

Newborn Screening

Today and Tomorrow

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Basic Questions in Newborn Screening

- Who should be tested?
- When should the test be done?
- How should the analysis be done?
- What should be done with the results?



Dr. Robert Guthrie
(1916-1995)



Chronology in NYS

- | | |
|------|------------------------------|
| 1963 | Guthrie leads national study |
| 1965 | NY begins PKU testing |
| 1968 | MSUD and GAL added |
| 1975 | SCD and HCY added |
| 1978 | Hypothyroid testing added |
| 1987 | Biotinidase deficiency added |
| 1997 | HIV testing begun |
| 2002 | CF, CAH, MCADD added |



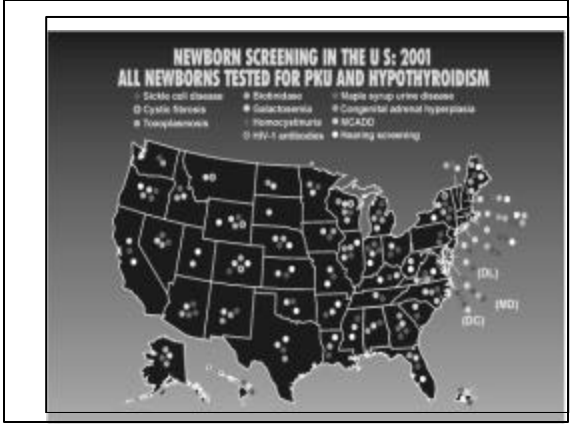
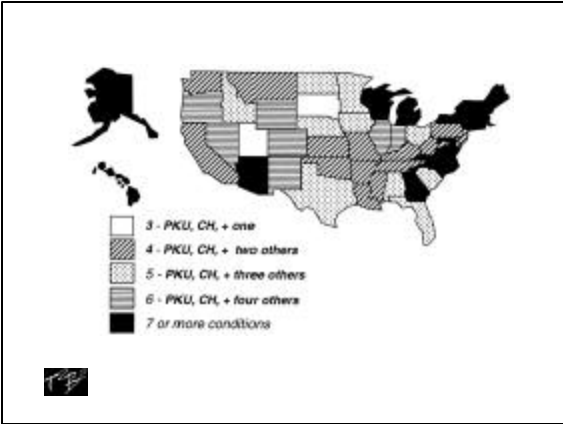
In NYS...

**PHENYLKETONURIA
IN
PUBLIC HEALTH LAW**

§ 2202-a

It shall be the duty of (1) the administrative officer or other person in charge of each institution caring for infants twenty-eight days of age and (2) the person required to register the birth of a child, to cause to have administered to every such infant or child in its or his care a test for phenylketonuria in accordance with such regulations as shall be prescribed by the commissioner.

§ 2. This section shall take effect on January first, one thousand six hundred sixty-five.



NEWBORN SCREENING PROGRAM ANNUAL REPORT - 2001

NEW YORK STATE DEPARTMENT OF HEALTH
HARRISON/1-224-5554
ALBANY, NEW YORK

Screening Test	New York State	Alabama	California	New York City
PKU	16,000			
CH				
Other				
Total	276,000			

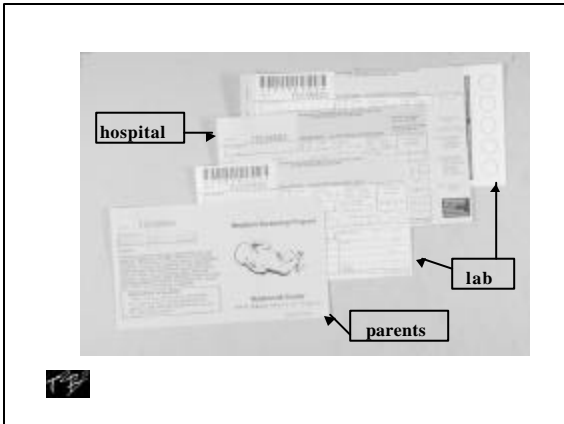
NYS Newborn Screening Profile

- PKU
- MSUD
- Homocystinuria
- Biotinidase Deficiency
- Hypothyroidism
- Galactosemia
- SSD
- HIV

2001

Newborn screening in the US today

- Every state provides a screening program
- PKU and hypothyroidism testing universal
- 15,000 newborns tested daily
- 58 newborns referred daily
- 2.5 infants identified during this talk

