

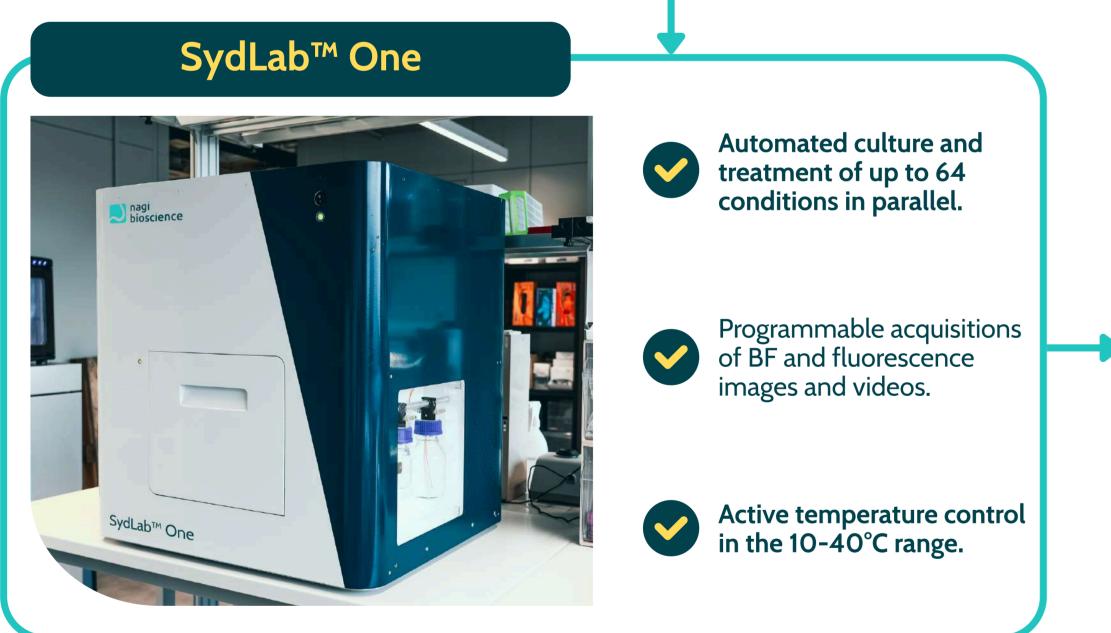


Marie Pierron, Alexnadre Vaudano, Morgane Bourgeois, Lazar Stojkovic, Fabien Tâche, Matteo Cornaglia & Laurent Mouchiroud\* Nagi Bioscience SA, EPFL Innovation Park, Rue des Jordils 1A, CH-1025 St-Sulpice, Switzerland. \*email: laurent.mouchiroud@nagibio.ch

