KU LEUVEN

synosense

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Summary

Synosense is a team of motivated KU Leuven students with a common passion for science and a desire to help rheumatoid arthritis (RA) patients. In the past few months, we are committed to turning this desire into reality by developing the Synosensor. It is a sensor for detection of adalimumab (ADM), a life-changing drug for RA patients.

The outcome of our endeavors is an elegant and user-friendly device that can replace an entire lab and allow untrained people to perform a measurement within minutes. To have the readout, the patient only needs to apply a drop of blood on the unique Synochip, activate it with a single push of a button, and place the chip in the Synosensor. The Synochip is based on the self-powered imbibing microfluidic pump by liquid encapsulation (SIMPLE) principle. This microfluidics system reliably guides the sample and all the reagents towards a fiber optic (FO) probe integrated in the chip. This automated and self-powered mechanism ensures consistent and accurate measurements. The quantification of ADM relies on the surface plasmon resonance (SPR) technology. SPR is caused by the resonance of surface plasmons with the incident light. The result is a decrease in the intensity of the reflected light. The exact location of this intensity decrease responds to modification of the fiber's outside surface. To specifically capture the ADM molecule on the fiber surface, we immobilize exclusive anti-ADM antibodies that allow outstanding performance without the need for excessive sample pretreatment.

Our unique business strategy combines a partnership with a multinational pharmaceutical company and additional novel revenue streams each year to bring our sensor to the market. In addition, Synosense does not only aim to offer a device, but also an entire community-building approach to connect persons living with RA globally for an all-encompassing healing experience.

The Synosensor is a new must-have tool for the doctor's office, with a promise to improve quality of life for thousands of RA patients.

2. Biosensor system and assay

An overview of our biosensor setup is displayed in Figure 1. In the following sections, each part is discussed individually.

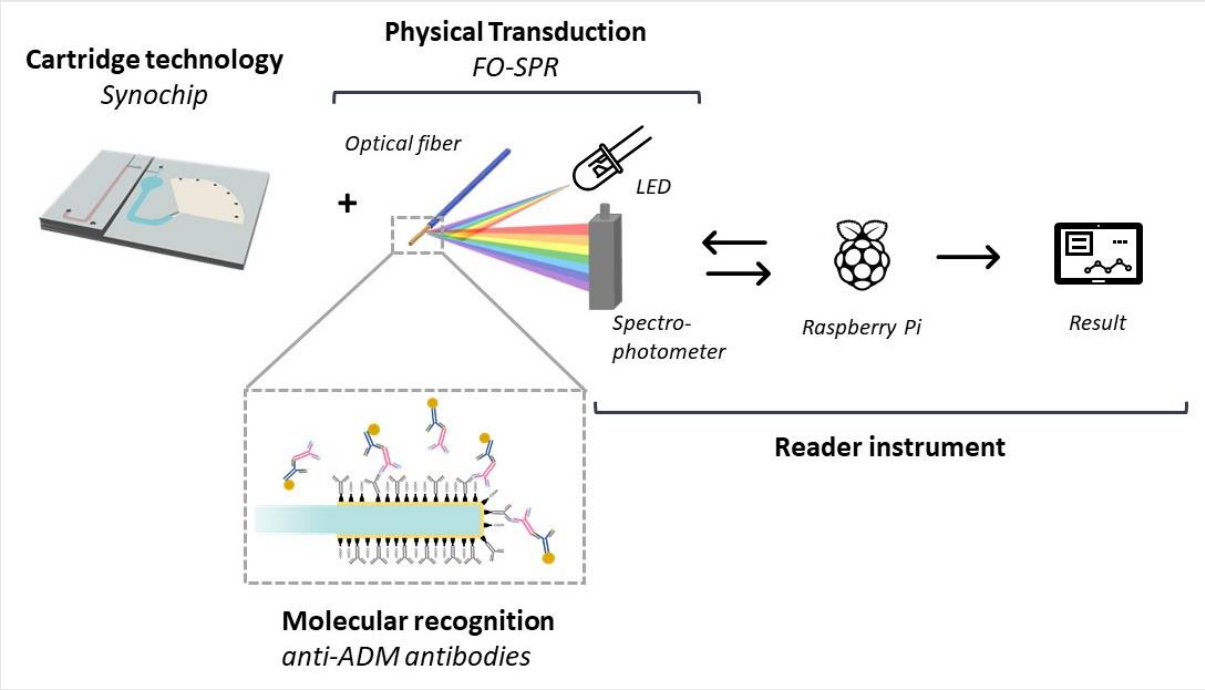

Figure 1: Overview of the Synosense set-up. *The Synochip guides the sample to an integrated fiber optic probe. On its surface, the fiber is functionalized with antibodies against adalimumab (ADM). This interaction is amplified by secondary antibodies conjugated to gold nanoparticles, and the resulting shift of absorbance is detected by a spectrophotometer. In only five minutes, the accurate concentration of ADM in the sample is displayed.*

2.1 Molecular recognition and assay reagents

A sandwich immunoassay was developed to achieve sensitive detection of ADM in buffer or plasma (Figure 2). The gold (Au)-coated FO probe is functionalized with capture antibodies against ADM using EDC/NHS chemistry on carboxylic acid self-assembling monolayers (SAM). When the functionalized fiber is brought in contact with the sample, ADM molecules bind to the capture antibodies. The sandwich assay is completed with secondary detection antibodies conjugated to gold nanoparticles (AuNPs) in order to amplify the signal generated from this interaction.

The monoclonal capture and detection antibodies are specific to different regions of ADM without cross-reactivity, and are provided exclusively for this immunoassay by PharmAbs, Belgium – the KU Leuven Antibody Center. After functionalization, we dry the fibers after treating them with a 10% trehalose solution to prolong shelf life stability and allow storage on-chip.

