

Ensure Your Future

with Reproducible Data



LI-COR®

Better Data, Better Future

Strict Journal Guidelines

Journals have tightened publication standards to ensure that high-quality data are also reproducible. Many editors are now requesting more complete details about experiments, such as antibody validation, methods, original images, and quantitative analyses.



"By combining enhanced clarity of reporting as recommended by the new guidelines with prepublication image screening, our intent is to ensure that every paper we publish meets not only the highest standards of interest and importance but also of credibility and reproducibility."

Marcus, E. Credibility and Reproducibility. *Cell*. 159.5: 965 – 966 (2014).

Funding Challenges

Funding agencies are evaluating more than a grant application's potential impact — they're also looking for robust data that can be reproduced today, tomorrow, and forever.



"NIH strives to fund the best, most rigorous science... Attention to scientific rigor will ensure we are all creating solid foundations on which future research can build."

Lauer, M. Scientific rigor in NIH grant applications. *National Institutes of Health (NIH)*. (2016).

Publishing, Funding, and Career Advancement

Take Your Research Further

The world is changing, and your research needs to change with it. Start collecting more consistent, reliable data that you'll be able to use in the future to publish and secure funding.



"Verifiable and reproducible data is essential to support downstream discovery... When scientists cannot verify or reproduce basic and pre-clinical data, research dollars are squandered and discovery is delayed."

Bonnette, S. A Western blot and immunoprecipitation assay to verify antibody specificity. *BioTechniques*. 59(3):168-169 (2015).



Eliminate Inconsistency

Variability Leads to Irreproducibility

Immunoblotting includes many manual steps, each subject to variability and potential inaccuracies. Tighten up your standard deviations by addressing the four primary sources of variability: technique, chemistry, imaging, and analysis.

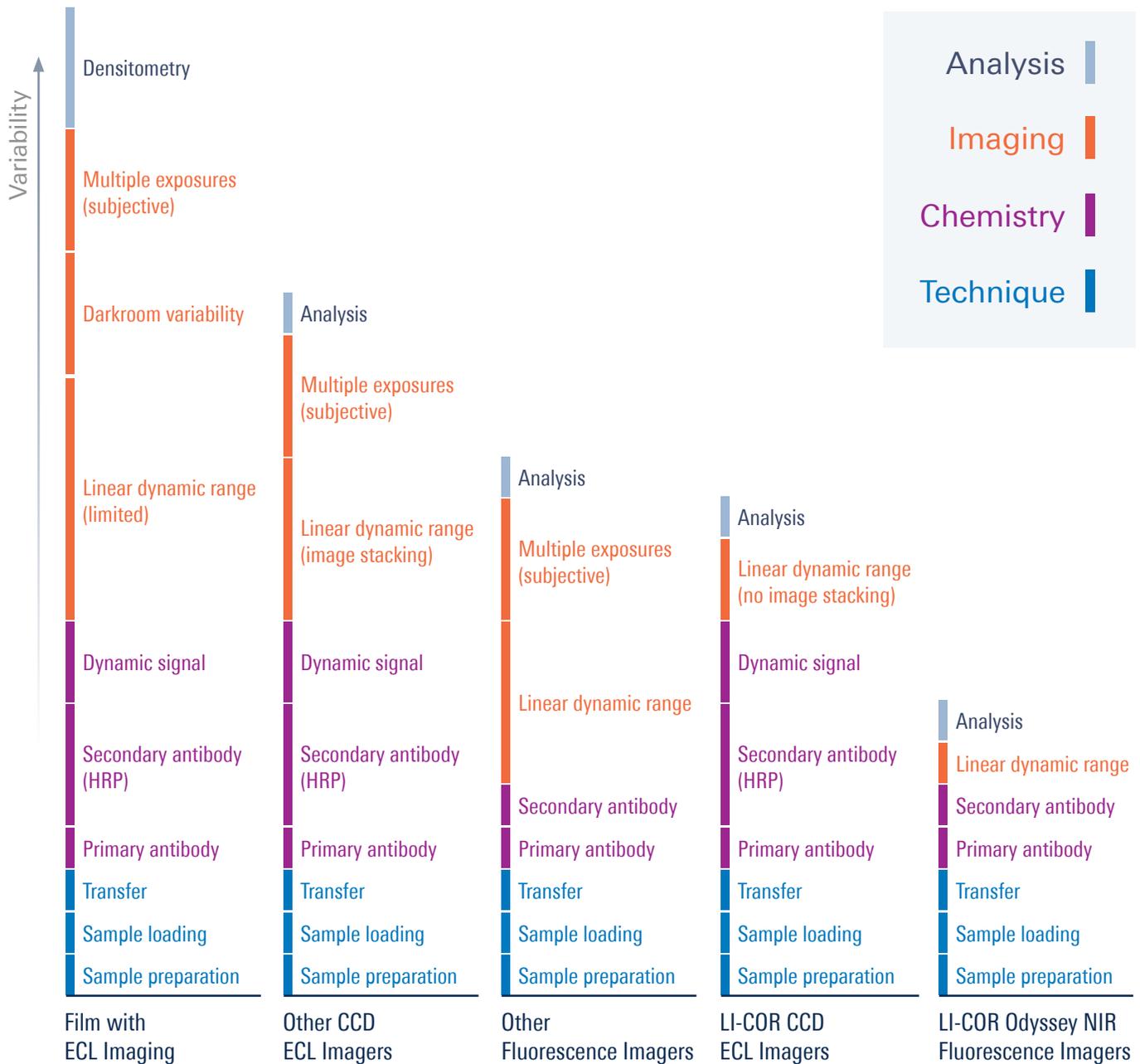
Minimizing sources of variability in your research means less worrying if your work will stand up to scrutiny. Publish faster and secure funding with consistent, reproducible data that will drive your research forward.



