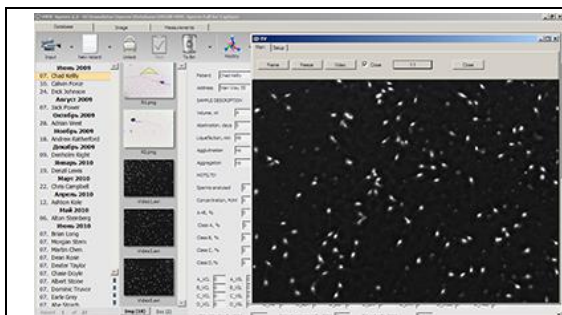
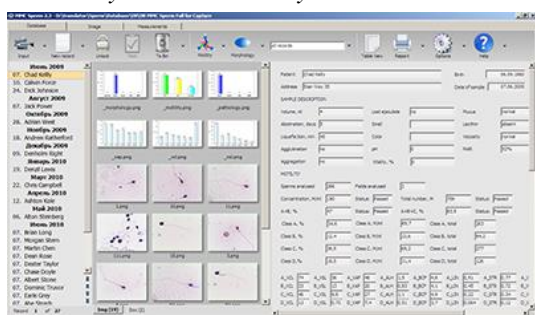


MMC Sperm software for automation of sperm analysis

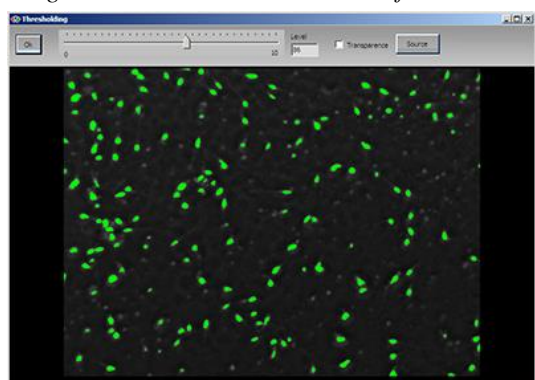
MMC Sperm is an automated image analysis software package for sperm quality analysis according to parameters recommended by WHO (World Health Organization).



Software in live preview mode. Direct camera drivers and preset camera modes for motility (high speed 60 fps) and morphology (best image quality). Fast analysis in PC memory.



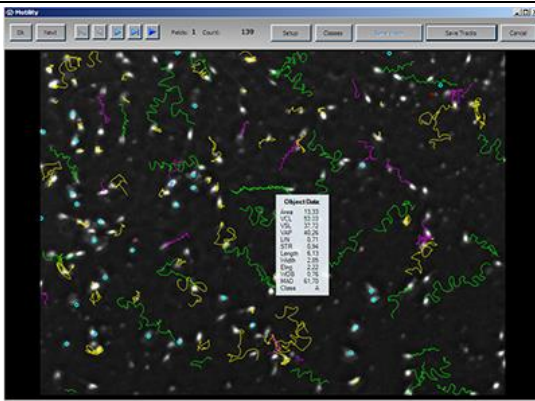
Software in database mode. Resizable sections allow you to arrange your workspace: more space to images or to the area with database fields.



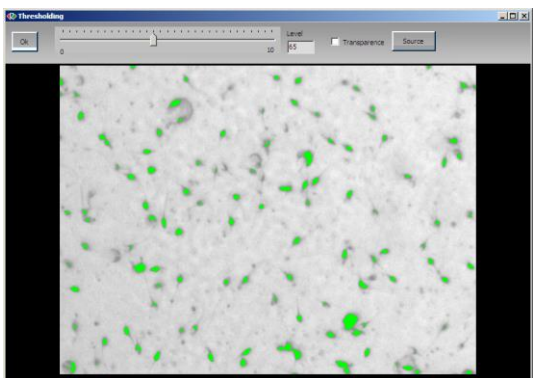
Sperm head detection tool for flexible motility analysis with different microscopes and contrast techniques. Negative phase contrast recommended.

