform – IMMray – is an antibody-based multiplex test that is designed to provide a snapshot of the immune system response, based on the information available in a single drop of blood.
IMMray is more than a technology. It is a systematic approach, based on cutting-edge bioinformatics, to finding the most clinically relevant changes that appear in the blood, and combining this knowledge into a "disease fingerprint" – called a biomarker signature – that is highly specific to the particular disease.

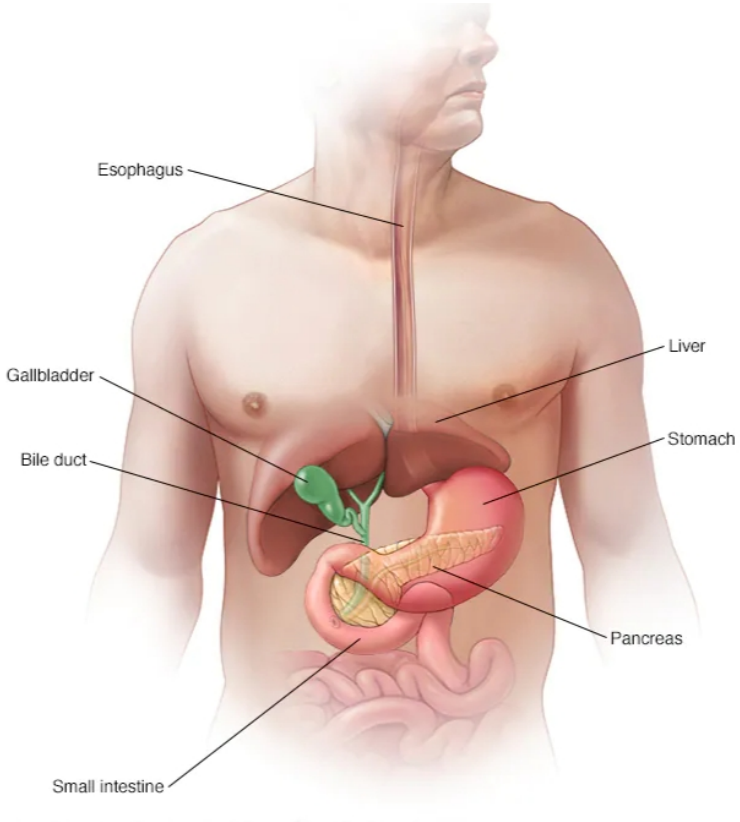
Since 2016, Immunovia has conducted a comprehensive programme for prospective clinical trials in the three main risk groups for pancreatic cancer: PanFAM-1 is a clinical trial for individuals with familial/hereditary pancreatic cancer, PanSYM-1 for patients with early, non-specific symptoms suggestive of pancreatic cancer, and PanDIA-1 designed for individuals at risk due to the diagnosis of new onset diabetes type II after the age of 50. These three large clinical studies today cover more than 10,000 subjects recruited at 30 sites in the US and Europe.



Source: The Company

Pancreatic cancer

The pancreas is located behind the stomach. Pancreatic juice flows in a duct through the pancreas. Bile from the liver and gallbladder flows through another duct that passes through the pancreas. Both the pancreatic duct and the bile duct continue out into the duodenum. Once in the duodenum, the bile and the pancreatic juice are mixed with food that has just left the stomach to begin its passage through the intestinal system.



Source: Mayo Clinic

Every year, around 1,500 people in Sweden get pancreatic cancer, and the disease is about as common in men as in women. Pancreatic cancer is uncommon among younger people, and three-quarters of patients are over 65 years old. However, the statistics are somewhat uncertain when it comes to pancreatic cancer (as with some other abdominal cancers) because it can be difficult to diagnose, which also means that many cases are not registered in the National Board of Health and Welfare's cancer register.

Cancers of the liver, bile ducts and pancreas are a group of cancers that usually have a very poor prognosis. Over the past ten years, the increase in pancreatic cancer has averaged 2.8 percent per year for men and 2.1 percent for women, and over the past 20 years the increase is 1.9 percent per year for men and 1.2 percent for women.

How is pancreatic cancer defected?

Some of the early symptoms of pancreatic cancer (abdominal pain, weight loss, loss of appetite) are the same as in gastric or colon cancer and rectal cancer.

It is therefore not uncommon for the investigation to begin with examinations such as gastroscopy or colonoscopy. This is especially true in cases where there are no signs of jaundice. However, these tests cannot detect pancreatic cancer and the tumour only becomes apparent upon examination with targeted ultrasound, computed tomography or an MRI scan. The only way to determine for certain if a patient has a malignant pancreatic tumour is to remove a small piece of tissue (biopsy) and examine the cells under a microscope. The tissue sample can be taken with a thin needle while the pancreas is being viewed using ultrasound or endoscopy. However, if the imaging indicates a tumour that can be excised, no biopsy is taken because there is a small risk of spreading it through the needle

tract and because the necessary tissue samples can be taken during the surgical procedure. However, if treatment other than a tumourectomy is indicated, it becomes necessary to determine whether the tumour is cancerous before starting treatment.

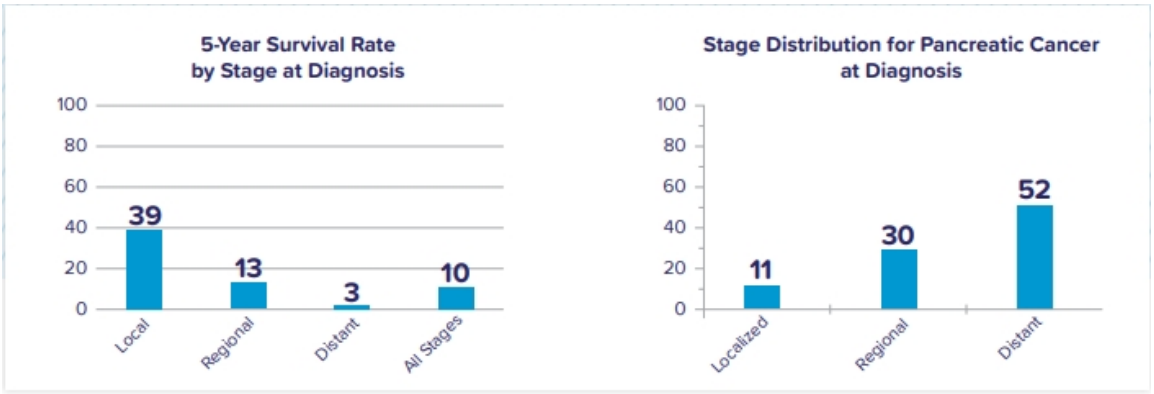
Prognosis

The only method that can cure pancreatic cancer today is surgery, but unfortunately most cases of pancreatic cancer are detected at such a late stage that the patient cannot be operated on and the chance of a cure is limited. Only about 20 percent of patients can be operated on, and of these most will sooner or later have relapses. This means that only 10–25% of those who can undergo surgery will be permanently cured. However, progress has been made in slowing the disease and alleviating the symptoms.

In summary, the wide-ranging symptoms of the disease and the lack of a simple diagnostic test (you essentially need a computed tomography scan to make a diagnosis) mean that the diagnosis is made late and that the majority of patients (> 80%) have an incurable disease at diagnosis. In addition, pancreatic cancer is highly resistant to chemotherapy and radiotherapy, which is why surgery is currently the only potentially curative treatment.

The prognosis for pancreatic cancer is generally very poor, with median survival (i.e. when half of patients have died) of about 6 months, and a 5-year survival rate of less than 5% for the entire patient group. The median survival in Sweden for the minority (< 20 %) who can be operated on is 26 months. The 3-year survival is 37%. These data stand up very well to international comparison. The corresponding figures for periampullary tumours are slightly better, with total 5-year survival of approximately 20% and median survival after surgery of 37 months. The 3-year survival rate is 57%.

The importance of detecting pancreatic cancer at an early stage

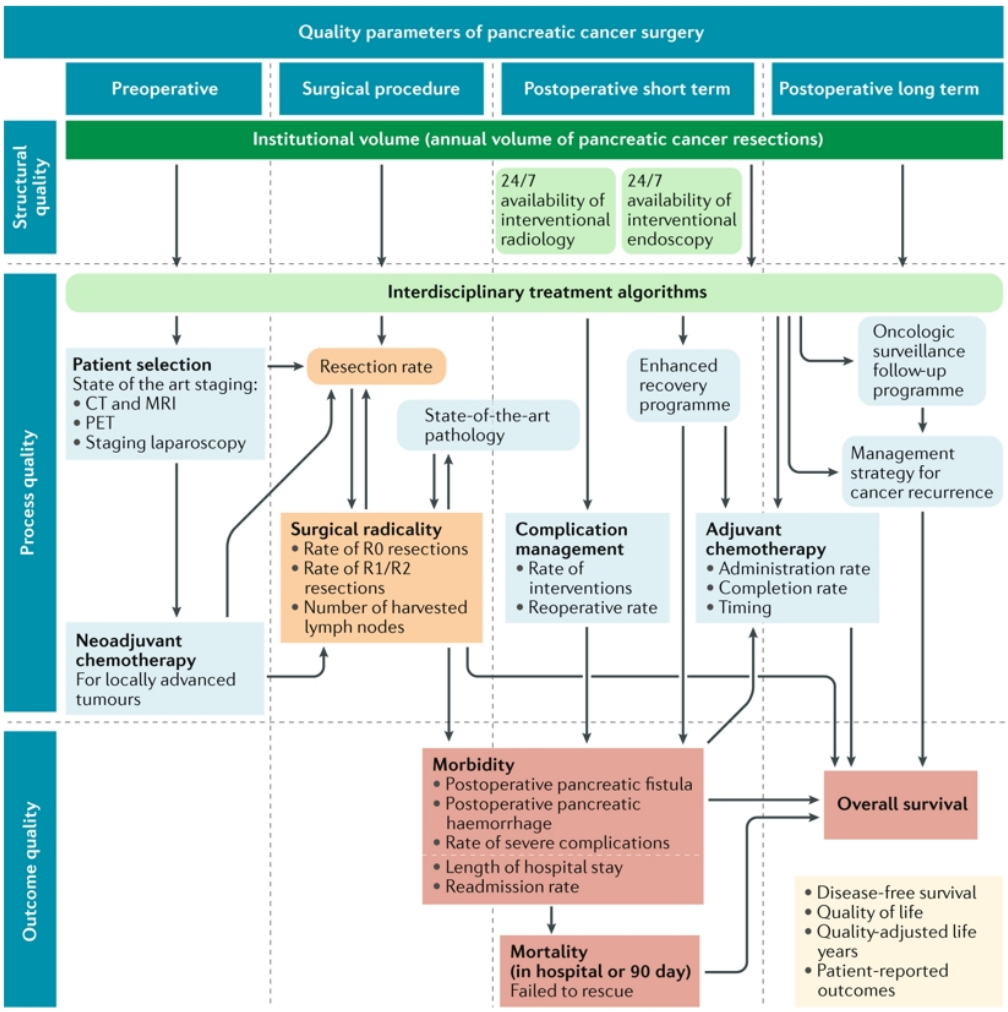


Siegel RL, Miller KD, Fuchs HE, Jemal A. Cancer statistics, 2021. *CA: A Cancer Journal for Clinicians*. 2021;71(1):7-33.