Get Reliable Data

Sources of Variability in Western Blot Data

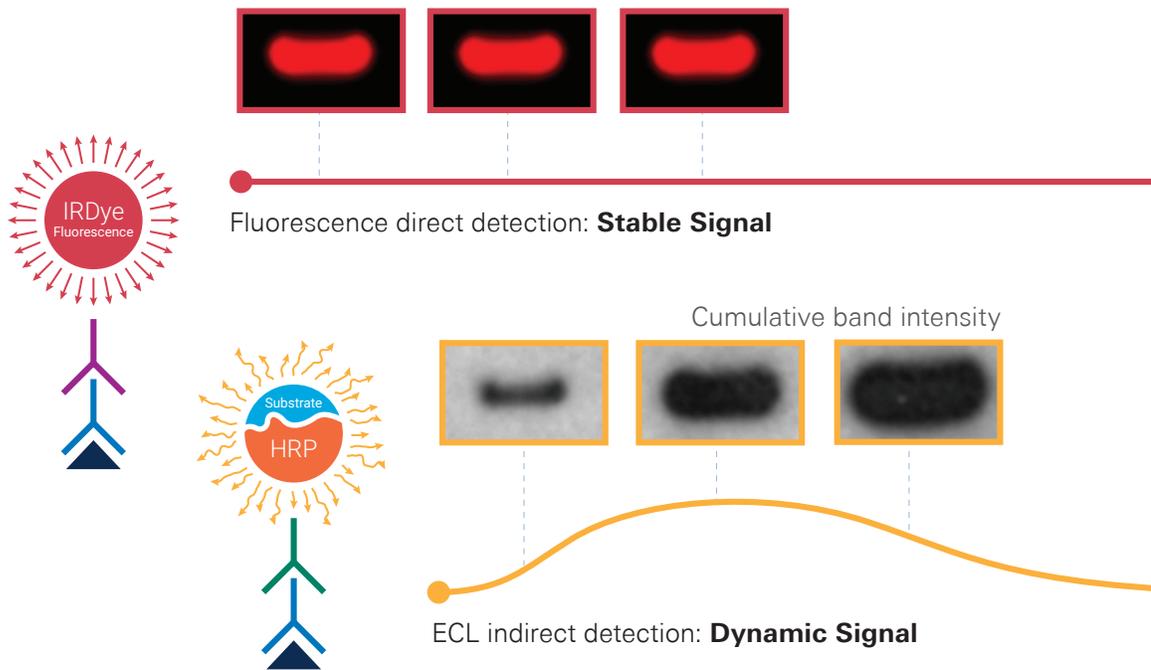
Many factors affect immunoblot quantitation. Taller bars represent more variability, which contributes to inconsistent or unreliable data.



Increase Reproducibility

Stop Chasing a Moving Target

Forget taking multiple exposures loaded with variability and inconsistency. With fluorescence imaging, you can re-image the same blot months later and see the same results. Substrate concentration, type, temperature, age, and availability no longer affect your results. Stable fluorescent signals are directly proportional and linear.

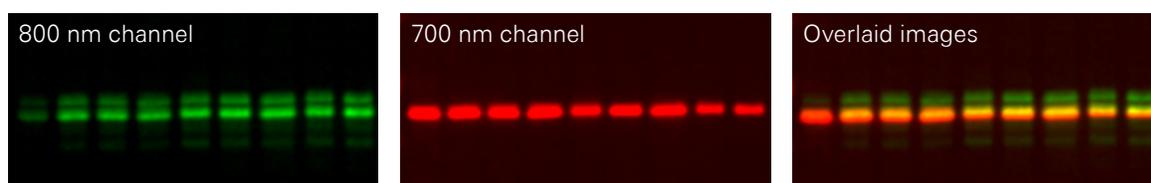


Fluorescent signals are stable and unaffected by exposure times. With ECL detection, changing the length of an exposure time introduces more variability.

By Stabilizing Your Chemistry

Detect Multiple Targets with Increased Accuracy

Stripping and reprobing affects quantitation accuracy. Incomplete stripping can create artifacts, and overly harsh stripping removes sample. Multiplex fluorescence allows you to be more accurate — and more reproducible — than stripping and reprobing.



Multiplex to detect two different protein targets in each sample lane. View, adjust, and analyze your results as a merged image, or as separate 700 nm and 800 nm channel images.

Normalization Versatility

Use the normalization strategy that works best for your research, including total protein stains, housekeeping proteins, and loading controls with LI-COR imaging systems.

Determine the best normalization strategy for your experiments at www.licor.com/normalize

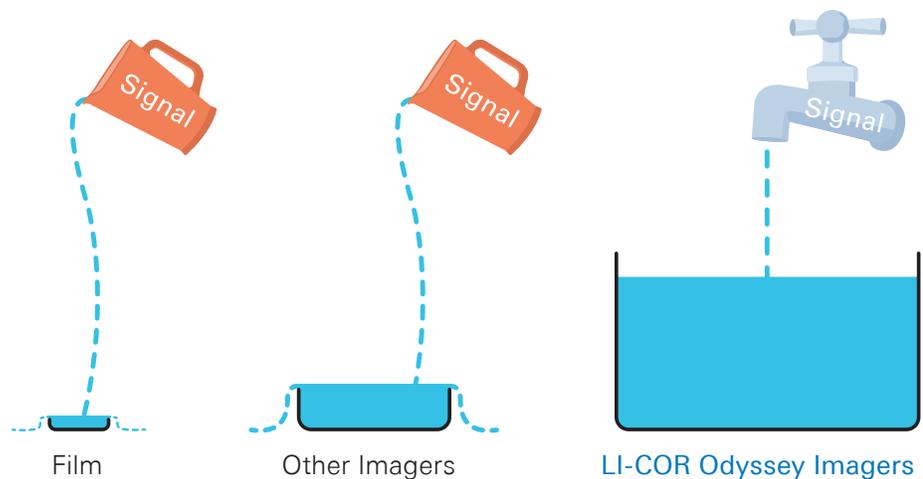
Expand Your Research

Increased Range for Better Reproducibility

The linear dynamic range (LDR) for an immunoblot detection system is the region over which signals are directly proportional to the amount of protein present. One of the most important factors for reproducibility is ensuring your range is wide enough to pick up faint signals without saturating strong signals.

A wider dynamic range makes it easier to get data within the linear range today, as well as next year — increasing reproducibility. Sensitivity (the lower limit of detection for LDR) determines how distinct your signals are from the noise.

The imaging window is wide open with LI-COR detection. Don't worry about constantly readjusting your technique to get within the linear range that enables accurate quantitation. Odyssey® imaging systems have the widest LDR (over 6 logs) of any detection method.