MAIN SOFTWARE FEATURES:

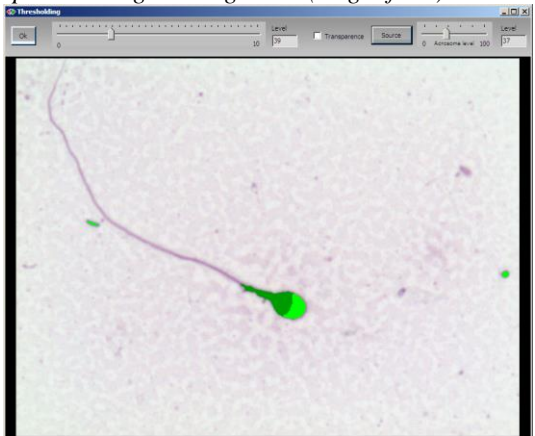
- Acquisition of images and clips in AVI format from an imaging device provided with **DirectShow drivers**.
- **Direct drivers** to our digital cameras and to cameras of other manufacturers (ask for details). Predefined settings for all analysis modes. Analysis is performed using PC operational memory without recording to HDD (recording on demand is available). Analysis from PC memory is faster, recording at high frame rates more reliable. You don't need to record all the clips saving your disk space.
- Storage of textual data, images, clips and other files of any type in the built-in MultiMedia Catalog database. You can take the advantage of all the powerful features of MultiMedia Catalog in application to semen analysis: The database is a perfect tool for archiving of patient data, analysis results, video clips, images and any other files in one record (accompanying documents of any office software like MS Office, Open Office etc., Adobe or similar applications for extended image processing). Fast and flexible search, spectacular reporting with images, graphs and other features can be adjusted to your particular needs. Herewith our database can serve the needs of virtually any laboratory or research institution.
- Our database is specially tailored for image analysis needs. You can catalogue virtually any digital assets corresponding with sperm analysis (provided that the 3rd-party software you use does not automatically create folders for its projects since this would destroy our database structure) in one place and have fast and smart access to any files.
- The **volume of data** in your database is restricted only by the size of your HDD or flash card.
- The **database can be stored on server** in your local network which will enable all the security policies and backup procedures provided by Windows. Alternatively, you can also save your database to **any suitable storage media** (internal/external HDD, flash, etc.) if you need to have access to it on different workstations.
- **Internal archiving tool** will help you to keep your important data save as well as to make archives with older information to free your storage space.
- There are many **security tools and procedures** to ensure the integrity of your data. Database records are deleted to internal recycle bin and deleted permanently only after you empty your bin. Images and videos are deleted to Windows recycle bin and can be restored. To prevent unwanted changes in the database records, all the records are locked for editing until you press special button.



The software has tracked the movement of every spermatozoon on a 1 sec. clip with 60 fps. This allows for accurate tracking and classification. Pointing to a track you can see all parameters.



The software is able to work with light objects on dark background (phase contrast) as well as dark sperms on light background (bright field).



Morphology analysis under 100x oil lens, smears stained with Diff-Quik. Separate adjustment tool for head an acrosome region will let you adopt the software to virtually any staining variations

- To avoid unwanted changes by unauthorized personnel, you can enable **PIN mode**. The PIN mode will disable the following options until you enter correct PIN: edit database structure (add/delete fields), edit print templates, making changes in the autotext box, deleting database filters, changing default calibrations. To disable PIN mode protection, you just enter 0000 and your current PIN.
- **Database structure** is implemented as a tree of folders with separate technical files, images, videos, 3rd-party files for every record. This provides the advantage of loading only one record at a time, which makes your work with a large database fast and effective. Furthermore, storage of data in multiple files will protect you in case your PC is infected with a virus: if the virus destroys some files, you will lose only several records and in no case the whole database.
- The database is written in XML Unicode which provides wide options of integration of your data in 3rd-party databases as well as the ability to use your local language to fill in the database fields.
- Database structure can be easily changed by the user through a plain and visually clear interface. Add fields for storing text data (also multiline fields for large amounts of text, drop-down lists with predefined values or automatically generated lists for fast selection of repeating words and phrases), numerical data (e.g. parameter values), use special date tool with calendar. Move single fields or large groups of fields to organize your working space. Rename fields as you need, add any number of fields to store additional analysis data besides the automatically calculated parameters.
- Use **fast search** option to find required data in the fields or to retrieve required images, video, documents.
- Apply extended **filters** to make selection of records according to any number of parameters (e.g. records created by certain doctor at certain time period having certain diagnosis etc.) Easy filters can be created fast on the go, complicated multiparametric filters can be saved to filter list and reapplied easily.
- Numeric fields can be set up to automatically count records in the database according to required parameters (e.g. you can keep track of the number of records with certain diagnosis in your database etc.)
- Special **autotext tool** allows you to make an extended tree of predefined text blocks (nomenclature, ready-made phrases describing the diagnosis, prescriptions etc.) Making an advanced tree will let you fill in the patient record with a few clicks without the need of typing long phrases again and again which saves your time and helps to avoid misprints in the record.
- **Automatic diagnosis.** Autotext box also contains special tool which combines database filters and autoinsertion of text blocks to required text fields. Create a filter describing a diagnosis (if a number of parameters meets normal limits) and select this filter as condition of insertion of the diagnosis into corresponding field. This will allow you to provide exact

