

Table S1: Enrichment of gut metabolic modules (GMM) in the caecum of mice with wildtype versus Sox9-deficient Paneth cells

GMM_module	p-value	q-value	Enriched genotype	Module_definition	Primary_module_metabolism_definition	Second_module_metabolism_definition
MF0049	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	maltose degradation	carbohydrate degradation	disaccharide degradation
MF0052	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	chondroitin sulfate and dermatan sulfate degradation	carbohydrate degradation	glycosaminoglycan degradation
MF0059	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	rhamnose degradation	carbohydrate degradation	monosaccharide degradation
MF0064	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	pectin degradation	carbohydrate degradation	polysaccharide degradation
MF0082	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	pentose phosphate pathway (oxidative branch)	central metabolism	energy metabolism
MF0092	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	kdo2-lipid A synthesis	endotoxin biosynthesis	lipopolysaccharide biosynthesis
MF0101	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	Sulfate reduction (assimilatory)	gas metabolism	sulfate metabolism
MF0133	0.0001554	0.0024864	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	menaquinone production	secondary metabolites	vitamins
MF0018	0.0003108	0.00361659	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	proline degradation (glutamate pathway)	amino acid degradation	nonpolar. aliphatic amino acid degradation
MF0048	0.0003108	0.00361659	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	lactose degradation	carbohydrate degradation	disaccharide degradation
MF0065	0.0003108	0.00361659	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	pectin degradation - 5-dehydro-4-deoxy-D-glucuronate degradation	carbohydrate degradation	polysaccharide degradation
MF0025	0.0006216	0.0049728	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	alanine degradation (glutamate pathway)	amino acid degradation	nonpolar. aliphatic amino acid degradation
MF0041	0.0006216	0.0049728	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	histidine degradation	amino acid degradation	positively charged amino acid degradation
MF0053	0.0006216	0.0049728	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	allose degradation	carbohydrate degradation	monosaccharide degradation
MF0079	0.0006216	0.0049728	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	bifidobacterium shunt	central metabolism	energy metabolism
MF0127	0.0006216	0.0049728	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	Succinate production	organic acid metabolism	succinate metabolism
MF0100	0.00093097	0.00700967	Sox9 ^{Loxp/Loxp}	Sulfate reduction (dissimilatory)	gas metabolism	sulfate metabolism
MF0102	0.0010878	0.00773547	Sox9 ^{Loxp/Loxp} ;VillinCre ^{ERT2}	mucin degradation	glycoprotein degradation	mucus degradation