its simplicity and could pave the way to a new adjuvant form of therapy during revascularization procedures.

They used resin-coated chromatography beads 7 mm in size in their studies. These beads are coated with SO_3^- so they bind basic, positively charged proteins. The beads were incubated with bFGF, and binding experiments indicated that approximately 2 pg of bFGF was bound to each bead. The bead preparation (10^5 beads per gram of targeted myocardium) was then injected percutaneously in the left circumflex coronary artery of healthy pigs. The control group was injected with beads that had not been incubated with bFGF. Hearts were removed at various time intervals up to 7 days after the single injection together with tissue samples from various other organs such as the spleen, liver, lung, kidney, bowel, and so on.

Microscopic sections stained with toluidine blue indicated that about 60% of the beads had obstructed small capillaries within the distribution of the left circumflex artery. The rest of the beads could not be accounted for and the authors assumed that, because of their very small size, they had been recirculated and evenly distributed within the vascular tree. Immunohistochemical staining of heart sections indicated that bFGF was present in the tissue sections, but had disappeared within 7 days. Tissue sections of control hearts, injected with beads without bFGF, failed to stain for bFGF, indicating that the bFGF identified in the tissue sections was not endogenous. On the basis of those data, the authors estimate that the concentration of beads in the targeted coronary artery area was 1500-fold that in the rest of the body and that 0.12 mg of bFGF was delivered to each gram of targeted myocardium.

Histologic studies of the myocardium showed a lack of inflammatory response to the beads as well as an absence of tissue necrosis. There was an increase of proliferating fibroblasts and endothelial cells around the microspheres. There was, however, no increase in vessel growth. The authors postulate that this indicates that not only an increase in growth factor but also an increase in growth factor receptor is required, such as happens following ischemia. Others have indeed shown that bFGF can induce angiogenesis in ischemic myocardium (*1*).

One can easily imagine having this simple method available in the cardiac catherization lab in a hospital setting. Physicians could inject coated beads in coronary arteries that they have just opened by angioplasty. Before this day comes, though, key questions still need to be answered. The most important is whether this approach will actually lead to vessel growth when applied to ischemic myocardium and whether the neovascularization will be of physiological significance for myocardial perfusion. Indeed true collateral arteries that are potentially capable of compensating the loss of the main arterial supply tend to grow from preexisting arteriolar connections between nonoccluded and occluded vessels mainly in the non-ischemic territories. So, it is concievable that squirting the microspheres in the periphery of the perfusion territory of the diseased vessel may not lead to the induction of tru collateral arteries (*3*). In addition, whereas healthy myocardium did not seem to be negatively affected by the beads, it is conceivable that ischemic myocardium will be more sensitive to the occlusive effect of the beads, hence, leading to additional myocardial necrosis.

This study is elegant in its simplicity: mixing small chromatography beads with commercial preparations of a growth factor and injecting them percutaneously into the coronary artery. Sometimes, just reassembling off-the-shelf components may be all that is needed to do the job.

–Richard Peters and Robert Sikorski

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Showing Off Your Lab

NET TIPS

These days, just about every lab has their own home page on the Internet. Laboratory Web sites are great because they provide a medium to exchange detailed versions of protocols and data that augment those sent to peer-reviewed journals. This month, we look into the technology needed to rapidly create digital images that can be added to your Web site. We'll move from digital camera to Web site to give you a sense of the hardware and software needed.

A digital camera can be viewed as a hybrid between a conventional film-based camera and a scanner. Instead of storing the picture on film, the image is recorded in a digital form, compressed, and stored in either a built-in memory chip or a removable PC card. There are several issues that users need to be aware of before making a significant investment (prices range from $300 to $1200; a high-quality single lens reflex model may cost $4000 or more) in a digital camera.

First, depending on the quality of the camera, there can be a significant delay of up to 1.5 s between the time you press the shutter and the time the picture is actually taken. If you are recording the phenotypes of a twitching mouse, this could be a problem. For fast moving objects, it is probably best to stick to conventional cameras for now. These pictures can then be scanned and digitized later.

After you take the picture with a digital camera, the camera will remain "busy" for 4 to 9 s, during which time it is converting the pictures to digital form, compressing, and archiving them. You cannot take rapid-fire pictures with conventional digital cameras. Another issue is the amount of memory you will need in the camera. Picture quality (and image size) is determined by the density of pixels used. The quality chosen can be altered so that you can take high- or low-resolution images. For the highest resolution images, you may be able to store only three pictures at a time on a 2-megabyte (MB) standard memory card. For the lowest quality, you may be able to store about 25, depending on the camera. Additional, removable memory can be purchased for about $50 for 4 MB.

Although it is improving, the picture quality of digital cameras is still less than the quality of traditional cameras. Quality varies significantly from camera to camera.

Perhaps the most surprising feature of digital cameras is just how fast they use up batteries. It is not unusual to go through four AA batteries after taking only 30 pictures. Power cables are available, but they obviously limit your flexibility.

When you are ready to format the images for the Web, things get a bit easier. Most digital cameras come with software packages for picture editing. In fact, the images are usually delivered in a form known as JPEG or jpg, one that can go straight to the Web without any editing at all.

In the end, the field of digitizing your data with a camera is getting easier, but it is still a work in progress. For more info, we have collected online reviews of the most popular cameras at www.medsitenavigator.com/tips.

–Richard Peters and Robert Sikorski

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