Step-by-step guide for case study "Oral drug absorption modeling in PK-Sim"
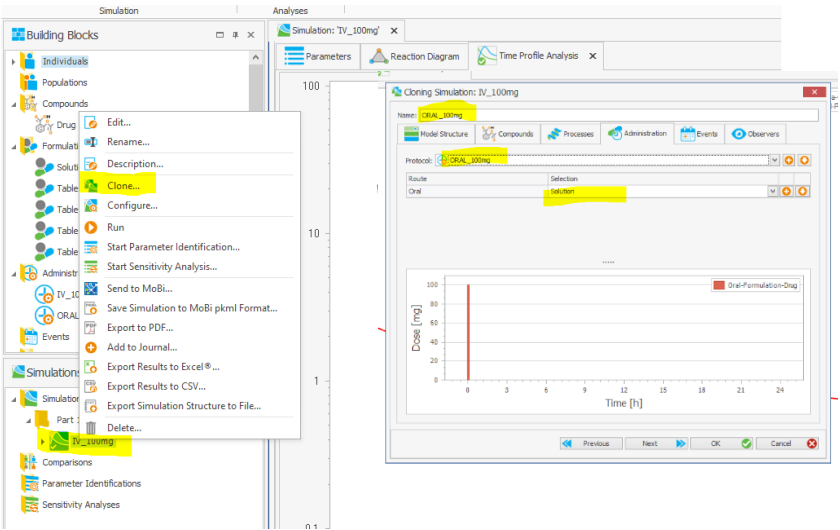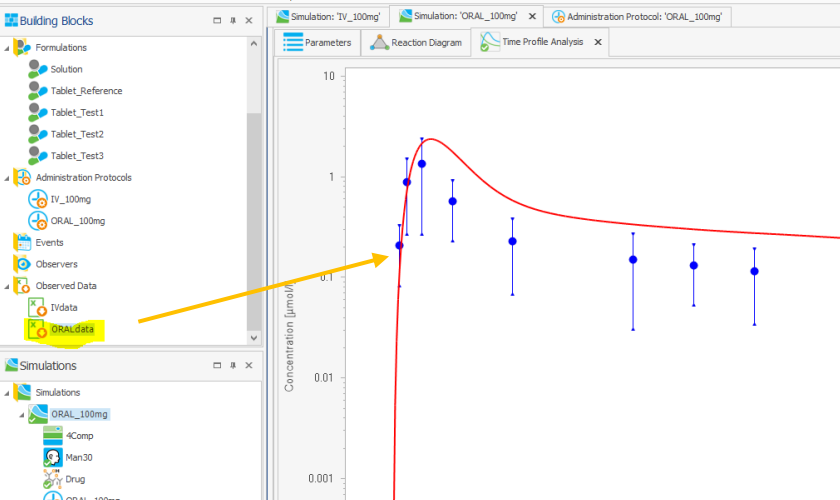
In this walkthrough guide basic operations and usage of PK-Sim are not show explicitly as there are excellent YouTube videos from scientist of Clinical Pharmacy Saarland University and detailed documentations on Open Systems Pharmacology
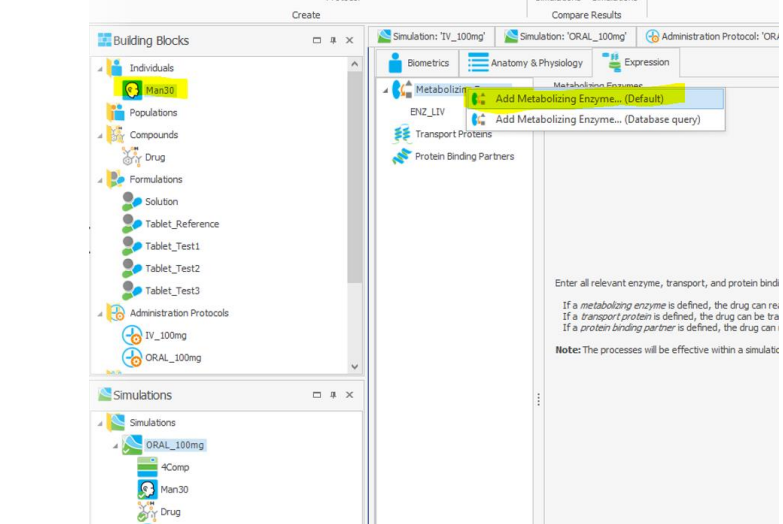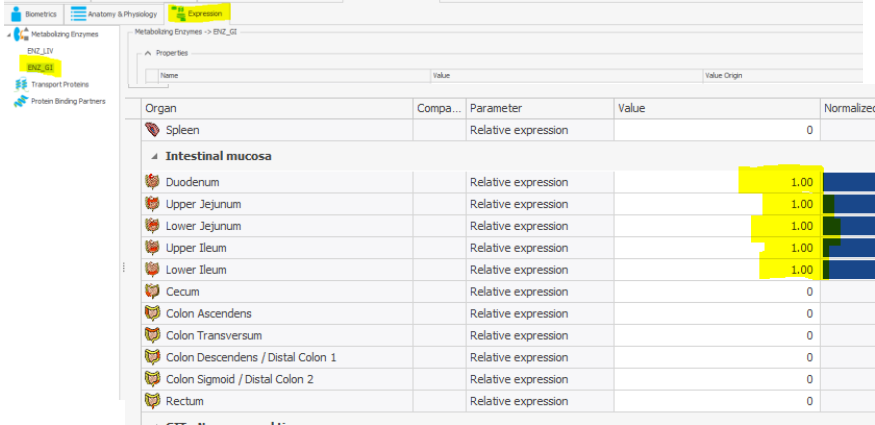
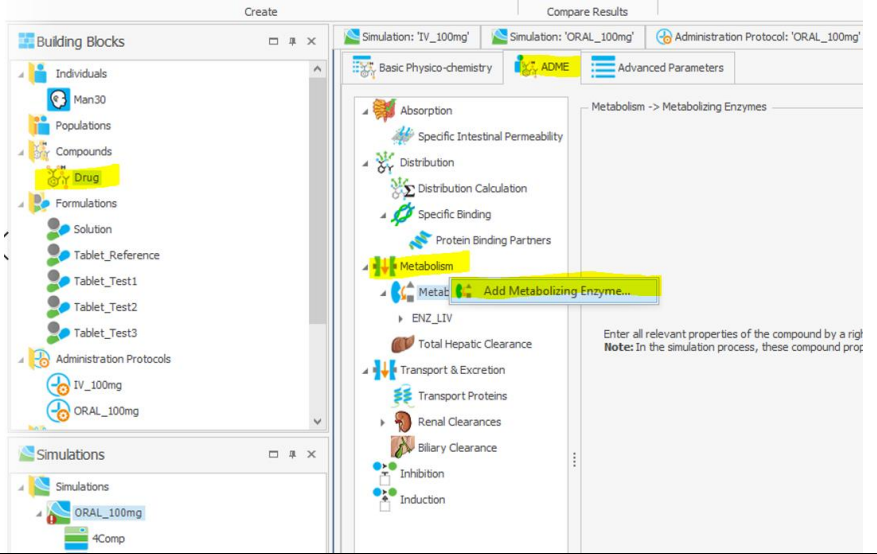In this content overview links are pointing to these YouTube videos.

