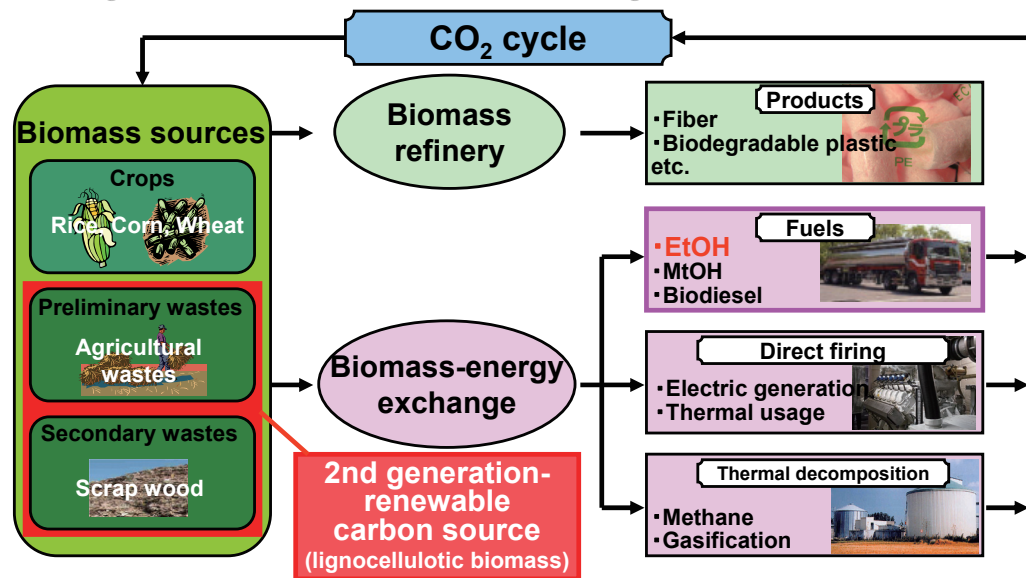


Pentose-metabolizing Yeast Technology for Carbon Neutral

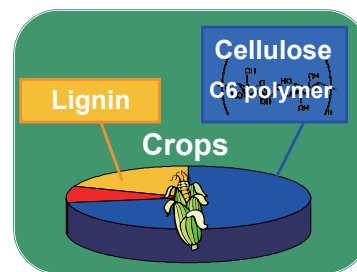
Seiya WATANABE, Shigeki SAWAYAMA, Keisuke MAKINO



1. Why is "bioethanol" necessary?



2. How to produce "bioethanol"

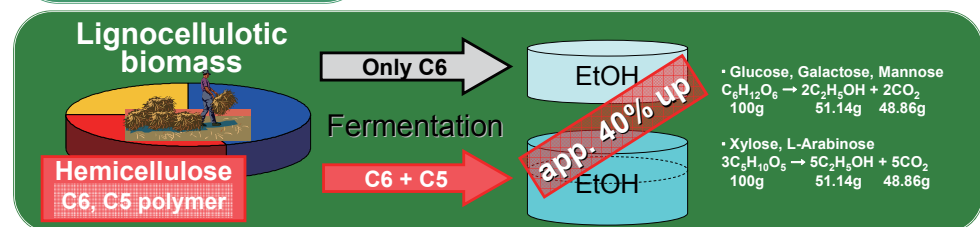


Comparison of microorganisms for industrial bioethanol production

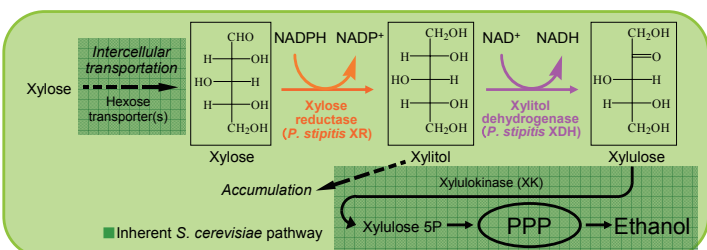
Microorganisms	Metabolic pathways					Ethanol fermentation	Ethanol tolerance	Culture pH
	Glu	Man	Gal	Xyl	Ara			
Anaerobic bacteria	+	+	+	+	+	+	-	N
<i>E. coli</i>	+	+	+	+	+	-	-	N
<i>E. coli</i> KO11 (R)	+	+	+	+	+	+	-	N
<i>Zymomonas mobilis</i>	+	-	-	-	-	+	+	N
<i>S. cerevisiae</i>	+	+	+	-	-	+++	+++	A
<i>S. cerevisiae</i> (R)	+	+	+	(+)	(+)	+++	+++	A
<i>P. stipitis</i> (yeast)	+	+	+	+	+	++	-	A