Before measuring the sample, 2.5 µL of sample spiked with ADM is pre-mixed with 22.5 µL conjugated AuNPs. Subsequently, this mix is deposited on the microfluidic chip inlet, and upon chip activation, the sample is pulled in the microfluidic channel. The fiber, integrated on the chip, is first washed by 36 µL baseline buffer (PBS/0,01% Tween) stored on the chip and then submerged in the pre-mixed sample solution, producing detectable output correlated with the concentration range of ADM.

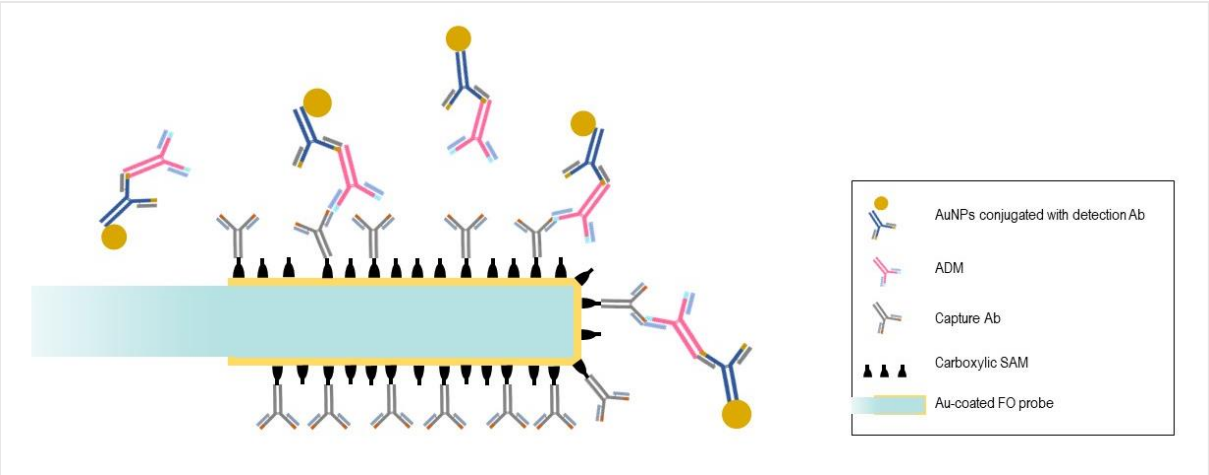

Figure 2: Sandwich principle of the immunoassay. *Capture antibody (grey) is immobilized on the fiber optic (FO) probe by self-assembling monolayer (SAM) chemistry. Adalimumab (pink) is bound by the capture antibody and the resulting signal is amplified by gold nanoparticles (AuNPs) conjugated with a secondary detection antibody*

2.2 Physical transduction

The probing part of the biosensor consists of a multimode fiber (400 µm core diameter) with coating and cladding stripped off. The stripped part of the optical fiber is coated with a 40 nm thin layer of gold and functionalized with SAM as described above. Incident light is reflected inside the fiber through a phenomenon called total internal reflection (TIR). TIR occurs when light travels from a medium with higher refractive index (RI) (e.g. glass) to that with lower RI (e.g. Au). The reflection at the medium interface creates surface plasmons: propagating electron density waves caused by interaction between incident photons and free electrons in the metal. The resonance caused by this wave delivers a decrease in the intensity of the reflected light at SPR wavelengths. This is referred to as the SPR dip (Figure 3A). Because the SPR conditions depend on the RI in the vicinity of the interface, changes to the outer surface will result in shift of wavelengths required to meet the SPR condition**.** Thus, the consequent changes of the outer surface can be followed in real-time by detecting the shift in SPR wavelengths (Figure 3B). Importantly, the electromagnetic field caused by the incident light and needed for SPR has a penetration depth of nanometer extent, thereby only envisioning interactions near the fiber surface. This makes the immunoassay described previously highly selective and extremely fit for turbid and complex matrices such as blood and plasma.