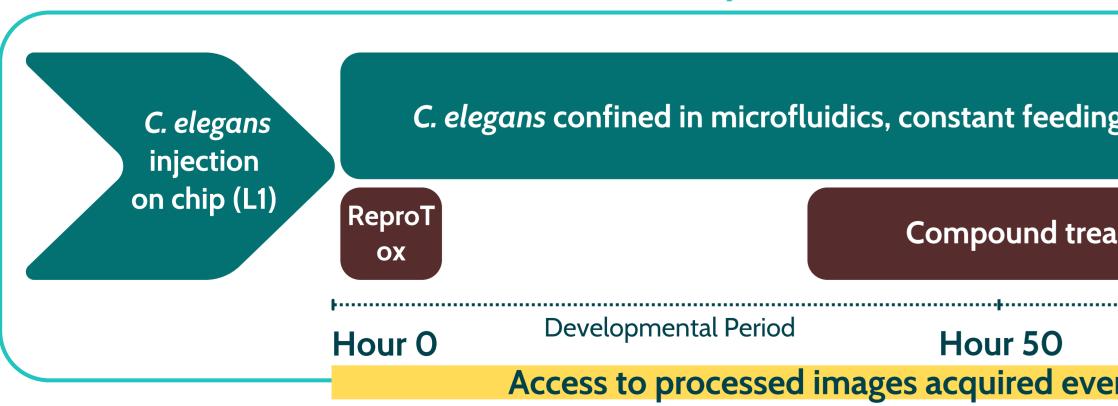
Conventional toxicological assays have limitations: cellular models lack organismal complexity, and vertebrate testing is costly, ethically constrained, and low throughput. **RESULTS 1 - Dose-dependent response to Paraguat and 5-Fluorouracil (5-FU) A** Multi-phenotypic analysis- Paraquat **C** Mitochondrial stress response to Paraguat from L1: 125 µM 1.5 125 µM —250 μM — 500 μM — control ÷ 2500 End points NOAEL (mM) **Maternal Maximum length** b 20 1.0-● 2.5 <u>v</u> 2000 Growth dynamic effects 2.5 ⊇ 1500 2.5 500 µm Repro Sexual maturity 0.16 0.5toxicity 250 µM 500 µM 出 1000 Egg accumulation 0.16 500 **Embryo survival** 0.16 Larvae emergence 0.16 Larvae accumulation 0.63 time (hours) Paraguat (mM **B** Multi-phenotypic analysis- 5-FU **D** Mitochondrial stress response to Paraquat from L4: 125 µM control <u>;</u> 2500 15 16 NOAEL (µM) paraguat <u>v</u> 2000 Maternal Maximum length >100 MWM patented technology: Microfluidic chips relying on passive t.0− effects Growth dynamic >100 j 1500 ->100 hydrodynamics. Fertility Repro - 1000 -Sexual maturity >100 500 µM toxicity 250 µM 명 0.5 Egg accumulation 50 500 **Embryo** survival 50 Larvae emergence 50 64 fluidic lines = 64 independent 0.0<sup>4</sup> Larvae accumulation experimental conditions  $\infty$ 60 80 40 12.5 (SydLab<sup>™</sup> One has a max. capacity for 4 time (hours) 5-FU (µM) 3-32 chips in parallel). 0.5 mm CONCLUSION BN Paraquat induces major maternal adverse effect (AE) at high doses (NOAEL: 2.5mM) and significant reprotoxic effect at lower doses (NOAEL: 0.16mM). ~1000 organisms in total total Expression of the mitochondrial stress reporter (hsp-6::GFP) is increased by paraquat treatment at L1 stage but not by the treatment at L4 stage. Therefore, Paraguat induced AE are not correlated with mitochondrial stress response. As reported, 5-FU has no maternal AE at the doses tested but a strong reprotoxic impact at mid doses (NOAEL: 50µM). **RESULTS 2 - Blind testing of 21 benchmark chemicals** SydLab™ One SydLab™ Analyzer Suite Automated culture and User-friendly software to treatment of up to 64 6 concentrations vs solvant (µM): run and mnitor conditions in parallel A ----bioscience experiments. DC BLOR Street server parymethet is made in the <12 37 75 111 333 >1000 3 technical replicates per experiment 2 independent experiments Programmable acquisitions Benza Time-resolved / highof BF and fluorescence content data extracted images and videos. 요~~ 노~~ using Al Dexa Positive pred. = 93.3% Diphe Active temperature control in the 10-40°C range. Negative pred. = 66.7% Integrated statistical analysis and data **Accuracy = 85.7%** Drug toxicity and efficacy profiling interpretation algorithms Lith Specificity = 80% Metho 14 Sensitivity = 87.5% SydLab<sup>™</sup> One Negative Positive Sodi **C. elegans toxicity with SYDLAB™ One SydLab**<sup>™</sup> *C. elegans* confined in microfluidics, constant feeding and image acquisition C. elegans Balanced Accuracy = 83.8% Analyzer Suite injection on chip (L1) **Real-time data** ReproT Compound treatment (L4 stage) extraction and CONCLUSION ΟΧ AI-based analysis This study highlights the strong advantages of our innovative technology which yield (1) reproducible and accurate results thanks to standardized **Developmental Period Reproductive Period** protocols, (2) an automated dosing of chemicals with low liquid consumption and (3) multi-phenotypic readouts in real-time. SydLab™ One represents the first «all-in-one» *C. elegans* microfluidic lab that contributes to the rapid identification of toxic compounds in the early stages of the drug Hour 50 Hour 130 Hour O Access to processed images acquired every hour and datasets discovery pipelines.

Caenorhabditis elegans provides a promising alternative, enabling whole-organism testing at an in vitro-like scale with easier handling and lower costs. To enhance scalability, we developed SydLab<sup>m</sup> One, an automated microfluidic platform for culturing, treating, and imaging *C. elegans* populations throughout their lifecycle. Hourly brightfield and fluorescence imaging, combined with machine learning-based analysis, generate multi-phenotypic data for both parental C. elegans and progeny. Our High-Content Screening (HCS) approach provides early insights into chemical modes of action, while fluorescence imaging with reporter strains expands phenotypic readouts for mechanistic studies. We validated SydLab<sup>™</sup> One by screening 21 benchmark chemicals at five concentrations each, including 16 known toxicants (e.g., methotrexate, thalidomide) and 5 considered safe (e.g., sodium chloride, ascorbic acid). The platform achieved 85.7% accuracy in classifying chemical profiles and a 93.3% positive predictive value for toxic effects. These results demonstrate its potential for scalable, high-accuracy toxicological and ecotoxicological testing, supporting early dose calibration and hazard identification. SydLab<sup>™</sup> One: Fully automated compounds testing and multi-phenotypic analysis on *C. elegans* 

