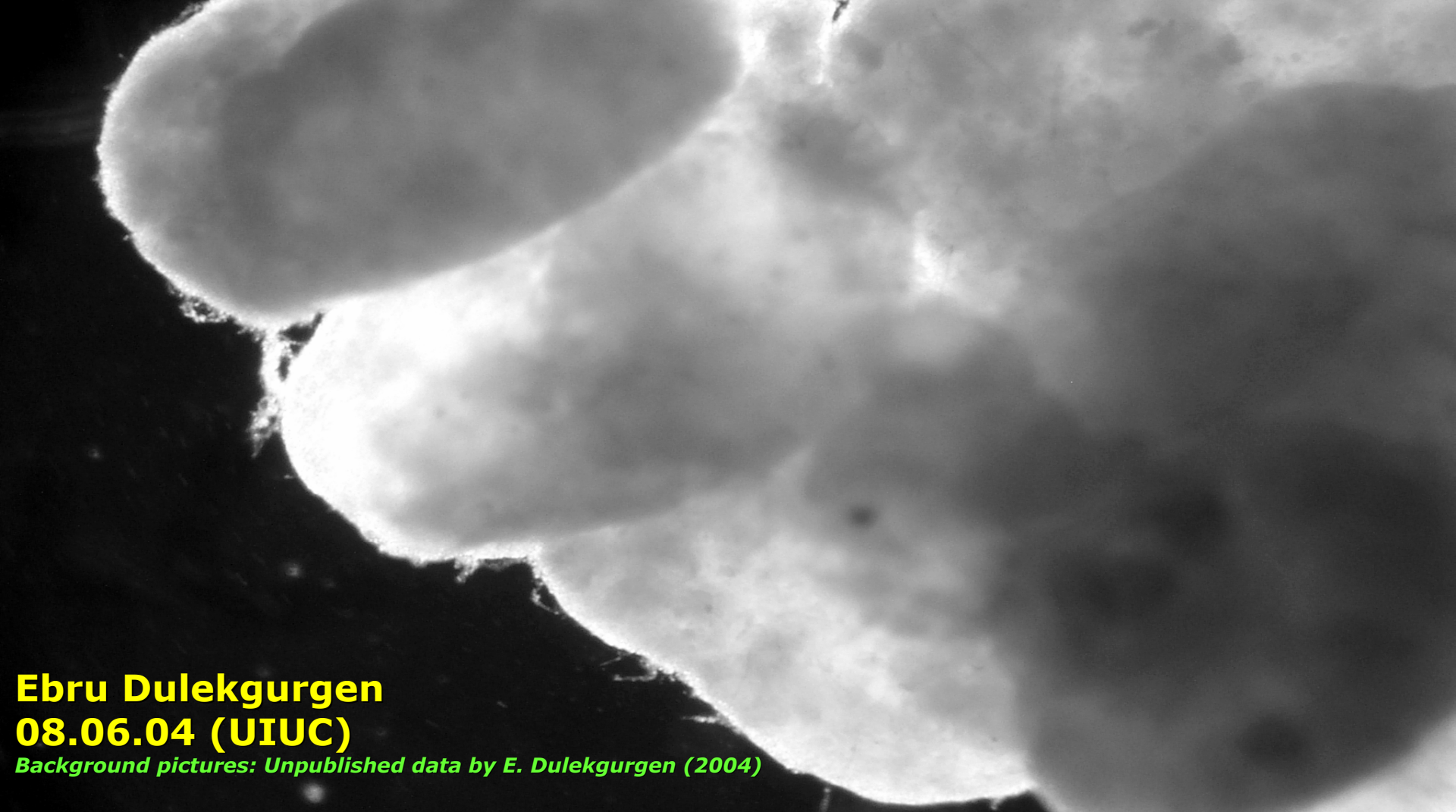
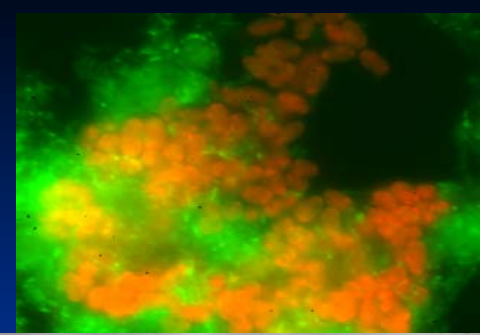
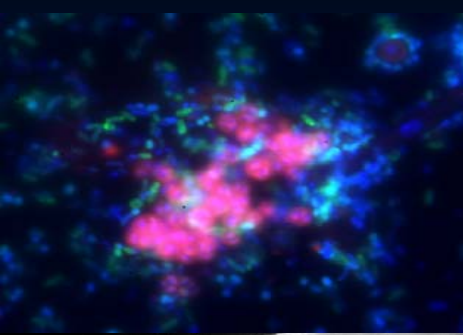


Granulation, P-Dynamics, and Population Shifts in a Column SBR operated for EBPR



Ebru Dulekgurgen
08.06.04 (UIUC)

Background pictures: Unpublished data by E. Dulekgurgen (2004)

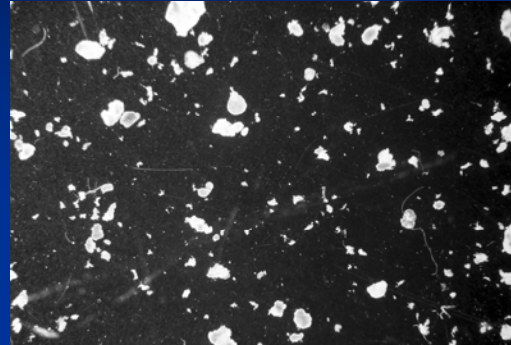
Column SBR

- Column-type SBR, $H/D=74.4/7.2\text{cm}$
- $V_w = 3\text{L}$
- Exchange = 50%
- $Q_{\text{air}} = 150\text{ L/hr}$
- $\text{Power}_{\text{aer}} = 0.26\text{ Watt}$
- $G_{\text{aer}} = 208\text{ sec}^{-1}$
- Influent:
 - 400 mgCOD/L (acetate)
 - 17 mg $\text{PO}_4^{-3}\text{-P/L}$
- Operation:
 - 2hr Anaerobic/ 3hr 44min Aerobic/ 1-5min settling



