Calprotectin Diagnostic Aid for Excluding Prosthetic Joint Infections (PJI)
- Commercially launched, Patent pending

Initial market response: This will be the next big thing for orthopaedic implants

Lyfstone AS, September 2018
Company presentation
Our mission is to create a step change in revision surgery health care
Case study from NNUH:
35 persons have undergone a joint revision surgery
Measured Calprotectin levels suggest that 25 of these persons could have undergone less complicated surgical or treatment procedures, thus more cost efficient for the healthcare system, compared to a Infection Replacement procedure.
Lyfstone has successfully developed a diagnostic aid that excludes PJI

- Clear and reliable separation of patient groups
- Immediate and reliable results
- Fits the clinical workflow and falls under the purchasing decision of the individual doctor
- The only commercial solution for excluding PJI
- Patent pending
Rule infection out in 15 minutes!

Powerful and positive message has resulted in positive initial response

**We’ve seldom come across a new diagnostic product pulling such initial interest in the Orthopaedic field**

**Calprotectin cost less and is as accurate as Alpha-Defensin in excluding a chronic prosthetic joint infection**

Sales agent, continental Europe

Dr Marjan Wouthuyzen-Bakker
University Medical Center Groningen, Nederland

You will soon be picked up, please promise me you will not go to the “dark side”

Clinic head, UK
Artificial joints are one of the **most important medical successes of our time**. The number of patients (EU+USA) with artificial knee and hip joints is approx. 25 million and is growing at 4% p.a.

This success has created a **new problem** – these implants loosen over time and have to be revised.

**Consequence is a rapidly growing need for diagnosis of prosthetic joint infection (PJI) and determination of «unspecific» pain**

- The cost for revisions has already passed 9 Billion Euro is growing at an unsustainable 9%
- Due to lack of appropriate diagnostic tools more than 30% of revision surgery is ill timed
Unspecific pain drives the patient into the clinic

Lack of relevant tools give slow and unclear answers to the important questions

First priority: Diagnosing or ruling out infection
Un-diagnosed infection gives the patient a risk of mortality or loss of limb. This needs immediate diagnosis and action.

Second Priority: Aseptic loosening of joint implant
Radiography has sensitivity of ~70% AFTER the implant is mobile, and much less before. This condition is less urgent to diagnose

There is currently no suitable tool for early detection and clinically relevant stratification of the patients
The surgeon lacks the tools to settle the important choices in time

An infected implant must be replaced, it cannot be cleared with antibiotic treatment
- An infected implant must be taken out before the infection can be treated. The new implant comes in after successful treatment. Un-infected but loose implants can be replaced with one-step surgery.
- The procedure to diagnose infection does not give sufficient information to diagnose loosening

The established diagnostic procedure for determining infection is costly and slow
- **X-ray**: Expensive equipment, slow patient throughput, lag time for image analysis, no real information about infection
- **Serology**: Blood based samples sent to central lab, results take time and have insufficient diagnostic accuracy
- **Culture**: May take up to 3 weeks before definitive answer

Infections may be Acute or Chronic.
- The established diagnostic matrix will accurately diagnose most Acute infections, but will severely under-diagnose Chronic infections

Diagnosis often set on basis of surgeon experience
- Patients operated before formal diagnosis
- Exploratory surgery in cases of doubt
- Joint fluid is readily available to the orthopedic surgeon, but is not sufficiently analysed by the hospitals today
Lyfstone is designed with attributes developed and tested to achieve rapid market adoption.

On September 6th, Lyfstone launched a cost-effective and accurate CE-IVD labelled POC diagnostic tool based on a patented usage of the Calprotectin biomarker.

Competitively priced at 100 USD per POC test to achieve low threshold for purchase and rapid adoption.
KOL’s are critical for success  
- to our advantage, they rely on facts

The most disabling complication of implants for patients is infections related to those implants. The question for the orthopaedic surgeon when a patient presents with pain related to an implant, such as a total hip replacement (arthroplasty) is: is this due to infection or just the bone around the implant dissolving causing aseptic loosening?