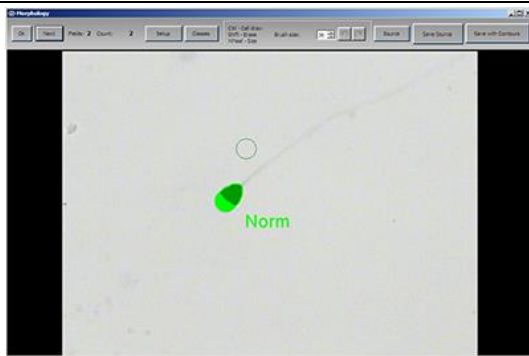
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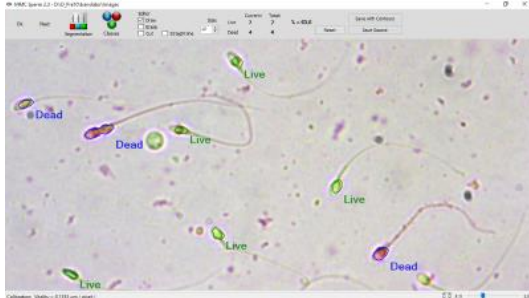


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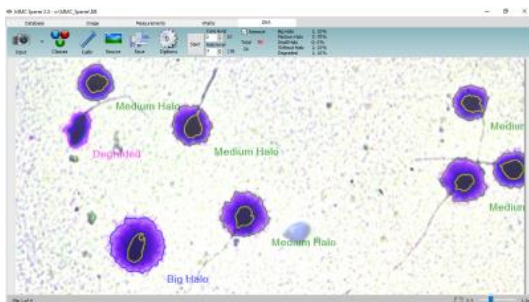
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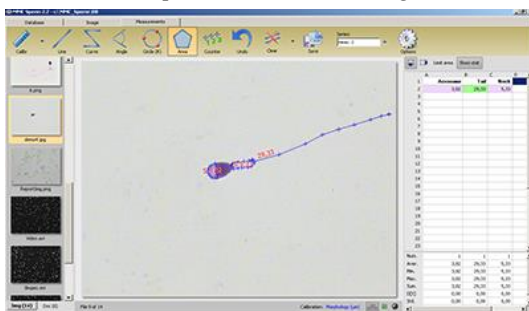
Morphology analysis: the software has estimated the sperm and marked its class. Image with contours and class names can be saved for the use in report.



Special mode for vitality analysis on a series of images. Percentage of live sperms will be transferred to corresponding database field.



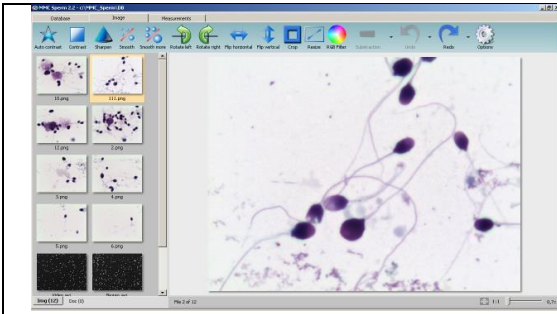
DNA fragmentation assessment based on Sperm Chromatin Dispersion (SCD) staining kits.



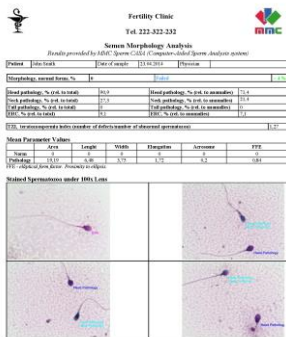
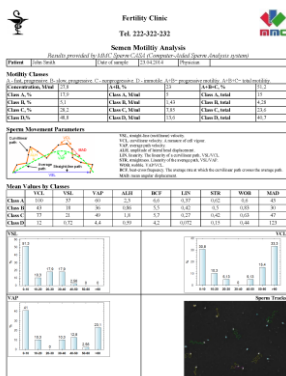
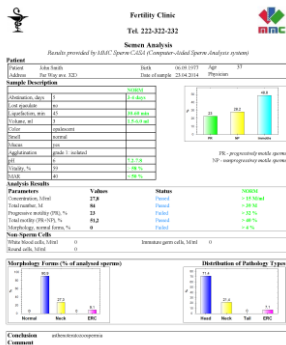
Manual measurements: measure sperm features on series of images for research purposes. The results can be sent to any numerical database field.

automatic diagnosis with one click without the need to look through a number of parameters and compare them to normal values.