- Generate Healthy individual
- Generate compounds (from template DB)
- Set up administration scenarios
- Import observed data
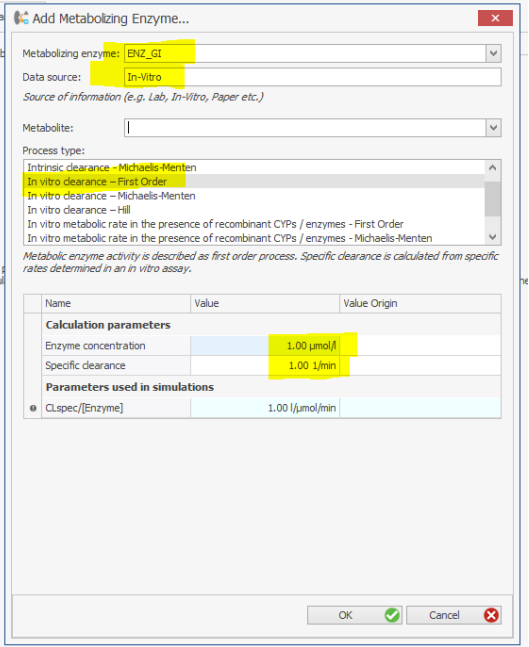- Build population and run simulations and compare to observed data
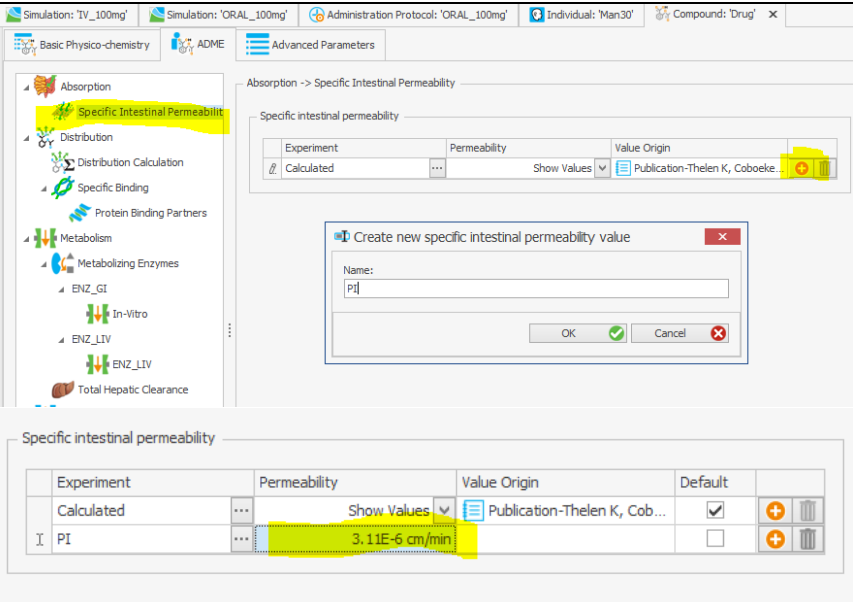- Compare Simulations

Detailed Step-by-Step

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
(1) Establish oral absorption model				
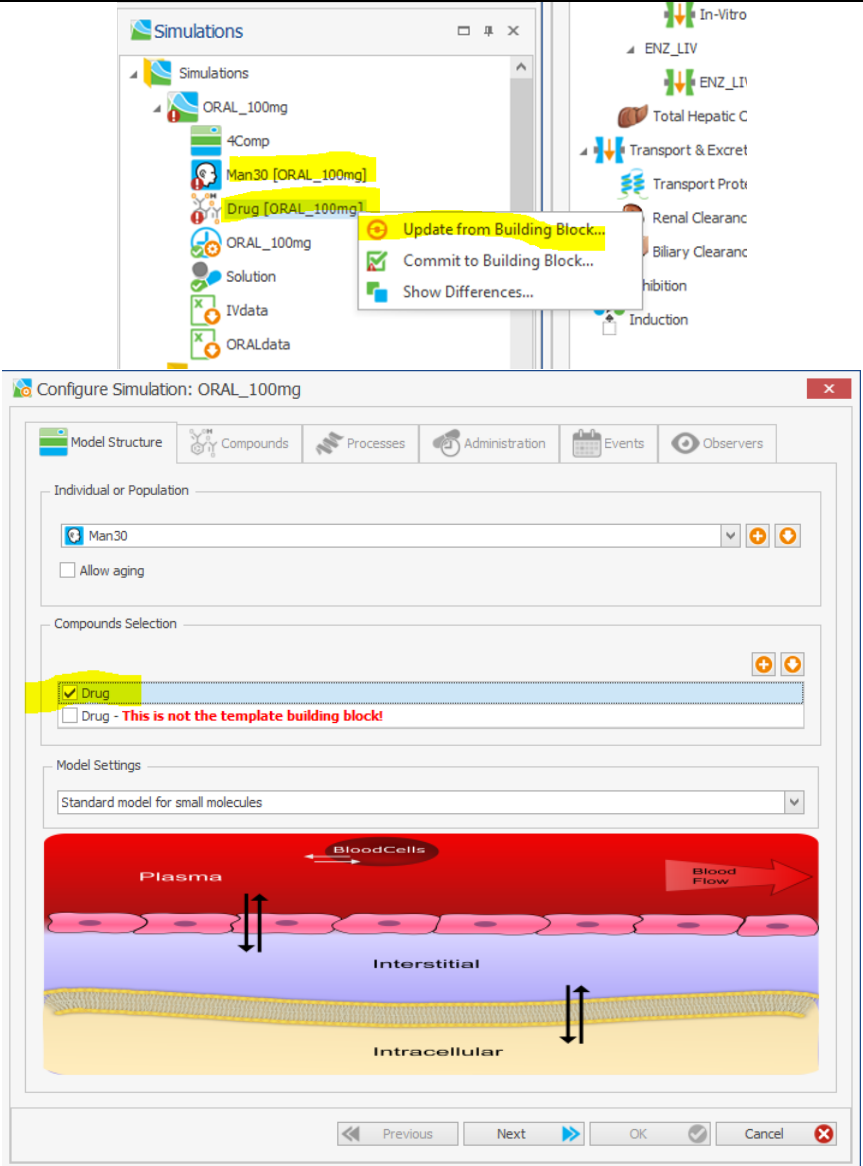
File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	1.a	*Clone compound*	Clone simulation "IV_100mg", name "ORAL_100mg" Select Administration protocol "ORAL_100mg" and formulation "Solution"	
