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Custom Gene Synthesis - FAQs

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1. **Do you have customer testimonials and publications citing your gene synthesis service?**
   We do collect customer testimonials and you can find some testimonials on our web pages. Our support team will be happy to send the testimonials upon your request. You can check out Google Scholar for some of the publications citing our gene synthesis service: http://scholar.google.com

2. **How do you guarantee the sequence accuracy of my genes? What QC data will be provided?**
   We guarantee 100% accuracy by sequencing. You will receive complete QC data. Each gene comes with complete QC data: project report, construct map, complete sequence, sequence verifying data (chromatograms) and alignment file.

3. **How are genes shipped? How long does it take for shipping?**
   We deliver 4ug of lyophilized plasmid, which contains your target gene in our standard vector or in your desired vector. We can prepare more plasmid (up to a few milligrams) upon request.
   The plasmid is shipped at room temperature. Overnight delivery within USA/Canada. Typically 3-4 days to reach researchers in other countries.

4. **What is the typical turnaround time for gene synthesis?**
   Our typical turnaround time is 2-3 weeks for a standard gene under 2-3 kb. The turn-around time varies depending on the gene length, subcloning and difficulty.

5. **What vectors can be used to clone the gene?**
   Biomatik offers several standard vectors for subcloning, free of charge. For example: pBMH-Amp, pBMH-Kan, pBluescript II SK (+) -Amp and pUC57-Amp. We can also subclone your gene into any vector of your choice, at additional cost.

6. **What is the maximum gene length that Biomatik can synthesize?**
   Although gene synthesis method has no theoretical limits, longer genes require extra planning and have a longer turnaround time, and can sometimes be very difficult to synthesize. We encourage our customers to synthesize no more than 10kb in length. It costs much more, and takes a much longer time to synthesize genes longer than 10kb.

7. **Can Biomatik synthesize "difficult" genes?**
   We have extensive experience in synthesizing difficult genes. Our synthesis platform allows us to produce very complex genes with high GC content, repetitive elements, or wobble bases. Our method is very reliable across a large range of AT to GC ratios. We have successfully synthesized genes with a GC content of over 85%. However, if your gene has a high GC content (>70%), and additional critical features such as many repetitive elements, you should contact our support team prior to ordering a gene.

8. **What is the difference between oligo synthesis and gene synthesis?**
   Oligo synthesis creates single-stranded DNA with limited length (normally up to 180 bases). Oligos are not cloned into a vector. Genes can be 20kb or longer, and it is double-stranded synthesis and cloned into a vector for delivery.

9. **Can you explain more about codon optimization?**
   Codon optimization is recommended to achieve optimal expression of recombinant proteins. Biomatik can help re-code the gene sequences according to scientifically researched algorithms, free of charge. Different genes encoding

the same protein can have expression in totally different levels. Most proteins are often difficult to express outside their original species or to over-express even within their native species. Altering the coding sequence by codon optimization to increase protein expression is highly recommended.

10. Can Biomatik optimize a gene for a specific organism or even for two specific organisms?

Yes, we can. Expression in different organisms or tissue types is often enhanced by the use of a special subset of codons. For many organisms and tissues, codon usage tables have been computed from genes with high expression in these target organisms and tissues. By adjusting the codon usage of your synthetic gene to the codon usage of your host organism, you will likely increase its expression efficiency, and consequently, the yield of the expressed protein. We can also optimize a gene using a mixed codon table computed from the codon usage tables of the two organisms.

11. Which is preferable between gene synthesis and gene modification?

It depends on the complexity of the necessary modifications. If they are scattered across the whole gene and abundant, a complete synthesis is probably advisable. A synthesis also gives you the opportunity to optimize many other features of the gene such as codon usage, restriction sites, introns adapted to the expression host, etc. Modification of an existing gene, on the other hand, is preferable if the modifications are few or are clustered in a small part of the gene. Simple hybrids should also be made by conventional modification procedures.

12. What is the difference between gene synthesis and fragment synthesis?

With gene synthesis, you receive a plasmid - the target gene is subcloned into a vector of your choice. With fragment synthesis, you receive a ligation product without being subcloned into a vector. The ligation product is immediate product of gene synthesis, which is sequenced and check for any errors. You must ligate the ligation product into a vector in your own lab. Since a small amount of incorrect bases at any position cannot be seen during sequencing (it is overshadowed by the large number of correct bases at that position), you have to transform a host with the vector and screen for correct clones. This is compensated by the much lower price of the ligation product. In our gene synthesis service, we handle the ligation, transformation and screening. You receive the complete plasmid with your gene insert.

13. Can I also use degenerated base positions (which contain more than one nucleotide, i.e. wobble bases)?

Yes, you can. We offer this service for completely degenerated positions (all four nucleotides in roughly the same amount) without an additional fee. We can also help you with more complex degenerations (e.g. only A and T). Please note that the exact ratio of all bases at a degenerated position cannot be predicted.

14. Isn't it less expensive to synthesize the gene on my own?

Unless you have a method considerably simpler than that invented by Khorana in the 1970's, you will need many ligation and cloning steps requiring several weeks, if not months, of work. A Biomatik gene with up to 2000 bp can be delivered as fast as 2-3 weeks. It is not only economical, but it also saves you precious time.

15. Do you have a comparison between PCR cloning and gene synthesis?

Comparison	PCR Cloning (1000bp)	Gene Synthesis (1000bp)
Cost	Minimal $1500 to cover one marathon-ready cDNA libraries, normally 3 or more mutations to be corrected, PCR cloning kit, primers, sequencing, enzyme etc. Labor cost is extra.	$350 or less for normal sequence. Labor cost is included.
Codon Optimization	Difficult, challenging	Easy, flexible
Delivery	Several weeks, with no guarantee	Typically delivered in 2 weeks