- **Multilanguage support.** If your clinic provides consulting in several languages, using autotext insertion based on filters, you can add diagnosis and other text blocks in as many languages as you need. Add a field marking required language and translate your text with one button.
- Database can be displayed in the **table mode** which allows you to keep track of all the statistics and make your own local reference values of all the measured parameters.
- All the data you have provided in the patient record along with automatically calculated parameters, corresponding bar or pie charts and images can be placed into your report. The reports are based on *.rtf format which is recognized by virtually any text editors. You can integrate your spermiogram into any local document form or use our default templates. Internal document editor will allow you to create your own *.rtf files, save the resulting reports to corresponding records. Create as many templates as you need for your clinic: brief ones containing only text and prescriptions, full reports with all the statistical data and images, comprehensive charts and visually supported explanations to patient's diagnosis.
- MMC Sperm software provides automated analysis of **sperm concentration and motility** on native samples according to WHO recommendations. The analysis is based on frame by frame detection of sperm heads on video clips and building precise tracks which reveal the nature of sperm movement and provide sperm concentration value. The total number of sperms is also calculated automatically. One frame with tracks is automatically saved to database record to be as visual support in the report or you can save a suitable frame yourself. Flexible tool for adjustment of sperm head detection will let you work with both bright field and phase contrast (negative phase contrast yields the best results) and not only human sperms but also many animal species.
- Automated **morphology analysis** on stained samples according to strict Krueger's criteria. Special detection tool will help you to adjust head and acrosome detection to your particular sample processing and staining procedure. Stains like Diff-Quik are required. Software is able to detect both samples prepared according to WHO recommendations for CASA including centrifugation (recommended) but also can be adjusted to easier procedures which provide higher background staining. For complicated cases, there is an option of manual drawing and deleting of objects.
- Sperm **vitality** is an important test, especially for samples with less than about 40% progressively motile sperms. The percentage of live spermatozoa is assessed by identifying those with an intact cell membrane, from dye exclusion or by hypotonic swelling. The dye exclusion method is based on the principle that damaged plasma membranes, such as those found in non-vital (dead) cells, allow entry of membrane-



A set of image processing tools. Furthermore, you can attach any 3rd party image editor of your choice.



impermeant stains. The hypo-osmotic swelling test presumes that only cells with intact membranes (live cells) will swell in hypotonic solutions. Vitality results should be assessed in conjunction with motility results from the same semen sample. The presence of a large proportion of vital but immotile cells may be indicative of structural defects in the flagellum. A high percentage of immotile and non-viable cells (necrozoospermia) may indicate epididymal pathology. Using MMC Sperm, you can estimate vitality on saved or newly captured images fast and reliable while keeping track of the number of sperms analyzed to avoid statistical errors.

- Sperm **DNA fragmentation** test provides additional information on semen fertility. MMC Sperm software allows you to detect and calculate percentage of fragmented sperms automatically. Spermatozoa are automatically classified into sperms wit Big Halo, Medium Halo, Small Halo, Without Halo and Degraded. **DFI** (DNA fragmentation index) is calculated which represents the percentage of fragmented sperms (small halo, without halo, degraded).
- MMC Sperm is a **fully interactive tool**. For both motility and morphology you can see all the parameters calculated for a sperm by just pointing your mouse cursor on the detected object and make your decision to confirm or to deny the automatic result. In morphology, the software provides the reasons based on which the decision has been made (which parameters are out of classification limits). If you find out that some of standard limits are not compatible to your sample preparation procedure, you can easily adjust the classifier.
- **Reference values can be changed** in software options if you prefer to use values different to those of WHO 2010 or if you work with nonhuman sperms.
- Special automatic fields will indicate if the analysis has **Passed/Failed the reference values**. Based on this information you can adjust the automatic diagnosis tool.
- Manual **assessment of concentration of white blood cells, immature germ cells, round cells** is available.
- Statistics: mean values of all motility and morphology parameters by classes are calculated. After having made a number of analyses, you can calculate your own local limit values for all the parameters using database table mode which will make your system a unique and precise tool adjusted to your current hardware and sample preparation procedures.
- All the raw data calculated for every spermatozoon can be automatically uploaded to separate text files for your extended research purposes.
- **Manual measurements** for special research or other individual tasks are available. You can make measurements on a series of images and send statistical results to previously assigned database fields. Such results will allow you to adjust your classifier limits to any special cases.
- Most important **image processing operations** like cropping, image brightness, contrast and color adjustment, rotation and flip. Enhance images with filters.