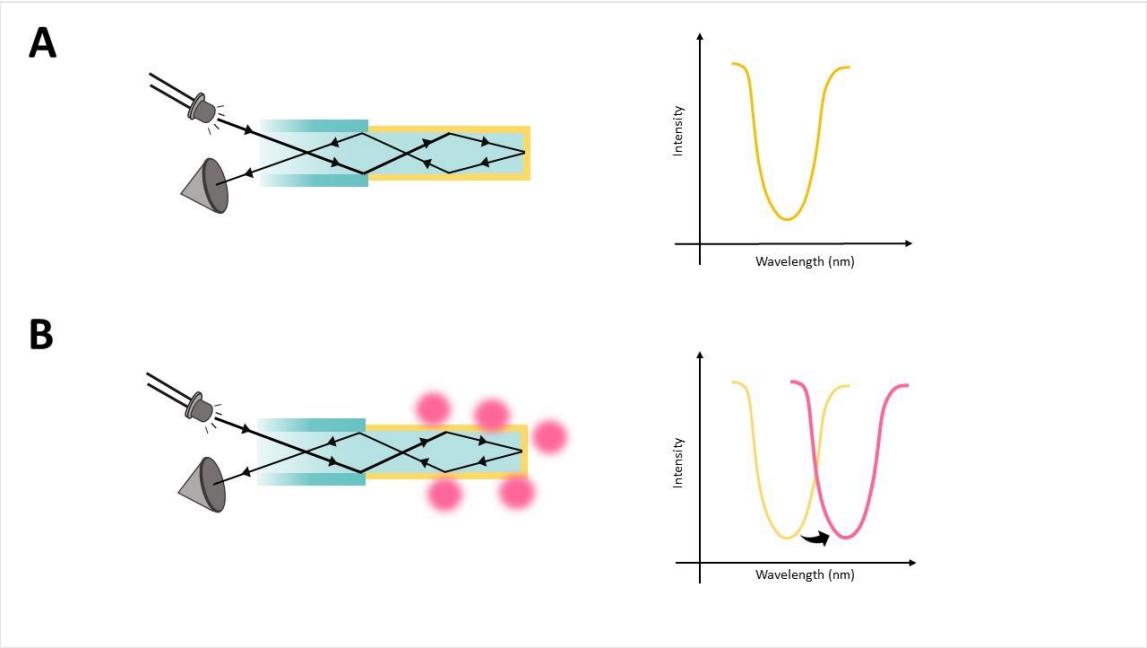

Figure 3: Simplified scheme of Fiber Optic Surface Plasmon Resonance (FO-SPR). ***A.*** *Total internal reflection (TIR) resulting in the creation of surface plasmons and a decrease of intensity at the SPR wavelengths, creating the SPR dip.* ***B.*** *Binding of molecules to the outer surface of the gold-treated multimode fiber, results in a shift of the SPR wavelength (red curve).*

2.3 Cartridge technology

The Synochip is a disposable, robust, autonomous, inexpensive microfluidic chip, based on the SIMPLE technology, developed within the MeBioS-Biosensors research group at KU Leuven. This technology integrates an on-chip capillary pumping mechanism on a channel-based microfluidic platform. The pumping part consists of an "engine" of porous material (e.g. Whatman 598 filter paper) and a "fuel" or working liquid (colored distilled water). The analytical channel, where the fiber is integrated, is connected to the working liquid chamber. When the chip is activated by pushing on the working liquid chamber (Figure 4B), the porous material starts to absorb the working liquid. This creates an underpressure in the analytical channel that pulls the prefilled baseline buffer and sample mix over the fiber (Figure 4C and Figure 4D respectively). In its essence, the SIMPLE technology consists of four distinct phases: initiation, activation, operation, and termination.[1] The chip is fabricated by laminating various layers of polymer foils and filter paper (Figure 5). By means of a digital craft cutting device, the microfluidic channels are patterned in the pressure-sensitive adhesive (PSA, 153 µm) middle layer, while inlets and outlets are cut out of polyvinylchloride (PVC, 300 µm) top and bottom layers. Herein, a functionalized fiber is carefully integrated to enable FO-SPR detection in the Synochip. A gel glue is used to ensure the airtight sealing of the fiber channel. In order to shorten cartridge insertion time, a custom made, 3D printed connector piece was co-developed together with our sponsor FOx Biosystems.

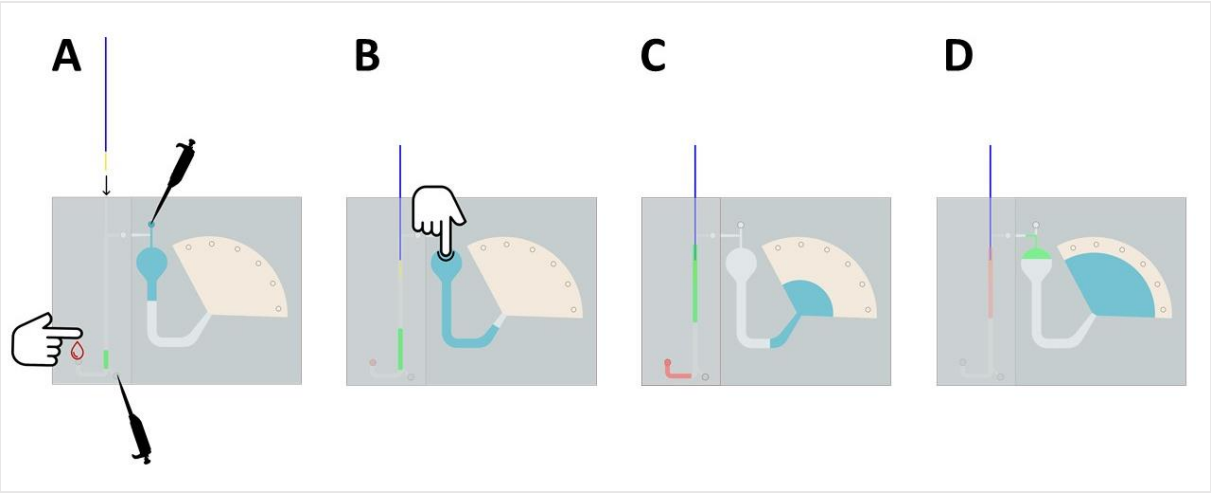

Figure 4: Four distinct phases of the SIMPLE technology**.** ***A.*** *During the initiation phase, the washing buffer is pre-filled through a prefilling channel while the sample is applied on the chip inlet.* ***B.*** *With a single finger-press the pump is activated by impregnation of the working liquid into the porous filter paper. By means of capillary forces, the fluid is absorbed by the porous material.* ***C.*** *During the operation phase, further absorption of the working liquid creates an underpressure in the analytical channel. Therefore, the sample flows through the channels and reaches the sensing area with the antibody-functionalized gold fiber.* ***D.*** *Finally, all working liquid is absorbed in the filter paper and the microfluidic mechanism will be terminated.*

