NOUL
COMPANY PROFILE
Introduction

NOUL* 노을

noul means sunrise in Korean. It is noul’s vision to make the world more beautiful with its innovative diagnostics as the sunrise does.

MISSION

We explore global challenges that threaten human health and life, discover novel potential solutions, and realize those possibilities.

GOAL

1. To contribute to eliminating Malaria, TB, AIDS and other neglected diseases through innovative diagnostic platform.
2. To proactively increase healthcare accessibility through next-generation blood diagnostics platform.
Facts about malaria (2016)

Death toll by malaria: **445,000**

Vulnerable to infection of malaria:
**3.2 billion people**

91 countries
Malaria endemic countries

About 200 million people
(5 million increase compared to 2015)
newly infected in 2016

90%
of death occurring at Sub-Saharan region

Investment on combating malaria (2015)
**$2.9 billion**

Infant mortality under 5 years old
**303,000**

WHO Malaria Report 2016
noul’s miLab provides unprecedentedly innovative diagnostic solutions by transferring the entire diagnostic laboratory into one single portable device.

Traditional Diagnostics vs. NOUL’s miLab Diagnostics:

**Traditional Diagnostics**
- Laboratory
- Technicians
- Big machines

**NOUL’s miLab Diagnostics**
- Consumable chip
- Artificial Intelligence
- Digital diagnostic device

15 MIN

Local hospitals to anywhere

Potentials to be applied to other blood borne diseases
Digital microscopy (morphology detection) based diagnostics

- Automated device (minimal training is required for technicians)
- Level of detection: 20 µl
- Quantitation of parasites
- Differentiation of parasites (identification of gametocytes)
- Surveillance

1. Consumable chip: Liquid-free
2. Digital microscopy: Oil-free
3. Artificial intelligence: Technician-free
4. Real-time data and surveillance platform
Operation of the platform

miLab® Technology
AI Mobile Malaria Diagnostics

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**Competitiveness**

- Microscopy is gold standard in malaria diagnosis but difficult to be applied to resource-limited settings
- Rapid Diagnostic Tests (RDTs) are widespread but frequently reveal limitations in accuracy

<table>
<thead>
<tr>
<th></th>
<th>Microscopy</th>
<th>RDT</th>
<th>noul</th>
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</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>High</td>
<td>Limited</td>
<td>Very high</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>Expensive</td>
<td>Affordable</td>
<td>Affordable</td>
</tr>
<tr>
<td><strong>Accessibility</strong></td>
<td>Low</td>
<td>High</td>
<td>High (portable/battery inside)</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>20 ~ 90 min</td>
<td>15 min</td>
<td>15 min</td>
</tr>
<tr>
<td><strong>Extendibility</strong></td>
<td>Low</td>
<td>Low</td>
<td>High (other blood-borne disease)</td>
</tr>
<tr>
<td><strong>Real-time data transfer (Surveillance)</strong></td>
<td>No</td>
<td>No</td>
<td>Highly possible (3G/LTE networked)</td>
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</table>
**History**

- **NOUL Inc. Established**
  - 2015.12

- **Clinical Trials Malawi & Cambodia**
  - 2016.09

- **SWISS TPH MOU**
  - 2017.02

- **2017.12 MOU with FIND**

- **1st UN STI Top 15 Innovators out of 700+ Companies**
  - 2016.06

- **Gates Foundation/GCAM Conference**
  - 2016.10

- **11th Seoul ODA International Conference/Keynote**
  - 2017.09

- **2018.6 ISO13485 Approval**

- **Ministry of Health Grant**
  - $1.5M
  - 2017.07

- **Ministry of Small Business Grant**
  - $900 K
  - 2017.05

- **GRANT $4.7M**

- **KOICA Grant**
  - $500 K
  - 2017.03

- **KOICA Grant**
  - $300 K
  - 2017.03

- **Ministry of Health Grant**
  - $1.5 M
  - 2017.04
Cooperation with Korea International Cooperation Agency (KOICA)

- Since 2016, noul has successfully carried out KOICA’s Creative Technology Solution (CTS) program