Column SBR

- **Inoculum (D01):**
EBPR biomass from Carlos's SBR

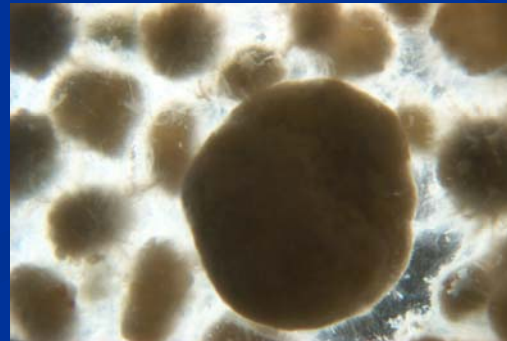


- **Granulation strategy:**
High shear, low settling time (t_s),
slow-growers (PAOs)

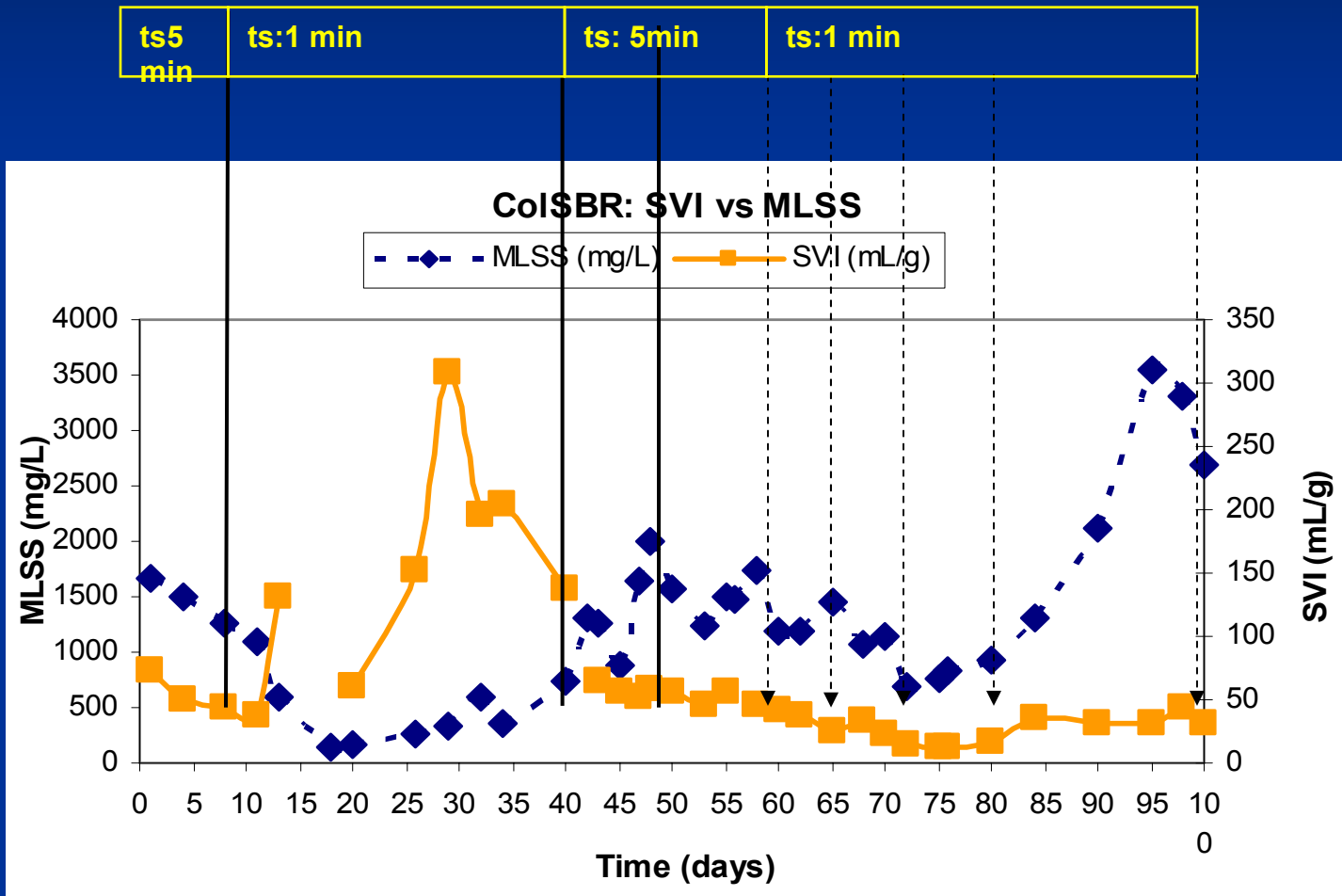
- **Augmentation (D40-D47):**
EBPR biomass from Carlos's SBR



