**Metafer Slide Scanning System**

**Equipment:** Metafer Slide Scanning System version 3.11.

**No. of Equipment: IEM2**

**Responsible coordinator:** Táňa Brzicová, MSc.

**Name of Institution:** Institute of Experimental Medicine, CAS

**Address of Institution:** Vídeňská 1083, 142 20 Prague 4, Czech Republic

**E-mail:** [tana.brzicova@biomed.cas.cz](mailto:tana.brzicova@biomed.cas.cz)

**Telephone:** +420 241062675

**Homepage:** <http://www.iem.cas.cz/>

**Contact person:** Jolana Vaňková

**E-mail:** jova@biomed.cas.cz

**Telephone:** +420 241062663

**Equipment Description**

***Description of equipment:***

Metafer is an automated multi-purpose slide scanning platform. Equipped with CometScan software for MSearch, it enables automatic detection of single cell gel electrophoresis (Comet assay) samples.

Metafer automated scanning platform for analysis of the comet assay slides consists of:

**Motorized microscope (AxioImager.Z2, Carl Zeiss, Jena, Germany)**

- Enabling automated acquisition of microscopic images (e.g. automated focusing, integration time setting)

- Objective: EC Plan-NEOFLUAR (20x/0,50x ∞/0,17; Zeiss)

- Eyepieces: PL 10x/23

- Individual filters: DAPI, FITC, TRITC

- Control: TFT display

**Fluorescence illumination (PhotoFluor® LM-75, 89 North)**

- 75W metal-halide lamp with associated optics

- Spectral range: 340 - 800 nm

- Lamp life guaranteed: 1 250 hrs

**Motorized X/Y scanning stage (SCAN for 8 Slides, Märzhäuser, Wetzlar, Germany)**

- Insert frames for eight 76 x 26 mm slides / two 76 x 52 mm slides / two 96-well slides (225 × 76 mm)

- Step size of stepper motor = 10 nm

**Computer (OptiPlex XE2, Langen, Germany)**, equipped with:

- Intel Core i7-4770S @ 3.10GHz

- 16 GB RAM memory

- 80-GB hard drive

- Microsoft Windows 7 Professional operating system (64-bit)

**High resolution CCD Camera (CoolCube 1m, MetaSystems)**

- Resolution of 1360 x 1024 pixels

- Pixel size of 6,45 µm x 6,45 µm

**CometScan software V 3.11 module for Metafer MSearch**

- Software for controlling hardware components (such as the microscope-focusing motor, the fluorescence filter-turret and the motorized stage), image acquisition, data storage and analysis

- The user-trainable classifiers precisely defines the analysis standards (parameters for slide-scanning and automated comet-assay analysis, i.e. details on image acquisition, number of captured fields at each well position, image-analysis procedures and cell selection - morphology criteria, such as size, aspect ratio, concavities)

***Automated image capturing and analysis process:***

The suitable preset classifier is selected by an operator for the analyzed samples.

Automated focusing: the plane of best focus is determined automatically at each captured field using advanced autofocus algorithm for automatic focusing.

Automated slide scanning: each image is analyzed for the presence of target comet cells.

Automated adjusting of the exposure time for the final image.

Unsuitable images rejection (in case of another object presence in the close neighborhood, background inhomogeneity, comet size larger than the region of interest, etc.).

In the non-rejected objects the head and tail of the comet is determined.

Different comet features (e.g. intensity of head and tail, comet shape, tail moment) are measured.

Image of each cell, its parameters and coordinates on the slides are stored in a gallery.

A detailed documentation for every cell found is provided within the report.

Graphic presentation of search progress and comet assay data is provided.

**Specification of expertise relevant to NanoEnviCz workpackages:**

**WP3**a,d,f,g,h, **WP4**a,b, **WP6**a,d, **WP7**a,c,e,h,i, **WP9**a,b,c

**Detailed description of expertise**

**Please, specify the main research topics connected with equipment**:

Evaluation of genotoxic potential of nanomaterials

- Automated scanning, detection and analysis of comets in single cell gel electrophoresis (comet assay) samples to determine DNA damage of cells exposed to potentially genotoxic agents, including nanomaterials

**Please, specify the secondary research topics connected with equipment**:

Evaluation of oxidative DNA damage in cells exposed to nanomaterials by employing restriction enzymes (e.g. FPG, Endo III)

-Evaluation of DNA reparation process in cells exposed to nanomaterials

**Keywords describing research area:**

Comet assay, Single cell gel electrophoresis, Genotoxicity, Nanotoxicology

**Competence**

**Relevance for applied and industrial research:**

High throughput analysis of DNA damage caused by nanomaterials, complex mixtures, individual chemicals or air pollution.

Enhanced reproducibility and reliability of the results using automated scanning approach. Time and cost savings.

**Relevance for fundamental studies:**

Analyses of mechanisms of toxic effects of nanomaterials.

Analyses of oxidative damage by nanomaterials