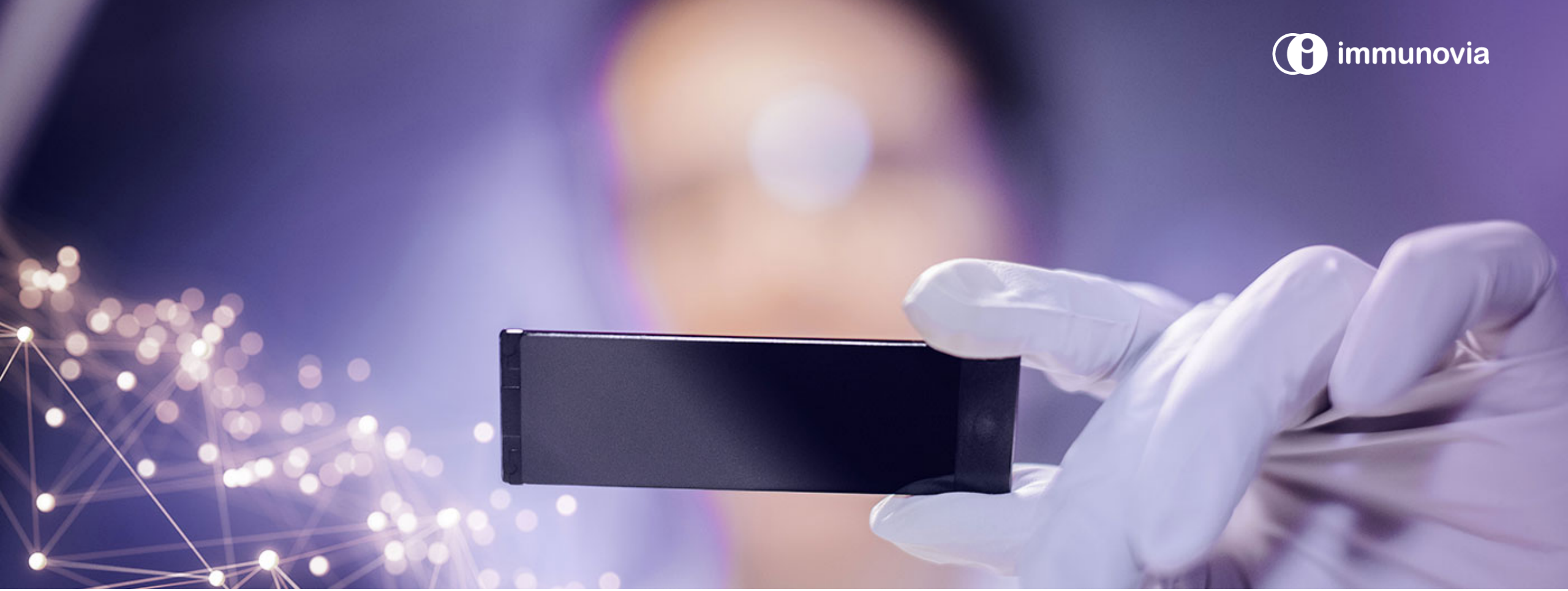
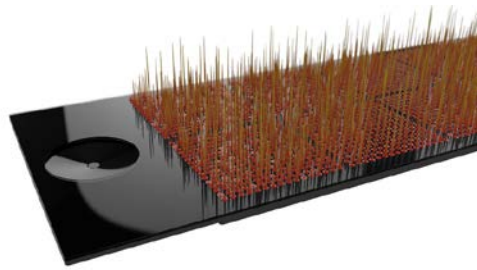


Does PDAC have an autograph?
Serum Biomarker Signature-Based Liquid Biopsy for Diagnosis of Early-Stage Pancreatic Cancer with ROC AUC values above 0.95