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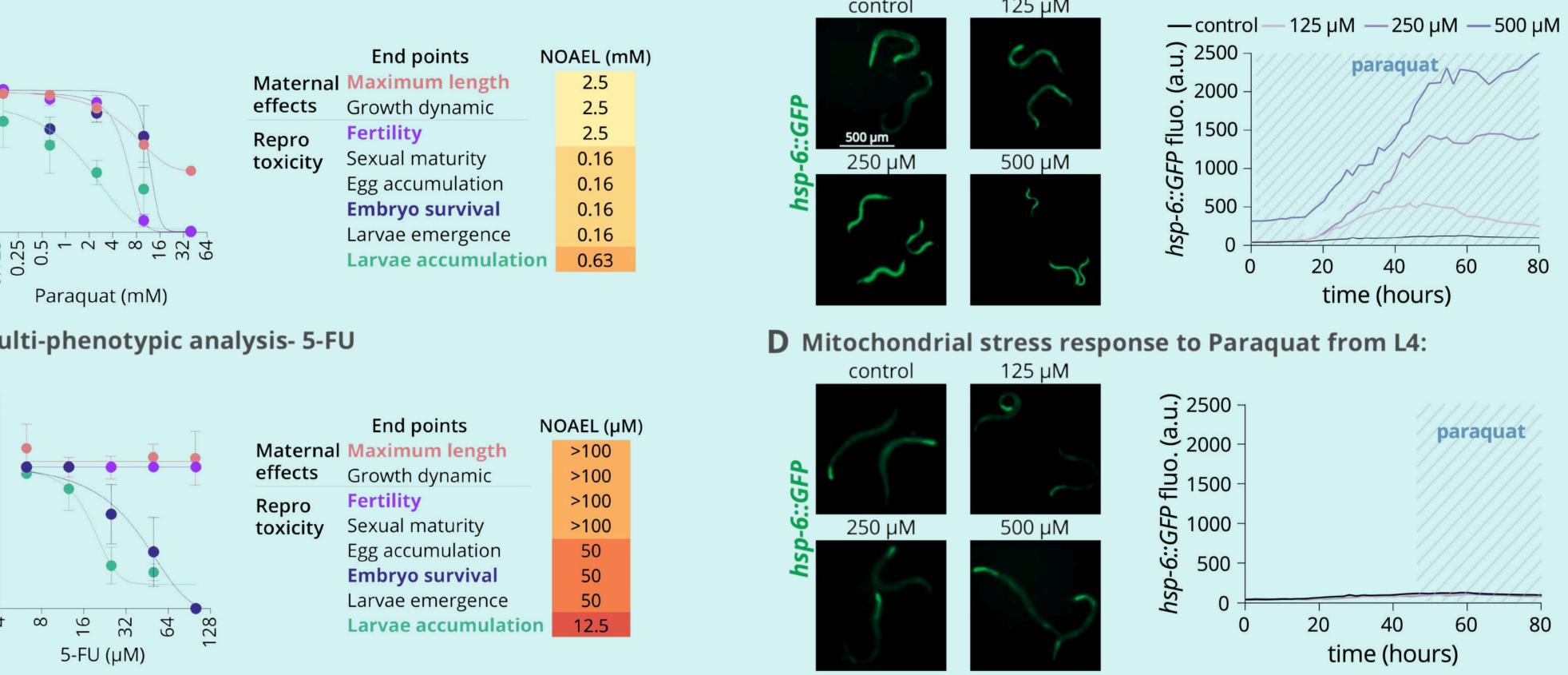


## **Reproductive Toxicity Assay**



### 2025 SOT Annual Meeting and ToxExpo

# SydLab™ One: An Automated Microfluidic Platform for Scalable, High-Content **Toxicological Screening in C. elegans**



	Maximum length	Growth dynamic	Fertility	Sexual maturity	Egg aččumul.	Embryo survival	Larvae emergence	Larvae accumul.	Progeny growth	Conclusion		ic profil ertebrate	:	Predictive			6
-Fluorouracil		00			ш.()					Reprotoxicity		Toxic	,	Yes			
Ascorbic acid										No AE Observed		Negative	`	Yes			
alkonium chl.										Maternal AE		Toxic	,	Yes			4
Bisphenol A										Maternal AE		Toxic	,	Yes			
Busulfan										Reprotoxicity		Toxic	`	Yes			Γ
kamethasone										Maternal AE		Toxic	`	Yes			
enhydramine										No AE Observed		Negative	`	Yes		ive	
Fingolimod										Maternal AE		Toxic	,	Yes	ť	Negative	1
Hydroxyurea										Maternal AE		Toxic	,	Yes	toxicity	Ne	
Imatinib										Maternal AE		Toxic	,	Yes	e to		
nium chloride										No AE Observed		Toxic		No	rate		
Methotrexate										Embryotixicity ef	fect	Toxic	`	Yes	tebi		
oxyacetic acid										Maternal AE		Toxic	`	Yes	Verte	ive	
Paraquat										No AE Observed		Toxic		No		Positive	1
Penicilin G										No AE Observed		Negative	`	Yes		Å	
Phenytoin										Reprotoxicity		Toxic	`	Yes			
Progesterone										Maternal AE		Negative		No			
ium Chloride										No AE Observed		Negative	`	Yes			
Tetracycline										Maternal AE		Toxic	`	Yes			
Thalidomide										Maternal AE		Toxic	`	Yes			
Thiamazole										Reprotoxicity		Toxic		Yes			







