Innovation in wireless in-body devices
- the power of wireless -

IRACon
3rd MC meeting and
3rd technical meeting

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About us

Product portfolio: interventional endoscopy
About us

R&D pipeline: diagnostic systems
Strong history in European R&D projects

- **BILOCH**
- **netMEd**
- **VECTOR**
- **WIBEC**
- **ARA.K.N.E.S.**
- **EndoVespa**

Projects:
- FP4
- FP5
- FP6
- FP7
- H2020
2001: Market launch of the M2A (mouth to anus) capsule endoscope, Given imaging, Israel
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M2A (later: ’Pillcam‘) led to a paradigm shift in GI diagnosis
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M2A (later: 'Pillcam') led to a paradigm shift in GI diagnosis

Hagenmüller et al, 2014
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Pillcam: Pioneering the field of small bowel diagnosis
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Pillcam, an integrated battery powered system
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The race began – research gone wild
Today’s competitors – an USD 600 million market in 2017, CAGR 8.7%
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Both Ovesco divisions synergetically address the same clinical indication areas from both, diagnostic and therapeutic sides.

Ovesco Endoscopy AG

Clinical indication areas

- Bleeding
- Closure
- Tumor detection and removal
- Further areas

Division Therapeutic Devices

Division Diagnostic Systems
Innovation in wireless in-body devices: A field just starts to unfold
HemoPill acute (market launch 2017): Quick check that can save lives

**Application**
Patient with suspected acute UGIB

Patient swallows *HemoPill acute*

*HemoPill acute* sends sensor data

Sensor data displayed on the receiver in real-time
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HemoPill: the world's smallest battery-powered telemetric in-body device

Sensor (20 vol%)
Power (45 vol%)
Communication (30 vol%)
Data processing (5 vol%)
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HemoPill: the world’s smallest battery-powered telemetric in-body device

**Data processing unit (comparable device):**
- 20 MHz CPU
- 9 KB internal Memory
- 8 sensing channels
- Timers, comparators, serial interface, temperature sensor...
- Wireless communication speed:
  - up to 600 kbit/s
- Dimension: 3mm x 3mm
- Price < 1 EUR

**386 SX (1989):**
- 16 MHz CPU
- 40MB internal Memory
- Communication speed:
  - analog max. 40 kbit/s
- Price ~ 1000 EUR
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Innovation in wireless in-body devices: A field just starts to unfold
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Flexible endoscopy... coming of age?

- Endoscope advancement and steering capabilities
- Advanced bio-photonic imaging capabilities
- High-throughput communication for high quality video feed
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Today’s capsule endoscopes have its niche in the small bowel; flexible endoscopes cover >98% of procedures

Small bowel endoscopy: < 200k procedures p.a.

Colon and gastric screening: >10M procedures p.a.

FIGURE 3. Images seen during capsule endoscopy include actively bleeding jejunal arteriovenous malformation (A), small bowel ulceration and luminal narrowing due to Crohn’s disease (B), small bowel tumor (C), and multiple angiodysplasias (D).
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The organ caliber is main limitation of capsule endoscopy.

**Small bowel endoscopy:**
< 200k procedures p.a.

**Colon and gastric screening:**
> 10M procedures p.a.

- **Esophagus**
  Ø 1-1.5cm

- **Small bowel**
  Ø 1-2.5cm

- **Stomach**
  Ø 10-15cm

- **Colon**
  Ø 4-6cm

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Small bowel endoscopy: < 200k procedures p.a.
Colon and gastric screening: > 10M procedures p.a.
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Flexible endoscopy is today indispensible for majority of digestive disease diagnoses

Evidence supporting the concept of early detection & treatment:
- Screening endoscopy reimbursed in many EU healthcare systems
- Literature widely supports screening endoscopy
- Literature widely supports early treatment of pre-malignant and early malignant lesions

Relatively few patients make use of the screening opportunity, due to:
- Pain and discomfort during the procedure.

Stretching the bowel wall: Pain creation
Stretching the mesentery: Pain creation

Healthy bowel mucosa
Invasive cancer
Endoscopists need to be able to position the endoscopic device

**Passive locomotion**

1) Detection of a suspicious lesion  
2) Capsule is passing the lesion  
3) Capsule has passed the lesion without gathering information

**Selective on site-locomotion**

1) Detection of a suspicious lesion  
2) Capsule is passing the lesion  
3) Capsule uses on-site locomotion to further investigate the lesion
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VECTOR capsules can keep up with flexible endoscopes in terms of steering
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Magneto-robotic position control proves intuitive and allows capsule locomotion
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Imaging technology for integrated smart systems is unfolding

Fluorescence imaging

Al-Rawhani et al. 2015
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Technology is the bottle neck... every advancement results in improvement!

**Capsule endoscopy today: Obscure GI bleeding**

- Single-shot imaging (2 per second)
- Resolution 250x250 to 320x320
- Datarate 2 Mbit/s
- Power consumption < ~10 mW

**VECTOR capsule endoscopy: Fighting GI cancer**

- Fluent video (> 11 fps)
- Resolution 720 x
- Datarate > 10 Mbit/s
- Power consumption < ~40 mW
Conclusion

Wireless in medical applications is a true enabler – significant examples in digestive disease diagnosis

Exploitation of wireless technologies in healthcare is years behind other fields of applications

But…

Healthcare applications come with technological challenges (level of integration, low power, etc), therefore stimulate and boost research and innovation

… to be continued
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THANK YOU!

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