Source: The Company

Physicians distinguish between tumours located in the pancreatic-juice-producing exocrine pancreas and in the periampullary region (close to the small intestine), even though from a patient perspective and clinical perspective they are similar in terms of symptoms, investigation and treatment. But as noted above, they differ in terms of the survival prognosis.

Flow chart for the care process



Source: Nature reviews clinical Oncology

Heredity and screening programmes for familial pancreatic cancer

Patients with hereditary pancreatic cancer can be divided into two groups. The first group are patients who have an increased risk of pancreatic cancer as part of a syndrome that also includes other symptoms, such as familial malignant melanoma, Peutz-Jeghers syndrome or hereditary pancreatitis. This is a very small group, and if a hereditary syndrome is suspected the family should be referred to an oncogenetic clinic. The second and larger group are patients with familial pancreatic cancer. The definition of this group is two first-degree relatives with pancreatic cancer, or three relatives regardless of degree in the same line. It is often stated in the literature that 5–10% of all cases of pancreatic cancer have hereditary factors.

At present, we know of a number of genes with a weak link to familial pancreatic cancer. A variant in one of the known cancer genes BRCA2, ATM, PALB2 and genes associated with Lynch syndrome, together with a first-degree relative with pancreatic cancer, means some increase in risk for pancreatic cancer. However, no gene is yet known in which mutations give the increased risk for familial pancreatic cancer that is today the inclusion criterion for screening programmes (> 15 % lifetime risk). Currently, this means that risk assessments for individuals in a family where there is a raised incidence of pancreatic cancer are usually made on the basis of the family association instead of with a genetic test. If an individual has two or three first-degree relatives with pancreatic cancer, the lifetime risk for that individual is 3–5% and 14–25%, respectively (population risk 0.8 %). Early onset appears to increase the risk

of hereditary pancreatic cancer, and there is data on a 16% lifetime risk if there are two first-degree relatives, one of whom presented before the age of 40.

Magnetic imaging (MRI and MRCP) and endoscopic ultrasound examination are the most common modalities for screening.

For individuals with a heightened risk of pancreatic cancer, it is desirable to offer a screening programme that can with great certainty detect early cancers where intervention leads to the patient being cured. Two aspects must be considered in the evaluation of screening programmes. First, there is still uncertainty about the natural progression of a large part of the identified changes in the pancreas. Second, surgery is the only way to intervene to reduce the risk of cancer, and this is associated with significant morbidity as well as some postoperative mortality. For every individual undergoing surgery for a premalignant or malignant lesion, there are several individuals with benign changes who undergo the procedure, and these patients subsequently risk a significantly poorer quality of life.

The existing screening programmes evaluated in the scientific literature still cannot reliably show any reduced mortality in the group with familial pancreatic cancer, and therefore in future only patients with a significant increase in risk (> 15 % lifetime risk) should be included in screening programmes. These individuals need to be informed about the pros and cons of the screening. Screening begins at the age of 50, or ten years before the first illness (the index case in the family), and is performed annually. Examinations can be terminated when a surgical procedure is no longer considered feasible due to the patient's functional status.

Symptomatic patients with early vague symptoms

Early symptoms of pancreatic cancer are often vague and non-specific. These might include back pain, abdominal pain, digestive problems, fatigue, unexplained weight loss or incipient jaundice. This complicates the detection of the disease.

In fact, it takes an average of 6–9 months and 18 doctor visits before a patient with pancreatic cancer is diagnosed. This delay can lead to the patient's disease having time to go from treatable to untreatable.

Patients with vague and non-specific symptoms are usually examined in primary care, and the disease prevalence in this group is 2–3%. The number of patients in the risk group with vague symptoms is estimated at 1–2 million annually in the United States and Europe. The goal is to help clinicians make an earlier diagnosis of pancreatic cancer while it is still operable in patients with a non-specific but concerning symptom profile where the clinician suspects – or wants to rule out – pancreatic cancer. Routine testing of this risk group should be able to improve patient survival and lower the cost of healthcare.

The relationship between diabetes and pancreatic cancer

It has long been known that there is a statistical link between diabetes mellitus and pancreatic cancer, and there is at least a doubled risk of pancreatic cancer in patients with diabetes. Dividing patients according to how long they have had diabetes shows a clear correlation between the onset of diabetes in the age group 50–70 and pancreatic cancer; typically, the cancer is detected a few months or a half-year after the onset of diabetes. The correlation is very strong, but the frequencies are still so low that screening is not cost-effective (including ultrasound, DT and MRI) because type II diabetes is so common and pancreatic cancer so rare.

It is known that acini (berry-shaped groupings of cells in exocrine glands that produce secretions) located near the pancreatic islets are much larger and more enzyme-rich than those located distally. In all likelihood, this is an insulin effect, and it is well established that insulin is an anabolic hormone. It is therefore easy to believe that insulin stimulates increased cell division, which heightens the risk that a cell division will go wrong and lead to cancer. In experimental pancreatic cancer caused by nitrosamines, no cancer can be developed if the beta cells are disabled first. Even in human studies, it is extremely rare for patients with type I diabetes to suffer from pancreatic cancer.

It has been clearly shown that smokers have a greatly increased risk of pancreatic cancer, and that the risk increases further with diabetes. In non-smokers, morbid obesity (BMI ≥ 35) is strongly associated with both diabetes and pancreatic cancer. Sedentary obese individuals – who in all probability have high insulin levels around their islets

– have a greatly increased risk of pancreatic cancer. Rising age, smoking, obesity and sedentary lifestyle are well-established risk factors for diabetes, and prove to be at least as strong risk factors for exocrine pancreatic cancer.

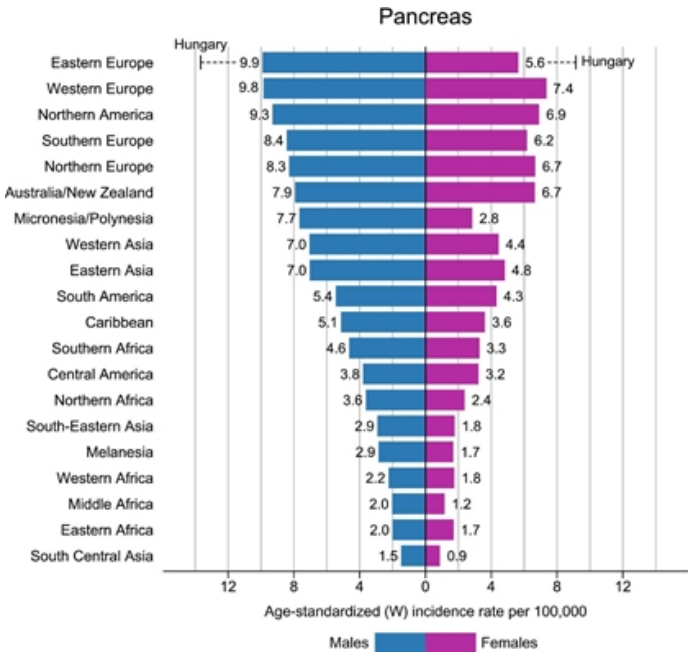
At the onset of pancreatic cancer, at least 80 percent of patients have impaired glucose metabolism, measured by glucose load. In radical surgery for pancreatic cancer, previously insulin-dependent diabetes may be completely reversed, which means that the patient manages completely without diabetes medication. This has been interpreted as the cancer itself secreting some substance that is diabetogenic, but despite extensive research it has not been possible to establish what chemical compound this might be.

INTERNTIONALLY

Pancreatic cancer is far from the most common cancer, and is in 14th place in terms of the number of new cases diagnosed each year. On the other hand, the data for the number of deaths per year are affected by the very poor prognosis for pancreatic cancer. In fact, the number of deaths per year shows pancreatic cancer to be the seventh most deadly form of cancer globally.

CANCER SITE	NO. OF NEW CASES	(% OF ALL SITES)	NO. OF NEW DEATHS	(% OF ALL SITES)
Female breast	2,261,419	11,7	684,996	6,9
Lung	2,206,771	11,4	1,796,144	18
Prostate	1,414,259	7,3	375,304	3,8
Nonmelanoma of skin	1,198,073	6,2	63,731	0,6
Colon	1,148,515	6,0	576.878	5,8
Stomach	1,089,103	5,6	768,793	7,7
Liver	905,677	4,7	830,180	8,3
Rectum	732,21	3,8	339,022	3,4
Cervix Uteri	604,127	3,1	341,831	3,4
Esophagus	604,100	3,1	544,076	5,5
Thyroid	586,202	3	43,646	0,4
Bladder	573,278	3	212,536	2,1
Non-Hodgkin Lymphoma	544,352	2,8	259,793	2,6
Pancreas	495,773	2,6	466,003	4,7
Leukemia	474,519	2,5	311,594	3,1
Källa: GLOBOCAN 2020				

Worldwide, the incidence of pancreatic cancer is considerably more common in Europe and North America, and in the United States it is the third-deadliest cancer numerically.



