

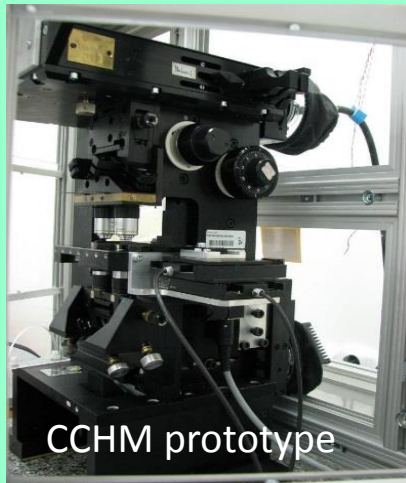
Investigations of Living Cell *in vitro* Dynamics with Quantitative Phase Imaging (QPI) using new Coherence Controlled Holographic Microscope (CCHM)

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CCHM brings novel opportunity to image how cells react even to turbid environment, interact with the other cells and measure translocation of dry mass of the cell by Dynamic Phase Differences (DPD) method.



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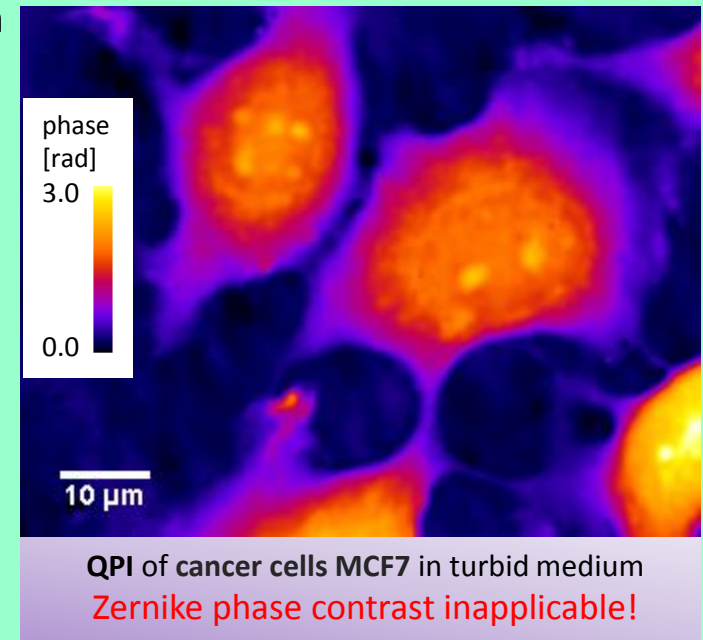
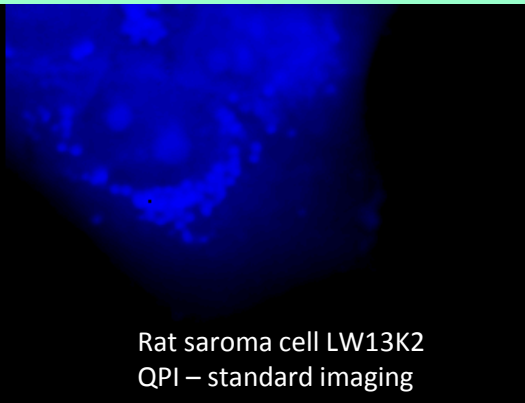
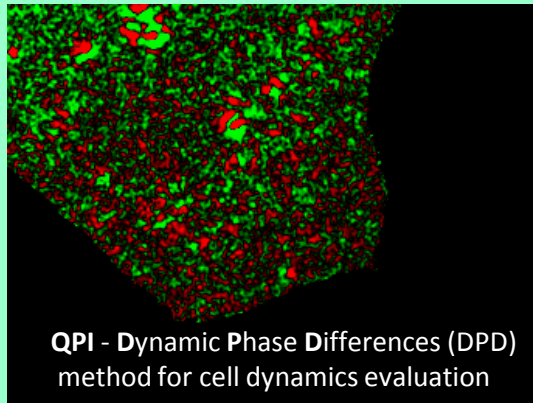
What we offer

- Acquaintance with advanced holographic microscopy of live cells
- Carrying out assisted experiments with CCHM of one's own design
- Elaborate a plan of mutually complementary experiments focused on behavioural analysis of a particular reaction of cells to a chosen challenge

CCHM provides the opportunity to innovate criteria for **objective classification** of **dynamic traits** of *in vitro* living cell behaviour using **DPD method** and selected cell populations

Derivation of the criteria is based on

- properties of normal cell overall motility and/or migration
- fast intracellular motion
- results of cell-to-cell interaction
- changes of an equivalent of cell dry mass



For videos see <http://www.biophot.cz/CCHM-videos>

New multimodal CCHM with fluorescence allows us to concentrate on study of **cancer cells**.

Our aims

- **Alterations** of the **elementary behavioural criteria** in cancer cells will be assessed in standard and challenging culture conditions including use of model drugs. Particular attention will be paid to synergic effect of drugs' combination each applied at **subtoxic** concentration. A **multi-hit** approach will thus be exercised.
- **Resulting criteria** of cell behaviour will be available in **digital form**, therefore be processed and automatically evaluated by computer. This can lead to **predictive information** about the course of development of cell reactions.
- The **multimodal CCHM** will serve a tool to develop a **fully robotic** high throughput working process.

The **final aim** is to find out indications of **cooperative anticancer activity** of simultaneously applied cautiously selected and concentrated drugs. We believe this has to be done at a **cellular level** first before **analysis** of the undergoing **molecular mechanisms** can be initiated.

Norwegian **PARTNER** is deemed to provide & confirm:

- **Suitable models of cellular activities and reactions to drugs** that are beyond our reach. In this way **our results should be verified** for further practical exploitation and the overall **evidence broadened**.
- The investigation of wider range of representative cancer cell lines and drugs - it should take place with emphasis on specific feature that could obstruct generalization.
- An attempt to simulate the goal of personalized medicine = investigation of reactions of primary cells from patient's biopsy.
- Mutually agreed **protocol** accompanied with a **knowledge base** of cell behavior traits. Protocol revealed in this project should be finally elaborated for **dissemination** of the approach.

Details regarding the cooperation can be discussed with **Pavel Vesely MD PhD**

pavel.vesely@ceitec.vutbr.cz

Main outputs/results

- **Quantitative Phase Imaging** has brought new dimension into noninvasive microscopic investigation of living cells because the QPI **DPD** method enabled development and use of **measurable criteria of cellular activities**.
- Such contribution will be employed in search for drugs combination that can **modify malignant phenotype of cancer cell**.
- Once such an approach is established, it can be employed not only in **screening new anticancer drugs**, but also transferred into **personalized medicine in oncology**.
- The **results** will be presented in the preliminary form at International Meetings, in the final form in suitable journals of the field.
- Finally, **the protocol accompanied with a knowledge base** for practical application in clinical oncology will be formulated together with **recommendations regarding the implementation**.