

focus on Laboratory Products

The Advantages of the Celvin® S Western Blot Chemiluminescence System Compared with Film-Based Detection and the Related Cost Savings Associated with Long Term Usage.

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Chemiluminescence (CL) Western blot detection is, nowadays, a widely used method in scientific and clinical applications. Detection can be made by X-ray films (historically) or with CCD cameras (more recent development). Nevertheless, there are still many users working with films. Besides the chemiluminescence substrate, they need a developing machine, cassettes, films, chemicals and have maintenance as well as waste disposal costs. Time to develop the films also has to be taken into account. These running costs are not negligible and should be included in the cost-benefit calculation when comparing instrumentation. Celvin® S by biostep® is a new innovation with a cooled CCD camera, a very small bench footprint, (H x W x D: 42 x 24 x 36cm) and low price. It has excellent sensitivity and resolution with very low maintenance and no chemical disposal costs.



Chemiluminescence Detection

Chemiluminescent labelled proteins in western blots can be detected by exposure to scanners, X-ray films or CCD cameras. In this article we want to focus on the comparison of X-ray films and the newly developed CCD camera system, the Celvin® S.

The new way of Detection

biostep® in Germany has developed a new chemiluminescence detection system with outstanding sensitivity and resolution. The CCD camera is placed in the base of the unit and the sample is positioned 'face down' on a glass plate positioned above the camera. This is completely new approach for a system. Depending on whether the customer is looking for optimal resolution or sensitivity, biostep® offers four bespoke camera systems. The price of Celvin® S 830 is only €9,350 and below the cost of competitive instruments. Even the Celvin® S 320+ with the highest sensitivity and a price of €15,500 offers excellent value for money in the marketplace.

Celvin® S Versus Film-Based Detection Systems

What about the comparison of Celvin® S with the well established detection method using X-ray films?

Again, Celvin® S has clear advantages. CL detection with Celvin® S needs only the typical blotting and CL substances whereas working with X-ray films requires additional equipment and chemicals.

An exercise was carried out to compare the costs of film development systems versus the new biostep Celvin® S. Figure 1 shows an overview of the accumulating costs during 10 years of operation.

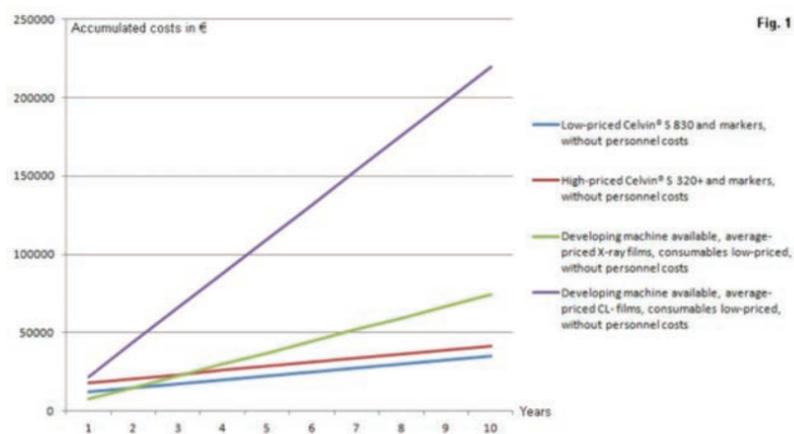


Figure 1. Accumulated costs in Euro during 10 years regarding consumables costs of average X-ray film-based (green) and CL-film-based detection (violet) versus costs of a new, top of the range Celvin® S with expensive markers (red) or the low-priced Celvin® S with low-priced markers.

For this comparison the following assumptions were made:

A daily workload of 10 Western blots.

2h 20min for the X-ray detection and 1h 40min for Celvin® S detection respectively. The longer time for X-ray film detection is due to the fact that the films have to be scanned after development.

Assuming 220 working days and that one blot was used twice with different exposure times, making 4,400 X-ray films per year. Prices for film and chemicals were given by different companies on the internet.

Note: the personnel costs of running the systems are not included.