Source: GLOBOCAN 2020

United States

Of great interest at this stage is of course the US market, the location of Immunovia's first launch. In the US, pancreatic cancer is the third most common in terms of mortality, with more than 46,000 deaths in 2019. In addition, pancreatic cancer is expected to be the second most deadly form of cancer in the US within a year or so. As in the rest of the world, US patients are diagnosed at a late stage of the disease, which means that only a small minority are offered curative treatment, which in turn is not very successful. This means that early diagnosis and detection of carcinogenesis is attracting great interest from doctors and researchers in the field.

The IMMray platform

Background

For all cancers, the earlier they are detected the greater the chance of being cured. And at least as important is that each patient receives the treatment that is most effective for that individual – known as personalized medicine. Biomarkers, a kind of biological indicator in the body, have proven to be highly interesting for providing better and faster diagnosis and treatment of diseases like cancer. A biomarker is a biological substance that is used to indicate the presence of a particular biological state or condition. A biomarker signature might, for example, consist of around 20 proteins in the blood that form a pattern – a kind of fingerprint – that is typical of patients at risk of a specific cancer or relapse of a previously diagnosed cancer.

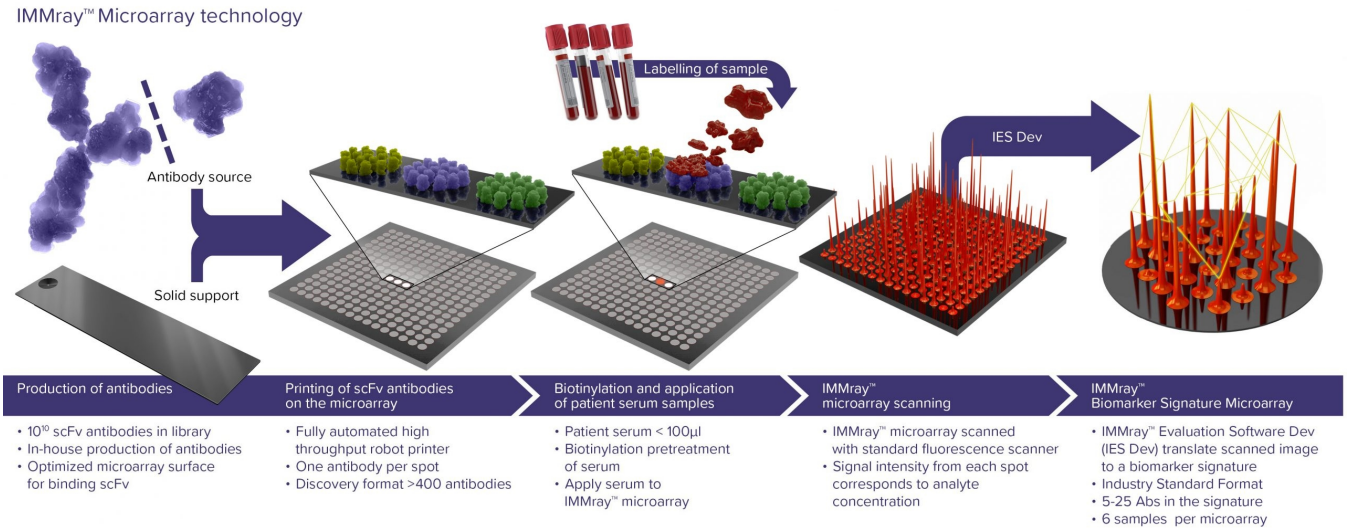
Bioinformatics is about structuring, analysing and visualizing large amounts of biological data. Bioinformatics is an interdisciplinary subject that ranges from biology and biomedicine to computer science and mathematics.

IMMray is a unique technology platform that employs advanced bioinformatics to produce biomarker signatures and blood tests with the potential to detect complex diseases early in their progression and with greater precision.

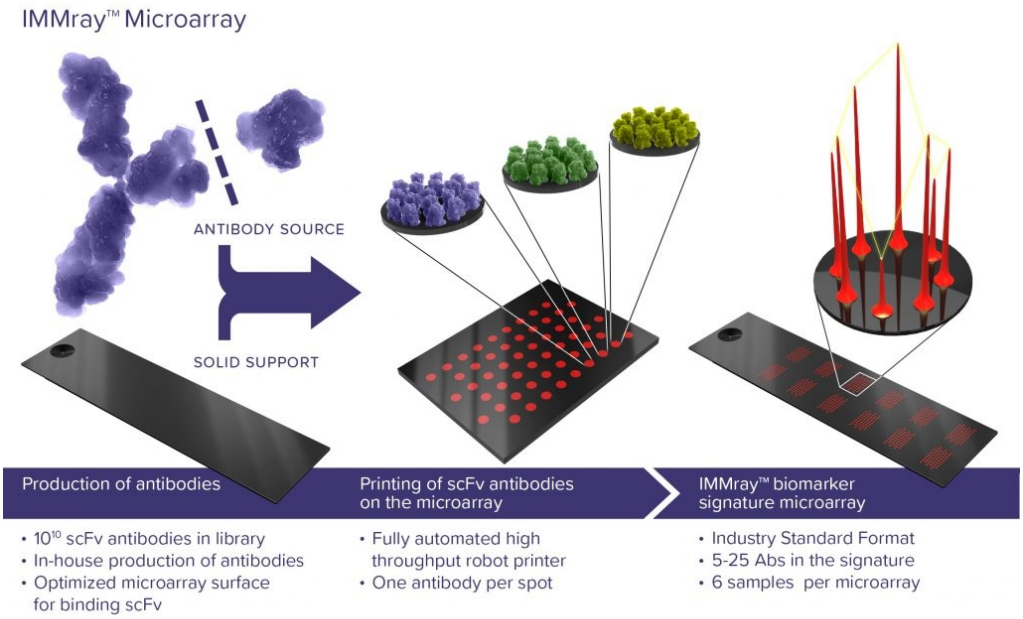
The platform utilizes antibodies that are a natural part of the human immune system. Microarrays use not the whole antibody molecule, but only the part that can bind to other molecules. This area is called a single chain fragment variable (scFv). The scFv fragments are attached to the underside of a chip, and when the sample is added each fragment captures the biomarker that the particular fragment is able to bind to. Because the platform is in a small-scale microarray format, only small amounts of sample and antibody fragments are required. Before the sample you want to analyse is added to the chip, it is marked with a fluorescent tag that enables the levels of each biomarker to be measured.

Immunovia's testing platform makes it possible to investigate in an efficient and structured way which set of biomarkers best indicates a disease. The purpose is to quickly identify a unique fingerprint that has the potential to detect disease in areas where there is an unmet clinical need, such as in the diagnosis of cancer and autoimmune diseases.

Antibodies to relevant biomarkers are placed on a microarray (a powerful high-capacity technology for parallel analysis and quantification of a large number of molecules). The technique is based on a large set of scFv fragments attached to a microarray, such as a slide or a silica surface, and examined using blood samples from diagnosed patients (retrospective studies). A series of advanced bioinformatics are used to test which combination of biomarkers best identifies the disease. The IMMray software is then trained to recognize the selected biomarker signature for the disease. In this way, the system is trained to get better and better until it can identify patients as early as possible and with the greatest accuracy. Once training is complete, the biomarker signature is confirmed through prospective studies in partner clinics and hospitals. Each of these unique "disease fingerprints" has the potential to provide a higher accurate diagnostic value than current practice, especially at early stages of disease.



Production takes place in Immunovia's own facilities and is fully compliant with the general regulatory requirements of EN ISO 13485. Please see below for a schematic of the production. All of the company's recombinant scFv antibodies are produced and purified in-house. Immunovia's vast library of recombinant scFv antibodies has been specifically designed at the molecular level to give a reliable source of renewable high-quality recombinant scFv antibodies to ensure optimal on-chip functionality. Antibody microarrays for multiplexed protein detection in blood samples are produced by a high-throughput robotic spot printing system which prints ultra-low volumes (picoliters) of antibodies onto a solid support.



IMMray PanCan-d

IMMray PanCan-d is a laboratory developed test (LDT) and the first blood test on the market intended for early detection of pancreatic cancer. By recognizing biomarker signatures, or signs of disease in the blood, IMMray PanCan-d has the potential to greatly increase patient survival thanks to earlier detection of pancreatic cancer.
Immunovia has conducted extensive clinical trials to document IMMray PanCan-d. We summarize here the most important research data that forms the basis for the launch, and refer readers to the appendix for a more detailed presentation.
Since 2016, Immunovia has conducted extensive prospective studies focusing on the main risk groups for pancreatic cancer:
• PanFAM-1 for the risk group familial/hereditary pancreatic cancer
• PanSYM-1 for the risk group of vague, non-specific symptoms associated with pancreatic cancer
• PanDIA-1 for patients in the risk group newly diagnosed type II diabetes after the age of 50

These three large clinical trials currently include more than 10,000 individuals recruited in over 30 different locations in the United States and Europe.

PanFAM-1 trial: Familial/hereditary pancreatic cancer (FPC)

PanFAM-1 is a prospective multicentre study focusing on the early diagnosis of individuals at high risk of familial/hereditary pancreatic cancer (FPC) designed in close collaboration with key opinion leaders in pancreatic cancer.