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**CTS SEED1**
- **DISCOVERY & RESEARCH**
- **DEVELOPMENT**
- **EVALUATION**
- **DEMONSTRATION**
- **IMPLEMENTATION**

**PRODUCT REGISTRATION**

**ADPTION INTO GLOBAL POLICY**

**ADPTION INTO NATIONAL POLICY & SCALE UP**

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**FEASIBILITY STUDIES**
- Average 200 subjects, 1-3 sites

**DEVELOPMENT STUDIES**
- Average 400 subjects, 1-3 sites

**EVALUATION STUDIES**
- Average 2,000 subjects, 3-6 sites
  - * Clinical performance
  - * Ease of use
  - * Surrogate patient Important outcomes
  - * Cost comparisons

**DEMONSTRATION STUDIES**
- Average 10,000 subjects, 4-20 sites
  - * Accuracy in intended settings
  - * Cost-effectiveness
  - * Operational requirements for implementation

**SCALE-UP & POLICY REFINEMENT STUDIES**
- Validation for product selection to assess best fit
- Algorithms, operational requirements
- Test & resource utilization
- Impact assessment

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**2016-2017**
- Development of prototype of malaria diagnostic platform
- 1st clinical trial in Cambodia: 197 subjects
- 1st clinical trial in Malawi: 130 subjects

**2018**
- 2nd clinical trials in Cambodia and Malawi: 2500 subjects
- ISO/CE approval

**2019-2020**
- Clinical trials with global research institutes
- WHO PQ
- Distribution of the platforms
Joint clinical trials (Cambodia and Malawi)

- Made MOU with National Malaria Centre (CNM) in Cambodia and Daeyang Luke Hospital in Malawi
- Conducted two rounds of clinical trials in each country
- Initial results (sensitivity and specificity: 94.44%) – more clinical trials are expected
Joint research with Swiss TPH

- Made MOU with Swiss TPH in 2017
- Dr. Hans-Peter Beck (Head of Molecular Parasitology and Epidemiology Unit) joined noul as a scientific advisory board member in 2018.
- Joint clinical trial with Swiss TPH in Cambodia and Malawi were conducted in 2018.
- More clinical trials are planned in 2019, to be joined by Columbia University (in Ghana) and London School of Hygiene and Tropical Medicine (in India)
Cooperation with Foundation for Innovative and New Diagnostics (FIND)

- Made MOU with FIND, which supports accreditation of diagnostic device on behalf of WHO.
- Noul’s platform is registered at the stage of validation in FIND’s online tracker.
Collaborative networks with funding partners, research and development institutions are expanding.

<table>
<thead>
<tr>
<th>FUNDING &amp; GRANT</th>
<th>RESEARCH &amp; CLINICAL TRIALS</th>
<th>REGIONAL RESEARCH PARTNERS</th>
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<tbody>
<tr>
<td>JX Partners</td>
<td>Swiss TPH</td>
<td>Papua New Guinea Institute of Medical Research</td>
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<td>KOICA</td>
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<td>Cambodia National Malaria Center (CNM)</td>
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<td>futureplay</td>
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<td>Daeyang Luke Hospital</td>
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<td>D.CAMP</td>
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<td>D. 한글</td>
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<td>Ministry of Health and Welfare</td>
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<td>Ministry of Foreign Affairs</td>
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<td>BILL &amp; MELINDA GATES foundation</td>
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A multidisciplinary team composed of high-level experts with more than 10 years of experience in different fields

**BIO MEDICAL ENGINEERING TEAM**
12 People

**PLATFORM TEAM**
Artificial Intelligence
Software
Hardware
10 People

**DESIGN TEAM**
6 People

**PRODUCTION**
2 People

**SALES/MARKETING**
3 People

**ADMINISTRATION**
4 People

**SUSTAINABILITY**
2 People

**TOTAL** 40 People
SUSTAINABILITY is the foundation for every work we do.

- The company which not only pursues profit but also willingly assumes its social responsibilities
- The company which prioritizes people
- The company whose philosophy of sustainability is deeply embedded in all activities of the organization.