The lines for the Celvin® S models are given as blue and red lines and it is obvious that the Celvin® S is the most cost-saving option for detecting chemiluminescence in Western blots. Personnel costs are higher for the film-based method because films have to be developed and scanned additionally.

The payback time for the Celvin® S systems is a little as 3 years when compared to running a film based system. A key point in any instrument purchase

Cooled CCD camera Eaglelce® - made by biostep®

biostep® offers the Celvin® S system with four different camera models according to the users requirements. The Eaglelce® camera is developed by biostep® and all four models feature the following characteristics:

- Cooled with Peltier elements down to 30°C below ambient temperature
- 65536 grayscales (16 bit)
- Prime lens = optimal distance between sample and detector chip

The four camera models differ in resolution and sensitivity. Celvin® S 830 has the highest resolution with an 8.3Mpixel full-frame CCD chip and delivers pin sharp images. Celvin® S 420 has an interline CCD chip with 4.2Mpixel resolution and a multi purpose unit. If you need higher sensitivity, Celvin® S 160+ or 320+ are the instruments of choice. They have 1.6 and 3.2Mpixel resolution, respectively. Even the weakest signals can be collected using exposure times up to (a maximum of) 24 hours.

Safety lid lock

The lid of Celvin® S has a magnetic safety lock to protect against interruption of measurement by opening the lid. Nobody can open it by chance. This is important for measurements over long periods if the instrument is being used without supervision.

SnapAndGo operating software

Celvin® S and the SnapAndGo operating software are both designed by biostep®. The software is intuitive to use (Figure 2). There are three operating modes to choose:

- Basic mode for easy imaging a chemiluminescent blot without colorimetrically-stained marker proteins,
- Master mode for GxP-conform imaging with colorimetrically-stained markers.
- Serial mode to take GxP-conform image series with colorimetrically-stained markers.

The use of colorimetrically-stained marker proteins enables molecular weight calculation of sample bands. SnapAndGo gives you the possibility to export data in different file formats, depending on further processing (tiff, jpg, png, bmp).

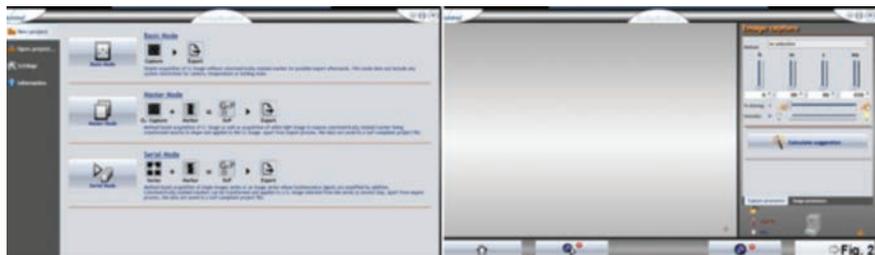


Figure 2. SnapAndGo operating software



Diagram 1. System architecture with camera in base unit.

The unique design of Celvin® S

The construction of Celvin® S is drastically different compared to other instruments. The highly sensitive Eaglelce® camera is fixed at the bottom of the unit, (Diagram 1), a constant distance to the glass plate where the blot is located.

This construction results in a small, compact device for personal use. You simply apply some millilitres of your CL-substrate to the glass plate, place the blot 'face down' (Figure 3), seal it with cling film, if necessary, and close the lid. The system is ready for imaging!