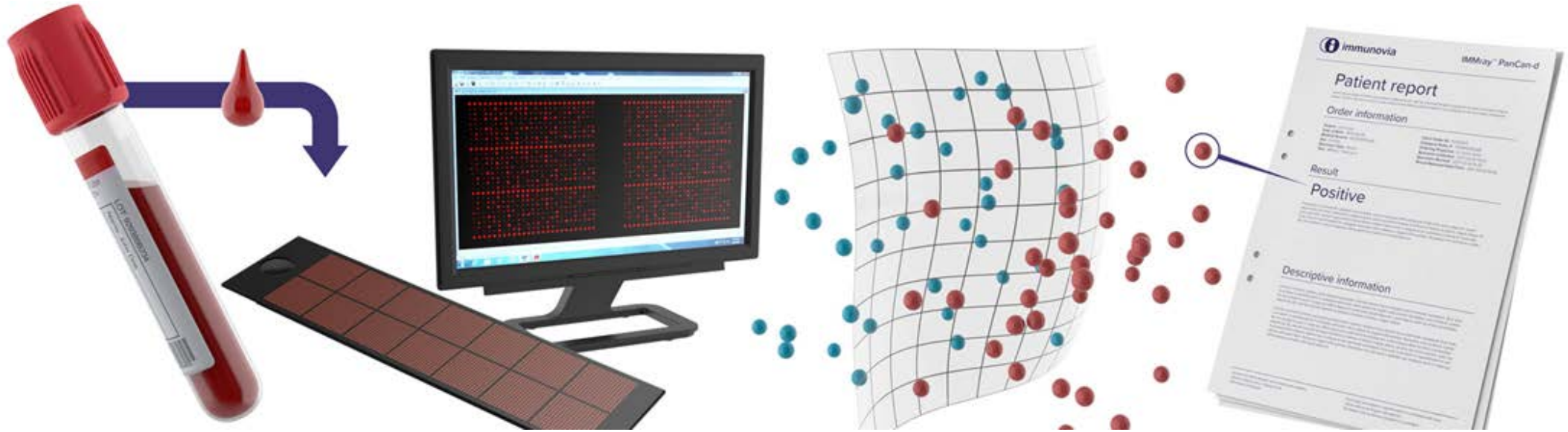
Laura Chirica, PhD
Immunovia, Sweden

Contents

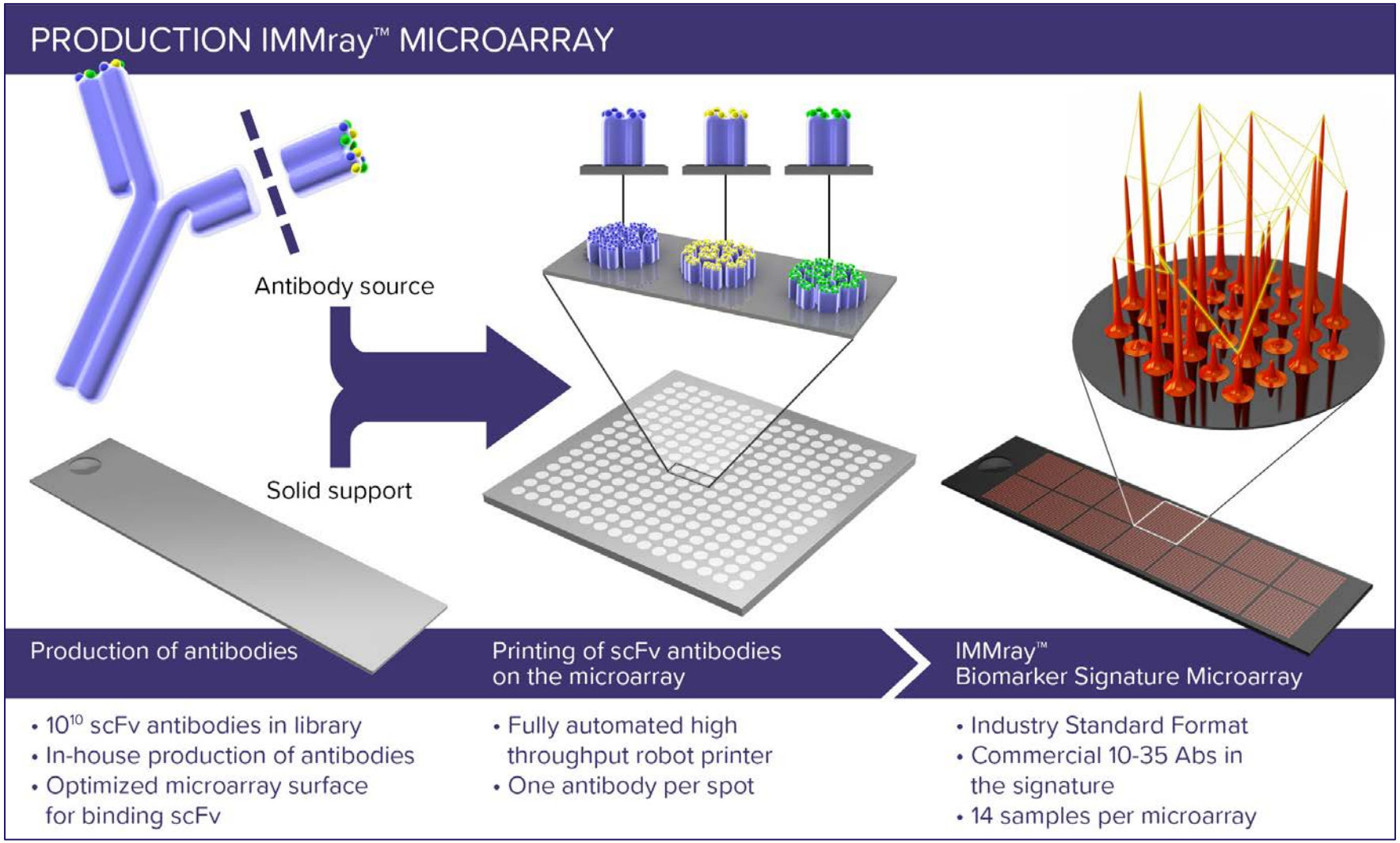


IMMray™ Technology

Combining multiple immune system and tumor biomarkers from a single blood sample can reliably detect early stage PDAC