	1.b	*Observe data*	Remove "IVdata" and add "ORALdata"	
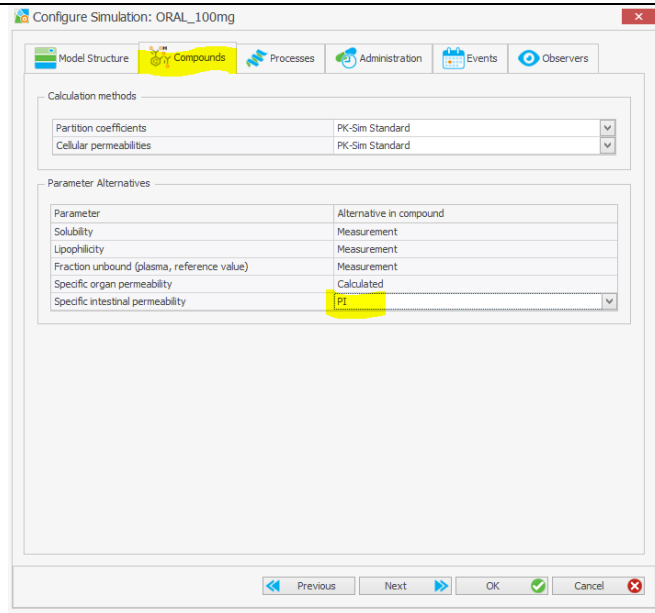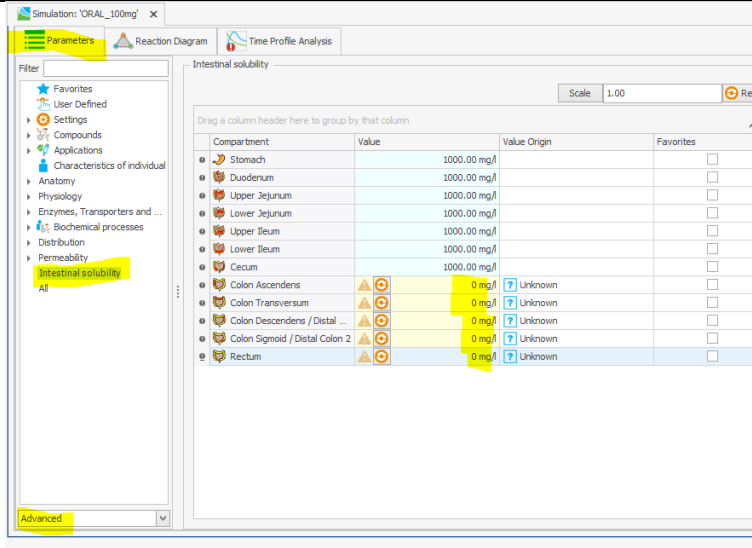
File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	2.a	*Add GI enzyme in individual*	Add "ENZ_GI" for individual Man30	
	2.a	*Add GI enzyme in individual*	Add relative expression = 1 in small intestine mucosa and keep other inputs as default	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	2.b	*Add enzyme in compound*	Add "Metabolizing enzyme" for ENZ_GI in compound Drug	
