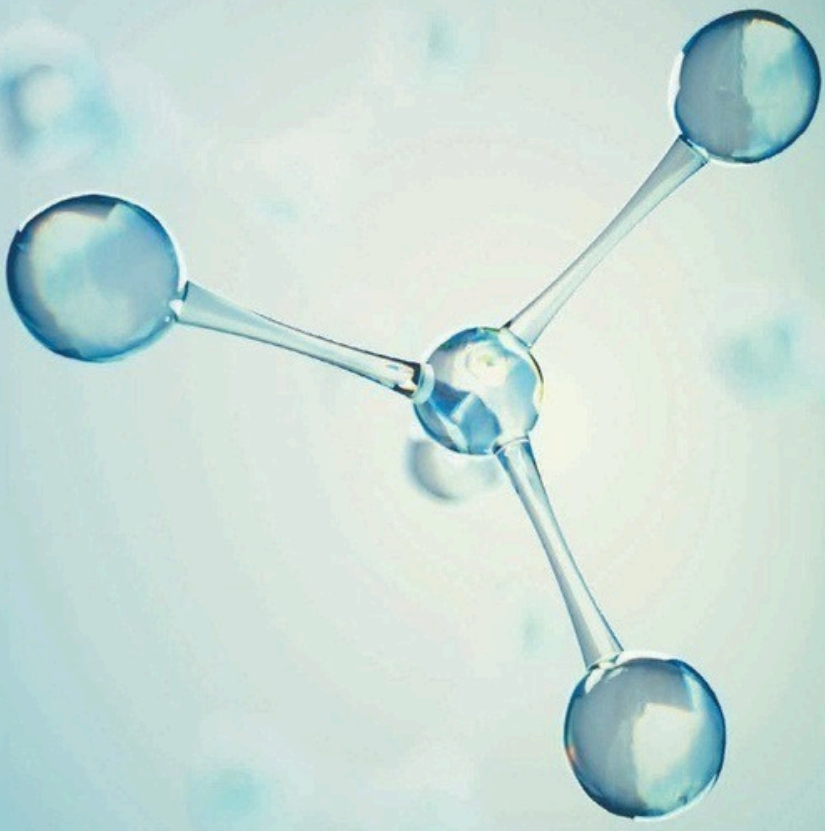
PHOSPHORAMIDITES



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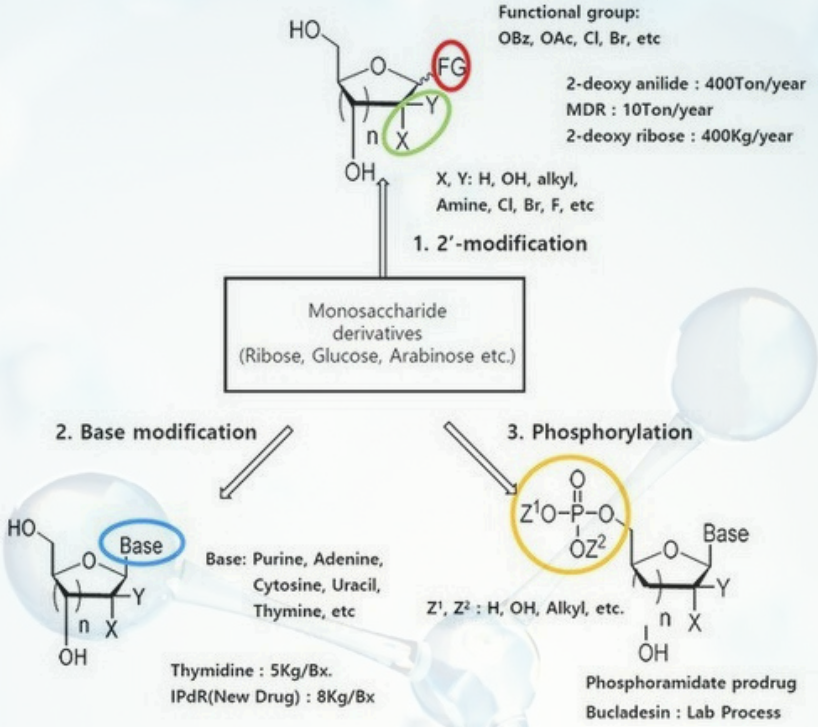
Overview