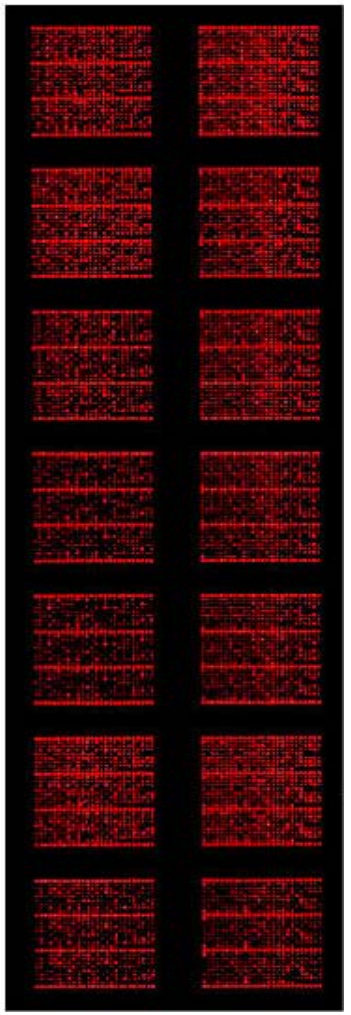


IMMray® Technology - Production



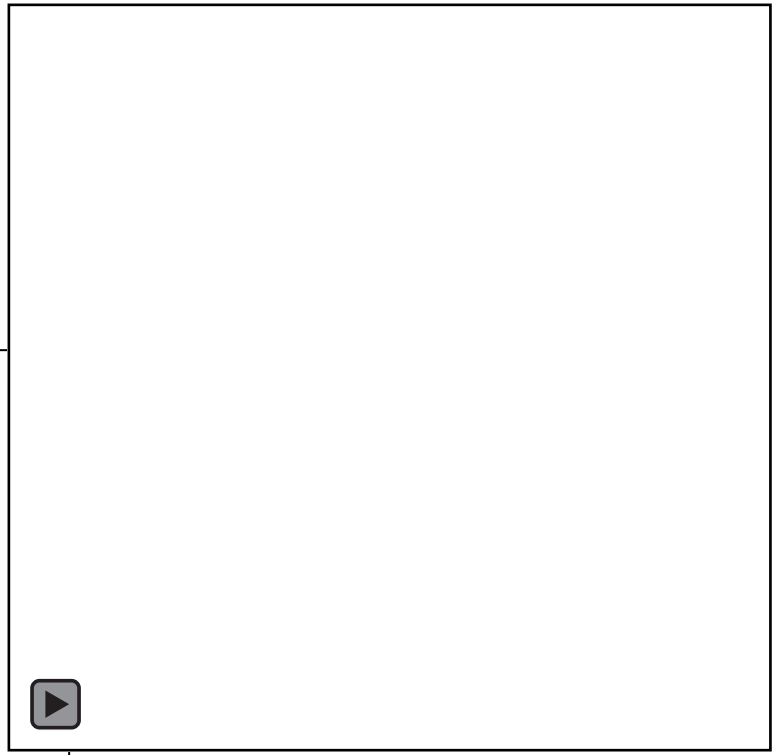
IMMray® Clinical Assay

- Biotinylate patient and control serum proteins
- Incubate labeled serum with antibody microarrays
- Wash arrays and label biotinylated proteins with fluoresced streptavidin
- Wash arrays and measure fluoresceinated intensities for all antibodies
- Combine the intensities for individual antibodies mathematically to yield a decision value that indicates a *Positive* or *Negative* result



Distinguishing PDAC from Healthy Controls 2018

Identified Stage I & II PDAC with 96% accuracy



Healthy

PDAC Stage I and II

JOURNAL OF CLINICAL ONCOLOGY | BIOLOGY OF NEOPLASIA

Serum Biomarker Signature-Based Liquid Biopsy for Diagnosis of Early-Stage Pancreatic Cancer

Linda D. Mellby, Andreas P. Nyberg, Julia S. Johansen, Christer Wingren, Børge G. Nordestgaard, Stig E. Bojesen, Breeana L. Mitchell, Brett C. Sheppard, Rosalie C. Sears, and Carl A.K. Borrebaeck

Author affiliations and support information (if applicable) appear at the end of this article.

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Corresponding author: Carl A.K. Borrebaeck, DSc, Department of Immunotechnology and CREATE Health Translational Cancer Center, Lund University, Medicon Village Bldg. 406, SE 223 81 Lund, Sweden; e-mail: carl.borrebaeck@immun.lth.se.

A B S T R A C T

Purpose

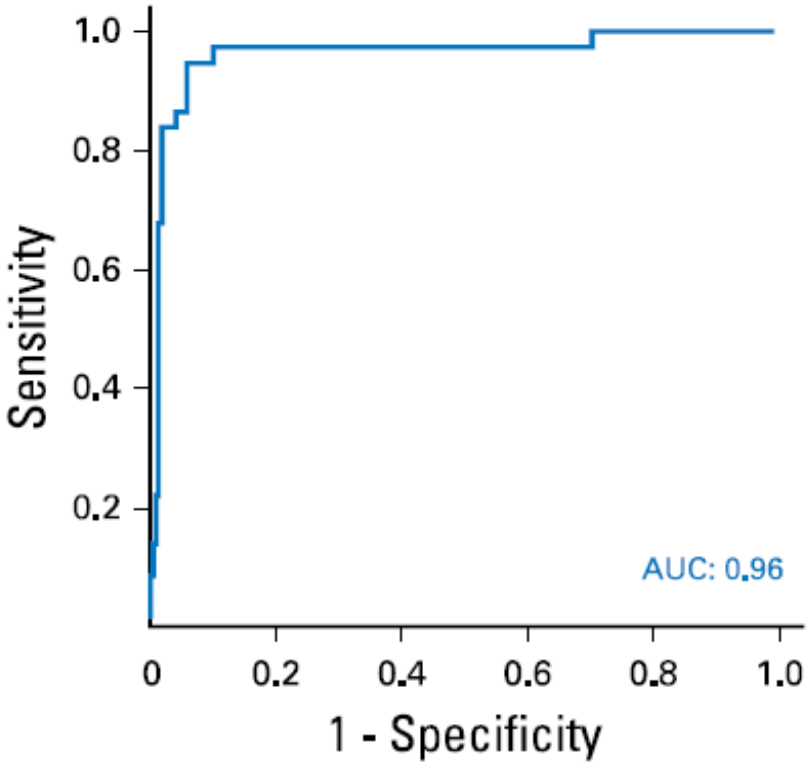
Pancreatic ductal adenocarcinoma (PDAC) has a poor prognosis, with a 5-year survival of < 10% because of diffuse symptoms leading to late-stage diagnosis. That survival could increase significantly if localized tumors could be detected early. Therefore, we used multiparametric analysis of blood samples to obtain a novel biomarker signature of early-stage PDAC. The signature was derived from a large patient cohort, including patients with well-defined early-stage (I and II) PDAC. This biomarker signature was validated subsequently in an independent patient cohort.