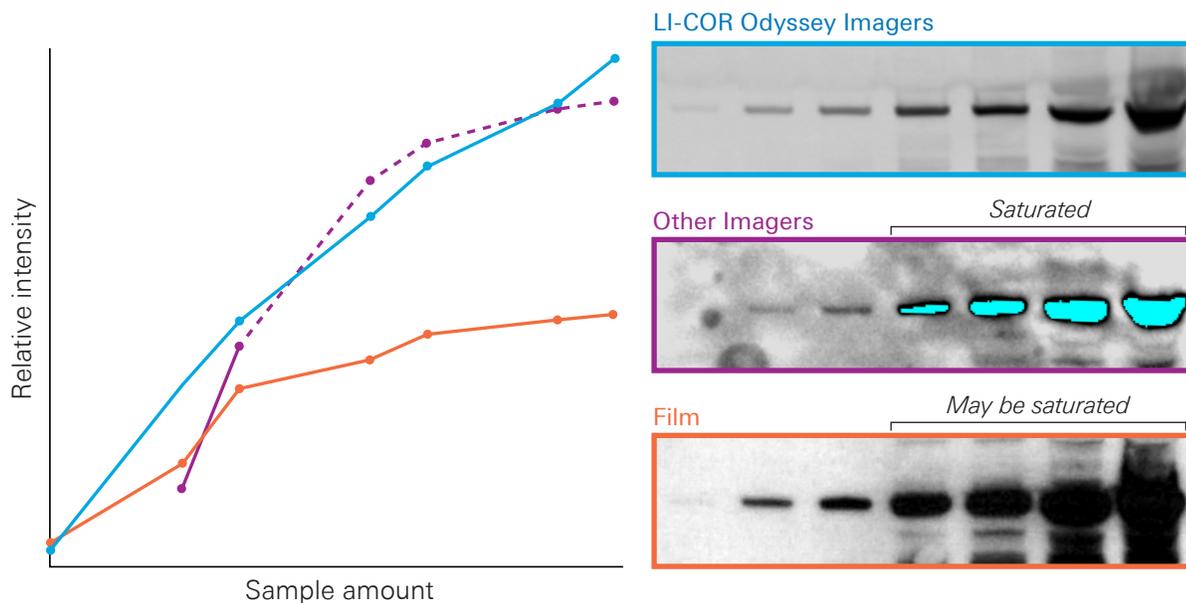


Get deeper data capacity with the wide linear dynamic range of Odyssey imaging systems. Film and other imagers have shallow data capacities and cannot accurately record strong signals.

Consistent Range, Every Time

Discover More with Quantitative Westerns

Capture all your data in one image with the wide linear dynamic range of Odyssey® detection. Strong signals can easily exceed the capacity of film and other imaging systems to show tonal variation, creating saturated bands. When saturation occurs, band intensities appear different, but relative signal intensity plateaus. Instead, see both strong and faint bands clearly in a single image. Eliminate saturation with a wide linear dynamic range with a wide linear dynamic range — yielding truly quantitative Westerns.

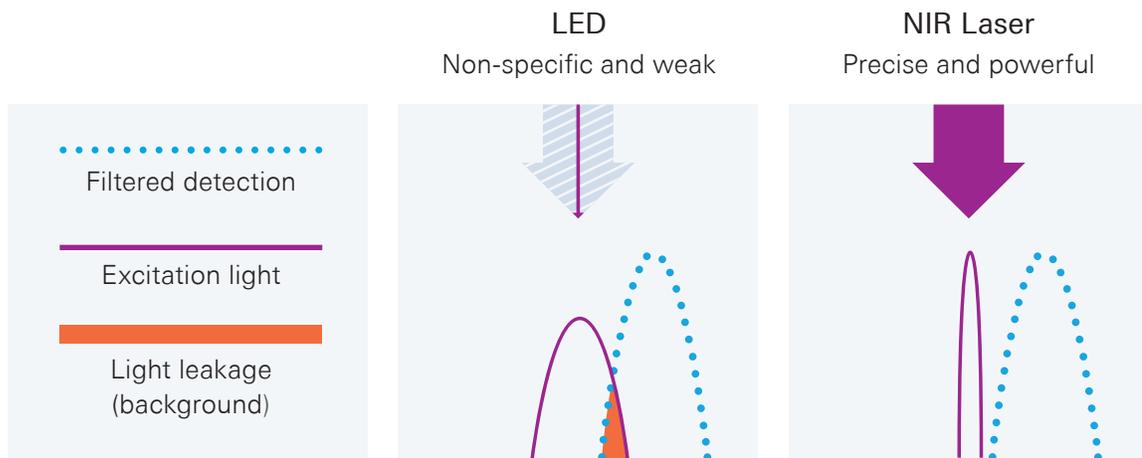


Odyssey imaging systems (blue) have the widest linear dynamic range (6 logs) for capturing the most quantitative data. Other detection systems, like film (orange) or traditional CCD imagers (purple), have limited linear dynamic ranges of 1.5 logs and 4 logs, respectively.

Quantify with Confidence

Focus Your Research with Focused Light

Powerful, precise laser excitation and specialized optics are the keys to high signal-to-noise ratios and outstanding image quality for truly exceptional data. Lasers have less light leakage (lower artificial background), which gives you increased sensitivity. Using near-infrared laser excitation means exceptional fluorescence sensitivity — without the need for data manipulation like binning or image stacking.



NIR lasers deliver powerful, precisely tuned excitation light to generate strong signals and superior image quality. Eliminate light leakage and artificial background caused by the weak, non-specific excitation light of LED systems.

Sensitivity Without Saturation

Low Background with Near-Infrared Imaging

Visible fluorescence is limited by autofluorescence of membranes, plastics, and biological materials. Using near-infrared fluorescence lets you see subtle changes with the best sensitivity.

