

# PhyNexus, Inc.

by Brian Howard

Sample preparation and purification are widely recognized as important steps in laboratory practice, often determining the success of all subsequent operations. Recently, I met with the principals of the two-year-old company **PhyNexus, Inc.** (San Jose, CA) to hear about the company's technology and products for this critically important activity. The business is headed up by CEO Douglas T. Gjerde, Ph.D., who brings to the company both technical and business experience. Dr. Gjerde was trained as a research chemist, but having already founded two companies before the launch of **PhyNexus**, he has a strong track record on the business side. Dr. Gjerde's leadership is complemented on the technical side by Dr. Christopher P. Hanna, Executive Vice President for Business Development and R&D. Dr. Hanna developed an interest in protein sample preparation in his previous employment at **HTS Biosystems** (East Hartford, CT), where he recognized an urgent need for easy-to-use, effective techniques for the purification of small protein samples that retained functionality. The purification techniques then in use were effective for large samples, but with the trend to smaller and smaller samples, it was widely recognized that there was a need to develop purification procedures for samples with volumes of less than 500  $\mu$ L. This is the application area that **PhyNexus** has chosen for its first sample preparation products. The company's mission is to become a leader in the field of protein sample handling, focusing on very small samples that retain functionality. Dr. Hanna said his company's plan is well under way to develop a complete range of products that will purify and enrich protein samples, yet retain their functionality. Retaining functionality is of cardinal importance for the protein chemist. Thus, by meeting the needs of the life science community, the company will follow a business strategy that is basically market driven.

For Dr. Hanna, the company's leadership mission includes anticipating the customer's needs so that products are in place when the need arises. **PhyNexus's** products will be made with conventional materials but designed for enhanced performance. All the sample preparation devices will be disposable to provide effective, secure functionality, free from contamination and carryover. The construction of the company's sample preparation pipet tip illustrates these concepts. The affinity resin has a volume of approx. 5  $\mu$ L and is held in place at the end of the disposable tip by two membranes that are very thin, creating only a very low backpressure. As noted earlier, it is of paramount importance in sample preparation to retain the functionality of any adsorbed proteins. Without the proprietary tip design, the backpressure would be much higher, greatly

compromising the ability to have the necessary fine control of the separation, hence reducing the recovery of the protein. This aspect of the tip design is what allows agarose-type resins to be applied correctly. A key benefit of the **PhyNexus** tips is their ability to provide enrichment from small-volume samples. Enrichment is achieved by eluting the retained sample using a volume of liquid much lower than that of the original sample.

The proprietary PhyTip™ sample preparation tip-based products are listed on the company Web site, [www.phynexus.com](http://www.phynexus.com), and include the following: Protein A products for purification and enrichment of intact IgGs of various subtypes and human Fabs; Protein G products for miniscale enrichment and purification of intact IgGs of various subtypes; immobilized metal affinity chromatography (IMAC) products for miniscale enrichment and purification of His-tagged recombinant proteins; and glutathione products for miniscale enrichment and purification of GST-fusion recombinant proteins. The products are packed in kits with all reagents to ensure optimum performance. Current R&D projects have many additional affinity modalities in the pipeline. Indeed, Dr. Hanna sees no shortage of chemistries to use on the resins. Even though **PhyNexus** is a fairly recent startup, its reputation is growing, and the company regularly receives offers for collaborations on new products. Dr. Gjerde explained that he will be looking both upstream and downstream for business opportunities. **PhyNexus** currently collaborates with **Dyax, Inc.** (Cambridge, MA), among others; in the area of robotic liquid handling, the company is in collaboration with **Caliper Life Sciences** (Hopkinton, MA).

The affinity reagent kits can be used with three levels of hardware. The simplest approach is to use a syringe or manual pipettor with the **PhyNexus** tip fitted using an adaptor. Semiautomatic separations offering greater throughput and automation are provided by the company's computer-controlled purification systems (models ME200 and ME1000). Finally, for laboratories requiring high throughput, the tips are compatible with the automated liquid handling systems from leading vendors. The **PhyNexus** products can be used with the liquid handling systems of **Caliper Life Sciences**, **PerkinElmer** (Wellesley, MA), **Tecan** (Maennedorf, Switzerland), and **Beckman Coulter** (Fullerton, CA), without the need for any new software.

"Being able to handle small sample volumes fluently is an enabling technology, creating new opportunities," explained Dr. Hanna. For example, he noted that cell culture currently is per-

formed at the macro level in relatively large flasks, placing a physical limitation on the number of cell types that can be cultured. With recently developed liquid handling techniques, cell culture can be performed in a 96-well format instead of in flasks. This makes massive cell culture operations possible, which would not be practical using conventional flasks or conventional sample preparation technologies. Moreover, working in the 96-well format makes subsequent operations, including sample preparation, fully automatable.

## Conclusion

**PhyNexus** is a company dedicated to advancing the practice of sample preparation in the life science laboratory. By developing expertise in the technologies of small-scale liquid handling and chemical affinity, the company has launched products that efficiently purify and concentrate protein samples with volumes of less than 500  $\mu$ L with full retention of function. The company is committed to the development of an expanding range of purification and enrichment products based on traditional and novel chemistries. For convenience and ease of use, the products will be marketed as kits with all necessary reagents. Sample preparation continues to be one of the laboratory's most time-consuming, error-prone operations. Accordingly, with the success of its products, **PhyNexus** has an opportunity to make a significant contribution to improving the efficiency of the life science laboratory.

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