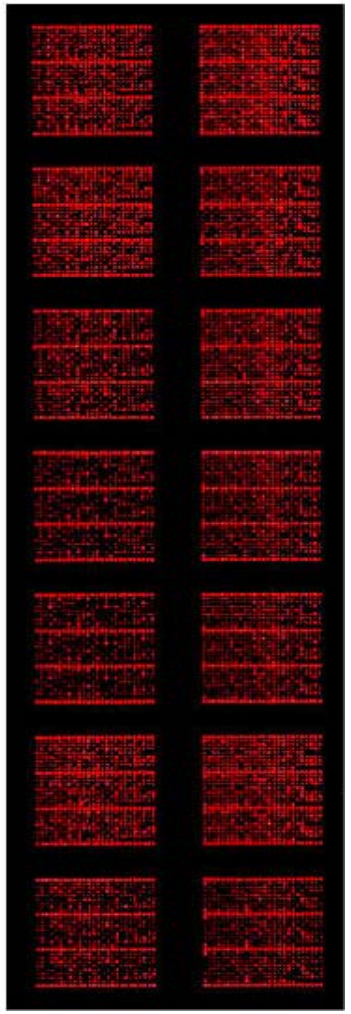
Patients and Methods

Validating the Signature in two different cohorts: Scandinavian followed by US

Stage I and II

- Sensitivity and specificity were very high for discriminating 250 samples Stage I and Stage II PDAC patients from 1000 controls.
- ROC curve for Stage I and Stage II PDAC patients versus controls showed an AUC of 0.96 for the **Scandinavian** cohort
- ROC curve for Stage I and Stage II PDAC patients versus controls showed an AUC of 0.96 for the US cohort



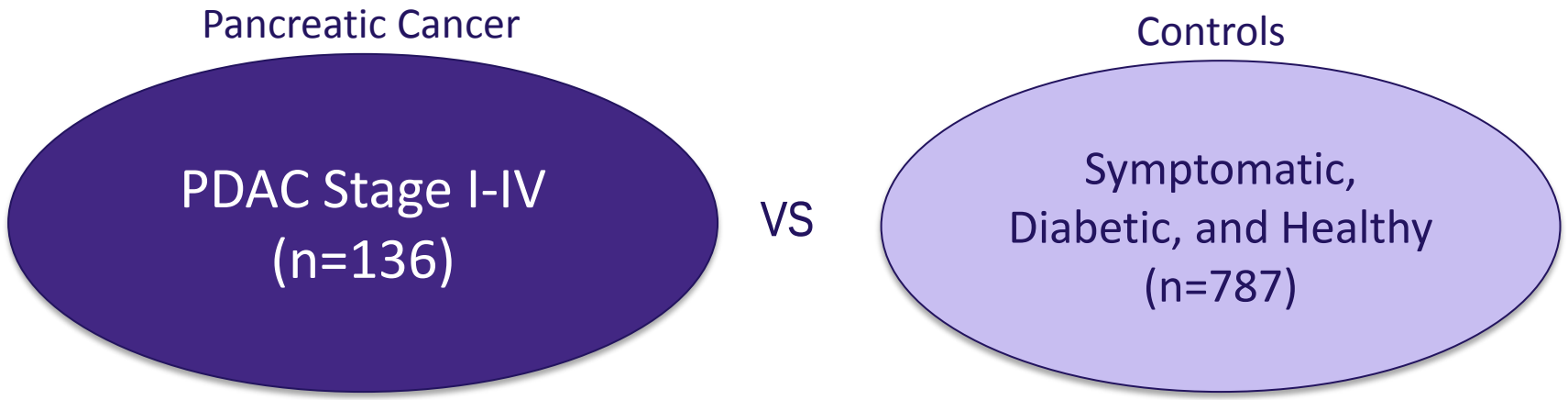


Mellby LD et al. *J Clin Oncol.* 2018: DOI: 10.1200/JCO.2017.77.6658

Optimization Study 2019

- A useful clinical test needs to be able to distinguish individuals with PDAC from patients with other relevant diseases, especially:
  - Patients with non-specific but concerning symptoms associated with PDAC (e.g. back or stomach pain, fatigue, digestive problems, weight loss)
  - New onset type II diabetes after age 50
- Partnered with University College London, University of Pittsburgh and Växjö Central Hospital, Sweden to obtain freshly collected patient samples to assess IMMray™ performance in these patient populations
- Also investigated if adding CA19-9 to our signature would enhance IMMray™ performance

