CHARITÉ/BIH-PARTNER WANTED!

Short profile

Name: Breath Of Health

Medical field	Breast cancer
Product type	Breath based point of care diagnostic platform
Growth stage	TRL 5
Team	7

Description of product:

BOH Exhalome 1.0 device diagnose breast cancers using molecular prints e.g., Volatile and non-volatile Organic Compounds (VOC) present in breath. The concept is based on a completely new method to collect and analyze particles via exhaled air in the small airways to easily identify chemical changes and potential biomarkers for various cancer types. The screening method utilizes mid IR spectroscopy applied on an aerosol of the breath sample, with aerodynamic range of the droplets of 60-120 seconds, in a gas cell with an optical length of 5 meter, or circultedc in a shorter gas cell detecting a large number of volatile and nonvolatile organic compounds combined with artificial intelligence (AI) generated algorithm applied to Mid IR reading interpretation. The entire process is performed by a mobile point-of-care machine within less than 4 min (Fig 1).

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- The BOH device use a disease specific spectrometric profile for cancer diagnosis developed based on corelative spectrometric profiles to cancer patients, location, subtype, and stage in conjunction to known to the identification of disease specific molecules .
- This is accomplished by generating an AI-based algorithm for cancer diagnosis via Mid IR breath analysis.
- The BOH screening technology has the potential to fundamentally change the way breast cancer is diagnosed and treated today by offering a best alternative of the existing methods, which brings a substantial commercial potential. By doing a simple breathing test and without any potential risk for the patients, the instrument provides a quantitative, reliable, user friendly, non-invasive, less painful, faster, repeatable method for early-stage diagnosis.

Desired project goal: *Please also elaborate on the primary outcome*

Development and proofing of the BOH Exhalome 1.0 ability to diagnose breast cancer by stage, subtype, source and DCIS, through a global clinical study in Europe, USA, Brazil and Israel, towrd

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regulatory approval. To determine the diagnostic capacity of BOH technology for the diagnosis of Breast cancer according to priority listed:

1. Diagnosing breast cancer at any stage through use of the same breath biopsy generated profile with specificity and sensitivity >70%.
2. Diagnosing the breast cancer ad it's subtypes, origin, and staging through BOH breath biopsy profiles with a specificity sensitivity >70%.

Desired project type: *Please also elaborate on the following points, if applicable: population, intervention, study design etc.*

Study design and Ethics

We will start with a pilot, prospective, controlled, non-interventional study. To be followed after a proof of concept with a multicenter prospective, controlled, non-interventional study.

The Pilot and full project will be divided to two phases. In Phase 1, exhaled breath samples will be analyzed *unblindly* by BOH to determine the pattern of OC most reliably associated with the presence of breast Cancer and potentially it's subtypes and staging , and similar on high-risk participants (ROC curve).

In Phase 2, exhaled breath samples will be analyzed *blindly* for the presence or absence of disease to determine the diagnostic sensitivity, specificity, positive and negative predictive values.

All participants will sign their informed consent. The study protocol will be submitted to the Ethics Committee of every participating Hospital for evaluation and eventual approval. The investigation will comply with the Helsinki declaration.

1. **Breast Cancer Participants General**

- International clinical trial: Starting with several medical centers in Israel, later this year or next year: Spain, India, Brazil and the US.
- In phase 1 (unblinded) we will study 180 Patients with breast cancer from evey common subtype and 100 (controls of similar age, sex and Risk group.
- Total of: Breast cancer subtypes In phase 2 (blinded) we will study another 300 with at least 30% patients with all subtypes.

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- All diagnosed patients are to be recruited before chemotherapy, radiology, or biological treatment regime.
- Total : P1: 180 +100 Subjects, P2:300 in each country.

Breast cancer types:

- **Graded on a 1 to 3 scale.**
- **Hormone receptor (HR) negative.**

- **Group 1 (luminal A).** This group includes tumors that are ER positive and PR positive, but negative for HER2. Luminal A breast cancers are likely to benefit from hormone therapy and may also benefit from chemotherapy.
- **Group 2 (luminal B).** This type includes tumors that are ER positive, PR negative and HER2 positive. Luminal B breast cancers are likely to benefit from chemotherapy and may benefit from hormone therapy and treatment targeted to HER2.
- **Group 3 (HER2 positive).** This type includes tumors that are ER negative and PR negative, but HER2 positive. HER2 breast cancers are likely to benefit from chemotherapy and treatment targeted to HER2.
- **Group 4 (basal-like).** This type, which is also called triple-negative breast cancer, includes tumors that are ER negative, PR negative and HER2 negative. Basal-like breast cancers are likely to benefit from chemotherapy.

2. Enrollment Table

Histopathology	Breast cancer Total	Group 1 Breast cancer type	Group 2 Breast cancer type	Group 3 Breast cancer type	Grou Brea canc type
Number of Patients	180	>10	>10	>10	>10

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3. **Inclusion/exclusion**

Breast Cancer

Investigational Population-Suspected Invasive Breast Cancer (any size) or DCIS (pre-invasive) are of particular interest. Women with abnormal screening mammograms (R3-5) recalled for further investigation.

Inclusion Criteria:

- Women with suspected Invasive Breast Cancer (tumours of any size and/or DCIS).
- Individuals with an abnormal or suspicious screening mammogram recalled for further evaluation.
- Suspected Invasive Breast Cancer (tumors of any size and/or DCIS).
- See previous list of subtypes.
- Willing to give written Informed Consent and provide whole blood samples
- Age 30-75 years

Exclusion Criteria:

- Previous history of cancer previously at any site
- Previous history of breast cancer
- Concomitant or other concurrent anti-cancer therapy
- Male
- No histopathological diagnosis

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Control Population

Healthy Controls Inclusion criteria

- Normal breast examination - No cancer detected/suspected by physical exam, diagnostic radiology or screening mammography
- Willing to give Written Informed Consent and provide whole blood samples
- Aged 30-75 years

Exclusion criteria

- Cancer diagnosis
- Male
- Breast surgery within the previous 12 months (for any reason) or recent breast biopsy (including needle core biopsy)
- Previous history of any cancer

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