- Knowing for certain if an implant is infected or not significantly affects the outcome for the patient, as it eliminates the need for a patient who has a loose implant from being treated as if it is infected.
- Ruling out infection is critical

Lyfstone’s diagnostic device will give the surgeon the answer he needs, when he needs it

“Infeksjoner i proseseledd er vårt største problem. Lyfstone har utviklet et presist og raskt verktøy som vil ha stor verdi i vårt arbeid”

Gunnar Knutsen, Overlege Ph.D  
Spesialist, Ortopedi og generell kirurgi  
Universitetssykehuset i Nord-Norge, Tromsø

“Infection is one of the greatest challenges in orthopaedics and is likely to remain a global problem for years to come. Good diagnostics are essential to managing patients and Calprotectin from Lyfstone has the ability to offer a step change in patient care”

Prof. Iain McNamara  
Consultant Orthopaedic Surgeon, Honorary Professor, University of East Anglia

Prof. Emeritus Simon Donnell  
Norwich and Norfolk University Hospital, Orthopaedic Dept.  
University of East Anglia
Lyfstone already has real access to 50% of the key clinics in OECD needed to produce a commercial success.

<table>
<thead>
<tr>
<th>Region</th>
<th># of key clinics</th>
<th>Lyfstone real access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sweden</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>German speaking</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Benelux</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>UK</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Spain</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Rest of EU</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Rest of OECD</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
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# of key clinics needed to dominate the market: 40, Lyfstone access: 50%

If you get Hamburg, Munich and Berlin to adopt, then all others will follow. We know these people closely and they trust us.

Crosstec GmbH, Germany

If this product delivers what it says on the packaging, we would order an annual usage of 1,000 POC tests per year.

Clinic head, Germany

The large arthroplasty centers in the US capture the vast majority of the marketplace. We estimate that the top 20 centers handle over 225K cases per year, representing a significant percentage of the entire market.

By expanding Lyfstone’s research program at Cleveland Clinic to these other centers, the company can effectively engage with the market leaders and capture significant utilization and further development of our products.

Jonathan L. Schaffer MD MBA
Program Director, Advance Operative Technology Group
Center for Joint Reconstruction
Department of Orthopaedic Surgery
Cleveland Clinic
Consultant to Lyfstone
Lyfstone’s initial target market of 100 MUSD is a prudent estimate. With extended use 300+ MUSD

# revisions as a proxy for PJI diagnostic need:

<table>
<thead>
<tr>
<th>Relevant market</th>
<th># revisions</th>
<th># POC</th>
</tr>
</thead>
<tbody>
<tr>
<td># of revision joint replacements in OECD</td>
<td>250 000</td>
<td>1 000 000</td>
</tr>
<tr>
<td># of revisions in Germany</td>
<td>40 000</td>
<td>160 000</td>
</tr>
<tr>
<td># of revisions in USA</td>
<td>120 000</td>
<td>480 000</td>
</tr>
<tr>
<td># of revisions in OECD excl USA</td>
<td>130 000</td>
<td>520 000</td>
</tr>
</tbody>
</table>

20% complain about unspecified pain
20% need diagnosis or possible infection
80% need less urgent diagnostic response

# of patients with implants in OECD
23 598 564
# of patients with implants in Germany
4 165 036
# of patients with implants in USA
12 121 443
# of patients with implants in OECD excl USA
11 477 120

Initial response: key clinic Germany

# 7,500 primary joint replacements
# 250 revision replacements
# 1,000 suspicion of PJI
# PJI tests/revision = 4
# 1,000 POC tests annual purchase, contingent positive validation test
Lyfstone’s business plan targets a rapid revenue growth as key clinics drive adoption.
Lyfstone team is hard working, highly motivated, highly qualified and demonstrate strong integrity

Stein Lian, CEO
- MSc Biotech, BSc Analytical Chemistry, University of Tromsø
- Previously Manager of patenting agency and marketing firm
- 20+ years of R&D experience, business development and sales

Anders Einung Hansen, Chief Operating Officer
- MSc Biotech, BSc Analytical Chemistry, University of Tromsø
- 20+ years of experience from biotechnological R&D and Commercialization

Jarle Mikalsen, Chief Scientific Officer
- PhD Microbiology, Norwegian School of Veterinary Science, Oslo and MBA North University
- Inventor, researcher and project manager at the Norwegian Veterinary Institute in Oslo, successfully developing several diagnostic tests
- Broad experience from monitoring programs, disease categorizations and development of diagnostic tests

Eric Bendiksen, Chief Laboratory Officer
- MSc Molecular Biology, University of Tromsø
- Expertise in molecular techniques and development of diagnostics tests

Dirk Van Hoegaerden, Sales Director
- HBO Medical Assistant at KHB Brussels
- 17 years of experience in sales and product management, business development EMEA

Eivind Burkow, Chief Marketing Officer
- MSc Business Development, University of Tromsø, BA Marketing, University of Stirling
- Experienced in marketing, project development/management and sales management