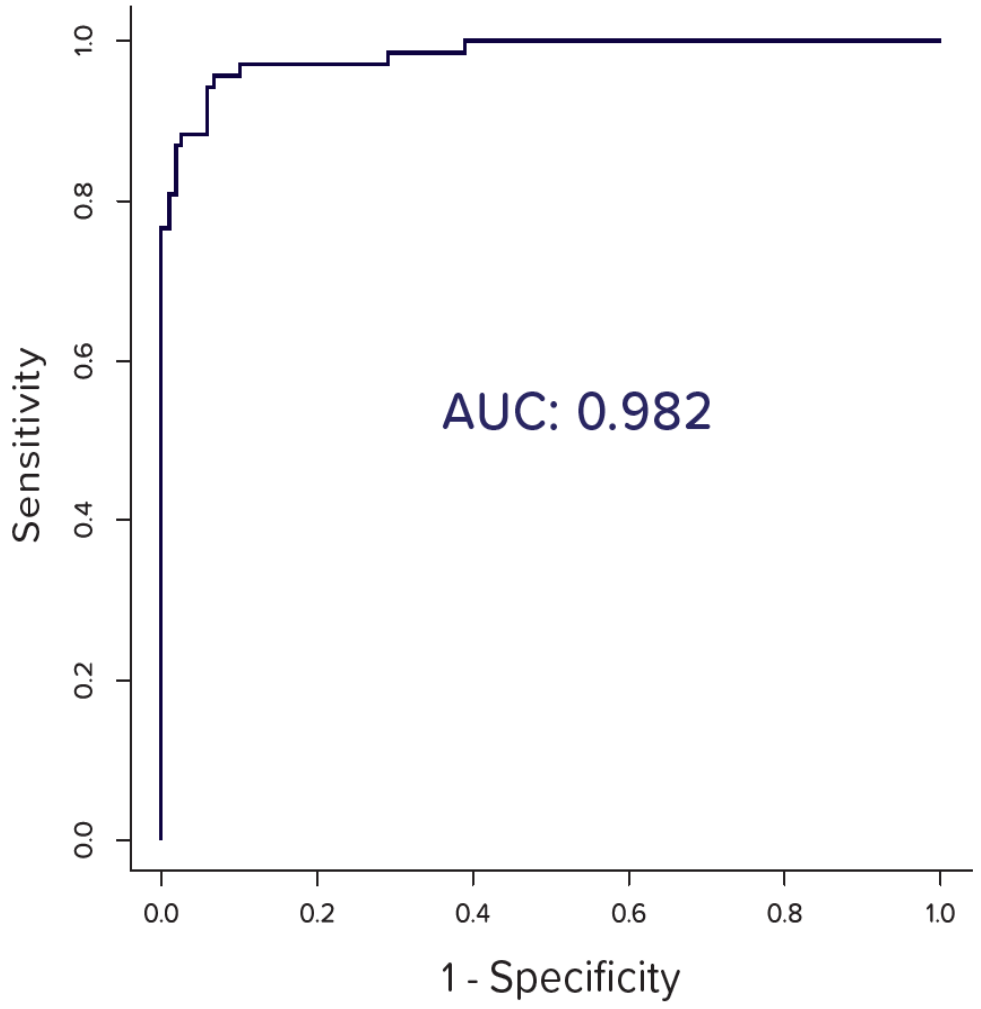
Optimization Study Results
PDAC vs Symptomatic, Diabetic Controls



	PDAC				Controls		
	Stage I	Stage II	Stage III	Stage IV	Healthy controls	Symptomatic controls (without diabetes)	Diabetes controls
No.	20	34	21	61	217	480	90

