

# Is It Possible to Treat *Klebsiella pneumoniae* Diseases by Non-Antibiotic Drugs?

Kasimova, Anastasiia

*Klebsiella pneumoniae* are optionally anaerobic gram-negative bacteria which cause a lot of virulent diseases in people with poor immunity. Existence of capsular polysaccharides (CPS) and antibiotic resistance are the main constitutional peculiarity of this strain. Nowadays development of novel medical products based on bacteriophages is becoming a pressing problem. During our project we studied a possibility of using non-antibiotic drugs to treat *Klebsiella pneumoniae* diseases. In our project we worked with degraded cell materials. First part of our study was the determination of *Klebsiella pneumoniae* 03 and 05 CPS by analyzing  $^1\text{H}$ ,  $^{13}\text{C}$  NMR spectra using 2D experiments and using chemical methods of determination the structures: Water-phenol isolation, Treatment with acid, Smith degradation, Sugar analysis, Absolute configuration determination. The structure of *Klebsiella pneumoniae* 03 CPS had been already known in literature (repeating furanose and pyranose forms of  $\alpha$ , $\beta$ -Gal). *Klebsiella pneumoniae* 05 polysaccharide represents the branched pentasaccharide chain and was unknown previously. The chain has  $\beta$ -D-Galp-(1 $\rightarrow$ , 3)- $\alpha$ -D-GlcpA-(1 $\rightarrow$ , 3)- $\alpha$ -D-Manp-(1 $\rightarrow$ , 2)- $\alpha$ -D-Manp-(1 $\rightarrow$ , 1)- $\alpha$ -D-Galp-4,6-pyr monosaccharides. Then we studied a mechanism of degradation the *Klebsiella pneumoniae* 05 CPS induced by recombination depolymerase of new bacteriophage K40. We determined a structure of oligosaccharide resulted in after treatment by analyzing  $^1\text{H}$ ,  $^{13}\text{C}$  NMR spectra using 2D experiments and founded that tail protein of bacteriophage reacted with CPS breaking up a link between  $\beta$ -D-Galp and  $\alpha$ -D-Manp. In conclusion we have made a significant contribution to the development of an approach to treatment these dangerous diseases.

**Awards Won:**