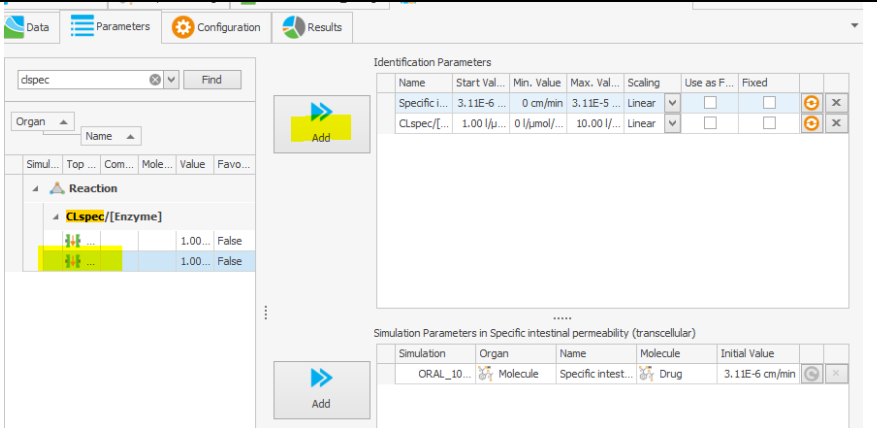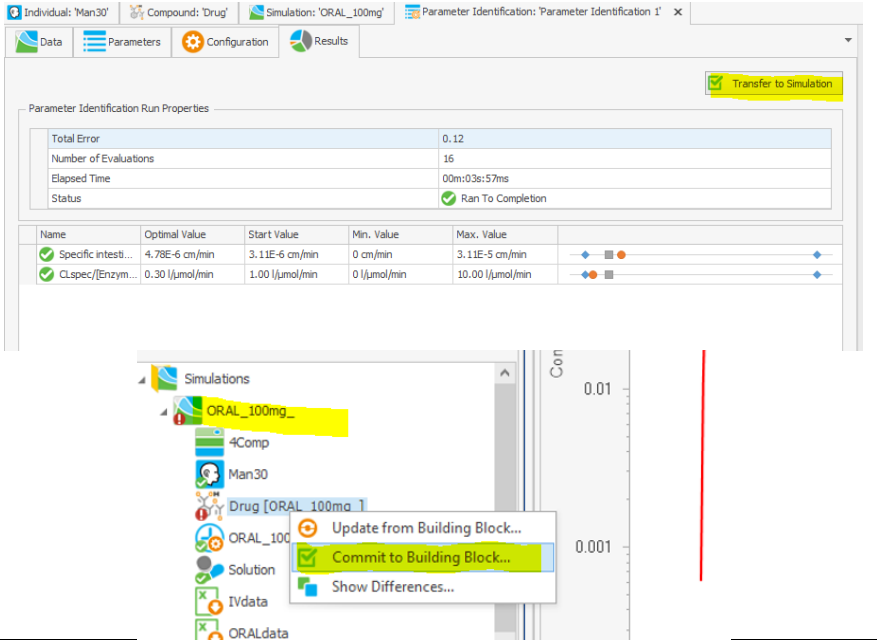
File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	2.b	*Add enzyme in compound*	Fill in, ENZ_GI, in vitro, CL-first other, Enzyme concentration and specific clearance 1 µmol	
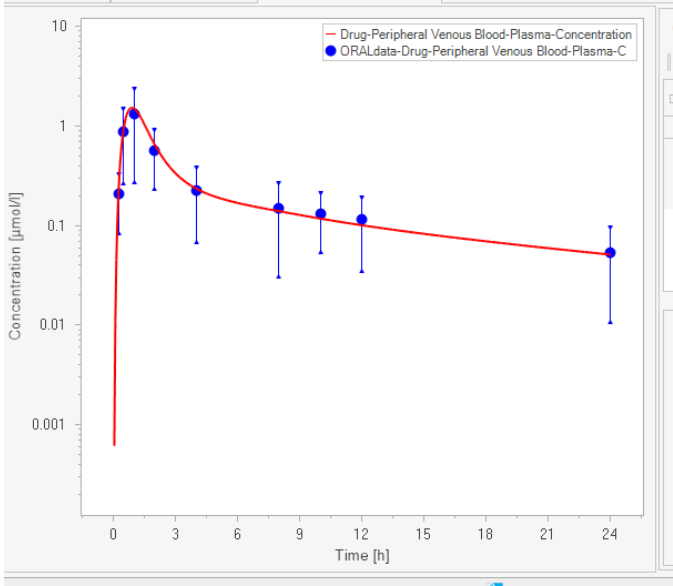
File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	2.b	*Add enzyme in compound*	Create new "specific intestinal permeability value" (PI) set to calculate value (3.11E-6 cm/min)	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	3.a	*Simulate oral model performance*	Update "Man30" and "Drug" from Building Block and Select the "Drug" in automatically opened configuration window	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	3.b	*Simulate oral model performance*	1. Use new permeability value (PI) form drop-down	
	3.b	*Simulate oral model performance*	Exclude absorption from colon ascendens −rectum e.g. by setting intestinal solubility (visible in "Advanced" view-mode) to 0 in these compartments	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	4a	*Parameter Identification*	Create a parameter Identification and include "ORAL_100mg"	
	4a	*Parameter Identification*	Delete IV data	

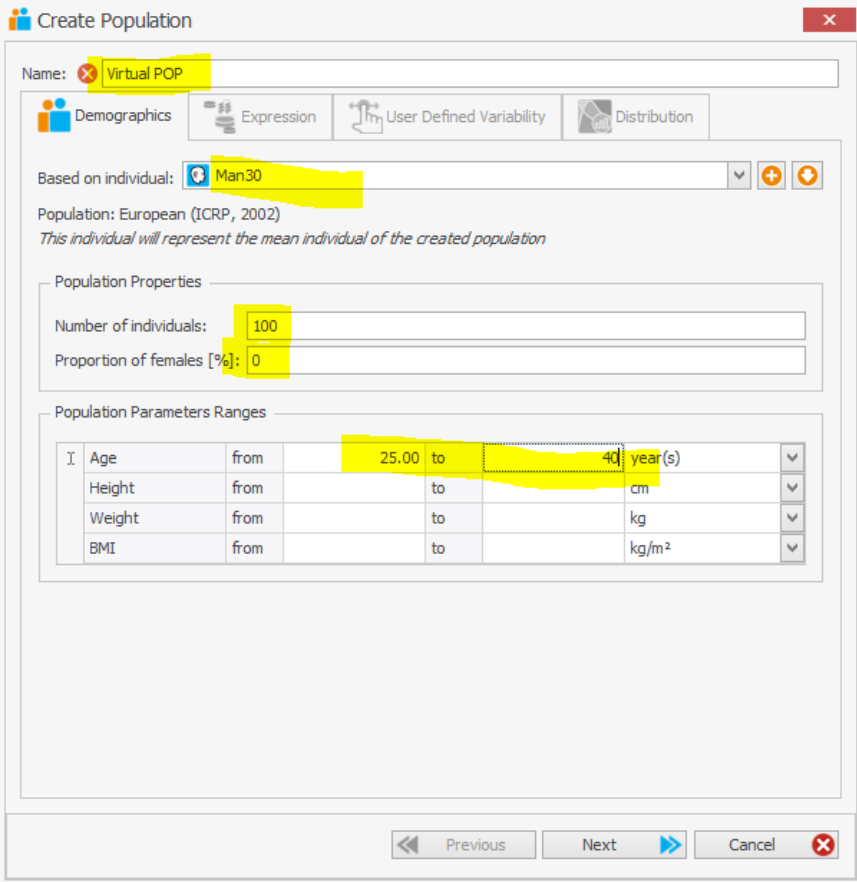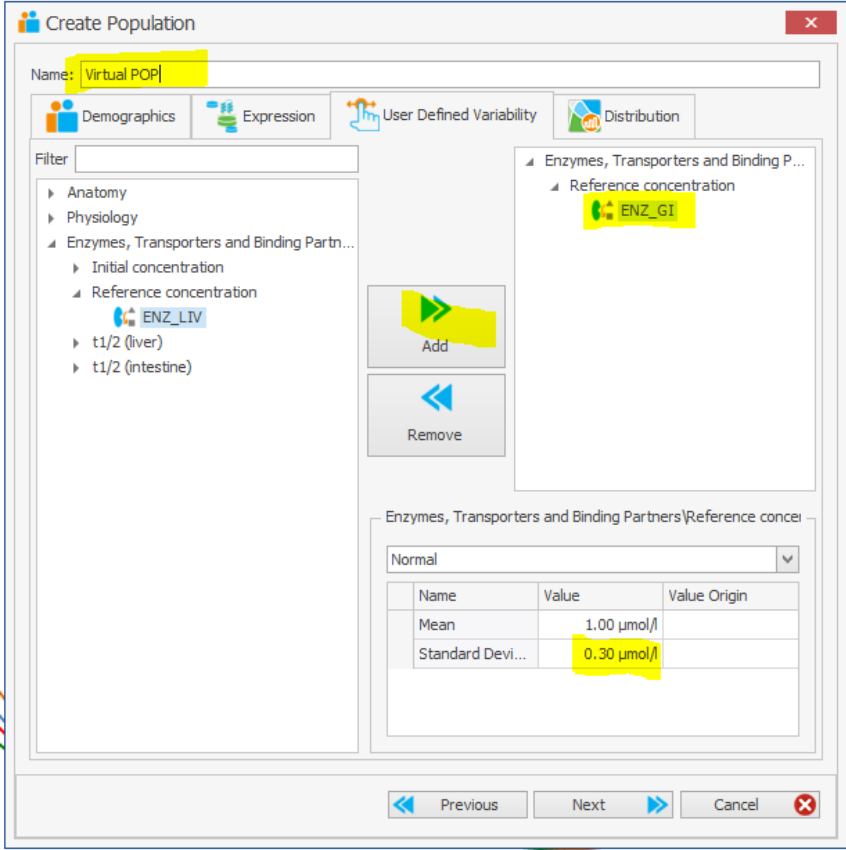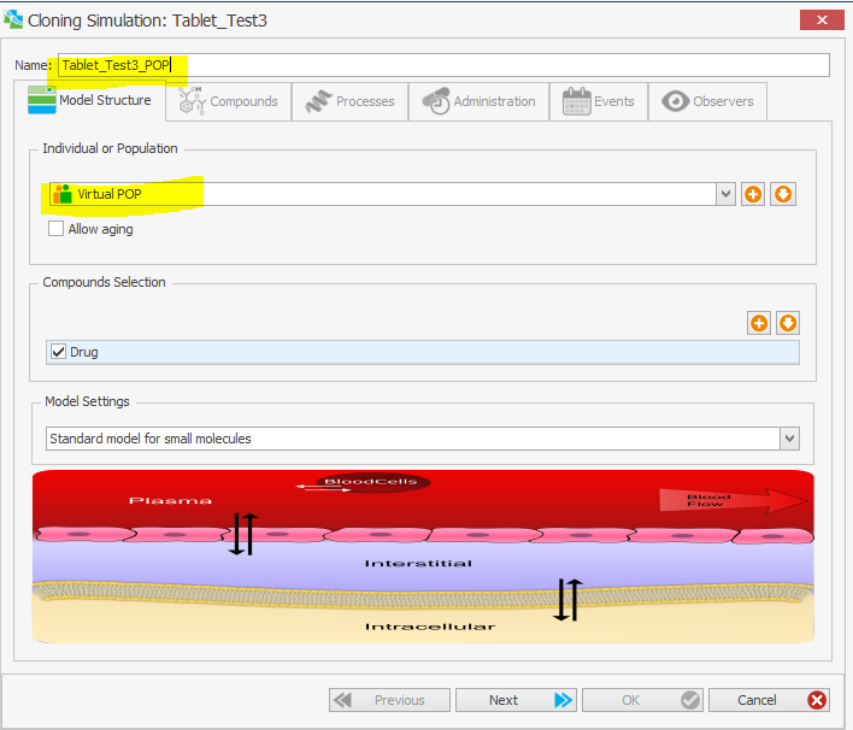| File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	4a	*Parameter Identification*	Select "Specific intestinal permeability (transcellular)" and "CLspec/[Enzyme]" for (only!) ENZ_GI and Run	
	4b	*Transfer Parameter Identification*	Transfer to Simulations from "Results" and "Commit to building block"	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	5.a	*Look at results*		

(4) Formulation performance in virtual populations