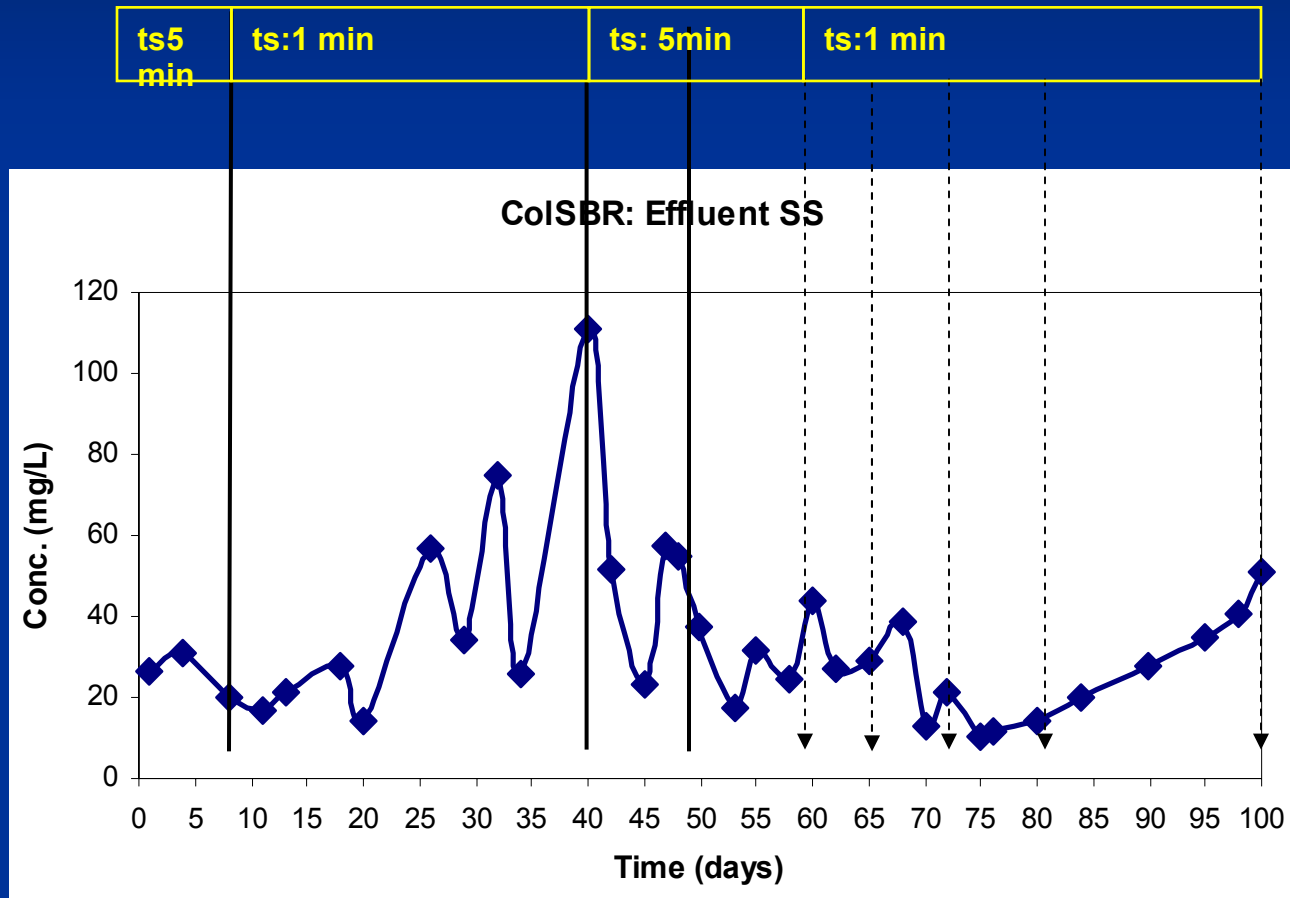
- **Granular Biomass (D99)**



Biomass/Settling

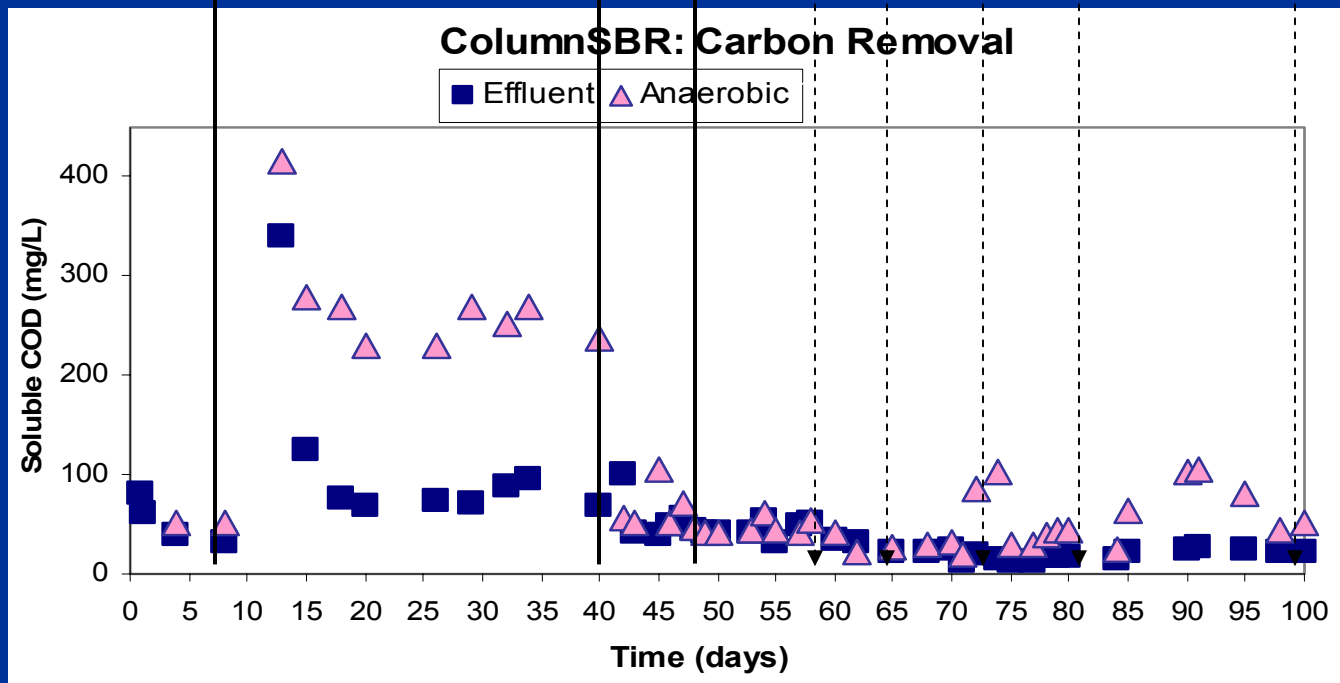


Effluent



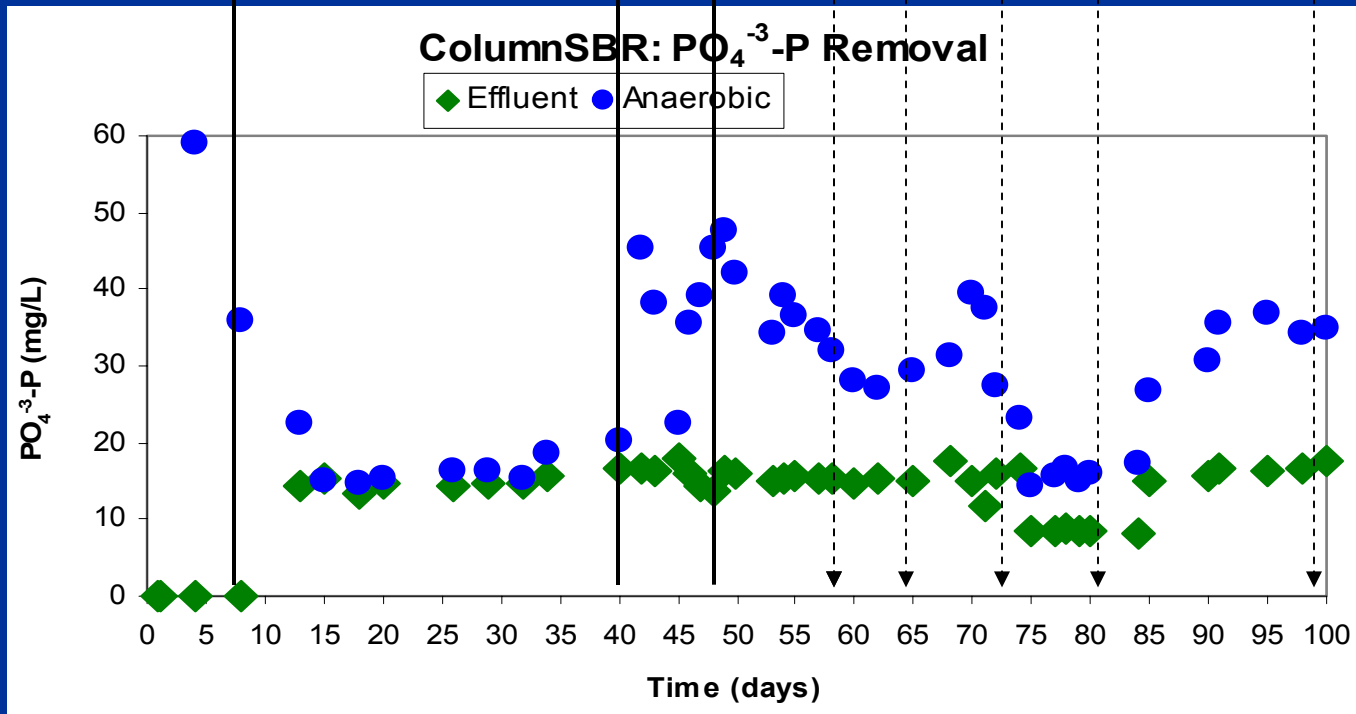
C-Dynamics

Start-up	Biomass washout Extensive FOAMING Extensive BIOFILM 1st granulation	Augmentation1 +2: Foaming and biofilm formation stopped	After Augmentation: 2nd granulation Cycle profiles P-dynamics
