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### Optimizing, Automating, Purifying

PhyTips utilizes dual flow chromatography to efficiently perform protein purification at a high throughput level. The PhyTip, a modified pipette tip, is placed on a liquid handler which is programmed for sample processing. Manual protein purification is still common practice, despite the growing popularity of large molecule research. PhyTips addresses the need for automation and provides easy integration in current workflow as this technology is compatible with all major liquid handlers.

The product design of PhyTips consists of a packed resin bed lodged between two hydrophobic frits. This unique design allows for maximum contact with sample lysate and resin. Buffer and sample are aspirated through the PhyTip and dispensed into various deepwell plates set up on the robot's deck. With this application, flow rate is a crucial element in the protein purification process. A consistent and slow speed is required to ensure maximum protein binding and washing of genomic contamination. For this reason, PhyTips can only be automated on a liquid handler and cannot be done manually.

Manual alternatives include Spin Columns, Filter Plates, and Magnetic Beads. While spin columns may have high yields, performing this by hand is tedious for large sample volumes and requires three times the amount of time to perform as compared the PhyTips. Filter plates, even though they are higher throughput than the Spin Columns, yield inconsistent results. Finally, Magnetic Beads have the possibility to be integrated on an automated platform but are relatively expensive and quality of results depend on the strength of the magnetic used, which typically involves purchasing an expensive additional magnetic modular.

## References

The following references follow APA style guidelines.

Lambiase, G., Klottrup-Rees, K., Lovelady, C., Ali, S., Shepherd, S., Muroi, M., Lindo, V., James, D. C., & Dickman, M. J. (2023). An automated, low volume, and high-throughput analytical platform for aggregate quantitation from cell culture media. *Journal of chromatography. A*, *1691*, 463809. <https://doi.org/10.1016/j.chroma.2023.463809>