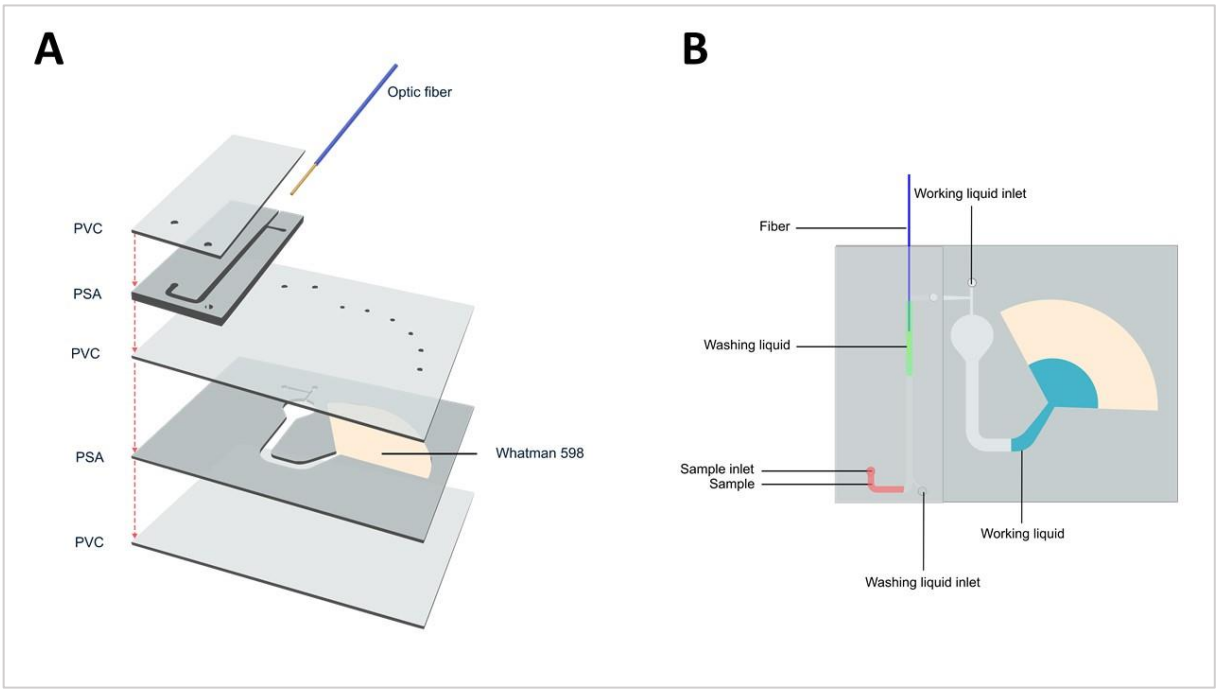

Figure 5: Schematic representation of SIMPLE chip. ***A.*** *Layering of laser-cut polyvinylchloride (PVC, 300 µM) and pressure-sensitive adhesive (PSA, 153 µm) allow formation of channels in which sample, washing liquid and working liquid are transported.* ***B.*** *Top view of assemble chip with channels and respective liquids during operation phase.*

2.4 Reader instrument and user interaction

As described above, the procedure starts with reflecting light through the optical fiber and ends with the measurement of the intensity of the returning light. This light is provided by a LED (LUXEON C White 3000K, Lumileds, USA) light impulse and the returning light is captured by the US/VIS Micro Spectrometer (Insion, Germany). The spectrometer and LED light are connected to and commanded by a Raspberry pi 3 model B which contains in-house written programs for the spectrometer, LED and screen control. The measurements are shown on a 7 inch Raspberry Touch display. All of this is brought together in a compact device of 25 cm x 26 cm x 12 cm. In our design, the user-friendliness, size and aesthetics were taken into account for an optimal user experience. The device is a rectangular cuboid with one slanted wall which contains the screen to optimize visibility and ease of use. The connection with the disposable Synochip is situated on the top of the device. In practice, a qualified individual connects the Synochip to the device, adds a drop of blood or plasma onto the chip and presses the activation button. The measurement is then started by launching the procedure from the touchscreen. After 120 seconds, the device displays the concentration of ADM in the sample. The used cartridge can be discarded and a new measurement can be started. The whole procedure, from sample loading to result readout, takes less than 5 minutes and minimizes the room for human error.

3. Novelty and Creativity

3.1 Already available

Recognition and detection of ADM in diluted serum samples using FO-SPR was described by S. Bian et al.[2] This previously developed immunoassay delivered results within 45 minutes and required a dilution of 1/400. ADM molecules were quantified between two anti-ADM monoclonal antibodies through a two-step sandwich ELISA. Optimization of this assay was conducted on the commercially available White FOx 1.0 machines (FOx Biosystems, Belgium). Antibodies were kindly provided by Prof. dr. Ann Gils and Dr. Nick Geukens (KU Leuven – PharmAbs - Laboratory for Therapeutic & Diagnostic Antibodies).

A user-friendly, cost-effective and reliable way to manipulate sample is the SIMPLE. This technique, described by T. Kokalj et al.[1], matches most of the requirements for point-of-care (POC) devices. Simply by pressing a button on the chip, a working fluid is pushed into a porous material. This causes a negative pressure which in turn pulls the sample fluid trough the channels of the chip.[3]

3.2 New developments

The aforementioned immunoassay was thoroughly optimized to allow compatibility with a compact and fast biosensor. We have successfully reduced the 1/400 dilution of plasma sample from Bian et al.'s assay to only 1/10. Importantly, this dilution is not needed to overcome the matrix effect of the plasma but is required because of the inherent high dose hook effect of our assay. Additionally, pivotal adaptions have been made to the extensive protocol of Bian et al., to achieve a greatly condensed one-step immunoassay for POC sensing. Firstly, this short assay enables measurements in merely 5 minutes, opposed to Bian et al.'s 45 minutes. Secondly, the assay was reduced to a single step, with minimal loss of sensitivity, in order to enable integration of the immunoassay on the self-powered microfluidics system.