LI-COR Odyssey
(no background)

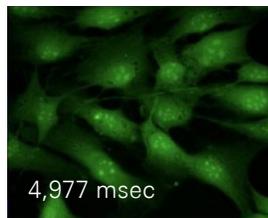


800 nm

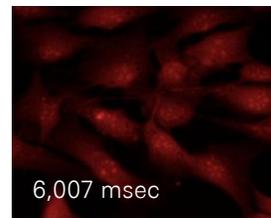
Other Fluorescence Imagers



Visible blue

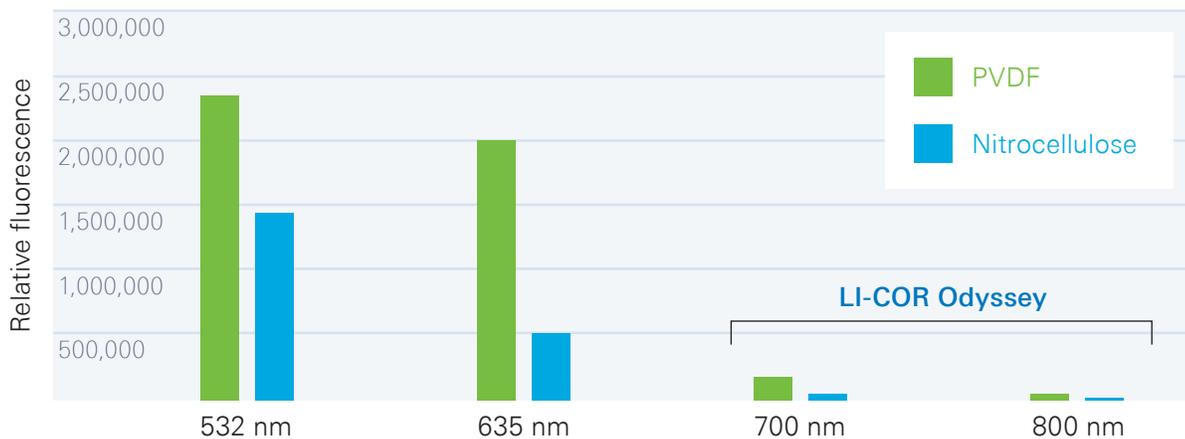


Visible green



Visible red

Get high sensitivity from low biological autofluorescence. Cellular proteins autofluoresce strongly in visible fluorescence channels (blue, green, and red). With near-infrared, no autofluorescence is observed, even with much longer exposure times. Data courtesy of Drs. Harold Fisk and Mark Winey, University of Colorado, Boulder.



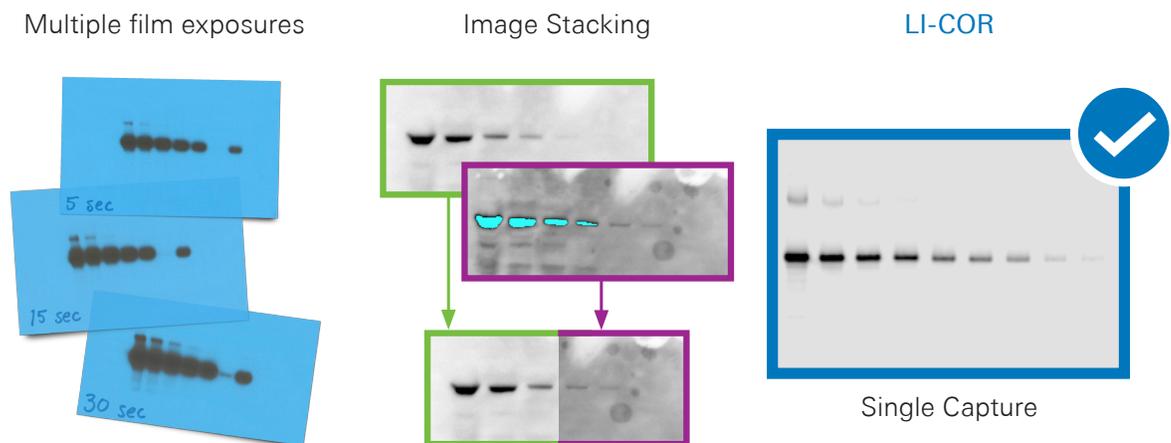
Near-infrared fluorescence imaging gives you low membrane fluorescence and high sensitivity. Visible fluorescent dyes have poor sensitivity, due to undesirable membrane autofluorescence.

One Integrated Image

View the Full Depth of Data Instead of Snapshots

With enhanced chemiluminescence (ECL), multiple film exposures are necessary to offset a narrow dynamic range and saturated strong signals. Likewise, other CCD imagers often “stack” images with different settings and varying exposure times to artificially expand dynamic range. This “image stacking” manipulates data and limits reproducibility.

Instead of several snapshots of a quickly changing enzymatic reaction, get a cumulative data set from reproducible imaging. LI-COR digital imagers integrate signal intensities during capture for accurate, consistent data quality. The wide dynamic range extends far beyond the full range of biological variability, removing any need for post-capture data manipulation.



One digital image contains all your integrated data. Instead of multiple exposures or stacked images captured with variable conditions, get a single file containing the cumulative data set.

Accurate, Consistent Data Quality

Outstanding Image Quality Without Binning

Other CCD imagers bin images to increase sensitivity, sacrificing image quality and resolution. Binning combines signal from areas surrounding the bands to boost signal output, which prevents accurate quantitation. The wide linear dynamic range of LI-COR imaging makes reproducible quantitation possible. Get excellent image quality, resolution, and sensitivity without manipulating data.

Take Instrument Variability Out of the Equation

Multiple variables, like different instrument settings, allow inconsistency to creep into your experimental results. For example, researchers often subjectively choose a favorite image as the “right” data. Capture images with the same resolution, sensitivity, and settings. Get reproducible data the first time, every time with LI-COR imaging — no matter if a seasoned principal investigator or an inexperienced undergraduate performs the experiment.

Quantitative, Reproducible Analysis

Inaccurate film densitometry skews experimental results. Desktop scanners further reduce data quality by converting gradient shades of gray to black or white pixels. Reproducible research depends on accurate quantitation. Use Image Studio™ analysis software to quantify Western blots accurately and consistently. For regulatory environments, a 21 CFR part 11 ready version of Image Studio is available.