The main objective of the study was to provide clinical data on the performance of IMMray PanCan-d regarding the detection of early pancreatic cancer within a prospective cohort of asymptomatic individuals at high risk for pancreatic cancer, and to compare these results with current practice in healthcare, i.e. various imaging techniques.

PanFAM-1 is the largest prospective study in pancreatic cancer ever conducted. It includes over 3,000 blood samples from 1,265 individuals in 23 different screening programmes for individuals with familial/hereditary pancreatic cancer in both the United States and Europe. The last blood samples were collected in April 2021. All blood samples will be analysed during the second half of 2021.

PanFAM-1 is being conducted in collaboration with 23 partners:

USA: New York University Hospital, NY; Columbia University, NY; Mount Sinai Hospital, NY; Stanford Gastroenterology and Hepatology, CA; Yale University, CT; University of Chicago Medical Center, IL; Massachusetts General Hospital, MA; University of Massachusetts, MA; The Ohio State University, OH; Oregon Health & Science University, OR; University of Pennsylvania, PA; University of Pittsburgh Medical Center, PA; and University of Utah, UT.

Canada: The Research Institute of the McGill University Health Centre.

Sweden: Karolinska University Hospital; Sahlgrenska University Hospital; Umeå University Hospital and Linköping University Hospital.

Spain: University Hospital Ramon y Cajal; University Hospital Santiago de Compostela; and Catalan Institute of Oncology (ICO Hospitalet) – Bellvitge Biomedical Research Institute (IDIBELL).

United Kingdom: University College London Hospital; and The University of Liverpool.

Sensitivity and specificity cf. CT, MRI and endoscopic ultrasound

	IMMray PanCan-d[1]	CT[2]	MRI[2]	EUS[2]
Sensitivity	92.0%	81.4%	89.5%	97.5%
Specificity	99.0%	43.0%	63.4%	90.3%
PPV (3% prevalence)	74.0%	4.2%	7.0%	23.7%
NPV (3% prevalence)	99.8%	98.7%	99.5%	99.9%

[1] Internal data on file. Immunovia, Inc.
[2] Costache MI, Costache CA, Dumitrescu CI et al. Which is the best imaging method in pancreatic ductal adenocarcinoma diagnosis and staging – CT, MRI or EUS? *Curr Health Sci J.* 2017;43(2):132-136.

Source: The Company

PanSYM-1 trial: Vauge, non-specific symptoms assicuated with pancreatic cancer

PanSYM-1 is an ongoing prospective validation study for the early diagnosis of pancreatic cancer in patients with non-specific symptoms, where risk factors and the physician's assessment give rise to increased concern. The study was designed in close collaboration with key opinion leaders in pancreatic cancer to provide clinical data on the performance of IMMray PanCan-d in this risk group. Immunovia collaborates with an expert group of European and American key opinion leaders in pancreatic cancer to influence medical practice and national guidelines in the field.

The goal is to help clinicians make an earlier diagnosis of pancreatic cancer, while the cancer is still operable, in patients with a non-specific and concerning symptom profile where the clinician suspects – or wants to rule out – pancreatic cancer. Procedures such as routine testing of this risk group should be able to increase patient survival and reduce healthcare costs.

Since 2018, a large number of blood samples have been collected from patients with non-specific symptoms associated with pancreatic cancer when they have visited endoscopic/gastrointestinal units in hospitals. This prospective collection of samples has taken place in close collaboration with University College London (UCL). Professor Stephen Pereira, a globally recognized expert on pancreatic cancer, has been a member of Immunovia's Scientific Advisory Board since 2017. The blood samples collected until 2020 have been used to further develop IMMray PanCan-d through the company's optimization study and commercial test model study, and for the company's verification and validation studies.

Intervention studies are currently being discussed with UCL and a number of different rapid diagnostic centres in the UK. The aim is to evaluate whether IMMray PanCan-d is able to identify pancreatic cancer in high-risk patients with non-specific but concerning symptoms earlier than with current practice.

PanSYM-1 is part of UCL's ADEPTS study (Accelerated Diagnosis of Neuroendocrine and Pancreatic Tumours), funded by Pancreatic Cancer UK to support the long-term plans of the national healthcare system in the UK (NHS) with the aim of providing the patient with a cancer diagnosis while it can still be operated on.

PanDIA-1 is an ongoing prospective observational study for early diagnosis of pancreatic cancer among high-risk individuals within the risk group new onset diabetes type II (NOD).

In late 2017, Immunovia launched PanDIA-1, the world's most comprehensive prospective study for the early diagnosis of pancreatic cancer within the NOD risk group. The study was initiated in collaboration with Lund University, Uppsala University, Lund University Diabetes Centre (LUDC), Region Skåne and Region Uppsala.

The objective of PanDIA-1 is to validate the clinical benefits of IMMray PanCan-d in the NOD risk group, as well as to show overall healthcare benefits and economic cost benefits through testing for pancreatic cancer within this risk group.

The study received a grant of SEK 7.6 million from SWElife, the government's strategic innovation programme. SWElife has supported the development of one of the world's largest biobanks of newly diagnosed diabetes patients (21,000 diabetes patients from two Swedish regions via the ANDIS (All New Diabetics in Skane) and ANDIU (All New Diabetics in Uppsala) studies). This collaboration allows the continued prospective studies based on IMMray PanCan-d for three years through access to samples from approximately 6,000 diabetes patients over the age of 50.

PanDIA-1's interim analysis is expected during the second half of 2021.

The molecular diagnostics market

The size of the global molecular diagnostics market was USD 36 billion in 2020, and is expected to grow by just over 4% annually from 2021 to 2028. The main growth factors are technological development, an aging population and an increasing willingness of funders to pay to finance new and innovative diagnostics. Of the various disease fields, the oncology market will grow fastest, driven primarily by early identification of predictive biomarkers to diagnose cancer diseases, which in turn will lead to the development of targeted and sometimes personalized cancer treatment being accelerated and implemented.

North America is the largest geographical market and accounted for just over 36% of revenues. Growth is being driven by increased awareness among consumers (partly via patient associations) about new diagnostic methods, technological advances and increased prevalence of diseases, combined with better healthcare infrastructure. Europe accounts for just over 27% of the market. Here too, future growth is expected to be good and driven by similar factors as in North America. Asia is expected to have the fastest growth in the future, with annual expansion of 6% driven by increased market penetration combined with great medical demand. Additional growth factors are faster diagnosis of diseases and the introduction of targeted therapies.

Growth for innovative companies in the sector is expected to be high, as shown in the table below of consensus estimates for sales growth.

Oncology Molecular Diagnostics - Company sales forecasts (consensus)

USDm	2015	2016	2017	2018	2019	2020	2021e	2022e	2023e	2024e	2025e	2026e
Cologuard/Laboratory Service	2522%	152%	168%	71%	78%	1%	37%	39%	26%	21%	17%	15%
Commercial Payor			430%	118%	99%	11%	37%	39%	26%	21%	17%	15%
Medicare			110%	48%	59%	-10%	37%	39%	26%	21%	17%	15%
Clinical Guardant Health			72%	86%	130%	31%	30%	43%	35%	26%	21%	21%
Precision Oncology/Genomic Health						566%	22%	9%	7%	7%	6%	6%
Oncotype Dx Breast						653%	23%	7%	6%	6%	5%	5%
Medicare								60%	39%	28%	23%	22%
Private Insurance								29%	32%	24%	20%	20%
clonoSEQ				45%	32%	-5%	83%	86%	74%	68%	45%	36%
Product (VolitionRX)							23784%	1385%	95%	69%	63%	29%
Colon Screening									93%	69%	65%	29%
MyRISK (Myriad Genetics)	46%	-15%	-2%	10%	-24%	-100%		-3%	-4%	-5%	-5%	-6%
Hereditary Cancer Testing	-3%	-15%	-10%	2%	-28%	-54%	102%	-3%	-4%	-5%	-5%	-6%
Biocept	357%	428%	57%	-36%	70%	397%	-69%	185%	76%	70%	79%	60%
Afirma Thyroid FNA Analysis	30%	31%	11%	28%	31%	-2%	6%	14%	8%	7%	6%	6%
Total	118%	103%	124%	131%	135%	110%	153%	128%	121%	118%	117%	115%
Max	2522%	428%	430%	118%	130%	653%	23784%	1385%	95%	70%	79%	60%
Min	-3%	-15%	-10%	-36%	-28%	-100%	-69%	-3%	-4%	-5%	-5%	-6%
Medel	590%	116%	104%	41%	50%	135%	2190%	138%	36%	28%	25%	18%
Median	46%	31%	65%	45%	59%	1%	37%	39%	26%	21%	17%	15%

Source: Evaluate Pharma

First geographical launch market

On August 4, 2021, Immunovia announced that it had begun a launch in the US market. The company's US subsidiary Immunovia, Inc. in Marlborough, Massachusetts, was authorized to begin testing patients with IMMray PanCan-d, the first and only test on the market for the early detection of pancreatic cancer. The test was launched at a list price of USD 995 per unit, which was higher than the previously communicated price of USD 600 per test. The price was adjusted to reflect recent market surveys that showed strong price elasticity and health economic benefits even at a higher price.

The approval came from the Massachusetts Department of Public Health, which has the authority to accredit laboratories under the CLIA (Clinical Laboratory Improvement Amendments) regulations. With this, Immunovia was able to immediately start selling the IMMray PanCan-d test for early detection of pancreatic cancer in the United States.

The Center for Medicare and Medicaid Services (CMS) regulates all laboratory testing (except research) performed on humans in the United States through the Clinical Laboratory Improvement Amendments (CLIA) regulations. In total, CLIA covers approximately 260,000 laboratories. The Division of Clinical Laboratory Improvement & Quality, which is part of the Quality and Safety Oversight Group at the Center for Clinical Standards and Quality (CCSQ) is responsible for the implementation of CLIA. The aim of CLIA is to ensure the quality of laboratory testing. Although all clinical laboratories must be properly certified to receive Medicare or Medicaid payments, CLIA has no direct Medicare or Medicaid responsibilities.

