THE FUTURE OF TOXICITY TESTING

Testing Approaches

CURRENT Animal Based		FUTURE Biological Pathway Based
~60%	CURRENT PREDICTIVE POWER	~55%
2500 BITS OF DATA PER WEEK	DATA GENERATED	1.4 MILLION BITS OF DATA PER WEEK
$3 MILLION	COST PER CHEMICAL	$6000
20 CHEMICALS PER YEAR	TESTING CAPACITY	4000 CHEMICALS PER YEAR
70%	FUTURE PREDICTIVE POWER	>90%

PROCESS EXAMPLE
EPA Pesticide Testing

CURRENT APPROACH

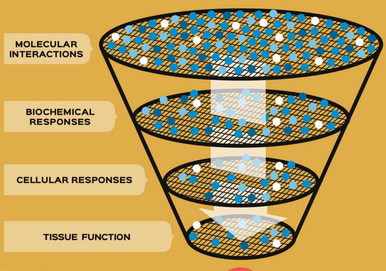
Test each chemical for every possible adverse outcome using -

ACUTE STUDIES	SUBCHRONIC & CHRONIC STUDIES	CANCER BIOESSAYS	REPRODUCTIVE STUDIES
x 300	x 642	x 960	x 2600
x 80	x 40	x 4	x 400
x 60	x 50		x 360
x 2			

NEAR-FUTURE APPROACH

Use existing information from -

Prioritize and screen chemicals.



Remaining chemicals analyzed for adverse outcomes with focused in vivo testing.

OPTIMAL APPROACH

Use EXISTING information from -

1 + EXPOSURE INFORMATION

INFORMATION | CHEMICALS

2

Testing strategy

PATHWAY: cell → tissue → organ → organism

test 1 | test 2 | test 3 | etc. as needed

TESTING STRATEGY BASED ON CONTEXT

Screening information to identify pathways & methods for further testing

SYSTEMS BIOLOGY KNOWLEDGE

TOXICANT EXPOSURE | MOLECULAR EVENT | CELLULAR RESPONSE | ORGAN | ORGANISM | POPULATION

3 4 5

Qualitative & quantitative information

6

PREDICTION – for – SAFE USE