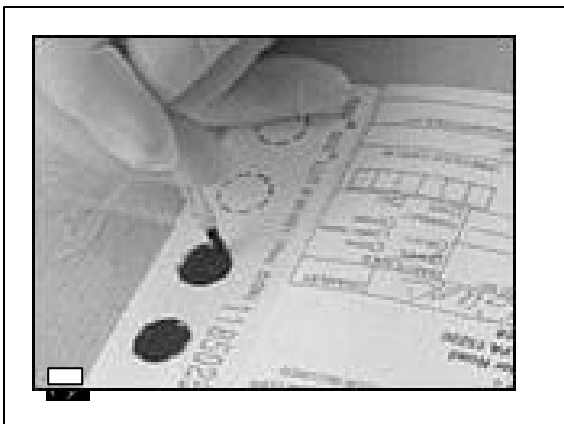


In order to screen, we need:

- identifiable condition, with PH significance
- marker analyte
- assay with appropriate sensitivity and specificity
- therapy

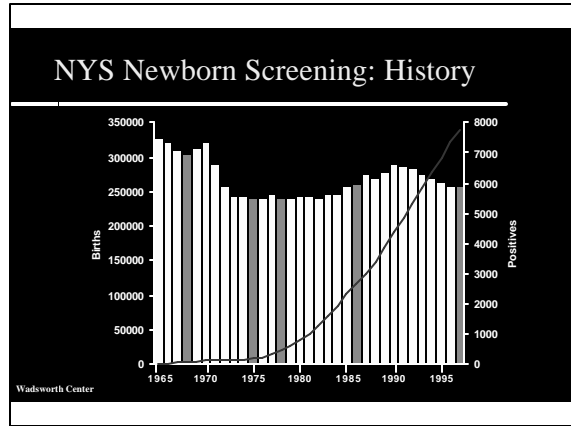
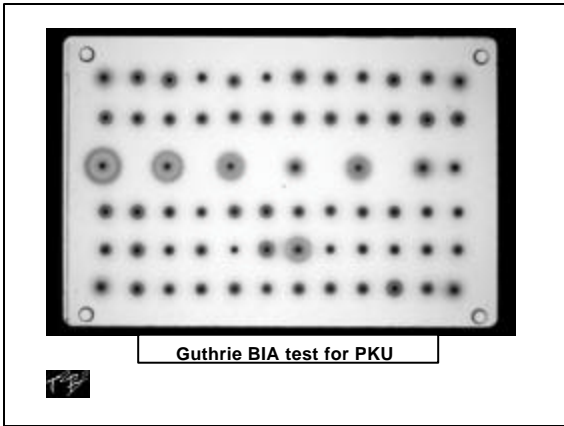
For example:

- identifiable condition, with PH significance
 - phenylketonuria (PKU)
- marker analyte
 - phenylalanine
- assay with appropriate sensitivity and specificity
 - bacterial inhibition assay (BIA)
- therapy
 - dietary restriction of phenylalanine



Many technologies used

Guthrie BIA
RIA
EIA
Electrophoresis
HPLC
MSMS



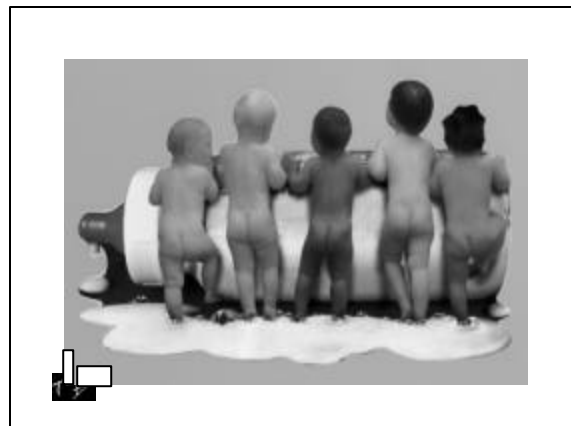
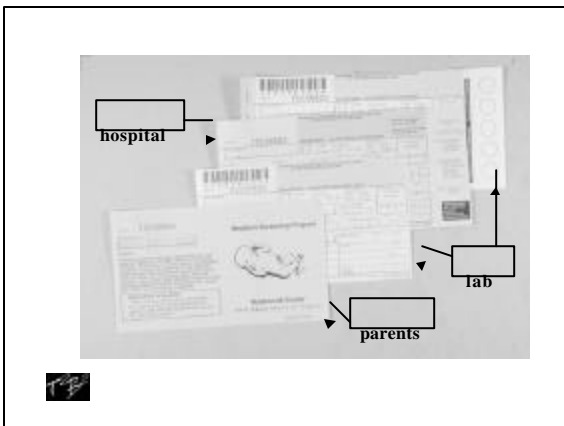
NYS NBS - First 35 years