Download a free version of Image Studio™ Lite at:
www.licor.com/analyze

Follow Your Questions

CLx

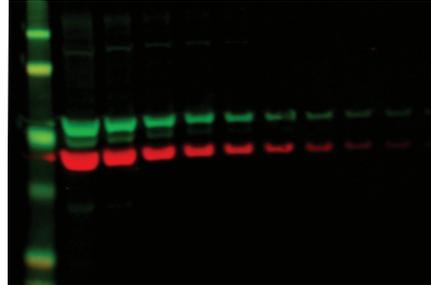
Odyssey CLx
Imaging System

Fc

Odyssey Fc
Imaging System

C-DiGit

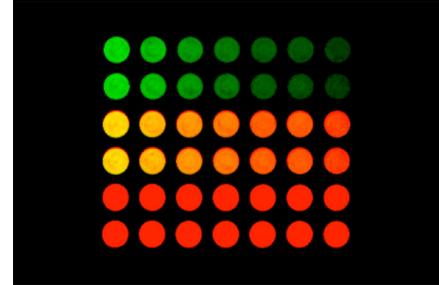
C-DiGit
Blot Scanner



Near-Infrared Fluorescence
Western Blot

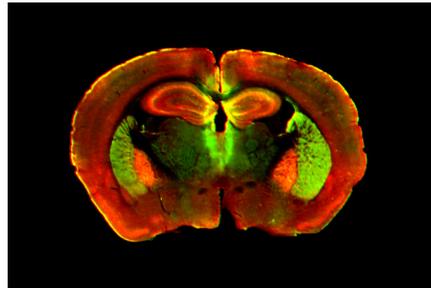
CLx

Fc



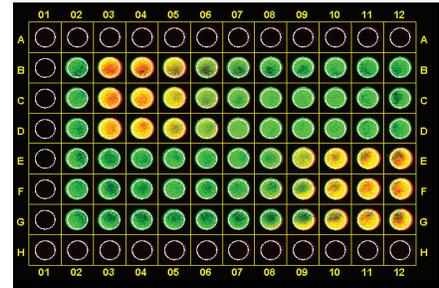
In-Cell Western™ Assay

CLx



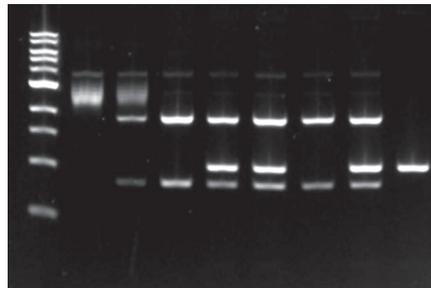
Tissue Section Imaging

CLx



On-Cell Western Assay

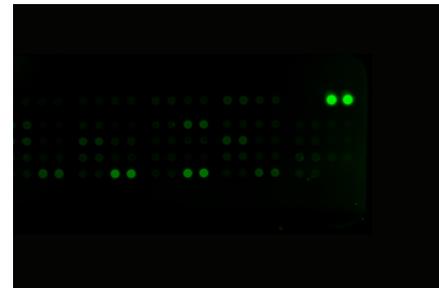
CLx



Nucleic Acid Gel
Documentation

CLx

Fc



Fluorescence Protein Arrays

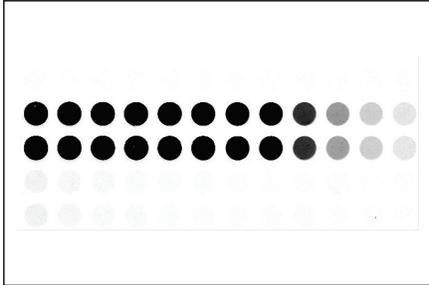
CLx

CLx Additional Applications

In-Gel Western
Southern Blot
In Vivo Imaging

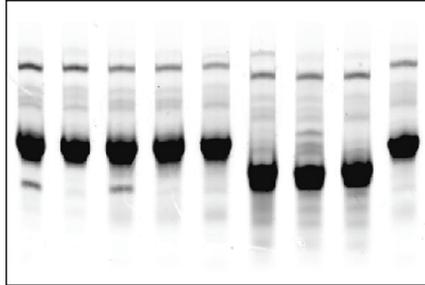
Glycoprotein Detection
Northern Blot
Transcription Factor Assay

Wherever They Lead You



ELISA

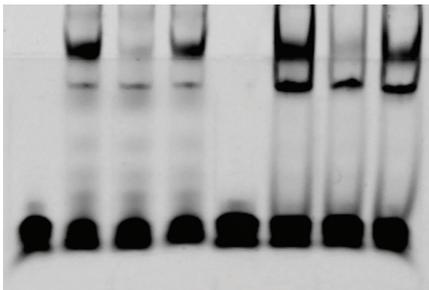
CLx



Coomassie Protein Gel
Documentation

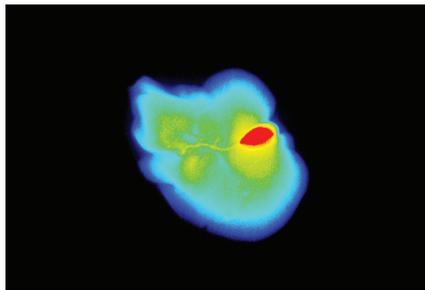
CLx

Fc



EMSA / Gel Shift Assays

CLx



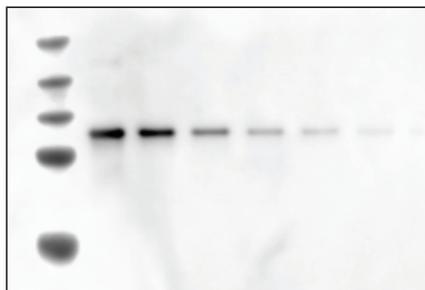
Whole Organ Imaging

CLx



ECL Protein Arrays

Fc



Chemiluminescent
Western Blot

Fc

C-DiGit

Transporter Targeting
Microwestern Array
Protease Assay

Receptor Targeting
Reporter Gene Assay
Reverse Phase Protein Array

Odyssey[®] CLx Imaging System

Detect All of Your Signals, Faint and Strong

See both strong and faint bands clearly in the same image, with great sensitivity and no image saturation. Get reproducible data with stable near-infrared fluorescent signals and over 6 logs of linear dynamic range. Capture images with exactly the same settings every time with the AutoScan feature, for the most consistent and reproducible results. Even new researchers can get high-quality images on their first try.