ts:5min	ts:1 min	ts:5min	ts:1 min



PO₄⁻³-P Dynamics

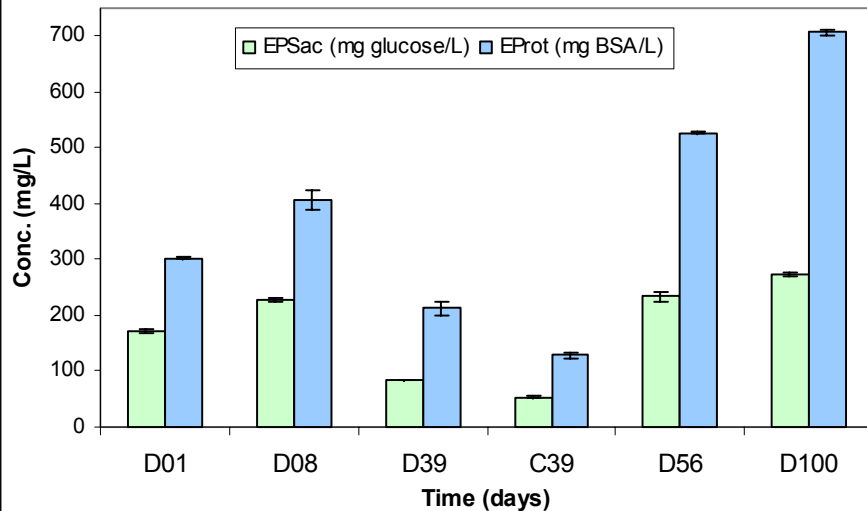
Start-up	Biomass washout Extensive FOAMING Extensive BIOFILM 1st granulation	Augmentation1 +2: Foaming and biofilm formation stopped	After Augmentation: 2nd granulation Cycle profiles P-dynamics
ts: 5min	ts: 1 min	ts: 5min	ts: 1 min