Our personal design of the SIMPLE chip automatically delivers the reagents to the sensing area, without the need for expensive robotic equipment. Additionally, we are in the process of designing chips that include a filtration unit to allow on-chip plasma extraction from whole blood, as well as on-

chip mixing of all reagents, in which we aim to remove the need for sample pre-treatment. Nonetheless, our current innovative design allows for the integrations of the FO probe into the chip, to combine SIMPLE with FO-SPR. Moreover, we co-developed connectors together with FOx Biosystems, for easy and robust coupling of the chip and spectrophotometer. Finally, the sensor and LED are controlled by in-house written programs. An optimized algorithm detects when the sample reaches the FO probe and the measurement data is processed by our own software, which has been written to run smoothly on a Raspberry pi, making everything more compact and user friendly.

In conclusion we are able to perform a specific and robust immunoassay, within five minutes, with minimally diluted plasma. Additionally, our choice of microfluidic approach enables on-chip plasmapheresis and sample mixing in prospective designs, for measurements on untreated blood samples. To top that off, there is no need for an elaborate lab and only minimal training is required to perform measurements with our device. This novel combination of FO-SPR and SIMPLE required various integration and optimization steps, steps that were successfully completed by our team and delivered a competitive device – the Synosensor– to this world.

4. Analytical performance

4.1 Dose-response curves

The performance of our bioassay was determined on FOx devices. Data analysis was performed by linear regression and slope analysis of the wavelength shift during the first two minutes. Preliminary tests in buffer (Figure 6, red curve) revealed a clear dose-response curve over the concentration range of 0.1 to 10 µg/mL ADM. For concentrations above 10 µg/mL however, we experienced a decrease in the wavelength shift. This high dose hook effect could be caused by the excess of ADM relative to the AuNP abundance. By consequence, our assay demands a final dilution of 1/10. The assay was repeated in plasma spiked with ADM. These samples were diluted 1/5 in buffer, which were then pre-mixed 1/2 with AuNPs to deliver a final sample dilution of 1/10. The delivered dose-response curve in plasma is shown in green in Figure 6. The signal is slightly decreased, yet sensitive enough for quantification. Although not immediately important for the SensUs Testing Event, we executed the same experiment with 1/5 sample dilution in plasma, instead of in buffer. Results are displayed as the blue curve in Figure 6. It is clear that high amounts of plasma proteins decrease the sensitivity of the assay. However, we estimate that it is possible to quantify concentrations that do not exceed the

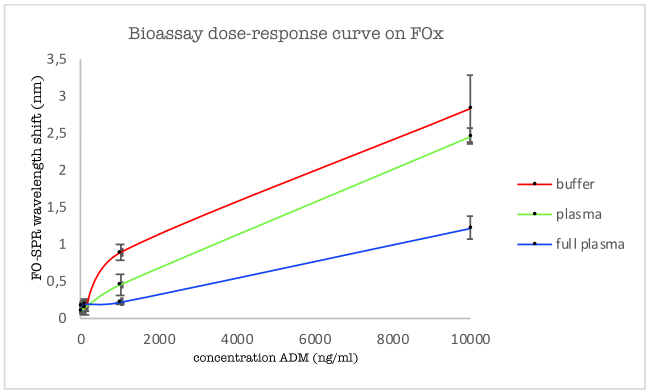

Figure 6: Dose-response curve of slope shift in resonance wavelengths for 0-0.1-1-10 µg/mL adalimumab concentrations after two minutes.

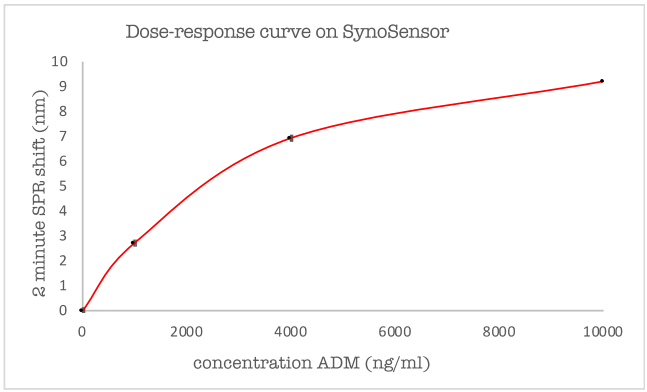

Figure 7: Dose-response curve of shift in resonance wavelengths for 0-0.1-1-10 µg/mL adalimumab concentrations in plasma after two minutes.

high dose hook, in full plasma . These results confirm the specificity and potency of our bioassay and antibodies.

We are performing the final calibration experiment with the most optimized version of all systems, e.g. immunoassay, microfluidics and sensor settings as close to the competition as possible. Figure 7 presents one of the preliminary calibration curves with data retrieved from the Synosensor.

4.2 Lower limit of detection, sensitivity, variability and precision

Lower limit of detection (LOD) analysis was performed by applying one site binding fitting (Equation 1) to the wavelength shift detected. The parameters of this curve fitting, *a* and *b*, were inserted in Equation 2 to calculate the LOD. In this equation, σ stands for the standard deviation and y_0 designates the average aspecific signal, i.e. the signal retrieved form blanco samples.

We report a limit of detection of 198 ng/ml, which is beneath the competition's lower range limit. The accuracy and precision of a given device can be determined by the calculation of the relative standard deviation (RD) of a measured concentration in comparison to the real concentration (Equation 3). C_n^{real} is the real concentration of ADM of the nth sample and C_n^{rep} is the nth reported data point. The smaller the RD, the more accurate and precise the biosensor is. We performed this analysis for the 1 µg/ml and 10 µg/ml conditions. Precision is respectively 6.14% and 26.69%. Repeatability was assessed through calculation of the mean correlation variance. The values for all sensing parameters are displayed in Table 1.