Relatively soon after the launch, patient associations in the United States began to announce that Immunovia's test was available on the market. For example, the United States' largest pancreatic cancer patient organization, the Pancreatic Cancer Action Network (PanCAN), announced that it had informed its members about Immunovia Inc's IMMray PanCan- d blood test on its website, in social media and via direct mail.

PanCAN underlines that IMMray PanCan-d is the first-ever blood test specific for pancreatic cancer and is available to people considered at high risk for the disease, due to family history or genetic alterations. PanCAN describes that the test is requested through one's doctor, who also will receive the test results from Immunovia. Interested individuals can contact PanCAN Patient Services, which provides free information and answers questions about IMMray PanCan-d.

"Pancreatic cancer is a tough disease. There isn't an early detection test for the general population, and there are very few treatment options, so it's exciting to see progress being made. The Immunovia IMMray PanCan-d test is an important step for some patients to be diagnosed earlier, have more treatment options and live longer," says Julie Fleshman, JD, MBA, President and CEO of Pancreatic Cancer Action Network (PanCAN).

Clear plan for cost reimbursement

Now that the results of the final validation study and the CLIA certificate required for the laboratory in Marlborough have been obtained, sales of IMMray PanCan-d have begun. Subsequently, a clear plan has been implemented to secure cost reimbursement from the insurance systems (both state and private) in the United States. The company is focusing on the familial/hereditary risk group in the cost reimbursement process and will present publications with data from the blinded validation study, the PanFAM-1 prospective cohort and key opinion leaders' market studies, called "investigator studies".

The size of the market was estimated at approximately 350,000 people in the United States with a clear hereditary risk of pancreatic cancer, and with the potential to rise to 1.5 million if a national recommendation is introduced to screen people with a close relative with pancreatic cancer in the US. Please refer to our comments under the Forecasts & Valuation section on how we assess that this launch will develop and when the next major launch in the European market will take place.

Forecast & Valuation

We value Immunovia using a customary DCF approach. We have modelled the expected revenue flow given the known facts such as patient volumes, prices and tests/year. Patients have been divided into three groups according to their risk of suffering from pancreatic cancer. The first group (PanFAM-1) consists of individuals who are at high risk for familial/hereditary pancreatic cancer. This group is estimated to amount to about 350,000 patients in North America, and about 525,000 in Europe. The second group (PanSYM-1) consists of individuals with vague, non-specific symptoms associated with pancreatic cancer. This group is estimated to amount to about 500,000 in North America and about 750,000 in Europe. The third group (PanDIA-1) consists of individuals who are newly diagnosed with type II diabetes after the age of 50. This group is estimated to amount to about 900,000 individuals in the United States and about 1,350,000 in Europe.

We estimate that the list price is approximately USD 1,000 per test in North America and EUR 425 in Europe. For the American market, we have assumed a discount of approximately 25–30% against the list price during the period 2022–2026. Thereafter, we have assumed that the price will gradually increase and reach a level of approximately USD 1,100 per test from 2031 onwards. It is important to point out that the two modalities currently used in screening programmes are reimbursed at USD 6–7,000.

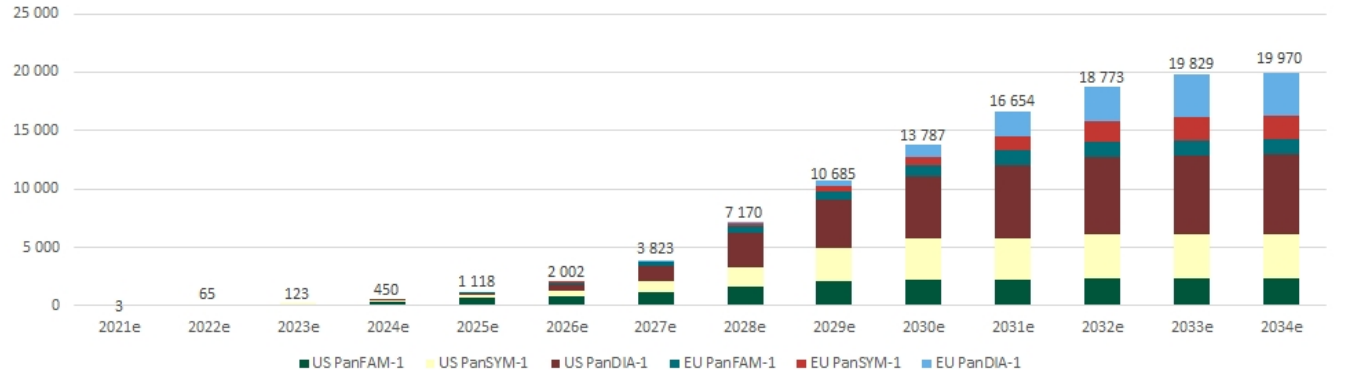
At the time of the launch of the IMMray PanCan-d test in the United States there is no established reimbursement system in place. This means that the first patients tested are having to pay privately. This is reflected in our sales estimates. We estimate that reimbursement will take effect in 2023 for the North American market and somewhat later for the European market.

Immunovia's sales focus will initially be solely on the North American market, after which it will penetrate the European market. Once the test is launched in Europe, we assume a similar volume growth as in the US, but it should be noted that the total volume of patients is larger in the European market.

We have not modelled other geographical markets at present, given the lack of visibility about launch dates.

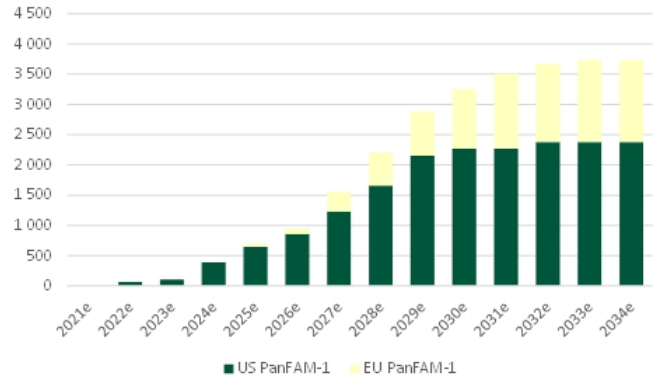
Below is a chart with our revenue estimates for the entire period, which assume that Immunovia will take a volume market share of 15–20% in North America by 2026.

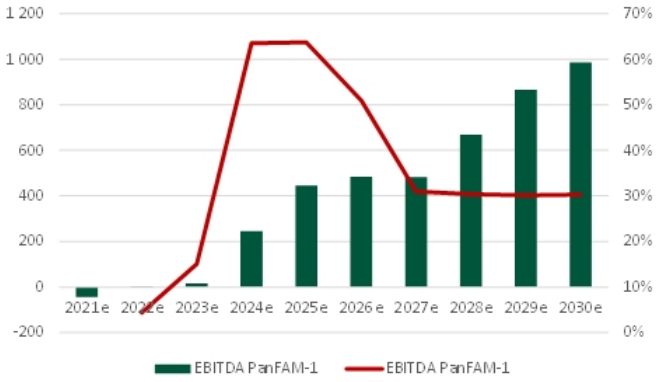
Revenues North America and the EU (SEKm)



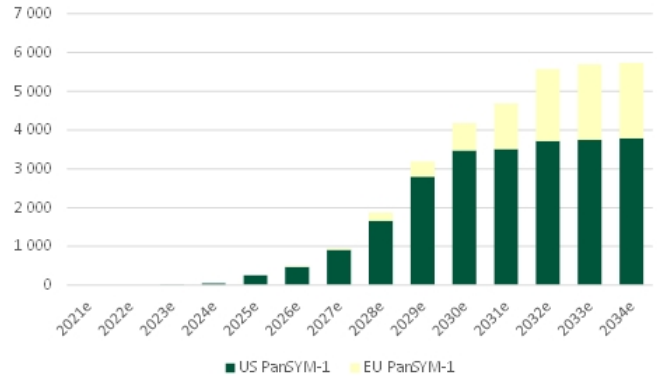
We have also modelled sales revenues and contributions at the EBITDA level per patient area divided into PanFam-1, PanSYN-1 and PanDIA-1:

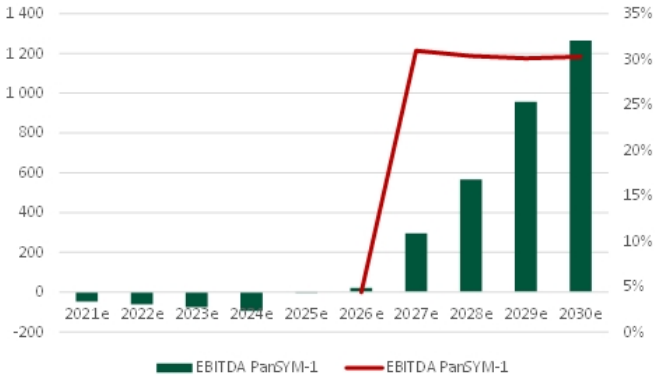
Revenues and EBITDA - PanFAM-1



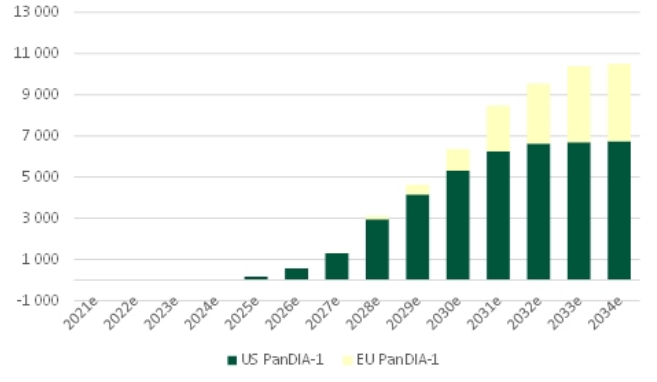


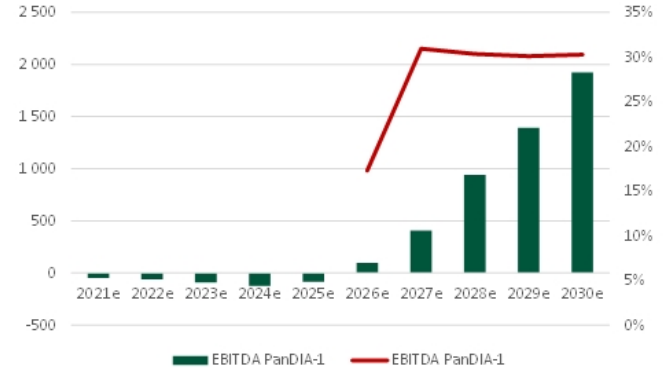
Revenues and EBITDA - PanSYM-1





Revenues and EBITDA - PanDIA-1





Valuation

We arrive at a fair value for Immunovia by calculating the present value of future revenues and expenses. The estimates are adjusted using a discount rate of 16%. The complete valuation is summarized in the table below. Overall, this generates a fair value of SEK 334 per share, justifying a value in the range SEK 330– 340 per share.