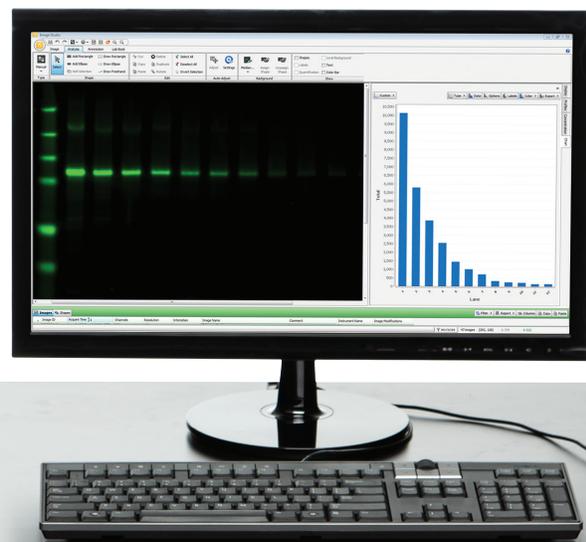
Open up Your Field of View

Analyze up to nine miniblots or six microplates in a single scan with a large imaging area. For excellent reproducibility, detect target proteins in a cell-based immunofluorescent microplate format with the In-Cell Western[™] assay. Protein arrays, gel shift assays, tissue section imaging, and more are at your fingertips with the Odyssey[®] CLx.

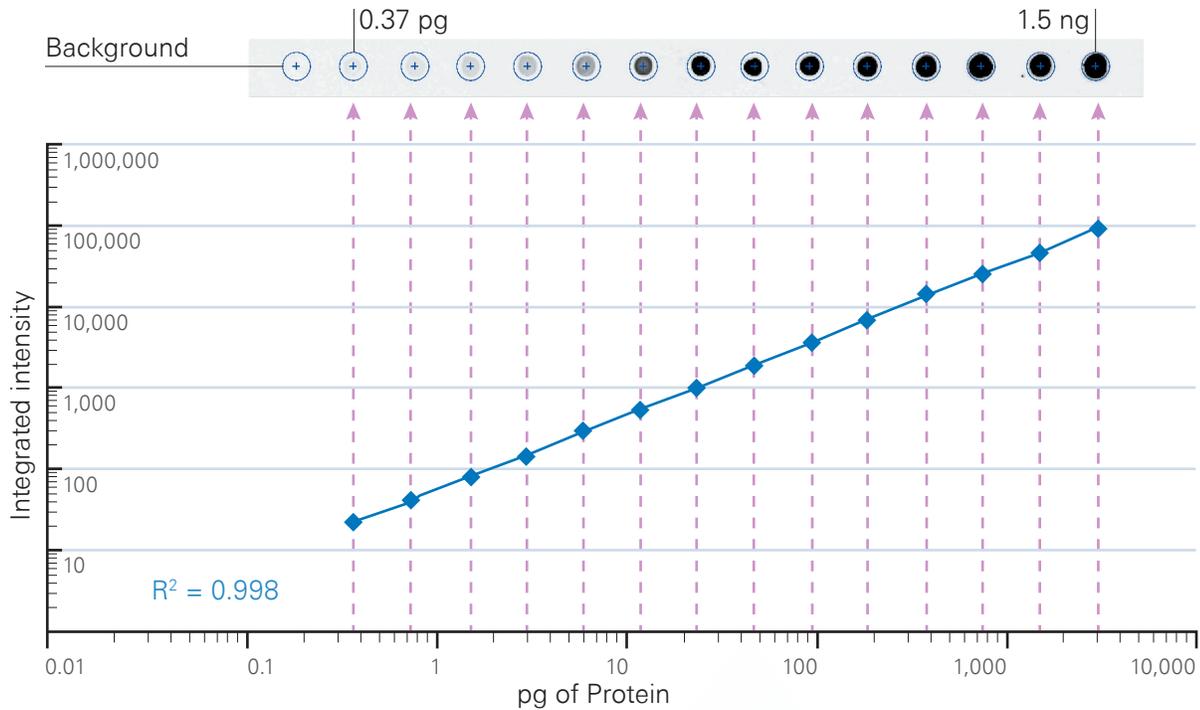


“The superior dynamic range and sensitivity allows me to confidently report my data.”

Lars Engstrom, Marati Therapeutics. Via Select Science[®]



The Most Quantitative, Reproducible Data



Get accurate, quantitative data from your blots. You can detect a wide range of data with high sensitivity and no saturation, due to the wide linear dynamic range of the Odyssey CLx.

Accurate analysis

Wide linear dynamic range

No darkroom variability

Stable secondary antibody



Odyssey[®] Fc Imaging System

Image Any Way You Want

The Odyssey Fc was designed from the ground up to capture the most accurate Western blot data possible. Get more consistent ECL data, or perform two-color multiplex detection using near-infrared fluorescence. Either way, capture clear images with uniform field illumination, thanks to the patented FieldBrite™ XT² optical system. With an unprecedented 6 logs of linear dynamic range, you'll never lose data because of image saturation.

Document Popular DNA Stains

Save benchtop space with one versatile instrument – document DNA gels with the additional 600 nm channel. Image nucleic acid agarose and PAGE gels stained with Ethidium Bromide, SYBR[®] Safe, SYBR[®] Green I, and many other popular DNA stains without the need for harmful UV light. Separate imaging trays prevent toxic ethidium bromide contamination, for more confidence in the quality of your work.