Table 1*:* Sensing parameters for bioassay in diluted plasma

Sensing parameter	Value
Accuracy (R^2)	0.9903
Precision ($RD_{10\ \mu g/mL}$)	6,15%
Sensitivity (LOD)	198 ng/ml
Variance (CV)	0,223

Table 2: Equations used to calculate LOD, sensitivity, variability and precision of the immunoassay.

$$\boldsymbol{y = \frac{ax}{(b + x)}}$$	Equation 1
$$\boldsymbol{LOD = \frac{(y_0 + 3\sigma) - b}{a - (y_0 + 3\sigma)}}$$	Equation 2
$$\boldsymbol{RD_n = \frac{C_n^{rep} - C_n^{real}}{C_n^{real}}}$$	Equation 3

4.3 Sample volume, time to result

The Synosensor uses 2.5 µL of ADM-spiked plasma sample. After addition of 22.5 µL AuNPs, the total volume of 25 µL is applied to the microfluidic chip. Upon activation, 36 µL baseline buffer reaches the integrated probe in less than 5 seconds, the probe is washed for approximately 15 seconds. The next 120 seconds, sample is drawn towards and over the probe. In a total of 360 seconds the device delivers the readout. Applying sample, chip activation, measurement and read-out takes a total of less than 5 minutes.

5. Translational Potential

5.1 Business model canvas

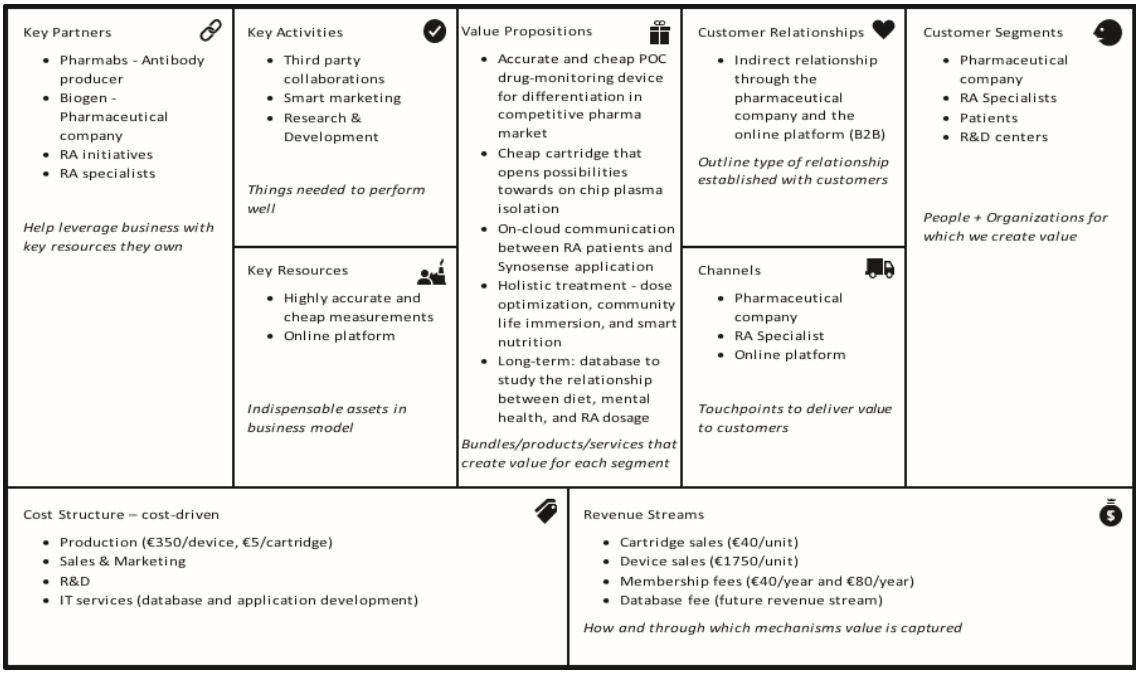

Figure 8: Synosense's business model canvas

5.2 Stakeholder Desirability

One out of six diagnosed RA patient is treated with biological drugs. Since responses to these drugs vary for each individual, limitations in determining drug levels in blood fast enough hinders providing optimal therapy for the patients. Non-optimal dosing can negatively affect the patient's treatment success and health, and leads to an increased annual spending for healthcare systems and implicit narrowing of the accessible market for pharmaceutical companies.

The solution we offer is a data-driven POC biosensor for a holistic RA treatment. The Synosensor brings down the time-to-results from several days to less than five minutes and provides a unique immuno-pharmacologic strategy for patients. The database formed from collecting patient measurement data will provide feedback for drug companies on patients' drug response and help them to further develop their product.

Until 2018, ADM – a leading drug for biological treatments – had been sold in the European market by its sole provider, Abbvie. With the expiration of their patent in November 2018, three new biosimilars have been approved by the EMA and 4 more are currently seeking for approval. Receiving more support from doctors is the key for these companies to penetrate into market while having no other differentiating factor than their price and untested quality. Synosense aims to use this decisive time frame and opportunity to partner up with new hit – Samsung Bioepis and its Europe distributor Biogen. This way, it will benefit from both sparking interest towards the more affordable drug – Imraldi – and already existing network Biogen is entering to, and play a role in lowering the price of ADM to achieve a more accessible European healthcare.