Valuation output	
Sum of PV of FCF (explicit period)	4 458
PV of terminal value (perpetuity formula)	2 754
Enterprise value	**7 211**
Latest net debt	-346
Minority interests & other	0
Equity value	**7 557**
No. of shares outstanding (millions)	23
Equity value per share (SEK)	**334**

Implicit multipl.	2022	2023	2024
EV/Sales	112	59	16
EV/EBITDA	-60	-48	272
EV/EBIT	-51	-41	-205149
EV/NOPLAT	-64	-52	-257725
P/E			
ROIC/WACC			
Current Share price			117,9

WACC assumptions	
Risk free nominal rate	0,4%
Risk premium	7,0%
Extra risk premium	7,8%
Beta	1,1
Cost of equity	16,7%
Cost of debt (pre-tax)	4,0%
Tax rate	20%
Target debt/(debt + equity)	5%
WACC	16,0%

Terminal value assumptions	
Long term growth rate	0,5%
Long term EBIT margin	20,0%
Depreciation (% of sales)	1,1%
Capex (% of sales)	2,0%
Working cap. (% of sales)	10,0%
Tax rate	20%

Sensitivity analysis

WACC \ Long-term growth rate	-0,5%	0,0%	0,5%	1,0%	1,5%
15,0%	367	372	377	383	389
15,5%	346	350	355	360	365
16,0%	326	330	**334**	338	343
16,5%	308	311	315	318	323
17,0%	291	294	297	300	304

WACC \ Long-term EBIT margin	15,0%	17,5%	20,0%	22,5%	25,0%
15,0%	338	358	377	397	416
15,5%	319	337	355	372	390
16,0%	302	318	**334**	350	366
16,5%	285	300	315	330	344
17,0%	270	283	297	310	324

Shareholders, management and board

The largest shareholder in Immunovia is Carl Borrebaeck with 7.6 % of shares and votes. Avanza Pension is the second-largest shareholder with 5.3 %, followed by Mats Ohlin (3.9 %) and Sara Andersson Ek (3.8 %).

Patrik Dahlen has been CEO since November 2020. Patrik holds an MSc in Biochemistry from Åbo Akademi University and a PhD in Biochemistry from Turku University. He has previously been CEO of organizations and listed companies with up to 2,000 employees in Finland, Denmark, the United Kingdom and the United States.

Hans Liljenborg has been CFO since 2013. Hans is a graduate of specialist education in business administration and mathematics from Lund University. Hans was previously Finance Director at Physio Control Inc/Jolife AB and Finance Manager at Vivoline Medical AB, which was listed on Nasdaq First North in March 2015.

Carl Borrebaeck is a founder and has been chairman of Immunovia since 2007. Professor Borrebaeck co-founded Senzagen AB (publ), BioInvent International AB (publ) and Alligator BioScience AB (publ). In 2017, Carl was named Biotech Builder of the Year for his entrepreneurship. Professor Borrebaeck is a Life Member of the IVA (Royal Swedish Academy of Engineering Sciences), a Director of CREATE Health – the Strategic Division of Translational Cancer Research, and former Deputy Vice-Chancellor of Lund University (responsible for its innovation systems and industrial partnerships) and Head of the Department of Immunotechnology. Carl Borrebaeck is also the Founding Mentor for NOME (Nordic Mentor Network for Entrepreneurship).

Shareholders

Largest shareholders	Votes	Capital
Carl Borrebaeck	7,6%	7,6%
Avanza Pension	5,3%	5,3%
Mats Ohlin	3,9%	3,9%
Sara Andersson Ek	3,8%	3,8%
Others	79,4%	79,4%
Chairman	Carl Borrebaeck	
CEO	Patrik Dahlen	
CFO	Hans Liljenborg	
IR	Patrik Dahlen	
Website	https://immunovia.com/	

Source: Holdings

ESG-analysis

Immunovia is a company whose business is focused on analysing the information available in blood and translating it into clinically useful tools for diagnosing cancer. The company's focus entails socially beneficial work by preventing illness and health risks. This in turn can lead to less strain on healthcare and society at large. At the individual level, this type of development and research means safety, and can be helpful both health-wise and socially.

Environment

The company's technology platform – IMMray – is an antibody-based test that has some impact on the environment but can ultimately assist society with less emissions and effective treatment of patients.

Social

With a vision to save lives and combat diseases, the company's contribution to social sustainability is important.

Governance

Immunovia has seven approved patent families internationally. The company's diagnostic method is currently in an ongoing launch phase in the United States.

Income statement

SEKm	2019	2020	2021e	2022e	2023e	2024e	2025e
Net sales	**1**	**1**	**3**	**65**	**123**	**450**	**1 118**
Cost of sales	-	-	-	-19	-31	-90	-168
Gross profit	**1**	**1**	**3**	**45**	**92**	**360**	**950**
R&D (incl. studies)	-56	-62	-69	-76	-83	-90	-141
Employee costs	-76	-103	-117	-139	-210	-293	-523
Capitalised production costs	27	40	45	49	50	49	70
Other operating expenses	-0	-0	-0	-0	-0	-1	-1
EBITDA	**-106**	**-125**	**-138**	**-121**	**-151**	**26**	**356**
Amortisation of intangible assets and depreciation of PPE	-8	-10	-18	-21	-24	-27	-29
EBIT	**-114**	**-134**	**-156**	**-142**	**-175**	**-0**	**327**
Financial income	4	6	-	-	-	-	-
Financial costs	-4	-17	-1	-1	-10	-10	-10
EBT	**-115**	**-146**	**-158**	**-143**	**-185**	**-10**	**317**
Income tax	-0	-	-	-	-	-	-
Net profit	**-115**	**-146**	**-158**	**-143**	**-185**	**-10**	**317**

Balance sheet

	2019	2020	2021e	2022e	2023e	2024e	2025e
Assets							
Intangible assets	92	135	166	199	228	255	300
Property, plant and equipment	55	49	45	41	37	33	30
Financial assets	3	3	3	3	3	3	3
Total non-current assets	**150**	**186**	**214**	**242**	**268**	**291**	**332**
Inventories	0	0	0	2	4	14	34
Trade receivables	6	6	6	8	15	54	134
Cash and cash equivalents	263	468	283	107	91	25	234
Total current assets	**269**	**475**	**289**	**117**	**109**	**93**	**402**
TOTAL ASSETS	**419**	**661**	**503**	**359**	**377**	**383**	**734**
EQUITY AND LIABILITIES							
Equity	358	599	442	298	113	103	420
Non-controlling interests	0	0	0	0	0	0	0
Total equity	**358**	**599**	**442**	**298**	**113**	**103**	**420**
Non-current financial liabilities	33	28	28	28	228	228	228
Other non-current liabilities	0	0	0	0	0	0	0
Total non-current liabilities	**33**	**28**	**28**	**28**	**228**	**228**	**228**
Current financial liabilities	5	5	5	5	5	5	5
Trade payables	5	4	4	3	6	23	56
Other current liabilities	18	24	24	24	24	24	24
Total current liabilities	**29**	**34**	**34**	**33**	**36**	**52**	**85**
TOTAL EQUITY AND LIABILITIES	**419**	**661**	**503**	**359**	**377**	**383**	**734**

Cash flow statement

	2019	2020	2021e	2022e	2023e	2024e	2025e
Net profit	-115	-135	-158	-143	-185	-10	317
Non-cash items	8	10	18	21	24	27	29
Changes in working capital	15	5	0	-4	-6	-33	-67
Net cash (used in)/from operating activities	**-92**	**-121**	**-139**	**-126**	**-167**	**-16**	**279**
Investments	-37	-47	-46	-49	-50	-49	-70
Disposals	0	1	0	0	0	0	0
Free cash flow	**-129**	**-168**	**-186**	**-176**	**-216**	**-65**	**209**
Dividends	0	0	0	0	0	0	0
Share issue / buyback	10	379	0	0	0	0	0
Acquisitions	0	0	0	0	0	0	0
Loan financing and other adjustments	-4	-5	0	0	200	0	0
Cash flow	**-123**	**206**	**-186**	**-176**	**-16**	**-65**	**209**
Translation differences in cash and cash equivalents	0	-1	0	0	0	0	0
Net debt	**-225**	**-435**	**-250**	**-74**	**142**	**208**	**-1**