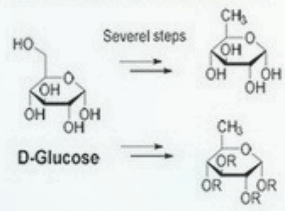
Kolon has been supplying **refined high-purity APIs and Intermediates** using our core technology, **Sugar Chemistry**. Our sugar chemistry consists of (1) control of functional groups (2) various refinement & crystallization methods (3) scale-up experience

KLS Sugar / Nucleoside Chemistry



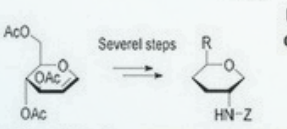
New Drug Intermediate / API

1. 2'-Modification derivatives

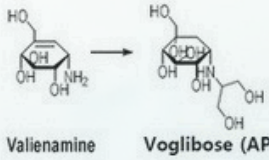


6-Deoxy-D-glucose(New drug intermediate) - 1Kg/Bx.

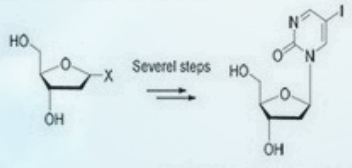
TEAD (New drug intermediate) - 5Kg/Bx.



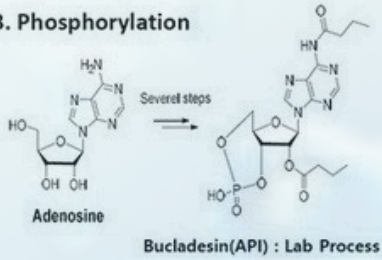
New drug intermediates
BTPC - 35Kg/Bx
DPZ - 65Kg/Bx



2. Base modification



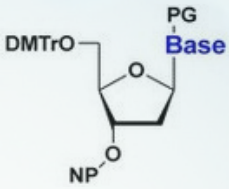
3. Phosphorylation



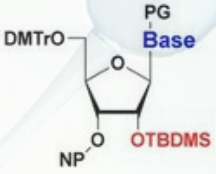
Product List

Kolon has completed the synthesis of **23 Phosphoramidites** through sugar / nucleoside chemistry. Each of them can incorporate flow chemistry, scale up, specific quality control and customization.

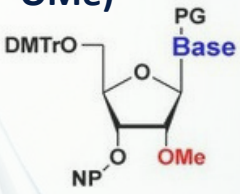
DNA Phosphoramidites



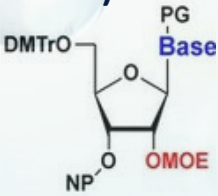
TBDMS-RNA Phosphoramidites



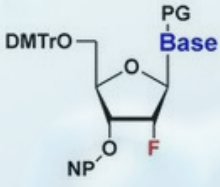
2'-Modified Phosphoramidites (2'-OMe)



2'-Modified Phosphoramidites (2'-O-MOE)



2'-Modified Phosphoramidites (2'-F)



Quality Control

As the basic quality control methods for Phosphoramidites, Kolon conducts **^{1}H NMR, ^{31}P NMR, UV, TLC,HPLC. LC/MS, GC/MS and MASS Spectrum** are used for stricter management of impurities that has adverse effects on Oligo synthesis.

