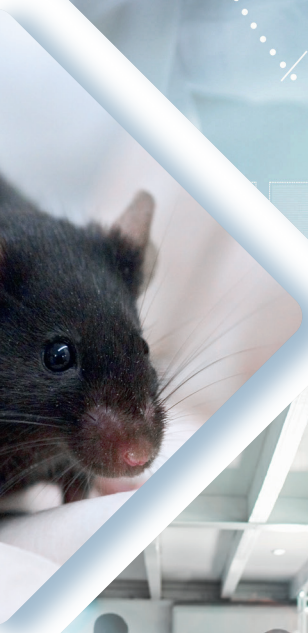

TECHNOLOGY FOR VASCULAR HEALTH

Retinal Vessel Analysis for rodents

- non-invasive and contact-free in-vivo examination – high tolerability
- high-precision eye tracking – maximum examination quality
- comparable devices for animals and humans – seamless research
- unique access to the endothelial function – Innovation Made in Germany
- unparalleled device system worldwide – ahead of the competition

Retinal Vessel Analysis for rodents

Retinal Vessel Analysis combines a number of exceptional methods for non-invasive and contact-free investigation of the conditions and functionality of the smallest blood vessels in an organism. The eye as a unique „mirror image“ of the entire body provides essential information on subclinical changes in this microcirculation. These parameters obtained enable access to the overall vascular health and allow conclusions to be drawn about systemic diseases and the development of end-organ damage.

The RCrodent represents a worldwide unique solution for assessing the microcirculation of rodents using Static and Dynamic Vessel Analysis. During the examination, either the condition or function of the retinal vessels is analyzed by using a single image or provocating the vessels in a live video. The algorithms and protocols used are analogous to those of human systems and thus enable seamless research starting at experimental animal models and ending at clinical use on

Powerful technology – Innovation Made in Germany

The **RCrodent** was developed for contact-free and non-invasive imaging of the retinal vessels of rodent. This enables imaging that is unique worldwide, which is characterized by a particularly high level of tolerability for the animal and at the same time excludes measurement errors due to increases in intraocular pressure caused by touching the surface of the eye.

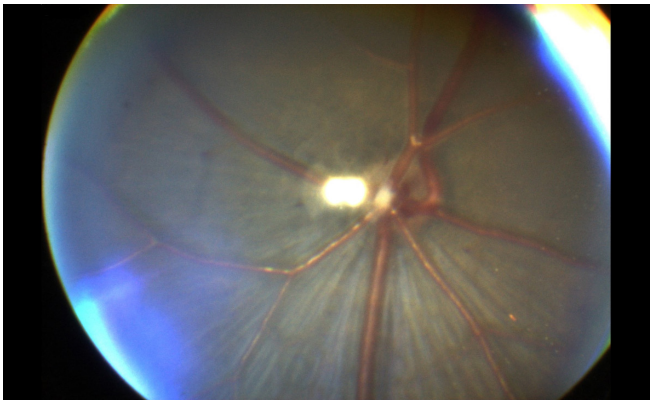

Figure 1: Fundus photography of the retina of a mouse using the RCrodent-M.

In combination with the **complete option**, the range of functions of the high-resolution fundus imaging is expanded to include the possibility of Static and Dynamic Vessel Analysis. In addition, it allows performing fluorescence angiography and determining oxygen saturation.

Both the RCrodent and the RCrodent complete can be designed as series devices for **mice** (RCrodent-M/ RCrodent-M complete) and **rats** (RCrodent-R/ RCrodent-R complete). If you are interested in examining other animal species, we would be happy to check the feasibility on request. Subsequent conversion of the device systems between different animal species is not provided.

Figure 2: Complete RCrodent including tripod, power supply, all-in-one PC and software.

Versatile application options

Static Vessel Analysis enables the determination of vessel diameters on individual images of the retina. The parameters obtained are valid biomarkers that can be used as risk factors or prognosis indicators for vascular diseases and vascular events in the eye and other organs. They are thus applicable for risk assessment, estimation and prediction of disease progression, validation of therapy approaches and monitoring of therapy progress.

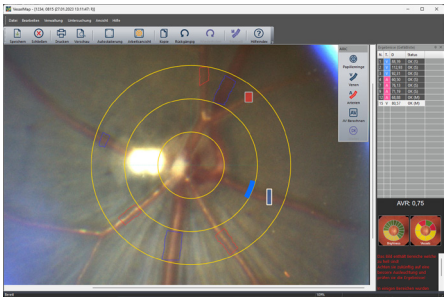

Figure 3: Static Vessel Analysis of a mice retina.