Appendix

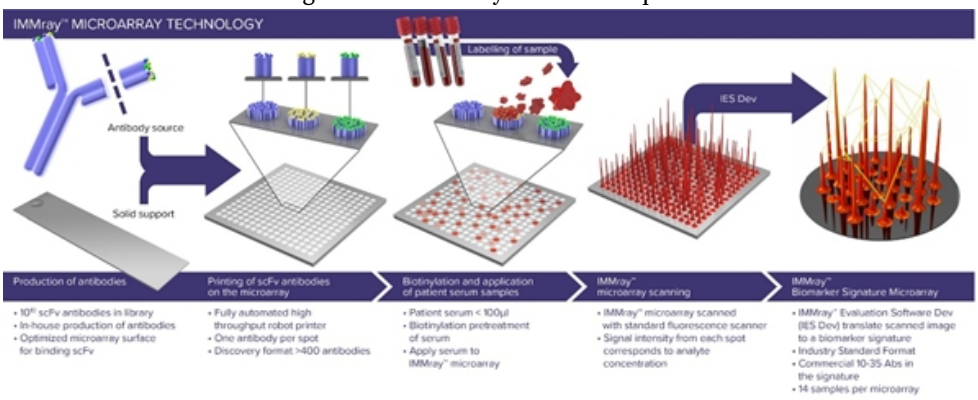
1. Optimization Study - Differentiating pancreatic cancer from individuals with concerning symptoms, including type II diabetes
2. Commercial Test Model Study - A multicenter survey
3. IMMray PanCan-d Blinded Validation Study

Studie 1: Optimization Study - Differentiating pancreatic cancer from individuals with concerning symptoms, including type II diabetes

Payam Delfani2, Anders Carlsson2,Thomas King2, Randall Brand3, Alexander Ney1, Stephen P Pereira1, Linda Dexlin Mellby2. 1 University College London, UK, 2 Immunovia, Lund, Sweden and Marlborough, USA, 3 Department of Medicine, University of Pittsburgh, USA.

Objectives

IMMray PanCan-d Optimization Study aimed to evaluate how IMMray biomarker signature could separate patients with PDAC (stage I-IV) from individuals with various concerning symptomatic conditions not caused by PDAC, which mirrors the clinical setting encountered by healthcare professionals.



Patients and Methods

PDAC				Controls		
Stage I	Stage II	Stage III	Stage IV	Healthy controls	Symptomatic controls (without diabetes)	Diabetes controls
20	34	21	61	217	480	90

In total, 923 serum samples were analyzed with IMMray discovery set up and a CA 19-9 ELISA. Patient samples from 136 PDAC (stage I-IV), 570 symptomatic individuals and 217 healthy controls were tested in a blinded manner. All PDACs were histologically confirmed. Based on one year follow up data non of the symptomatic controls developed PDAC. To minimize confounding and pre-analytical variables, all patient samples were collected and processed using the same standard operating procedures, stored at -80°C and tested within a year after collection. Data analysis for each group was performed using Support Vector Machine (SVM) algorithms. Data was divided into a training and test set, and test performance given as ROC AUC values, was then evaluated for the test set.

Results

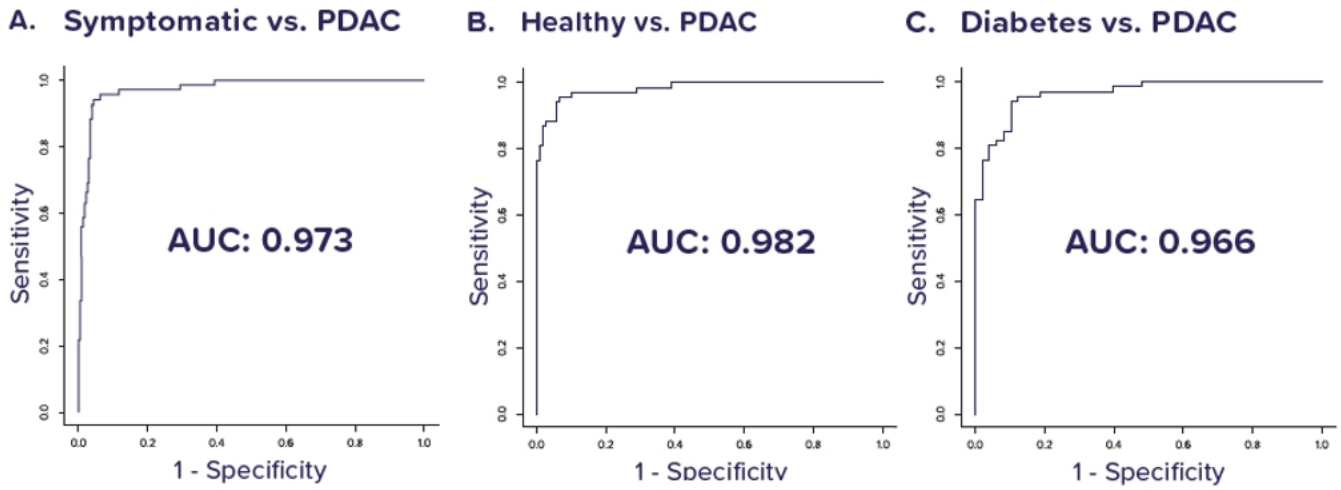


Fig. In total, 923 individuals were analyzed. Combining IMMray biomarker signature with CA 19-9, the results from the test set showed ROC AUC values of 0.973 and 0.982 differentiating PDAC (stage I-IV) vs. symptomatic individuals, and healthy controls, respectively.

PDAC (stage I-IV) could also be discriminated vs. diabetes type II controls with a ROC AUC value of 0.966.

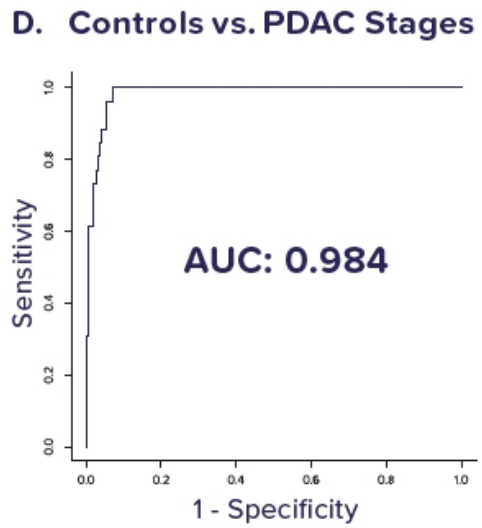


Fig. PDAC Stages I & II could be discriminated from controls (symptomatic + healthy + diabetes), using IMMray biomarker signature and CA 19-9 ELISA. The result from the test set showed a ROC AUC value of 0.984 differentiating PDAC Stage I & II.

Conclusion

IMMray PanCan-d Optimization Study showed for the first time that IMMray biomarker signature together with CA 19-9 has the capacity to differentiate PDAC (stage I-IV) from symptomatic, non-PDAC individuals, including type II diabetes. This study paves the way for the next, where the IMMray PanCan-d commercial biomarker signature is selected and the commercial test model is built.
Importantly, early stage I & II of PDAC was discriminated from controls with an unprecedented accuracy of 0.984.

These findings need to be validated but have significant clinical implications for individuals attending primary and secondary care units with non-specific but concerning symptoms where PDAC may be suspected.
Acknowledgements: Immunovia would like to acknowledge Växjö Central Hospital, Department of Transfusion Medicine, Sweden, for providing freshly collected samples for the optimization study.

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Studie 2: Commercial Test Model Study - A multicenter survey

Payam Delfani1, Anders Carlsson1,Thomas King1, Randall Brand2, Alexander Ney3, Stephen P Pereira3, A. James Moser4, Genesis Perez-Melara4, Corinne DeCicco4, Alfredo Carrato 5,

María E. Castillo-Sánchez5, Julie Earl5, Linda Dexlin Mellby1. 1 Immunovia, Lund, Sweden and Marlborough, USA, 2 Department of Medicine, University of Pittsburgh, USA,3 University

College London, UK, 4Beth Israel Deaconess Medical Center, Boston, MA, USA, 5 Ramón y Cajal University Hospital, IRYCIS, CIBERONC, Madrid, Spain.