* R, genetic recombination
 * Glu, glucose; Man, mannose; Gal, galactose; Xyl, xylose; Ara, L-arabinose
 * N, neutral; A, acidic

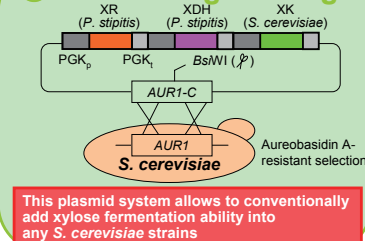
The yeast, *Saccharomyces cerevisiae*, lacks ability to ferment pentoses (in particular, xylose), derived from hemicellulosic component.



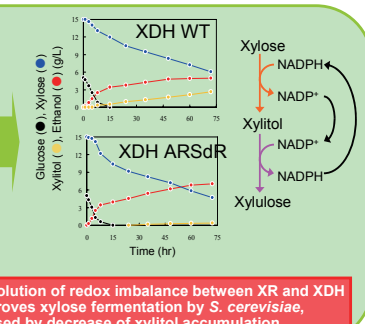
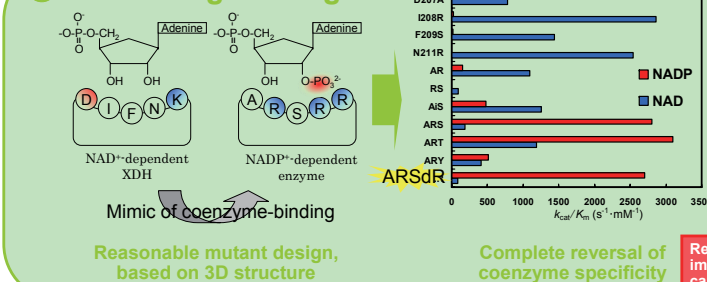
3. What is my technology?



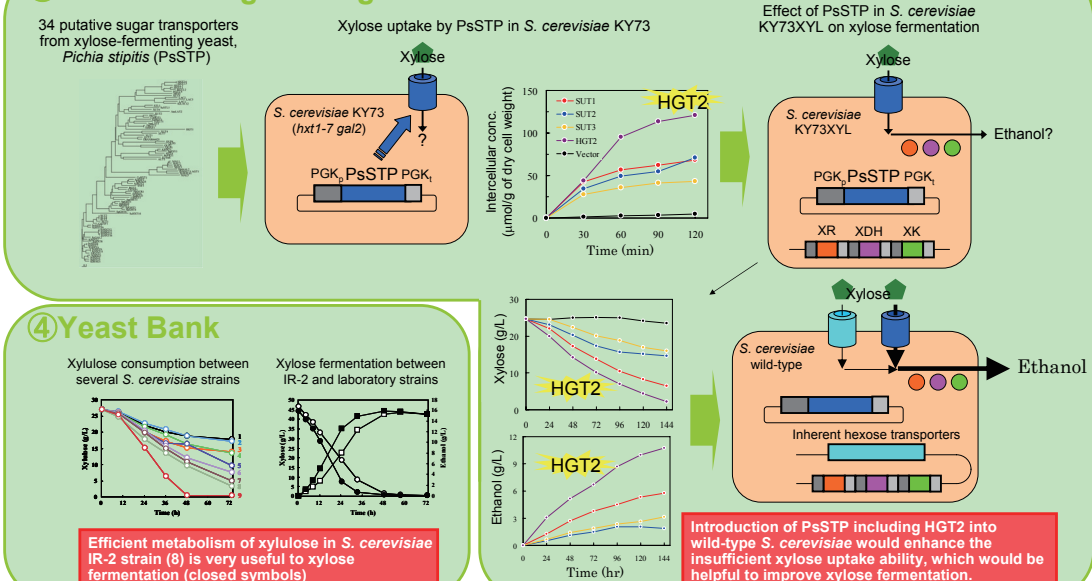
① Genetic engineering



② Protein-engineering



③ Metabolic engineering



④ Yeast Bank