^{1}NHMR

^{31}P NMR

UV –The UV test provides 4 values of data

TLC

HPLC
>98%

LC/MS

GC/MS

ESI-MS

Differentiation

- Securing product competitiveness through differentiated process development
- Preoccupation of the market through early establishment of GMP process

Stage 1. Fast Follower

✓ **Completion of general-purpose phosphoramidite development through competitor's product analysis**
·Continuously expanding the product portfolio with customer requests

✓ **Promotion through collaboration with top 3 oligonucleotide makers around the world**

Stage 2. Differentiation

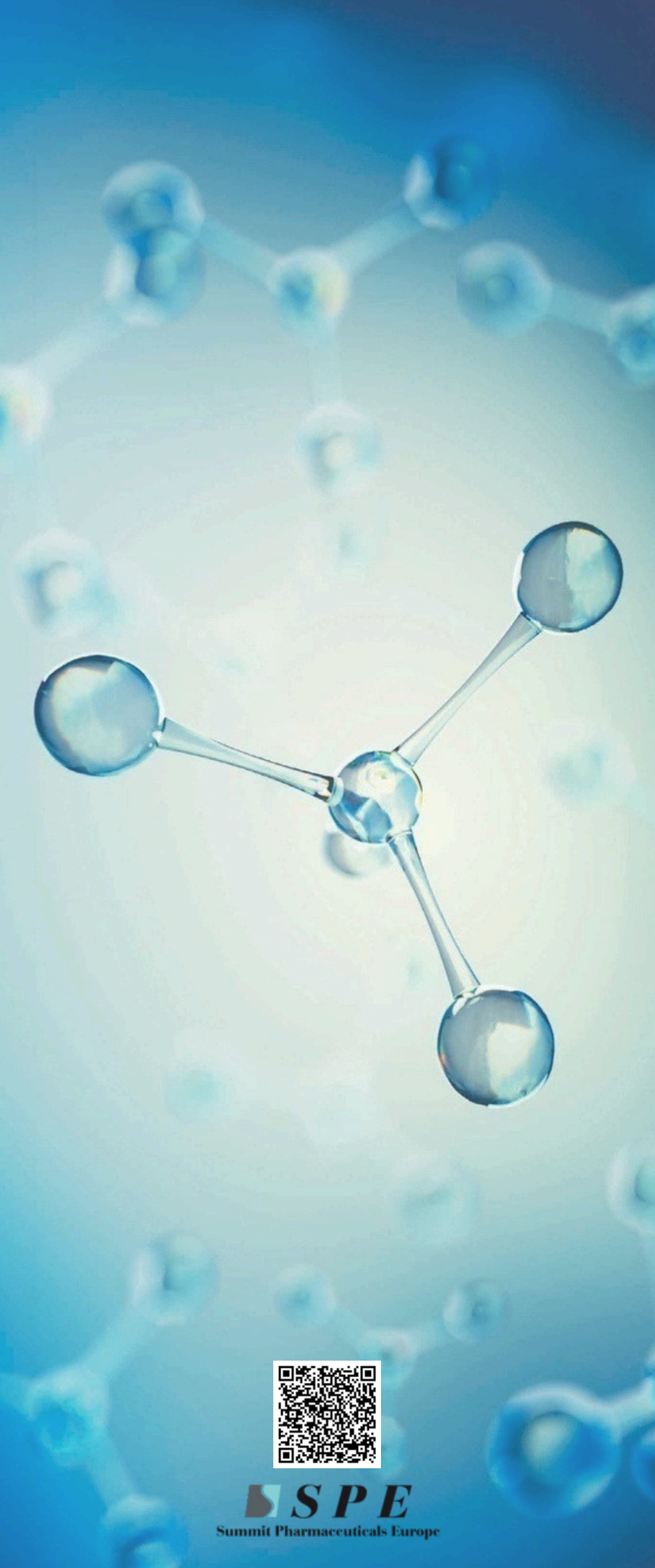
✓ **Securing cost competitiveness through differentiated process development**
·Reduce manufacturing costs by developing switchable continuous manufacturing process suitable for small-scale multi-variety production
·Development of crystallization process to replace column process

✓ **Diversification of Portfolio and development of customization**
·Development of a product line that can be used to manufacture oligonucleotides in the future (Diester, Triester, etc.)
·Development of various product lines to meet customer needs (Back-bone modification, 5'-capping, etc.)

Stage 3. First Mover

✓ **It is scheduled to build a production facility of 300 kg per year in the Kilo-Lab Center in 2025**

✓ **A production base of 3 MT per year will be established in the GMP plant in 2027**
·There is a high probability that regulation will be strengthened as the RNA market grows



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