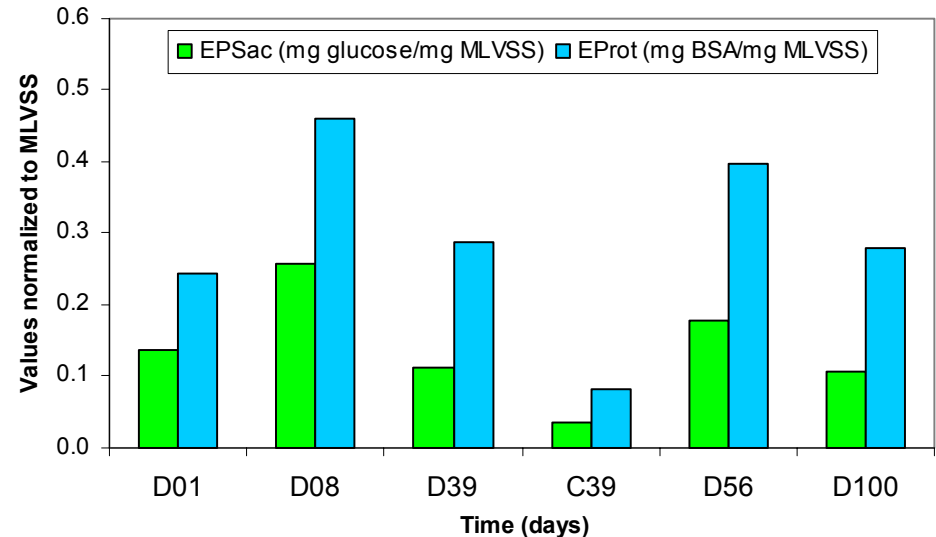
EPS

Extracellular polysaccharides and Proteins

Column SBR: Extracellular Polysaccharides (ECP) and Extracellular Proteins (E Prot)



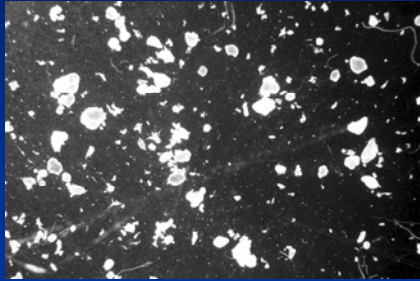
Extracellular polysaccharides and proteins per unit biomass



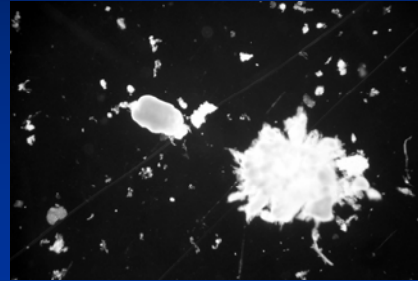
- D01** : Inoculum
- D08** : Before t_s decreased to 1 min
- D39** : Before augmentation
- C39** : Biomass for augmentation (Carlos's SBR)
- D56** : Before t_s decreased to 1 min
- D100** : Granular biomass

EPS

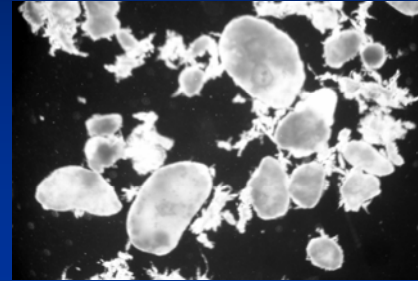
Extracellular polysaccharides and Proteins