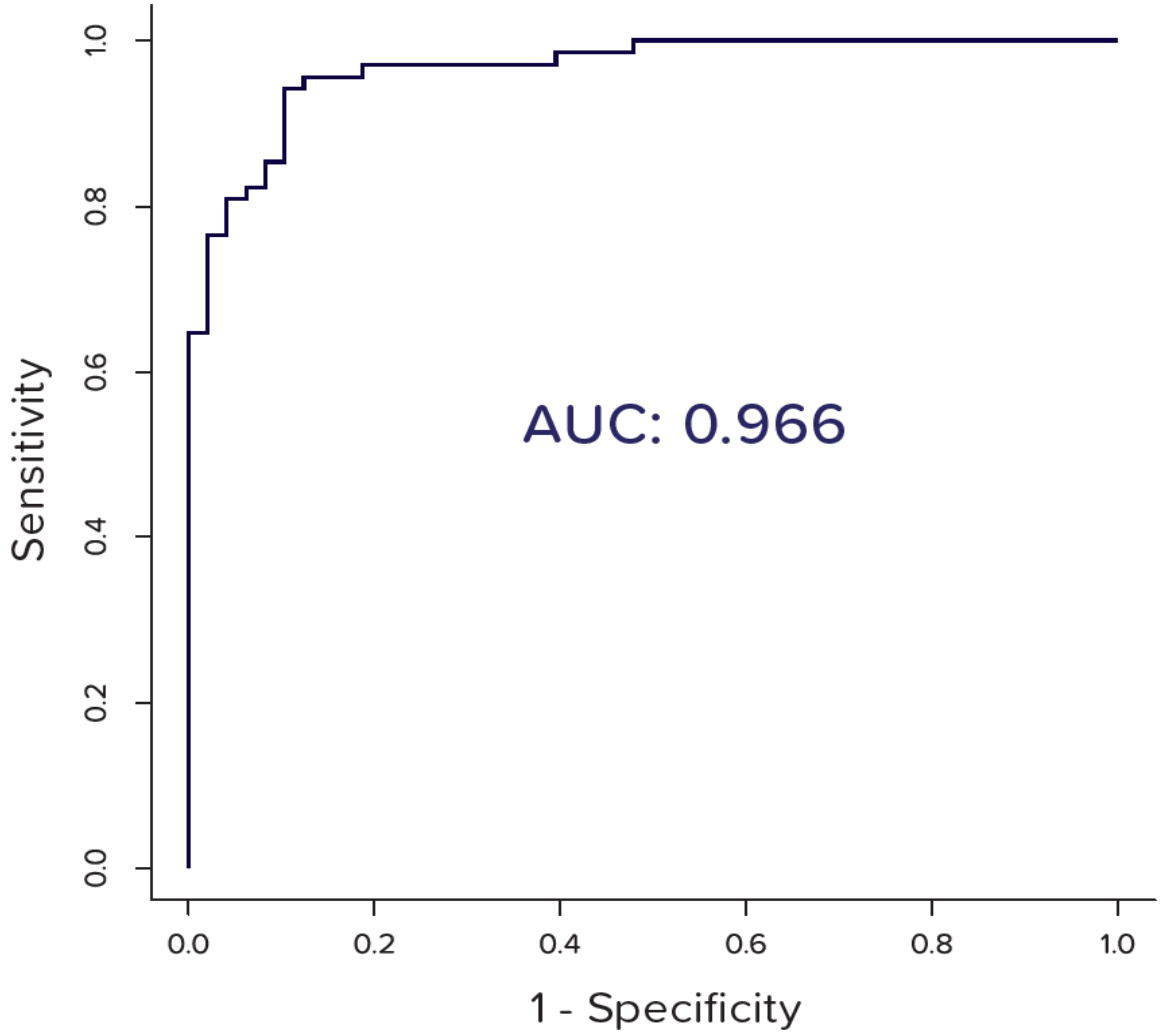
Healthy vs PDAC

Results combining IMMray ™ PanCan-d and CA19-9



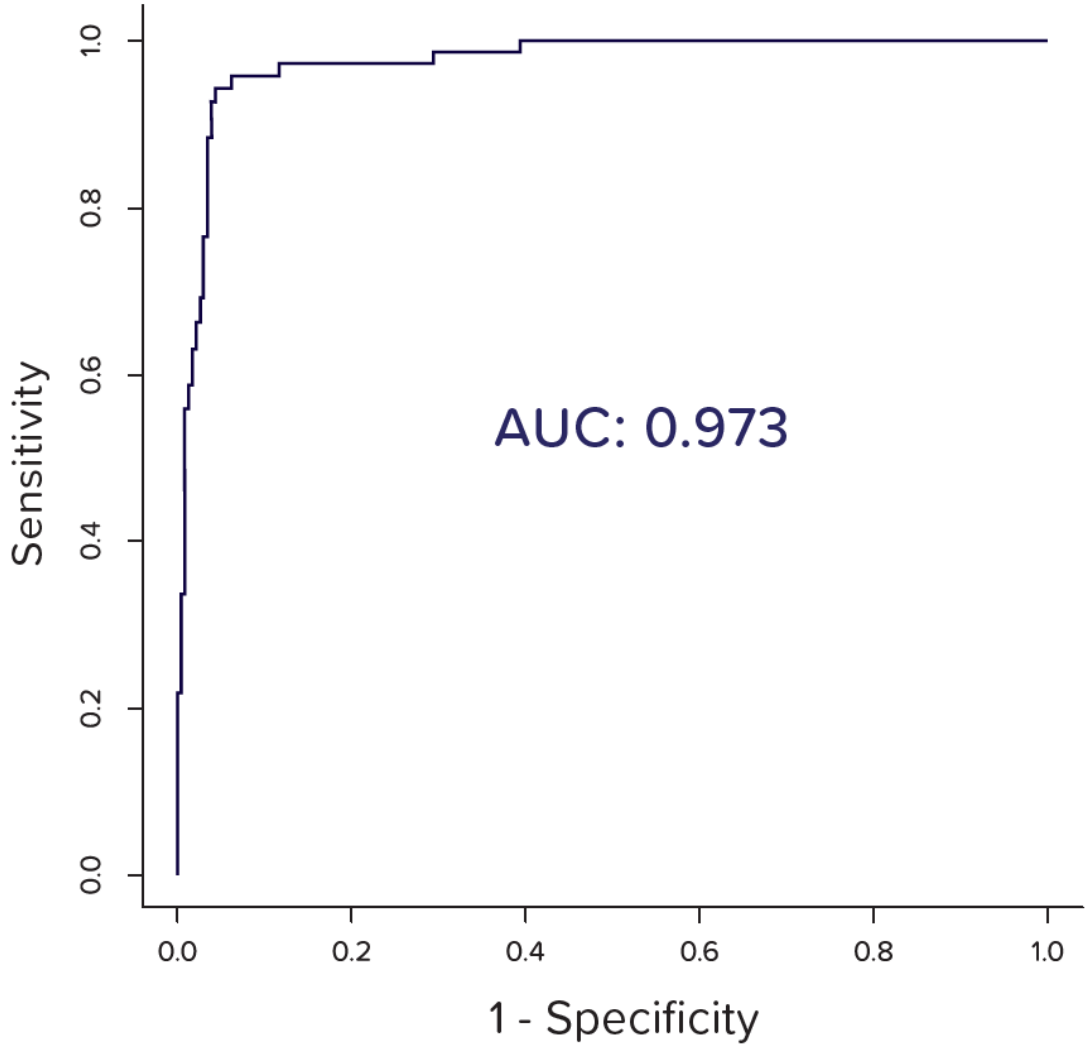
Diabetes vs PDAC

Results combining IMMray™ PanCan-d and CA19-9



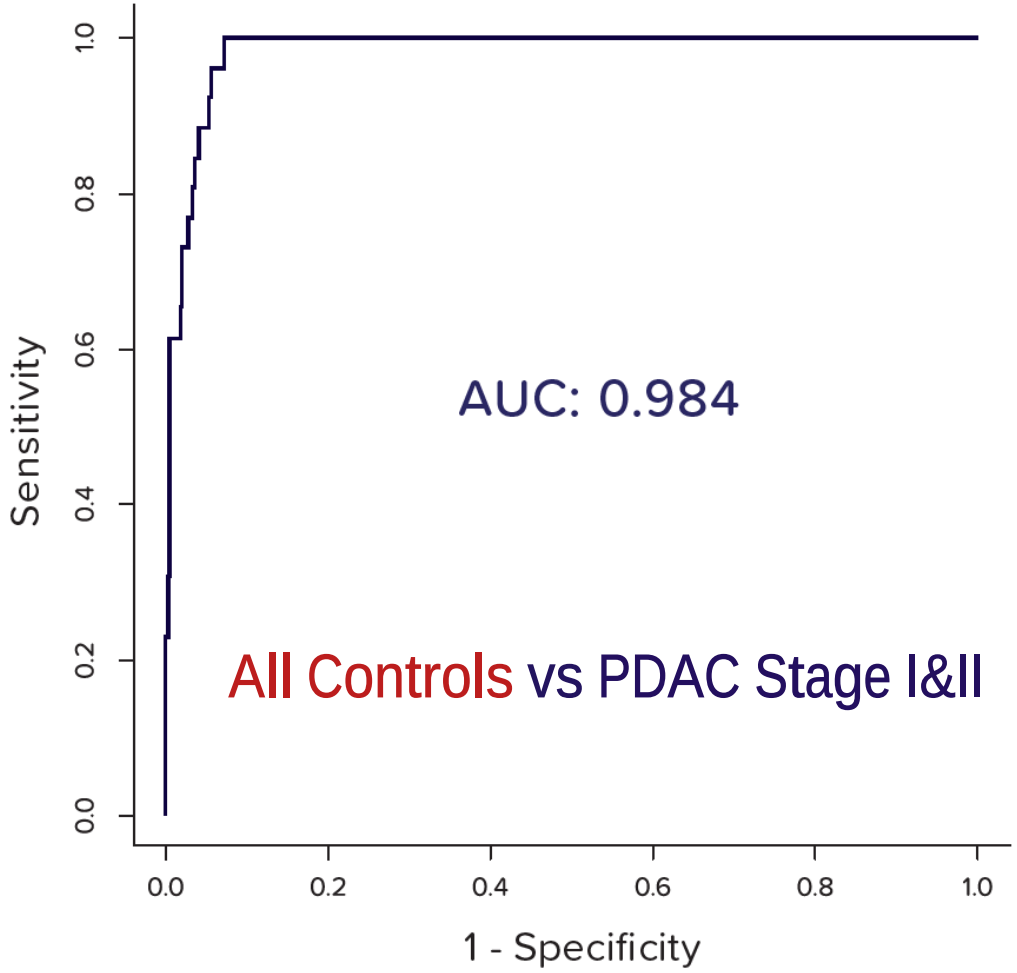
Symptomatic vs PDAC

Results combining IMMray™ PanCan-d and CA19-9

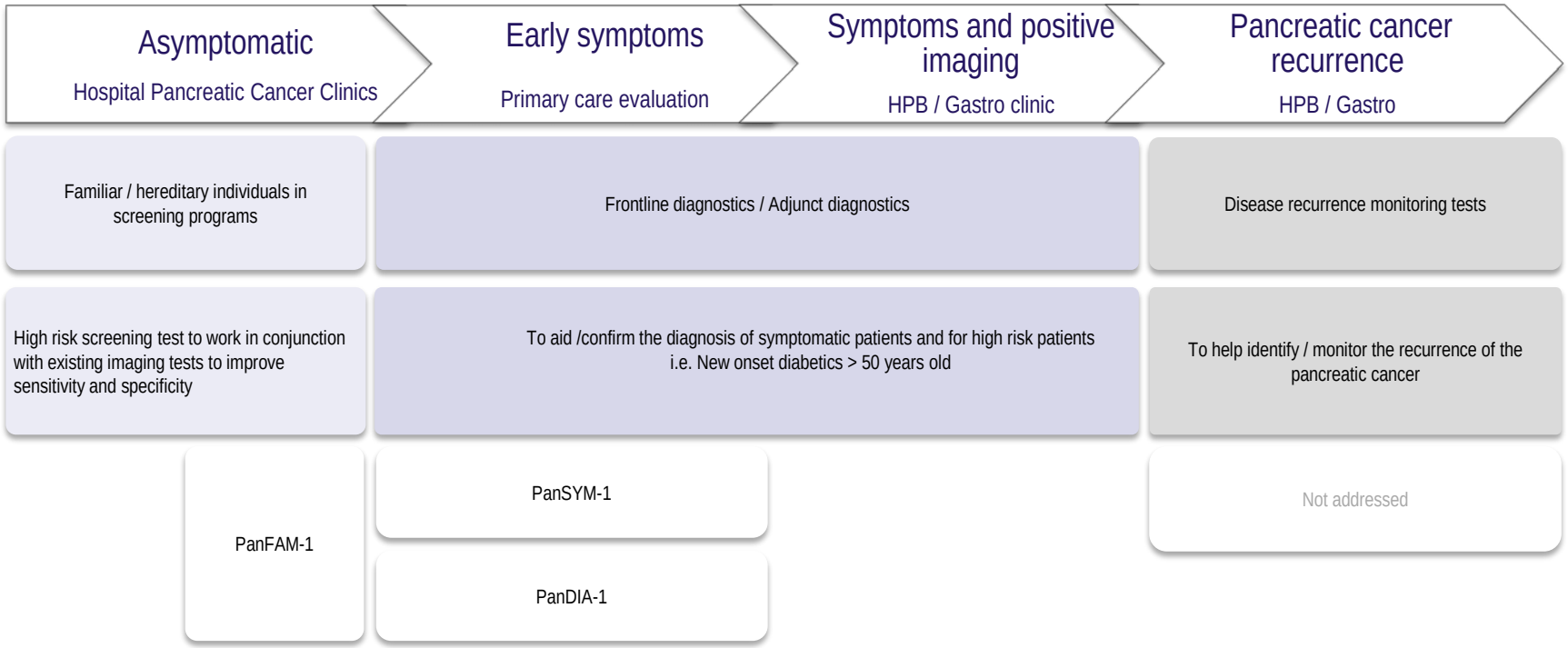


Healthy, Diabetic and Symptomatic Controls vs Early Stage PDAC

Results combining IMMray ™ PanCan-d and CA19-9



IMMray™ PanCan-d and disease progression



3 high risk groups for pancreatic cancer

Hereditary Familial

- Familiar autosomal ≥ 2 close fam members
- Familiar non-autosomal ≥ 3 close fam members
- BRCA1/2 Hereditary
- FAMMM p16, CDKN2A
- Peutz Jeghers
- Lynch Syndrome
- Hereditary pancreatitis

