



ATG:biosynthetics
Solutions
in biosynthetics

CODON NEWS
Issue 46

02 January 2014

Computation for Synthetic Biology Projects – Bioinformatics Consulting Service

Dear customers,

ATG is focused on and combines comprehensive bioinformatics services for the design and the realization of multi-gene expression systems with concerted gene functions.

ATG was founded in 2001 as a first mover in "Synthetic Biology" to provide our clients with advanced solutions in technical genetics. A time period of more than ten years we invested in development, testing and improving our proprietary software package **EvoMAG** for calculating sequences with specific artificial codon tables, accessibility of RNA structures, binding energy profiles and many more molecular features. A part of these are advantageous for gene cluster constructions (pathways, hetero-protein complexes), gene assembly strategies or specific positional exchange of genes. Improving gene expression substantially on improving sequence features effective on different molecular levels has always been subject of our work. With our gene cluster analysis tools we can demonstrate sequence features which can be subject for improvement. With our gene cluster calculation tools we calculate all sequence features which were shown to be functionally advantageous in literature or which are your personal considerations and requirements.

ATG offers a variety of Bioinformatics Consulting Services, as described in detail below.

Gene syntheses: We also realize your synthetic genes, gene variants and cluster designs.

INQUIRE/ORDER

Please inquire for our standardized multi-gene high-expression vector **FlexTEC** - Kits for **Mammalian**, **Baculoviral** and **E. coli**

INQUIRE/ORDER

Computational Molecular Biology – Analytical Genomics

Comparative *in silico meta* - Genomics: Annotation analyses, comparative gene regulators and gene evolution analyses, motive conservation pattern, codon usage

Genome Mining - identification of new genes, regulators and metabolic pathways

Functional Genomics - Data Mining - functional analyses, predictions

- Metabolomics and metabolic reconstructions
- Transcriptomics and conceptual expression optimization, **RNAseq** analyses
- Analytical and synthetic proteomics and structural molecular biology

Synthetic Molecular Biology – Gene Function Oriented Computation

Gene sequence analyses of expression relevant functional sequence parameters on different molecular levels (**DNA**, **RNA**, **Protein**, **Interaction level**)

In silico simultaneous multi-parameter calculations for expression optimization on different molecular levels

- Transcriptional and translational initiation optimization
- Translational elongation optimization

- mRNA stability, internal secondary structures, motives (e.g. internal SD, splicing sites etc.)

Identification and selection of regulatory genetic elements based on genomic analyses and data mining

DoE - Assessment of functional optimization strategies for expression and function of proteins e.g. enzymes

Constructional DNA – Design Projects

Constructional design and realization of functional gene clusters (artificial biochemical pathways, hetero-protein complexes)

Sequence calculations for different types of gene cluster **assembly strategies**

Sequence calculations for functional substitution of sequence building blocks

- Promoter Libraries
- Leader Libraries (TIR)
- CDS - libraries

Over a time period of **10 years**, with support of government funding, we at ATG developed and steadily improved our **in house** knowledge and proprietary computer programs like **EvoMAG** and **myBioDesign** along with the requirements of our customers. We are supporting our customers not only with genomic annotations, data mining, information generation, condensation and handling. In addition we are computing optimal sequence compositions for constructive and functional gene and gene cluster designs. Multi-target parameter compromise solutions in **in silico** gene evolution are Pareto optimized. you have in constructive and designing multi-gene applications in gene clusters for metabolic pathways (anabolic and catabolic), hetero-protein complexes and multiple constructive elements like for metabolic channeling etc.

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Examples processed by ATG

Bioproduction Product	Pathway in kb	Application	Constructional Design	Expression Optimization	Leader-Library	Specific Vector: Design & Syntheses
Epothilone	65	Cytostatic	yes	yes	yes/no	yes
ω-3-PUFA	31,4	Essent. Fatty Acid	yes	yes	yes	yes
Argyrimycin	37,2	Antibiotic	yes	yes	yes	yes
MethylMalonylCoA	18,8	Metabolic	yes	yes	no	yes
MyxoChromidin	32	Antibiotic	yes	yes	no	yes
Coronatin	36	Phytotoxin	yes	no	no	yes
Battimycin	20	Antibiotic	yes	no	no	yes
Myxopyronin	53,4	Antibiotic	yes	no	no	yes
Glumicin	35,2	Antibiotic	yes	no	no	yes
Magnetite	8,9	Biomagnetism	yes	no	no	yes
Hetero-Protein Complexes	10,4	Regulation on Protein Level	yes	yes	no	yes
Multiple Glycosyl-transferase Genes	9,5	Glycosyl-ation	yes	yes	no	yes

Decoupling of DNA - syntheses from constructional and functional gene design was anticipated as early as SB2.0 in Berkeley 2006. This process, which is in a direct analogy to the manufacturing of hard discs and memory sticks vs. the data store content (music like symphonies, computer programs a.m.m.) is now approaching its final stage to completion. This process, which is in a direct analogy to the manufacturing of hard discs and memory sticks now seems to approach its finalization. On the other side of the coin is the very interesting topic of predictive functional programming of genes for desired application purposes. It accumulated high levels of knowledge over the time frame of the last years not only in the scene of protagonists like Mutalik VK et al. (2013), Goler et al. (2008) and Andrianantoandro E. (2006) but Rössger K et al. (2013) and Arkin AP and Fussenegger M. (2013) even on very high impact. But

also in company environments with academic and company clients many projects are realized straight along to the customers desires and ideas without the high visibility on the list of authors of publications.

Arkin AP, Fussenegger M. (2013) Curr Opin Chem Biol. Dec;17(6):869-70. doi: 10.1016/j.cbpa.2013.11.005. Epub 2013 Nov 20. Synthetic biology. **Rössger K et al.** (2013) A closed-loop synthetic gene circuit for the treatment of diet-induced obesity in mice. Nat Commun. Nov 26;4:2825. doi: 10.1038/ncomms3825.

Mutalik VK et al. (2013) Precise and reliable gene expression via standard transcription and translation initiation elements. Nature Methods, doi:10.1038/nmeth.2404.

Goler et al. (2008) Genetic design: rising above the Sequence, Trends Biotechnol., 26:538-44

Andrianantoandro E et al. (2006) Synthetic biology: new engineering rules for an emerging discipline Molecular Systems Biology doi:10.1038/msb4100073.

For more information or a quote, just ask our experts at
<https://www.atg-biosynthetics.com/Optimizations/InfoRequestOpt.html>
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