



Division of Nephrology
Columbia University Department of Medicine

Case Study ““

For labs that extract on average less than 100 samples per day, the QuickGene-610L is the perfect solution. Having tried everything on the market, we have found less issues with this unit than with any other competitor.””

Sergey Kisselev, Laboratory Manager

Finding the Best Automated DNA Extraction Workflow to Meet the Needs of the Lab

Background

The Division of Nephrology at the Columbia University Department of Medicine is one of the highest ranked nephrology programs in the nation. The program has world-renowned faculty members and offers comprehensive clinical services, cutting edge research, and innovative training programs. The research of the Gharavi lab focuses on the genetics of kidney diseases. They aim to identify the genes and pathways underlying kidney disorders in order to facilitate the development of new diagnostic tools and therapies. The lab is comprised of 20 members, half of whom are research-oriented (technicians and post docs), and the other half of whom are clinical (clinical coordinators, genetic counselors and nephrologists). The lab extracts DNA to be used for next-generation sequencing, Sanger sequencing, quantitative PCR, and microarrays.

Over the years, the lab has used a variety of approaches for DNA extraction. Originally, they used phenol/chloroform, which was later replaced with Qiagen manual spin columns kits, before they ultimately switched to automated DNA extraction.

““ We are quite happy with the setup we have. With 2 units, we are able to have several people extracting every day and it accommodates all of our extraction needs, which are over 2,000 samples per year. ””

Sergey Kisselev, Laboratory Manager

Case Study

I. Challenges

Manual extraction methods can have a high failure rate and are time-consuming

Manually extracting DNA is an extremely time-consuming process that requires the undivided attention of the person performing the task. Because the procedure requires human intervention for every step, the risk of contamination or sample failure is significant.

Qiagen spin columns are not ideal for large-volume samples

The lab could not tolerate the potential for contaminated DNA, and therefore turned to Qiagen spin columns. The spin-column procedure reduces hands-on time thereby minimizing the risk for human error and contamination. However, the lab found that the columns would often clog and that the volume of sample that could be extracted was not sufficient. The lab routinely used blood volumes of 6 mL for adult patients and 2 mL for pediatric patients. Therefore, they needed to do several extractions per blood tube, which was time consuming and expensive. They preferred to extract the whole sample in one reaction in order to avoid the possibility of mix-ups.

To meet increasing demand requires increasing efficiency

The lab began receiving more and more blood samples for extraction, to the point that technicians were dedicating their entire work days to extractions with the spin column kits. More technicians were hired, but the workflow was still not satisfactory. Therefore, the lab began to explore alternative workflows that could provide faster and more efficient ways to do extraction.

II. Approach

Comparing the cost per sample of various automated options

Once the lab decided to move forward with acquiring an automated instrument, they began researching the options offered from different manufacturers, including Qiagen, Promega, and AutoGen. They tried several instruments, including the QIAcube, which mimics the manual spin column procedure, the QIASymphony, and also the Promega Maxwell 16. The lab determined AutoGen's QuickGene workflow using the 610L instrument was the most cost-efficient method for extracting DNA. The cost per sample using the other instruments was nearly double the cost per sample from the QuickGene.

Identifying the most important features for the lab's unique needs

Cost was not the only consideration of the lab when it came to choosing an automated workflow. It was also important that the extraction method could permit high volume extractions. The QuickGene-610L offers high volume extraction sufficient enough for the lab to process whole samples, up to 2 mL, at one time. The lab found that most other column-based methods offered much smaller blood volume extraction methods, in most cases, less than 1 mL. The QuickGene-610L is able to extract DNA from larger volumes, thereby minimizing the number of extractions necessary, and the need to split columns. The other feature of the QuickGene-610L that won the lab over, was its capacity for customization. The lab was able to modify the extraction protocol to accommodate higher sample volumes, allowing them to be much more efficient in their biobanking process.

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Utilizing the knowledge and availability of the AutoGen technical support team

It is the mission of the AutoGen support team to supply customers with the most practical, reliable workflows available and to back them with industry leading service and support. The lab found the AutoGen technical team to be especially helpful in customizing the extraction protocols to allow for large volumes. In addition, the lab appreciated that customer support streamlined the purchasing and procurement of reagents, usually receiving their kits the day after they placed their order.

III. Results

A more efficient extraction process that provides superior purity

With the acquisition of two QuickGene-610L models, the lab's extraction needs, which are over 2000 samples per year, are able to be met. The ease of training people how to use the QuickGene insures that all lab members can utilize the instrument and that it can be used daily. In addition, the lab found that the QuickGene extractions are more efficient, with concentrations that are higher, and quality that is much better than they had obtained using other extraction methods. On average, the lab yields about 100 µg of DNA per 2 mL sample using the QuickGene-610L model.

Results obtained with the QuickGene-610L

Sample Size	DNA Concentration (ng/µL)	Elution Volume (µL)	Total DNA Yield (average µg)	Yield per 1 mL Blood (average µg/ml)	260/280 (average)	260/230 (average)
1mL (n=18)	104.0	500	52.0	52.0	1.85	1.83
2mL (n=27)	186.8	500	93.4	46.7	1.87	1.97
3mL (n=6)	277.6	500	138.8	46.3	1.86	1.86

Additional applications possible with customizable extraction protocol

The customizability of the QuickGene-610L has allowed the lab to modify the extraction method in order to use it, with the same kits, for saliva extractions. Now the lab is able to process DNA from patients who are too young to give blood. The modified extraction protocol has demonstrated high success compared with blood samples.

Mini8L: a solution for large volume genomic DNA isolation

The QuickGene-Mini8L is the non-automated version of the QuickGene-610L, both using an ultra-thin polymer membrane along with gentle positive air pressure for efficient capture of high quality, high yield gDNA from up to 2 mL of whole blood or Oragene collected saliva. The lab occasionally uses the QuickGene-Mini8L and have found it to be easy to use and a valuable accessory to the QuickGene-610L.

About AutoGen

AutoGen is a leading provider of automated nucleic acid extraction workflows that allows lab professionals to produce premier quality and value-added extraction results. Our workflows provide solutions that are the best fit for our customers' laboratory needs and budget, and our customers include biorepositories, contract research organizations, academic research laboratories, pharmaceutical companies, clinical diagnostic laboratories, and government institutions all over the world. We strive to provide quality instrumentation and chemistries, as well as dedicated technical support – all with a level of post-sale service that is truly unmatched. Visit www.AutoGen.com to learn more.



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