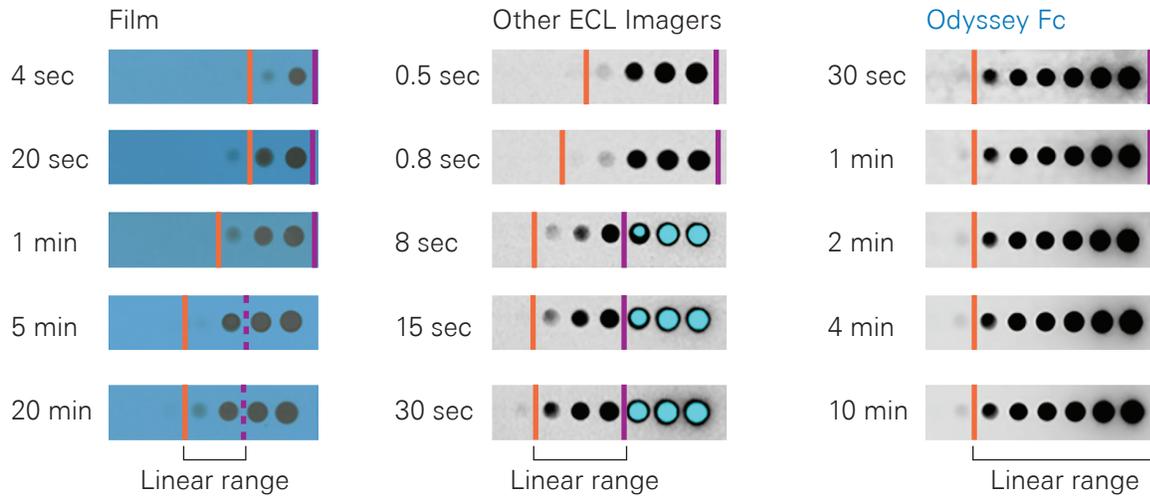


“I love this instrument — super easy to use for ECL or fluorescence.”

Catherine Bell, Virginia
Commonwealth University



Accurate, Consistent Western Blot and DNA Gel Data



Capture faint and strong signals without saturation, due to the Odyssey Fc imager's wide linear dynamic range. With film and other imagers, multiple exposures are required and saturation is common, limiting reproducibility.

Accurate analysis

Wide linear dynamic range

No darkroom variability

Stable secondary antibody



C-DiGit[®] Blot Scanner

Get More Consistent Data

Enhance your reproducibility by eliminating multiple exposures. Instead of several snapshots or stacked images captured under variable conditions, get a single digital file containing the cumulative data set. Stretch your grants farther with an economical imager that gives you reliable results.

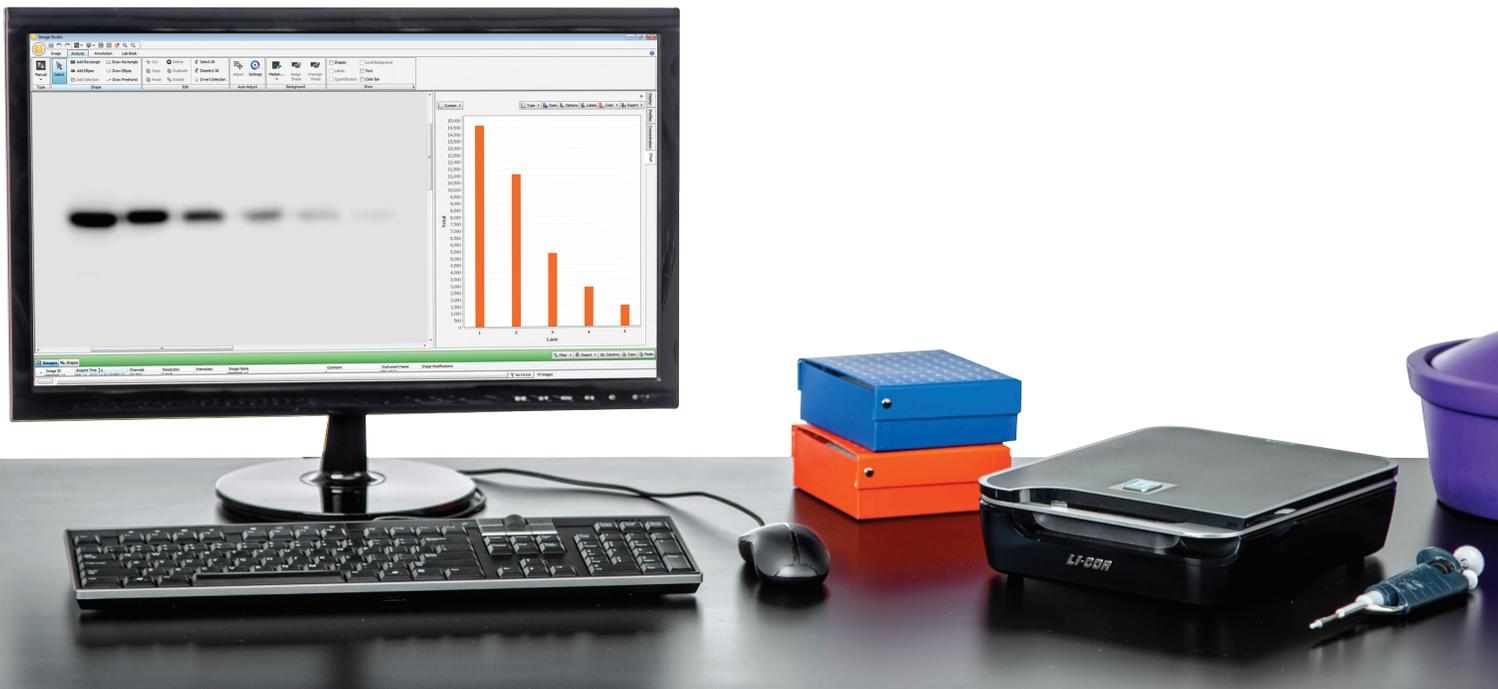
Take Back Your Benchtop

This personal-size imager is about the size of a lab notebook. It fits where you need it, when you need it. While you're saving benchtop space, scrap your darkroom as well. What else could you do with that darkroom space?