5.3 Financial viability

Synosense's financial viability will be supported by an innovative business strategy, consisting of the elaboration of three revenue streams. First, our in-house developed benchtop device and cartridge, the Synosensor and Synochip, will be the key drivers of Synosense's financial growth. Second, we will

offer a membership subscription for an in-app community and personalized dietary service, allowing for an extended social engagement among RA patients. By collecting the data from the online application, both in terms of drug measurements and lifestyle input by the patients (i.e. diet), we will form a complete database which will embody our third source of revenue. This database provides a holistic view on a patient's treatment progress and will be sold to pharmaceutical companies and research institutes.

Both benchtop device and cartridge sales will be enabled through a strategic business partnership with Biogen. Taking into account an estimated 30% profit margin for the pharmaceutical company, the benchtop device and cartridge will be sold to Biogen at €1750/unit and €30/unit, respectively. Moreover, we will offer two types of memberships to our online RA community: **(A)** €40/year and **(B)** €80/year (incl. personalized dietary service).

Reckoning with the untapped market of non-RA patients (i.e patients with Chron's disease, rheumatoid psoriasis etc.) that use Humira, we estimate that from a total addressable market of 90.000 European specialists – including rheumatologists, dermatologists and gastroenterologists – we will target 0.5% in our first selling year. This corresponds to 450 specialists, reaching 8 patients per specialist that use 12 cartridges per year. Taking into account these estimations, 450 benchtop devices and 48.000 cartridges will be sold. Furthermore, we assume that 12% of the patients that use our cartridges and 1% of all European RA patients will subscribe to membership A and B respectively.

In order to ensure a long-term sustainable business, critical initial and upscaling investments will need to be done in the first two start-up years. After two R&D and upscaling years, we will start selling our devices and cartridges. The break-even point will be reached after 3.5 years. An overview of the development costs and expected revenue is provided in Figure 9 and Table 3.

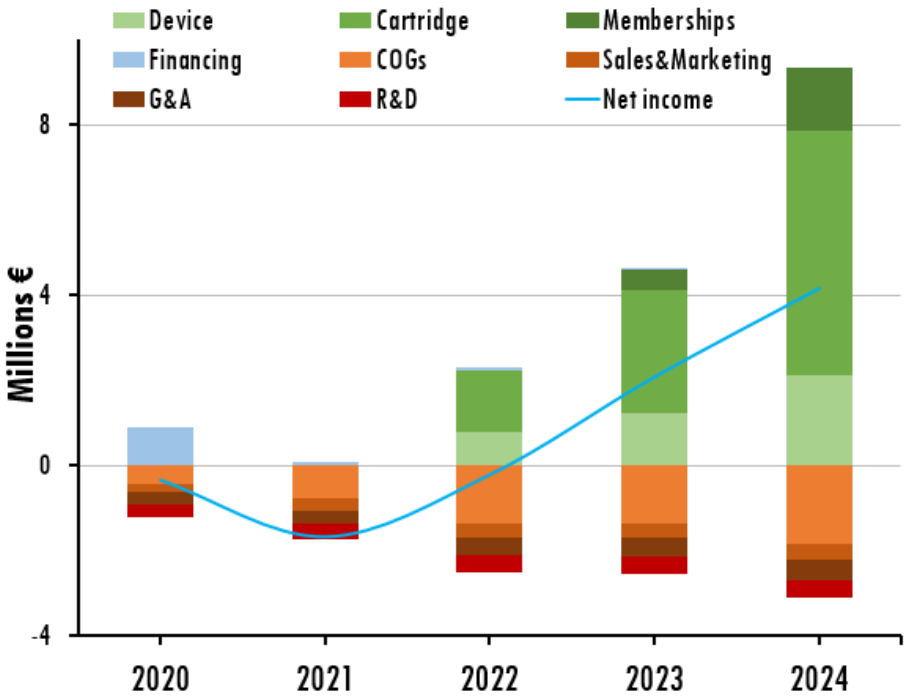

Figure 9: Estimated revenue and cost projection and net income for the first operating years.

Table 3: Overview of the estimated revenue, cost and net income for the first operating years.

	Year	2020	2021	2022	2023	2024
Revenues						
	Device	0	0	787 500	1 225 000	2 100 000
	Cartridge	0	0	1 440 000	2 880 000	5 760 000
	Memberships	0	0	0	480 000	560 000
	Database	0	0	0	0	0
	Financing	877 500	87 500	60 000	30 000	0
Costs						
	COGs	420 000	785 400	1 365 962	1 377 254	1 850 122
	Sales&Marketing	205 000	264 500	327 180	335 545	375 102
	G&A	277 500	319 100	415 161	424 391	476 398
	R&D	305 000	378 100	386 444	395 037	403 887
Net income		**-330 000**	**-1 659 600**	**-207 247**	**2 082 773**	**4 154 162**

5.4 Business Feasibility

The Synosense start-up consists of a technical team – a bioassay developer, a microfluidics engineer and a non-technical manager located in Bio-Incubator, Leuven. It is supported by advisory board from MeBioS KU Leuven specialized in SIMPLE and FO-SPR technologies. Pharmabs is our key partner that provides us with exclusive antibodies with superior specificity. Moreover, Synosense is sponsored by FOx Biosystems and it avails us their expertise in FO-SPR technology. To develop the online platforms such as the database and the mobile application, we need extensive IT services which will be outsourced to a data management company. The manufacturing and scaling up of our products will be outsourced to specialized manufacturing companies like Microfluidic chip shop, Micronit and Idex for the microfluidic cartridges and Unitron for the Synosensor.

The commercialization strategy will consist of selling our devices and cartridges to a pharmaceutical company to be further sold to RA specialists. The database that we will launch on our 3rd year will be our niche product for pharma companies and R&D centers. With RA initiatives' partnership, patients will have access to a holistic treatment through a membership for the mobile app developed by Synosense.