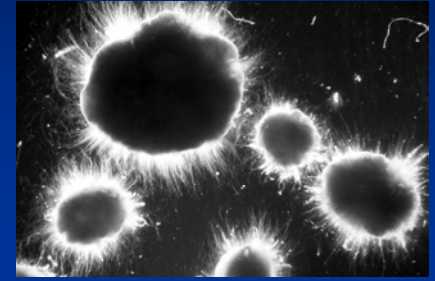
x8



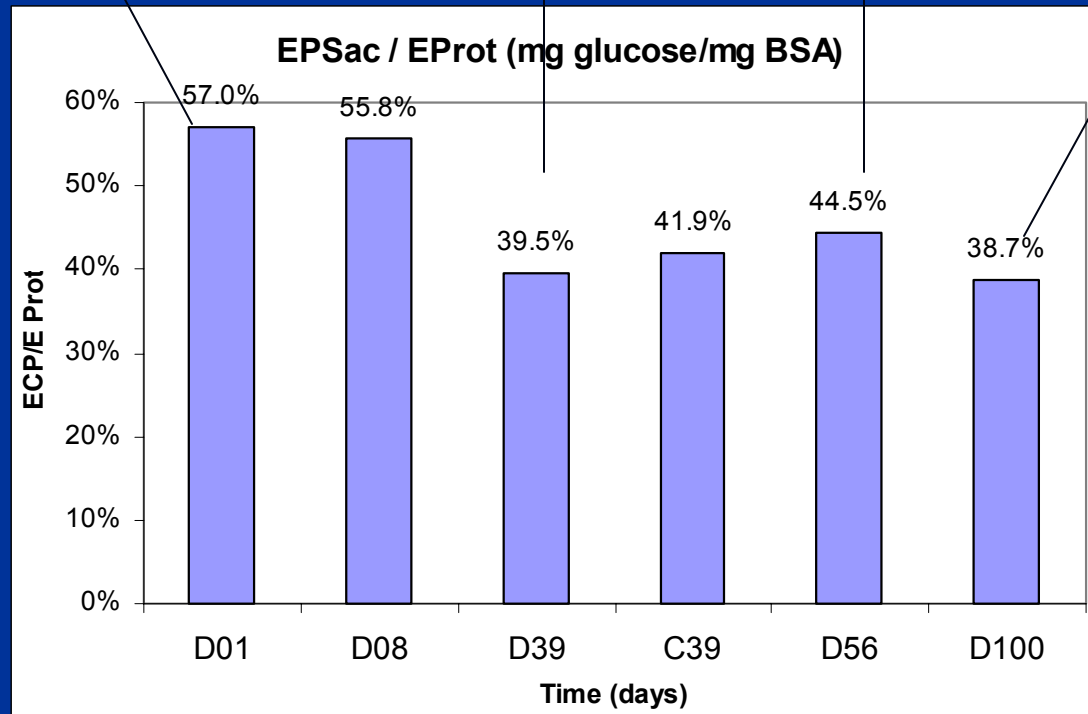
x8



x10



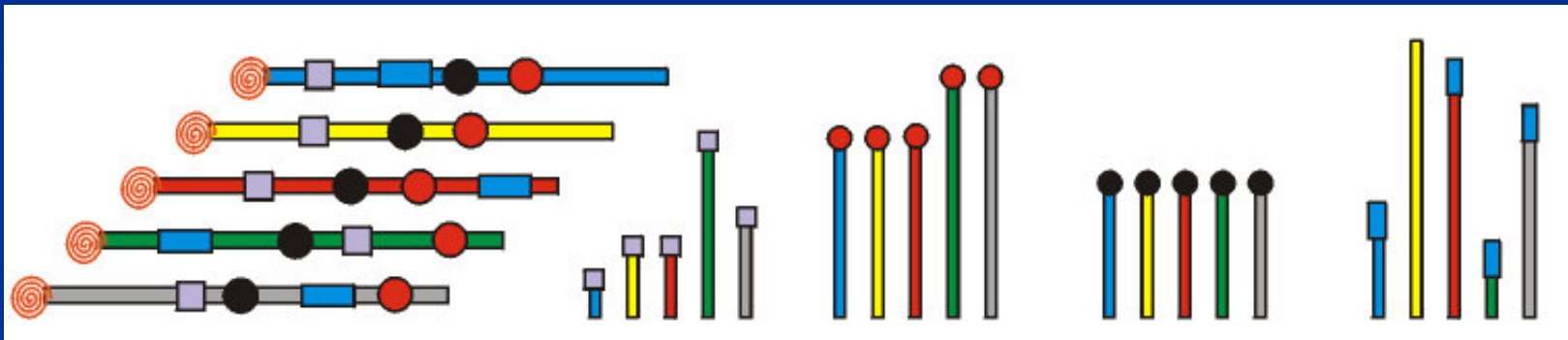
x6



TRFLP to Monitor the Populations

TRFLP?

Terminal Restriction Fragment Length Polimorphism



Extract genomic DNA

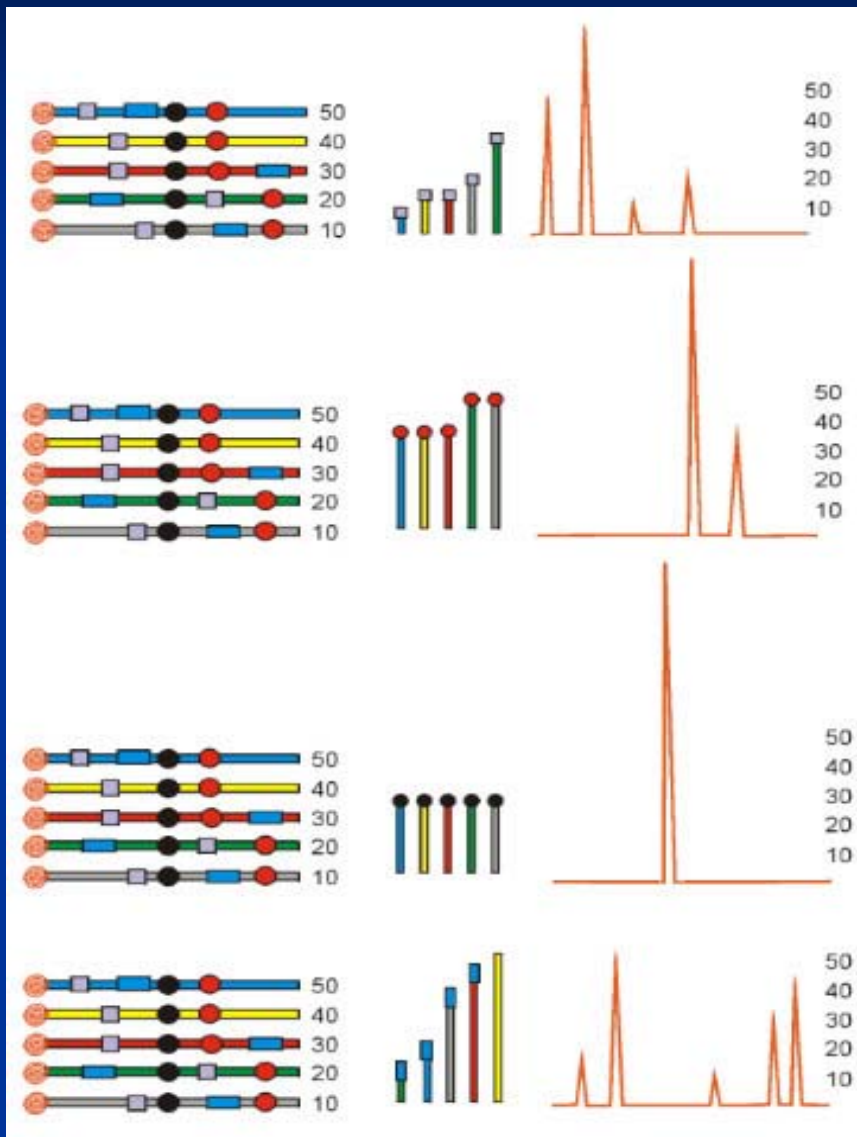
Amplify region on SSU rDNA (PCR)

Use Fluo-labeled primer (PCR: *Eub338 and Univ1392a)