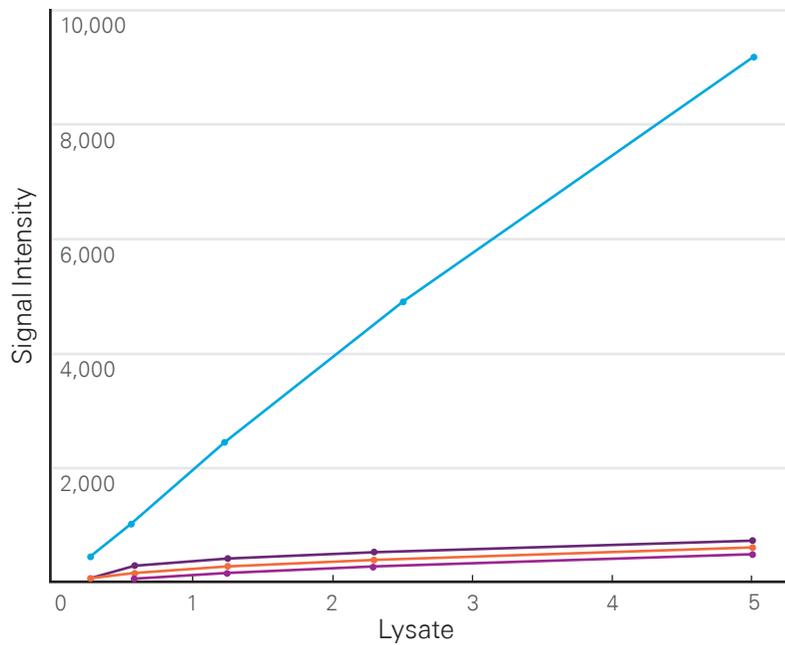


“The C-DiGit Blot Scanner is very easy to use, gives consistent results and is extremely reliable. It is a low-cost solution for any lab.”

Michael Irwin, Auburn University. Via Select Science[®]



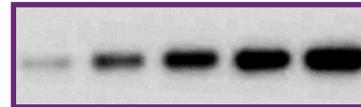
Reliable Digital ECL Data



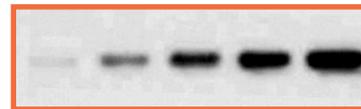
C-DiGit Blot Scanner



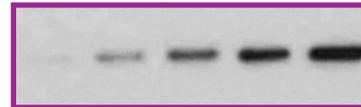
2 min film exposure



1 min film exposure



30 sec film exposure



Observe a linear signal response without taking multiple exposures. Strong signals imaged with the C-DiGit Scanner (blue) do not “plateau” or saturate like most film exposures (purple and orange).

Accurate analysis

Robust linear dynamic range (no image stacking)

No darkroom variability



Specifications

Odyssey® CLx Imaging System

Image Area:

25 cm x 25 cm

Dynamic Range: 4 logs

(Manual); >6 logs (Auto)

Laser Lifetime:

40,000 working hours

Scanning Speed:

5 - 40 cm/s

700 Channel Laser

Source: Solid-state 685 nm laser diode

800 Channel Laser

Source: Solid-state 785 nm laser diode

Resolution: 21 - 337 μ m

Operating Conditions:

15-35 °C and dew point < 20 °C

Focusing Range:

Microscope is adjustable 0 mm - 4 mm above the scan bed to obtain best signal-to-noise ratio

Odyssey CLx

25 cm x 25 cm

Detectors: Silicon avalanche photodiodes

Power Requirements:

Universal input range is between 100-240 VAC; 4 Amp maximum; 1 Amp typical; 50/60 Hz

Dimensions:

37 H x 53 W x 62 D cm (14.5" x 21" x 24.4")

Weight: 33 kg (72 lbs)

Odyssey® Fc Imaging System

Image Area:

12 cm x 10 cm

Dynamic Range:

22 bit (>6 logs)

Laser Lifetime:

20,000 working hours

Patented FieldBrite™ XT² Technology:

CV <3% across field

700 Channel Laser

Source: Solid-state 685 nm laser diode

800 Channel Laser

Source: Solid-state 785 nm laser diode

600 Channel Light

Source: Diffuse light at 520 nm

CCD Pixel Size:

6.45 microns

Fluorescence Scan Times:

30 s, 2 min, 10 min plus variable time feature

ECL Scan Times:

30 s, 2 min, 10 min, 60 min plus variable time feature

Operating Conditions:

15-35 °C and dew point < 22 °C, non-condensing

Focusing: Automatic

Detectors: Low-noise CCD Thermoelectrically cooled

Power Requirements:

Universal input between 100-127 VAC (4 Amp) and 200-240 VAC (2 Amp); 50-60 Hz. Voltage fluctuations not to exceed 10% of the nominal voltage. Insulation Category II.

Dimensions:

41.4 cm W x 47 cm D x 67.3 cm H (16.3" W x 18.5" D x 26.5" H). Depth with imaging drawer open is 59.7 cm (23.5")

Weight: 27 kg (60 lbs)

Odyssey Fc
12 cm x 10 cm

C-DiGit
10 cm x 8.5 cm

Actual Imaging Areas

C-DiGit® Blot Scanner

Image Area:

10 cm x 8.5 cm

Resolution:

196 µm x 196 µm

Scan Times:

Approximately 6 (Standard)
and 12 (High) minutes

**Image Generation and
Format:**

16 bit floating point tiffs

Operating Conditions:

15-30 °C and dew point
< 25 °C, non-condensing
For indoor use only

Power Requirements:

12VDC, 1A maximum,
provided by external power
supply. External power
supply requires 100-240 VAC
(voltage fluctuations not to
exceed 10% of the nominal
voltage), 1A maximum,
50-60 Hz

Image Display Options:

Pseudocolor, positive and
negative grayscale, single
color (red, green or blue)

Detectors:

Low-noise CCD

Dimensions:

27.94 cm L x 22.23 W x 7.3 H
(11" L x 8.75" W x 2.875" H)

Weight: 2.18 kg (4.8 lbs)

Connections to Computer:

Cat. 5E RJ-45 cable
(10BASE-T/100BASE-TX) or
USB 2.0 Type A to Type B
cable. Use supplied cables

Computer Requirements:

4 GB RAM

Compatible OS:

Win7, Win8, Win8.1, Mac®
Mavericks, or Mac® Yosemite

21 CFR part 11 ready Image Studio™ software is available for the Odyssey
CLx Imager, the Odyssey Fc Imager, and the C-DiGit Blot Scanner.

What questions can we help you answer?

www.licor.com/questions



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980-16080 03/16

The LI-COR board of directors would like to take this opportunity to return thanks to God for His merciful providence in allowing LI-COR to develop and commercialize products, through the collective effort of dedicated employees, that enable the examination of the wonders of His works.

“Trust in the LORD with all your heart and do not lean on your own understanding. In all your ways acknowledge Him, and He will make your paths straight.”

— Proverbs 3:5,6