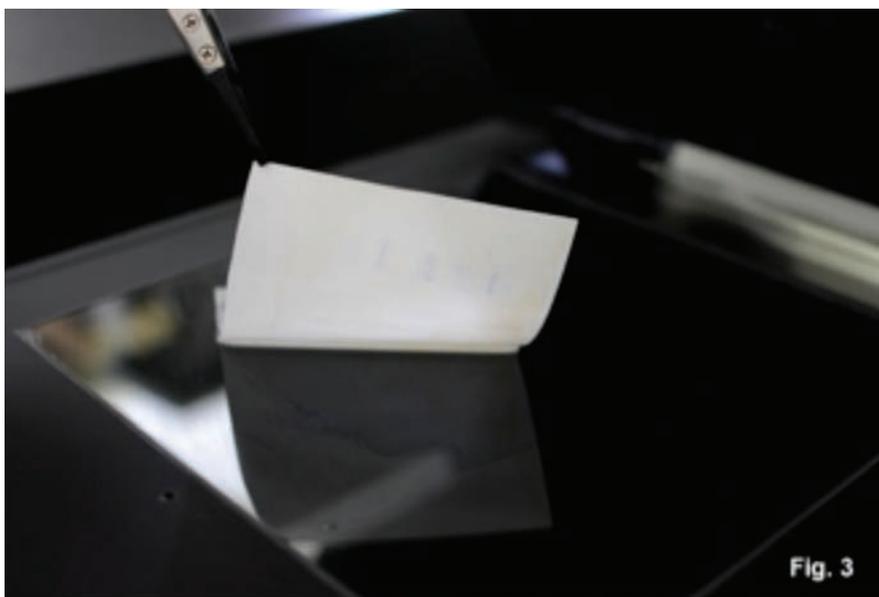


Figure 3. Placing blot on top plate.

Experimental Data from Customer Demonstration

Western blot detection with Celvin (R) S 420,
Exposure time: 1 min,
Image of customer, 2014

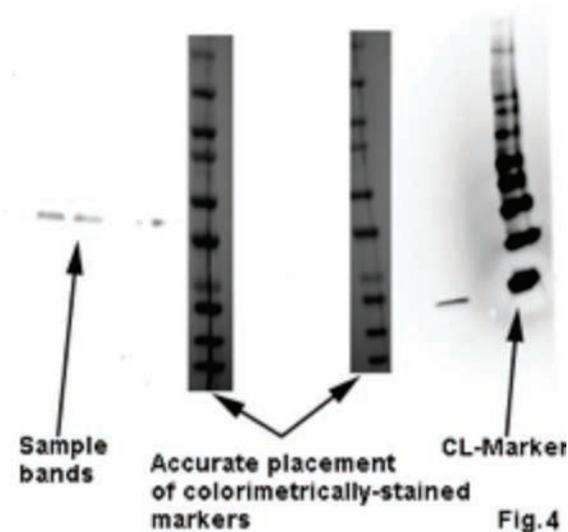


Figure 4. Western Blot detection with Celvin® S. Colorimetrically stained markers, sample bands and chemiluminescent markers are visible.

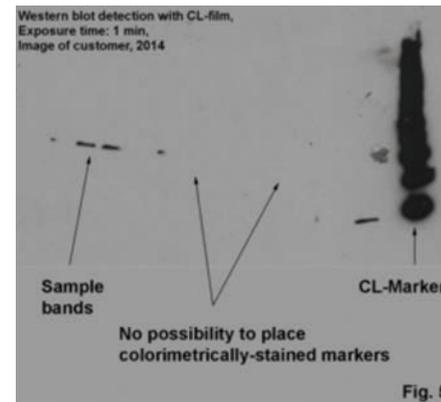


Figure 5. Western Blot detection with CL-film. Colorimetrically stained markers are not visible, sample bands are visible and chemiluminescent markers are overexposed.

In Figures 4 and 5 you see the direct comparison of the detection with Celvin® S (Figure 4) and with CL-film (Figure 5). With Celvin® S, the colorimetrically-stained marker proteins are visible and the chemiluminescent markers are not overexposed. Overall, the detection of sample bands is as sensitive as CL-films and colorimetrically-stained markers are visible

Summary

An economic comparison of film-based chemiluminescent Western blot detection and the newly developed camera-based Celvin® S system has been given. The initial price for a film developing machine starts from €3,500 up to €10,700 but you have to add the costs for consumables, disposal and maintenance over the years as well. A Celvin® S instrument starts from €9,350, there are no other significant costs and is virtually maintenance-free. The Celvin® S needs no darkroom. It is a personal instrument with a small bench footprint and weighs just 10kg. The easy to use data handling system for the digital image offers on screen flexibility to present the data. There is no requirement for film development with a scanner to get a digital image. A very important feature is the option for Celvin® S to record images with colorimetrically stained marker proteins for molecular weight calculation. The use of chemiluminescent marker proteins in film detection is possible but at a much higher cost.