For a successful commercialization, the key activities are smart marketing to transmit adequately our value proposition, third party collaborations in particular with the pharmaceutical company, and continuous research for future multiplexing.

6. Team and Support

Contributions of the team members

Charlotte van Tricht started as a member of the Bioassay Development team, but transferred to the Sensor Technology team when reinforcement was needed. She is single-handedly responsible for the final design of our SIMPLE chips. Additionally, she combined this with the upkeeping of our social media, helping create the business plan and recruiting sponsors.

Eline Rutten is a member of the Bioassay Development team and the Communication team. She was a fixed value in the lab during the whole competition, spending an incredible amount of hours in the lab. She made various of our detailed protocols and shared the responsibility for the meeting reports with Eline Vanhauwaert.

Carolina Gutiérrez Cisneros is a member of the Sensor Technology team and team leader of the Business Plan team. Along with helping create the business model of our sensor, she also laid the foundations of our SIMPLE chip design.

Chezhiyan Nanjappan is a member of the Sensor Technology team. He helped create the software for our user-friendly interface.

Eline Vanhauwaert is a member of the Bioassay development team and the Communication team. Besides spending countless hours on the improvement of our assay and the design of our housing, Eline wrote incredibly detailed meeting reports to keep everyone up to date.

Marta Ciwinska is a member of the Bioassay Development team that transferred to the Sensor Technology team when the situation required so. She helped out with a lot of practical work in the lab and kept the digital log book up to date.

Mattijs Bulcaen is the team leader of the Bioassay Development team. His incredibly hard work and dedication were the basis of our Bioassay Development team. He guided the team through many hardships as a reliable and motivating team leader. During the SensUs Innovation Days, he will show the results of our hard work during the Technical pitch.

Nika Marolt is a member of the Bioassay Development team and designed our flyers.

Sona Guluzade is a member of the Sensor Technology team and the Business team. Her deep interest in the business plan has led her to come up with some innovative ideas. During the SensUs Innovation Days she will represent our team by performing the Translational Potential pitch.

Sophie Kornblum is a member of the Bioassay Development team and the Sponsoring team. In the lab, Sophie showed great dedication and commitment. Additionally, she introduced our team to Christophe Devriese at a crucial point in time.

Lu Yuansheng, who we know as Valentino, is a member of the Sensor Technology team, the Communication team, the Business team and the Sponsoring team. As our youngest team member he wanted to learn as much as possible.

Xander Janssens is active as member of the Bioassay Development team, the team leader of the Sponsoring team and administrative team captain of Synosense. He used his technical capacities while working in the lab, writing protocols and analyzing data; but also his creativity to design our banner, Sponsor brochure and presentations. He will perform the One Minute pitch.

People who have given support

Prof. Jeroen Lammertyn is the head of the MeBioS-biosensors group of KU Leuven. He has granted us access to his laboratories, machines and materials. Without his generosity our participation to the SensUs competition would not be possible.

We would like to thank all our coaches for the countless hours they invested in the team. They did not only help us from a technical and intellectual point of view, but also found the time and energy to lighten up the mood when things didn't go as planned. We're immensely thankful for everything they have done for us.

Postdoc **Francesco Dal Dosso** is one of our coaches, specialized in SIMPLE chip and the business plan. Additionally, he has given an incredible amount of valuable feedback on all levels and was always ready to help guide us through hard times.

PhD candidate **Henry Ordutowski** is one of our coaches, specialized in ELISA and microfluidics. He also made sure all orders arrived in time and our stock of valuable reagents didn't run out.

PhD candidate **Jiahuan Qu** is one of our coaches, specialized in FO-SPR. Her insight has been of tremendous value for the Bioassay team to successfully plan, interpret and optimize the immunoassay.

PhD candidate **Saba Safdar** is one of our coaches, specialized in FO-SPR, along with the Business team and Sponsor team. Her experience and great pieces of advice have contributed to better results on many levels.

Christophe Devriese was introduced to our team by Sophie Kornblum. He took care of the programming of the spectrophotometer and Raspberry Pi. Without his help, we would have never been able to finalize our sensor.

Antibodies were kindly provided by **Prof. dr. Ann Gils** and **Dr. Nick Geukens** (KU Leuven – **PharmAbs** - Laboratory for Therapeutic & Diagnostic Antibodies

Sponsors

FOx Biosystems sponsored Synosense by delivering the FO-SPR fibers. In addition, their extensive experience and complete comprehension of biosensor development has greatly contributed to the creation of our own biosensor, and has vastly improved our pitches.

LCIE's expertise in coaching and pitching has had a great impact on the quality and professionalism of our pitches. Without the believe in our project and their financial support, we would have never been able to produce a final product.

6 Final Remarks

We are very proud of what we have achieved in the past ten months. We also believe that we could help thousands of people by bringing our product to the market. In fact, not only patients with RA can be helped by our device. ADM is also used to treat a plethora of other diseases such as Crohn's disease, psoriasis, uveitis, etc. Moreover, our concept of the biosensor can be used for the detection of other biomarkers, by simply changing the capture and secondary antibodies.

For all of us, it was a privileged opportunity to be part of the Synosense team. We want to thank SensUs for this event and the KU Leuven to participate. It gave us the occasion to evolve ourselves in different ways. We want to specifically thank our coaches for the support and the amount of time and work they put in our team. Additionally, we want to thank our sponsors once again for their advice and financial support. We are proud to have proven that their confidence in our project was not misplaced. Last but not least, the Synosensor could not exist without the team behind it. Therefore, we are thankful for the dedication of each individual of the team.

7 References

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