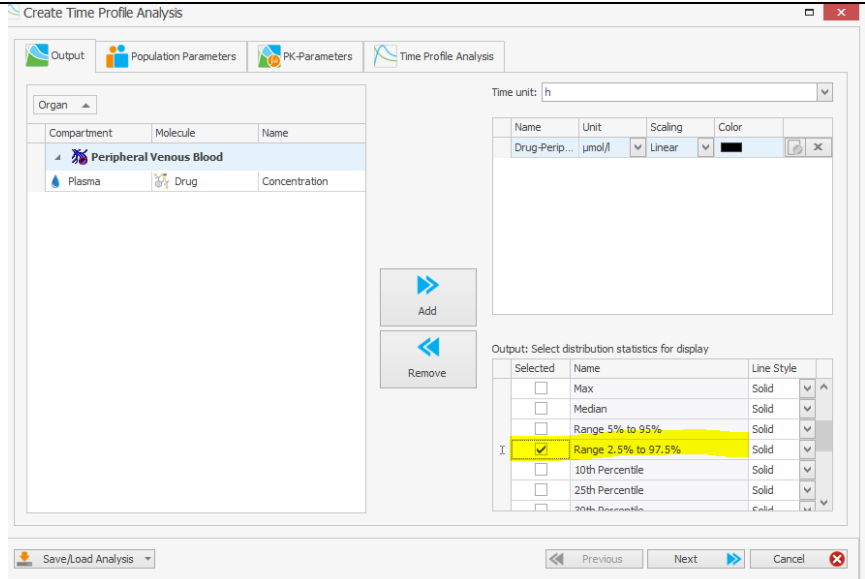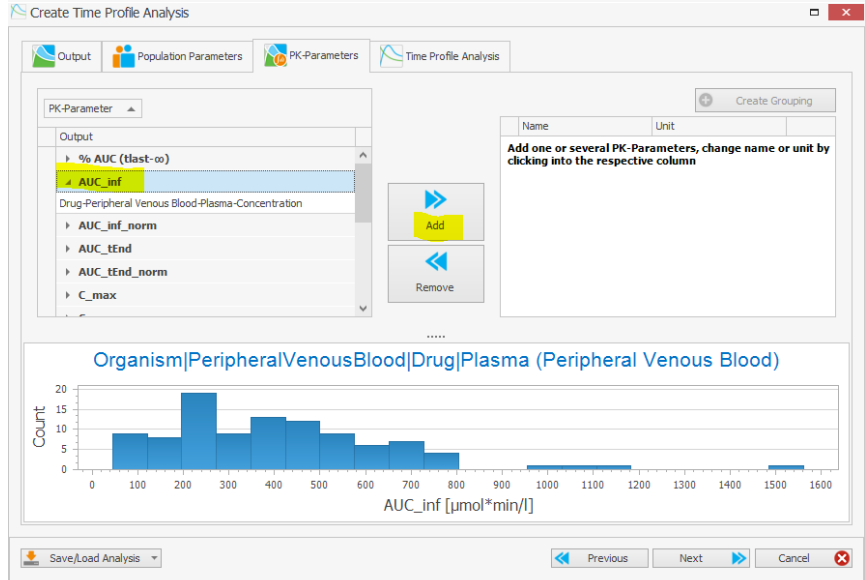|	Step	action	comment	image
	6.a	*Set up simulations for different formulations for typical individual*	Clone simulation "ORAL_100mg" and name "Tablet_Reference" and select formulation "Tablet_Reference. Remove ORALdata observations.	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	6.b	*Set up simulations for different formulations for typical individual*	Clone simulation "Tablet_Reference" to create simulations "Tablet_Test1", "Tablet_Test2" and "Tablet_Test3" and run each simulation.	