Digest amplicons w/ restriction enzymes

Electrophore the digests

TRFLP to Monitor the Populations



Electropherograms

Good

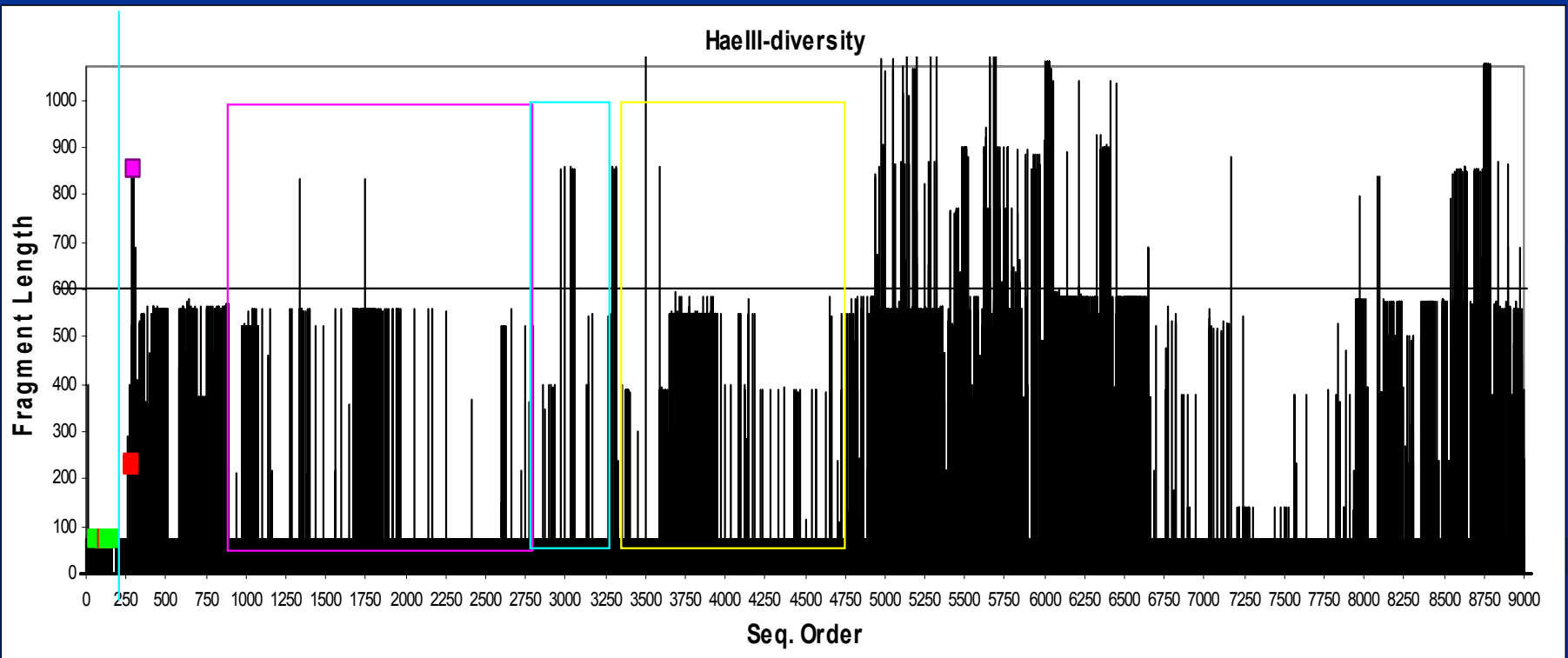
Low

Monomorphic!!

Polymorphic but;

TRFLP to Monitor the Populations

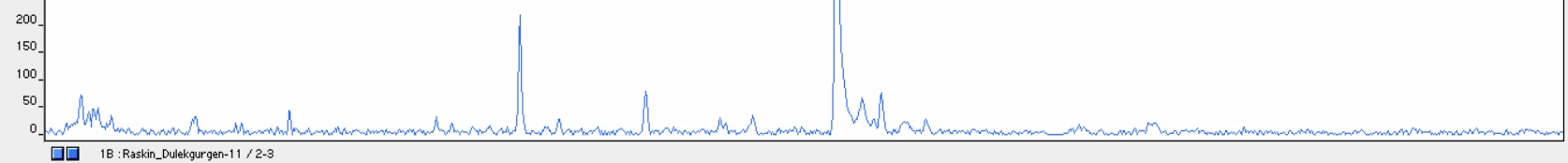
In silico TRFLP: Results of amplification and Digestion



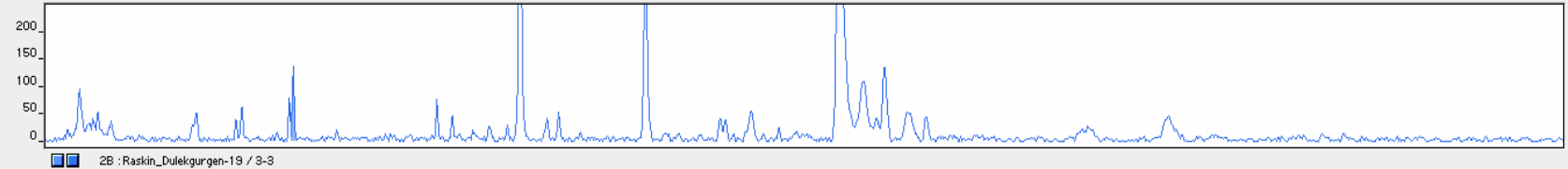
TRFLP to Monitor the Populations

Electrophorogram for PAO population in the Column SBR (Day1-18)