With the help of **Dynamic Vessel Analysis**, the dilatation and constriction ability of large retinal vessels is examined to assess their functional and autoregulatory mechanisms. For this purpose, the vessel diameters are measured in a sequence of digital images in real time. During the recording of this sequence of images, the autoregulatory mechanisms are stimulated and their vascular response is recorded and analyzed. Suitable provocations include stimulation by:

- Flicker light
- Temperature changes
- Blood pressure changes
- Inhalation of breathing gases with different compositions (e.g. 100 percent oxygen)
- Medication
- etc.

In addition, the RCrodent complete enables **fluorescence angiography** to diagnose circulatory disorders and the measurement of the **oxygen saturation** of retinal blood vessels. Contact us for more information.

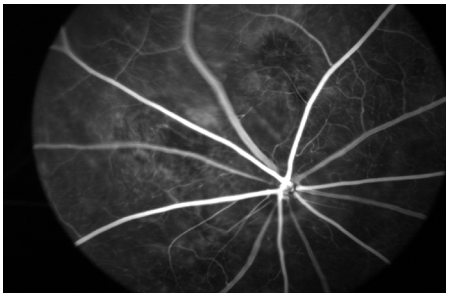

Figure 4: Fluorescence angiography image of a rats retina

Biomarkers

Static Vessel Analysis

CRAE - Central Retinal Arteriolar Equivalent: Arterial model vessel diameter

CRVE - Central Retinal Venular Equivalent: Venous model vessel diameter

AVR - Arteriolar-to-Venular Ratio: The CRAE/CRVE ratio

The central equivalents CRAE and CRVE describe model vessel diameters for characterising the central vessels. These model vessel diameters take into account all arterial and venous vessels carrying blood to and from the retina, according to a geometric haemodynamic weighting.

Dynamic Vessel Analysis

The biomarkers of the Dynamic Vessel Analysis depend on the chosen provocation and used examination protocol. Basically, the software is suitable for examining the dilatation or constriction maximum as a vascular response to a defined provocation in % compared to baseline. In addition, pulsation phenomena of the vessel diameter can be observed and analyzed.

Examination procedure

1. **Prearrangement of the hardware:** Preparation of the fundus camera, the heating mat, the anesthesia and the software.
2. **Preparation of the animal:** anesthesia of the rodent, shortening disturbing vibrissae, mydriasis of the pupil and moistening of the cornea.
3. **Positioning of the animal:** Place the rodent on the examination platform and heating mat, align the examination platform in front of the front lens of the fundus camera and center the papilla in the center of the image.
4. **Optimizing the image quality:** setting the light intensity to the required minimum, opening the aperture diaphragm by around 33%, setting the working distance and adjusting the sensitivity of the camera.
5. **Start of the examination:** recording of the fundus image for Static Vessel Analysis or execution of the Dynamic Vessel Analysis.
6. Checking the image quality and interpreting the data obtained.

Please note that a contact lens is required when examining mice. This is positioned on the test animal's eye during step 2 and removed again after the end of the examination.

Contact us for more information!

Image 5: RCrodent - contactless fundus camera for mice and rats.

Technical data

Dimensions/weight entire system	450 mm x 600 mm x 500 mm 54 kg
Dimensions/weight power supply	250 mm x 260 mm x 90 mm 2,9 kg
Ambient conditions	Temperatur: +10 °C bis +35 °C Rel. humidity: 30% – 75% height: up to 3.000 m above mean sea level
Storage conditions	Temperatur: 0 °C bis +45 °C Rel. humidity: 10% – 75%
Accessories	Polarization filter Green filter (red-free) Filter combination for fluorescein angiography Three-band-SO2 filter
Configurations available for	Mouse and rat

Electrical specifications

Power supply	IMNT-17
Supply voltage	100 – 260 V AC; 47 – 63 Hz; 2,3 A/115 VAC 1,3 A/230 VAC max.
Electrical power consumption	150 VA max.
Electrical protection class	I
Degree of protection	IP 40
Output voltage	Max. 38 V
Output current	White: 0,8 A Blue: 0,35 A
Number of Increments	100
Conformity	EN 60950

Optical specifications

Field of view angle	40°
Magnification	Mouse: 1,67 Rat: 1,18
Working distance (front lens to patient eye)	14 mm
LED illumination	White: ring LED 6500k Blue: ring LED ~465 - 485 nm
Pixel resolution	F046B: 780 x 580 F146C: 1388 x 1038 U-510(CB): 2464 x 2064 or 1232 x 1032 (Binning)
Aperture diaphragm	Adjustable iris diaphragm

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