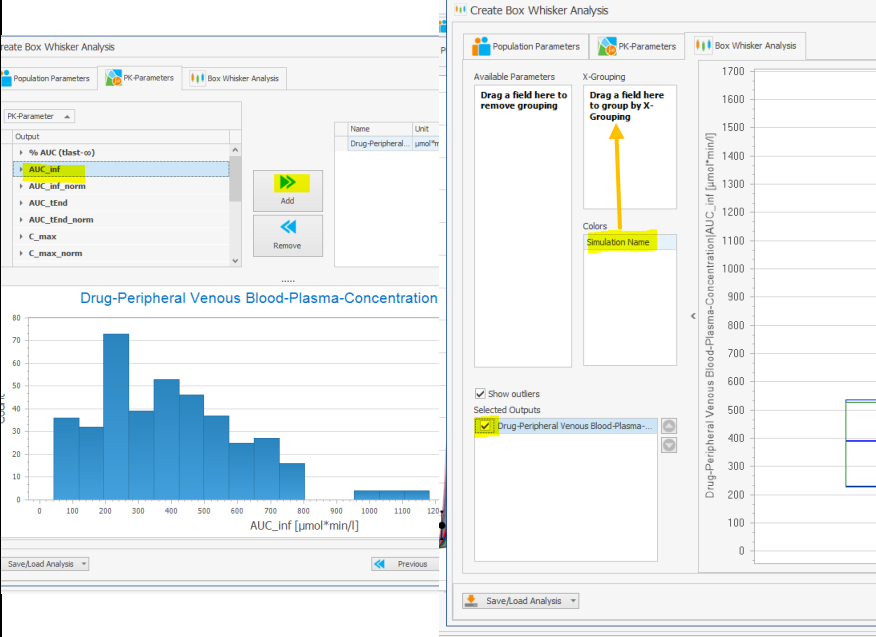
File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	7.a	*Create a virtual population*	Create virtual population based on "Man30", e.g., age 25-40 , 100% men, n=100	

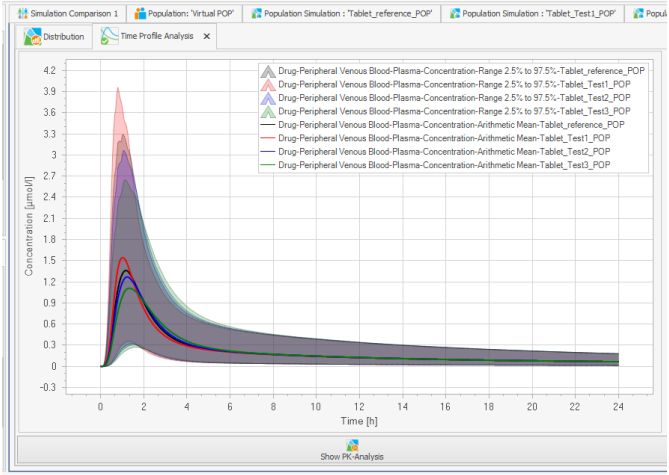| File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	7.b	*Add variability*	Add under "User Defined Variability" ENZ_GI and define variability with a SD of 0.3.	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	8	*Clone tablet simulations*	Clone tablet simulations, add suffix "_POP", and replace "Man30" with created virtual population for all tablet forms	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	9	*Run simulations*	Run all formulations and add the 95% quantile and add AUC_inf and C_max for PK-parameters check.	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	10.a	*Visualize results*	Make a simulation comparison of all Tablet forms under "Run & Analyze" and then "Compare Results". Select all pop tablet formulations. Select the 95% quantile under output and add AUC_inf and C_max under PK-Parameters.	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	10.a	*Visualize results*	Time Profile comparison	
	10.b	*Visualize results*	Make a Box Whisker comparison for AUC_inf by clicking on Box Whisker under analyze. Add AUC_inf and drag Simulation name to X-grouping under Box Whisker Analysis.	

File (Session #2-HandsOn.pksim5)	Step	action	comment	image
	10.b	*Visualize results*	Repeat for C_max	