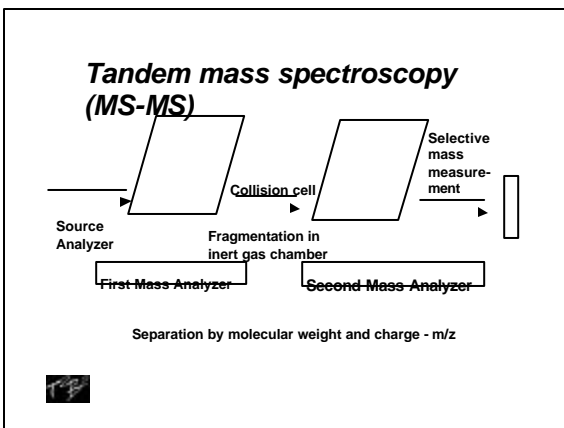
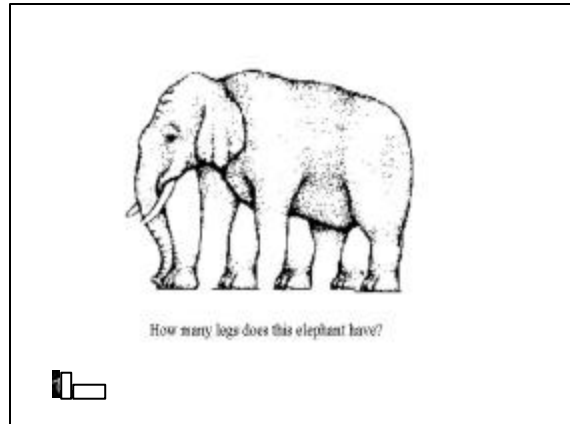
Disorder	Testing Initiated	Infants Tested	Confirmed Cases	Disease Incidence
PKU	1965	8.4 m	466	1:18,000
GAL	1968	6.4 m	118	1:54,000
MSUD	1968	6.4 m	23	1:278,000
HCY	1975	5.4 m	12	1:460,000
SSD	1975	5.3 m	2666	1:2,000
THY	1978	4.6 m	1845	1:2,500
BIOT	1987	2.6 m	30	1:87,000
HIV	1997	0.6m	1080	1:250

U.S. Incidence of Inborn Metabolic Disorders

Adenosine deaminase deficiency	~1,225,000
Biotinidase deficiency	1:72,000-126,000
Galactosemia	1:60,000-80,000
Homocystinuria	1:50,000-150,000
Isovaleric acidemia	~1:50,000
Muscle sialic urine disease	1:250,000-400,000
MC AD	1:10,000-25,000
Methylmalonic acidemias	~1:50,000
PKU	1:10,000-20,000
Propionic acidemia	~1:50,000
Pyroglutamic aciduria	~1:100,000
Tyrosinemia	1:40,000-50,000

Source: American Academy of Pediatrics





Testing profiles - 2010

PKU
hypothyroidism

MSUD	MCAD	G6PD
GAL	CAH	Alpha-1 AT
HCY	CF	
SSD	HIV	
BIOT	Tyr	
Toxo		

Pharmacogenetics

Genetics & Disease Prevention

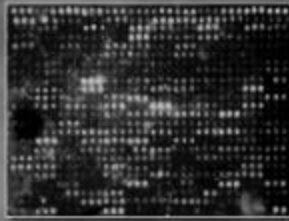
Pharmacogenomics
"Drugs by Design?"

"In the very near future, primary care physicians will routinely perform genetic tests before writing a prescription because (they will) want to identify the poor responders."

F. Collins
(AAFP Annual Meeting, 1998)

CDC

2D6 Chip is now available



The future?

- Financing
- Regionalization
- National (federal) coordination/oversite
- Data collection
- New technology

Remaining Challenges

- Informed consent
- Ownership of specimen
- Which tests to perform?
- Screening or diagnosis- or both?
- Target population?
- Who pays?
- Residual spots ☺

Education continues to be a priority.