Objectives

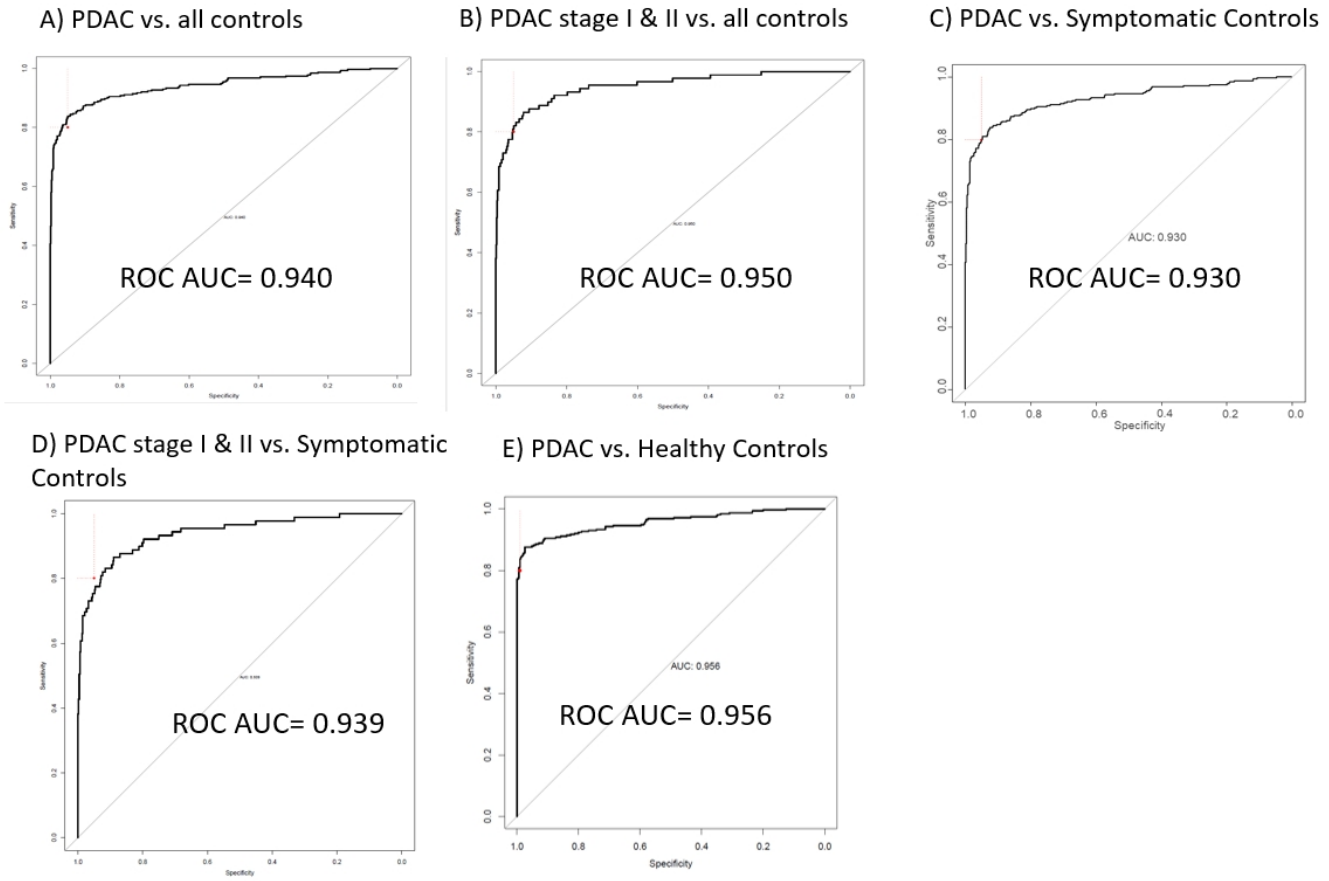
IMMray PanCan-d Commercial Test Model Study aimed to select and lock the IMMray PanCan-d commercial biomarker signature and evaluate its performance in differentiating pancreatic ductal adenocarcinoma - PDAC (stage I-IV), vs. controls, simulating a commercial test situation. In the current study, serum samples obtained from patients with non-specific but concerning symptoms, including diabetics, as well as healthy individuals collected from several sites both in EU & USA were analyzed.

Patients and Methods

PDAC					Controls	
Stage I	Stage II	Stage III	Stage IV	Stage non-confirmed	Healthy controls	Symptomatic controls (including diabetes)
34	55	64	118	44	310	488

In total, 1113 patient serum samples were analyzed with a focused IMMray set up and CA 19-9 assay. Patient samples from 315 PDAC (stage I-IV), 488 non-PDAC symptomatic individuals (including 79 diabetes and 56 chronic pancreatitis) and 310 healthy controls were tested. All these samples were freshly collected through our Key Opinion Leaders at eight reference sites in USA and Europe. Data analysis was performed, using Immunovia's software algorithms and the data were divided into training and test sets. The test performance was evaluated and displayed as ROC AUC values and sensitivity/specificity.

Results



Figures.

In total, 1113 individuals were analyzed. Combining IMMray PanCan-d 8-plex signature with CA 19-9, the results from the test set showed

- ROC AUC value of 0.940 differentiating PDAC (stage I-IV) from all controls (symptomatic + healthy + diabetes).
- ROC AUC value of 0.950 differentiating PDAC Stages I & II from all controls (symptomatic + healthy + diabetes),
- ROC AUC value of 0.930 differentiating PDAC (stage I-IV) from symptomatic control individuals,
- ROC AUC value of 0.939 differentiating PDAC Stages I & II from symptomatic control individuals,
- ROC AUC value of 0.956 differentiating PDAC (stage I-IV) from healthy controls.

The red point on the plots A-D (E) represents the specificity and the sensitivity at the cut-off of 0.95% (0.99%) and 80%, respectively.

Conclusions

In the Commercial Test Model Study (CTMS), we showed for the first time that the IMMray PanCan-d 8-plex signature, together with CA 19-9, has the capacity to differentiate between PDAC stage I & II and all controls, including diabetes, symptomatic, healthy individuals, with a clinically relevant accuracy of 0.950. In the CTMS, we also locked and tested the model algorithms, which were subsequently incorporated in the final IMMray PanCan-d test set up.
Important Notes:

- The 8-plex biomarker signature facilitated quality control and improved assay reproducibility.
- Patent was filed July 2020 for the locked commercial IMMray PanCan-d 8-plex biomarker signature

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Studie 3: IMMray PanCan-d Blinded Validation Study

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Objectives

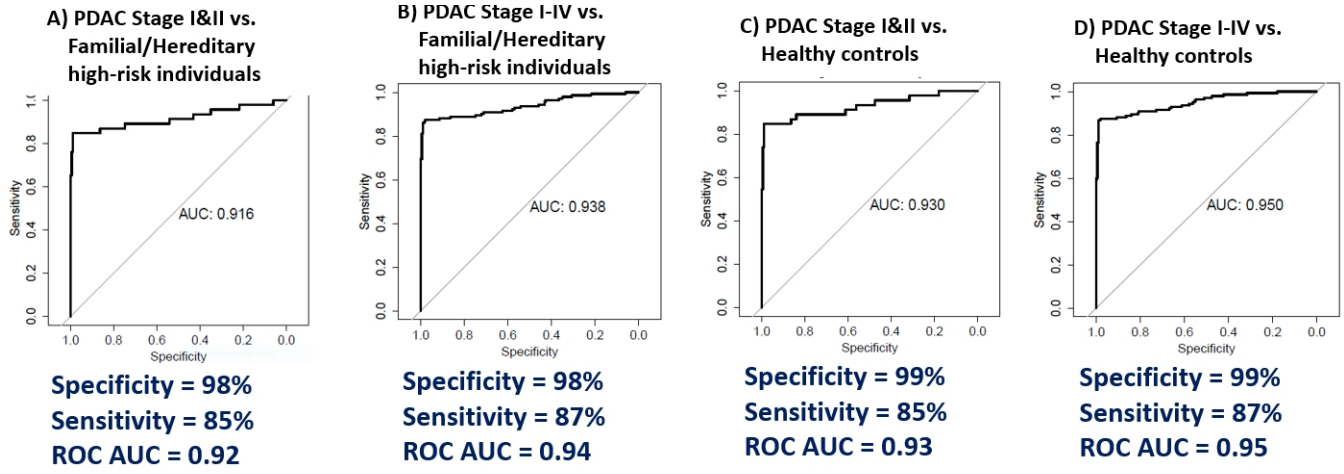
The IMMray PanCan-d Blinded Validation Study aimed to validate the clinical performance of the IMMray PanCan-d test in differentiating pancreatic ductal adenocarcinoma (PDAC) stages I-IV vs. familial/hereditary high-risk individuals (PanFAM clinicaltrials.gov) and healthy controls. The study was performed by Immunovia, Inc. in Marlborough, MA and sample identity was blinded to Laboratory Technologists and the Laboratory Director throughout the study.

Patients and Methods

PDAC				Controls		
Stage I	Stage II	Stage III	Stage IV	Stage pending	Healthy controls	Familial/hereditary risk group
24	32	38	57	16	221	203

In total, 591 patient serum samples were analyzed with IMMray PanCan-d biomarker signature and CA 19-9 assay. Patient samples from 167 PDAC (stage I-IV), 203 high-risk individuals from the familial/hereditary risk group, and 221 healthy controls were tested. All these samples were freshly collected through our study collaborators at eleven reference sites in USA and Europe. Test results were automatically generated, using validated custom software with locked model algorithms and predefined Decision Value cut offs for sample classification. Data was then uploaded automatically to Orchard Harvest Laboratory Information System before sample identity was un-blinded to enable calculation of the clinical test performance in terms of specificity, sensitivity and ROC AUC values.

Results



Figures.

In total, 519 individuals were analyzed. Combining IMMray PanCan-d 8-plex signature with CA 19-9, the results from the test demonstrated:

- Specificity of 98%, sensitivity of 85% and ROC AUC value of 0.92 differentiating PDAC (stage I&II) from familial/hereditary high-risk individuals
- Specificity of 98%, sensitivity of 87% and ROC AUC value of 0.94 differentiating PDAC (stage I-IV) from familial/hereditary high-risk individuals
- Specificity of 99%, sensitivity of 85% and ROC AUC value of 0.93 differentiating PDAC (stage I&II) from healthy controls
- Specificity of 99%, sensitivity of 87% and ROC AUC value of 0.95 differentiating PDAC (stage I-IV) from healthy controls

PDAC vs Familial/Hereditary high-risk individuals	Stage I & II PDAC	All Stages PDAC
Sensitivity	84.8%	86.8%
Specificity	98.4%	98.4%
NPV (3% Prevalence)	99.5%	99.6%
PPV (3% Prevalence)	62.1%	62.7%
NPV (1% Prevalence)	99.8%	99.9%
PPV (1% Prevalence)	34.9%	35.4%

Conclusions

In this Blinded Validation Study, IMMray PanCan-d test demonstrated a specificity of 98% and a sensitivity of 85% in differentiating PDAC stage I & II vs familial/hereditary high-risk individuals. Sample identity was blinded to Laboratory Technologists and the Laboratory Director throughout the study.

Acknowledgements: Immunovia would like to acknowledge Växjö Central Hospital, Department of Transfusion Medicine, Sweden, BioIVT, New York, USA and Discovery Life Sciences Inc, Alabama, USA, as well as the BioBank Hospital Ramón y Cajal-IRYCIS (National Registry of Biobanks B.0000678), integrated in the Biobanks and Biomodels Platform of the ISCIII (PT20/00045), for providing samples to this study.

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3. Carl A. K. Borrebaeck. Precision diagnostics: moving towards pro marker signatures of clinical utility in cancer. Nature Reviews Cancer. 2017 Mar;17(3):199-204.

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