2-132 risk of developing pancreatic cancer

NOD

- NEW ONSET DIABETES TYPE II AFTER 50 YRS OF AGE
- 8-10 Risk of developing pancreas cancer 1-3 year after diagnosis

Early Symptoms

- Depression
- Indigestion/Nausea
- Jaundice
- Mid back pain
- Upper abdominal pain
- Pain on eating
- Fatigue
- Unexplained weight loss
- Diabetes

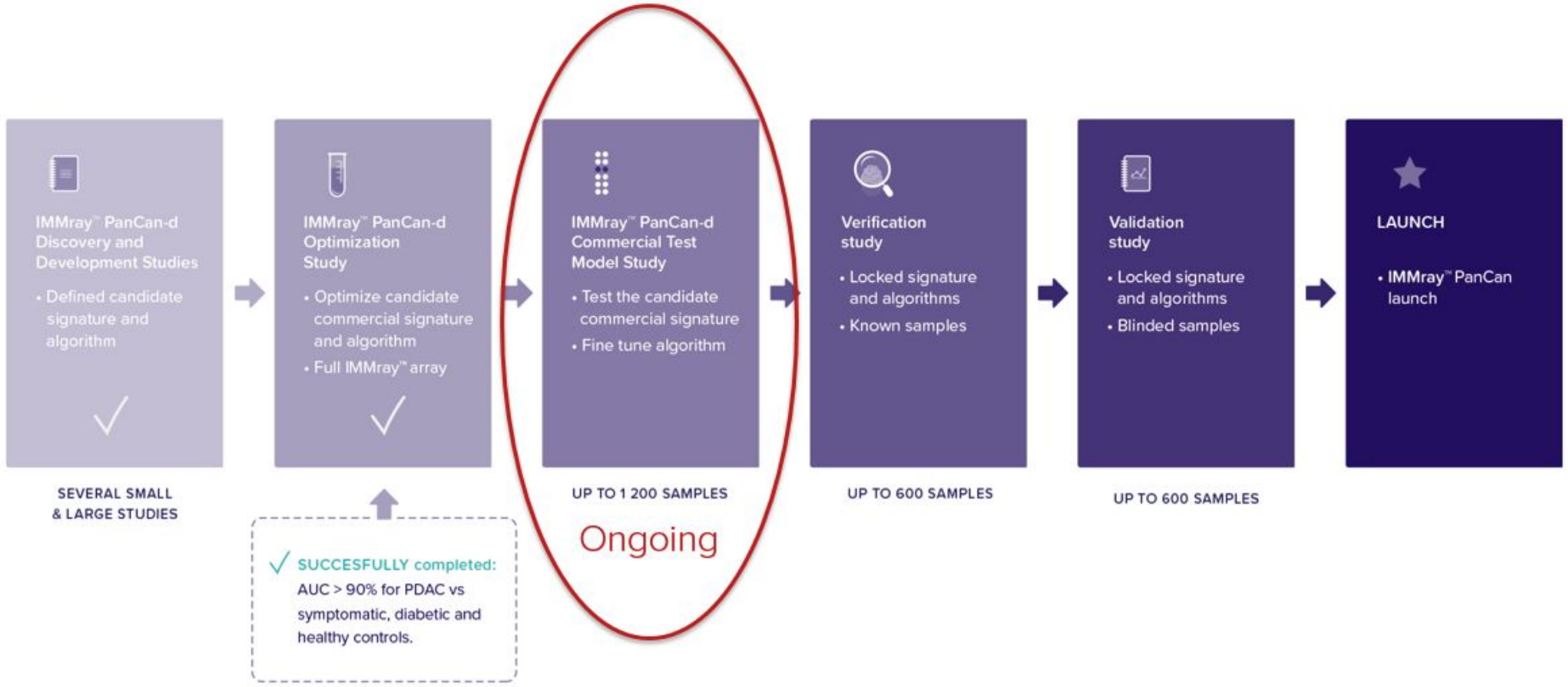
Prospective validation studies

27 sites from Europe and USA

3 large pancreatic cancer clinical studies: PanFAM-1, PanSYM-1 and PanDIA-1

Totally covering >10 000 high risk subjects

Important Next Steps Toward Launch



Summary

- Successful optimization of IMMray™ PanCan-d in combination with CA 19-9 leads to AUC ROC >0.96 when differentiating PDAC from symptomatic patients, diabetics, and healthy controls
  - Findings have significant clinical implications for individuals attending primary and secondary care units with non-specific but concerning symptoms where PDAC may be suspected

- Completion of Commercial Test Model study, verification and validation are on track to offer IMMray™ PanCan-d Q3 2020 at our IMMray Dx Laboratories in Marlborough, MA followed by IVD CE mark at IMMray Dx Laboratories in Lund, Sweden.

- Prospective clinical validation studies for IMMray™ PanCan-d with individuals from the three major risk groups are ongoing to provide the necessary clinical evidence for regulatory approval and national reimbursement

Immunovia sites

Headquarters staff

IMMray™ Dx Laboratories

Reference lab & production, Lund, SE

Reference lab, Boston, USA

Immunovia supporting pancreatic cancer awareness walks in US covering around 25,000 people in one year

Thank you!

Sunset, Öresund bridge (between Sweden and Denmark)