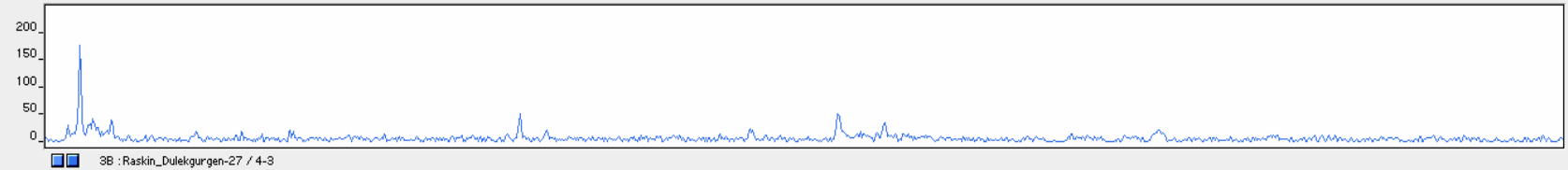
D1



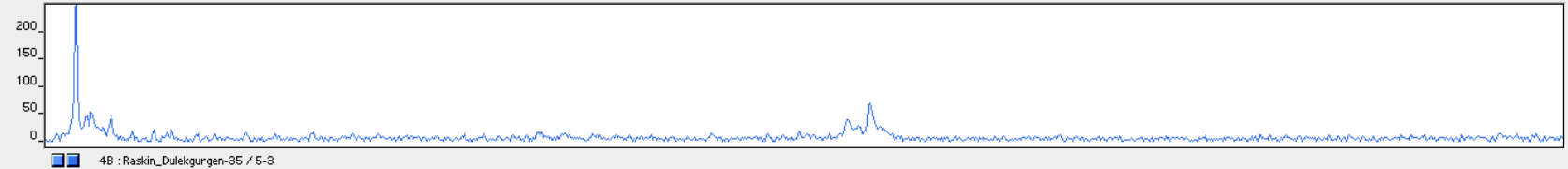
D4



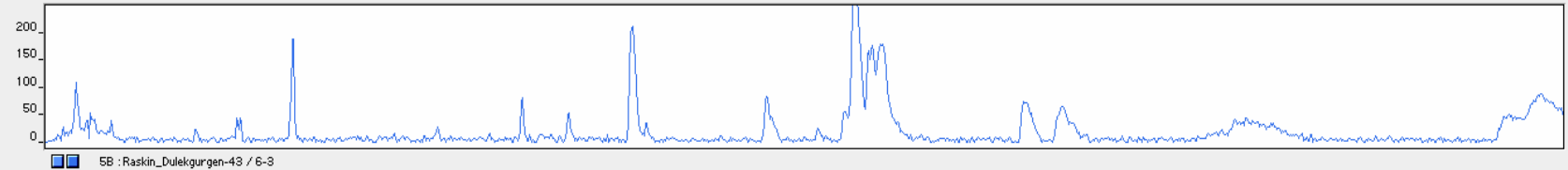
D8



D13



D18

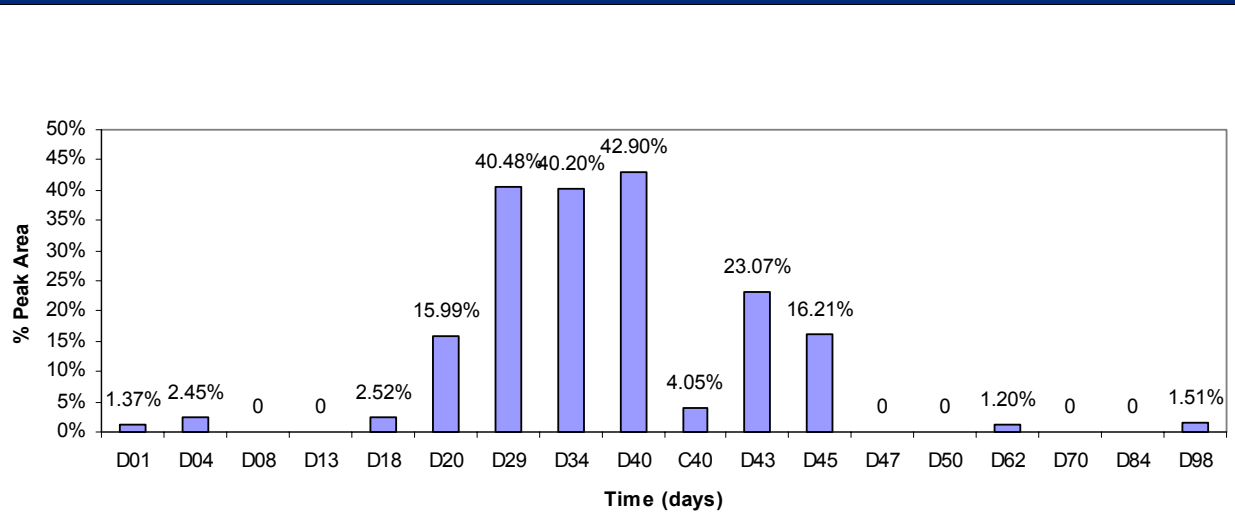


X: Y:

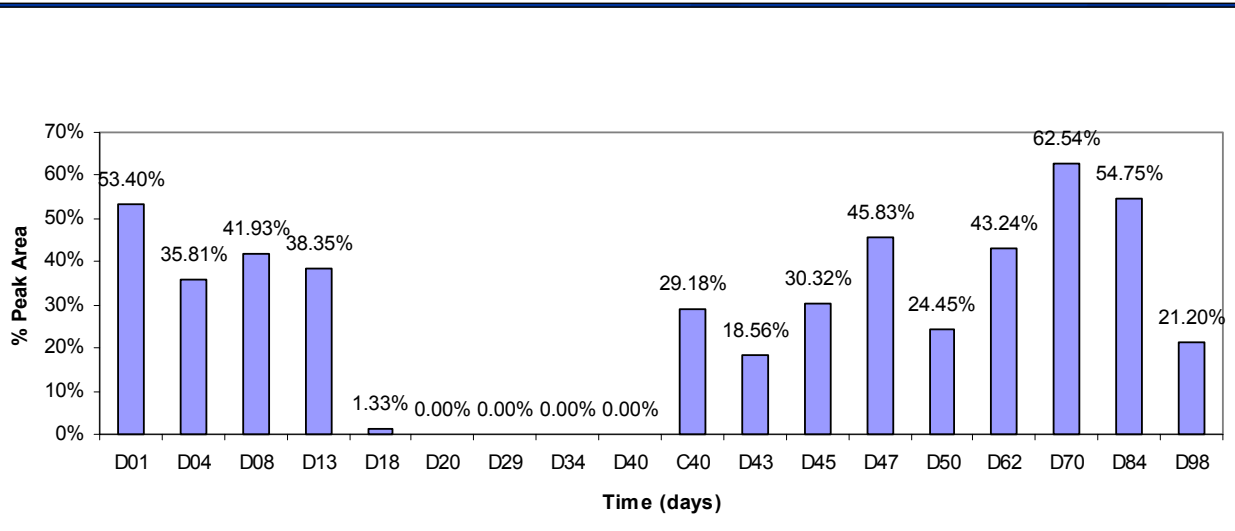
Preliminary TRFLP Results

Significant Results for PAOs and GAOs

PAOs



GAOs



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- Rocky BARIONES, Dominic FRIGON, Adam KLEIN, Carlos LOPEZ, Sudini PADMASIRI, Rob SANFORD, Chuanwu XI
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- Nazik ARTAN, Derin ORHON