Making Stunning Images

Tabletop electron microscope accelerates research into clotting and bleeding

Coagulation of blood is a complicated and critical process. At Maastricht University and Synapse, fundamental research is taking place to develop practical detection methods for thrombosis and bleeding. A good snapshot of the clotting helps researchers gain a better grasp of the phenomenon. Synapse is using a Thermo Scientific Phenom Desktop SEM for this purpose. With the support of advanced software, this table model electron microscope accelerates the analysis of a blood sample from three days to three minutes.

If the interaction of clotting factors in the blood is not functioning properly, the clotting may be too strong (thrombosis) or too weak (spontaneous bleeding). The role of the thrombin enzyme in the conversion of the fibrinogen clotting factor into fibrin was discovered at Maastricht University. In the event of damage to a blood vessel, fibers from that protein form a network that can "capture" platelets, whereby a clot is created that seals the wound. Synapse was established in 1999 as a spin-off of this scientific breakthrough.

Measuring thrombin activity

"Synapse researches new methods for detecting and predicting thrombosis and bleeding," says managing director Bas de Laat. "What's unique is that we do everything from basic research to prototype. In 2009, we were acquired by the French diagnostics group STAGO, the world leader in blood coagulation tests. They have invested significantly in us, and we have secured many grants, whereby we have grown to 35 employees and five labs." Synapse has its own technical lab but also often works with companies in the vicinity, such as Maastricht Instruments.

"After we have built a prototype, we transfer it to our parent company or to another company for production. We then have revenues from the licensing of our patents." Synapse developed a measuring apparatus for the thrombin activity in blood plasma (the liquid blood from which the blood cells have been removed).

Fiber measurements

And Synapse continues in the research on coagulation. Important parameters are the number of fibers and the thickness of the fibers in a fibrin network. "If it's a fine and strong network, there is more risk of thrombosis. If there are large gaps in the network, there is more risk of bleeding. Until recently we viewed a drop of blood under an optical microscope. It took three days to fully analyze. Now we put the sample under the SEM and we're ready in three minutes."

thermo scientific

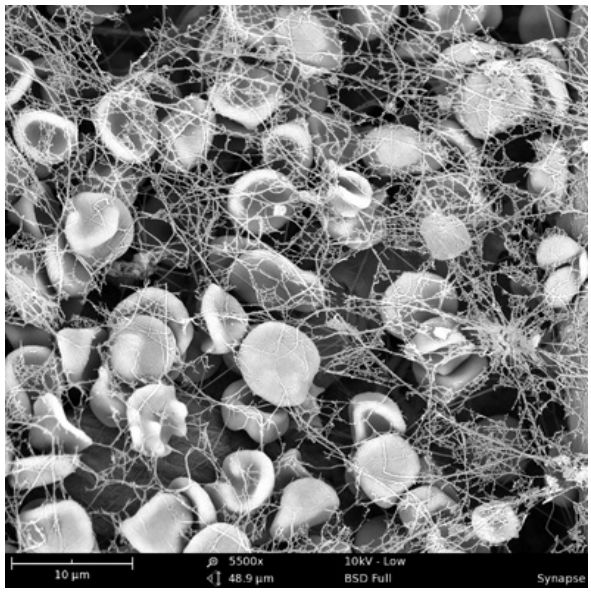
De Laat refers to the Thermo Scientific™ Phenom Desktop SEM. The speed of this instrument is due to its mechatronic construction and smart image processing software. Says De Laat, “The Phenom Desktop SEM has a nice algorithm for fibers. The Phenom Fibermetric Software automatically determines the thickness of the fibers in the order of 100 nanometers (one ten-thousandth of a millimeter, ed.) and the size of the pores between the fibrin threads.”

Into the picture

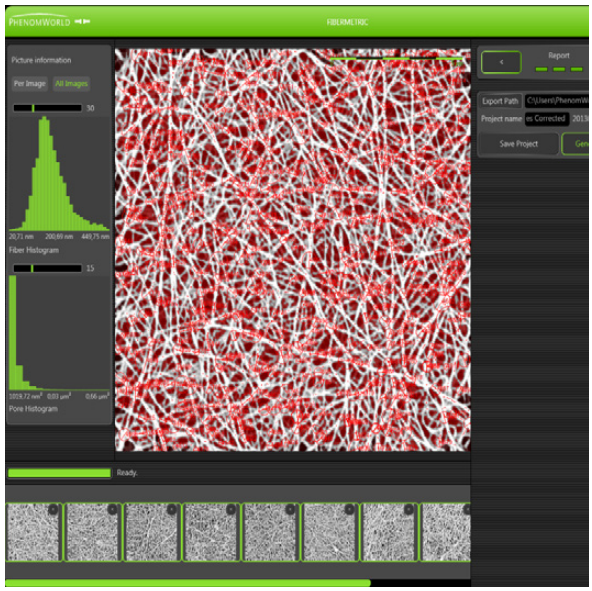
Owing to the simple operation and automatic analysis, the Phenom Desktop SEM saves significant labor costs at Synapse. “Put the sample in, operate with the touchscreen, anyone can work with it. We don’t need to continue to grow in numbers of personnel and instead of looking at a sample for three days, we can now focus on smarter thinking.”

Meanwhile, there is a second generation of Phenom Desktop SEMs, which includes higher magnification. Bas de Laat is taken with it. “This comes in very handy when we want more detail. Currently, we have to go to the university in order to put a sample under the big SEM.”

More and more requests are coming from the hospital for the Phenom Desktop SEM. “It is in constant use, and we are getting the first signals that the measurements are clinically relevant.” If the Phenom Desktop SEM can be used for the direct detection of thrombosis, then it really will come into the picture in the medical world.



Phenom Desktop SEM image of a clot at 5,500x magnification: platelets trapped in a fibrin network.



Analysis of fibers using Phenom FiberMetric Software.

Synapse b.v.

Synapse

Synapse BV carries out developmental research in the field of the (patho-) physiology of haemostasis and thrombosis, operating in the niche between biochemistry and molecular biology on the one side and pharmaceutical and clinical sciences on the other.

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