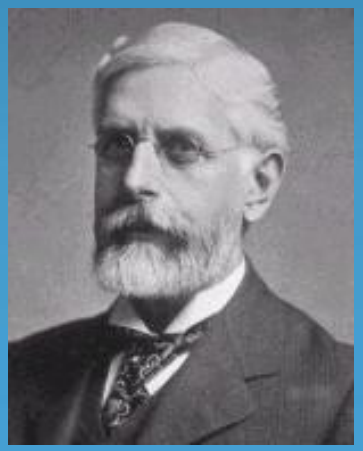
Surveillance and control of *Salmonella* infections in poultry in Israel

Dr. Elyakum Berman
Israel Veterinary Services



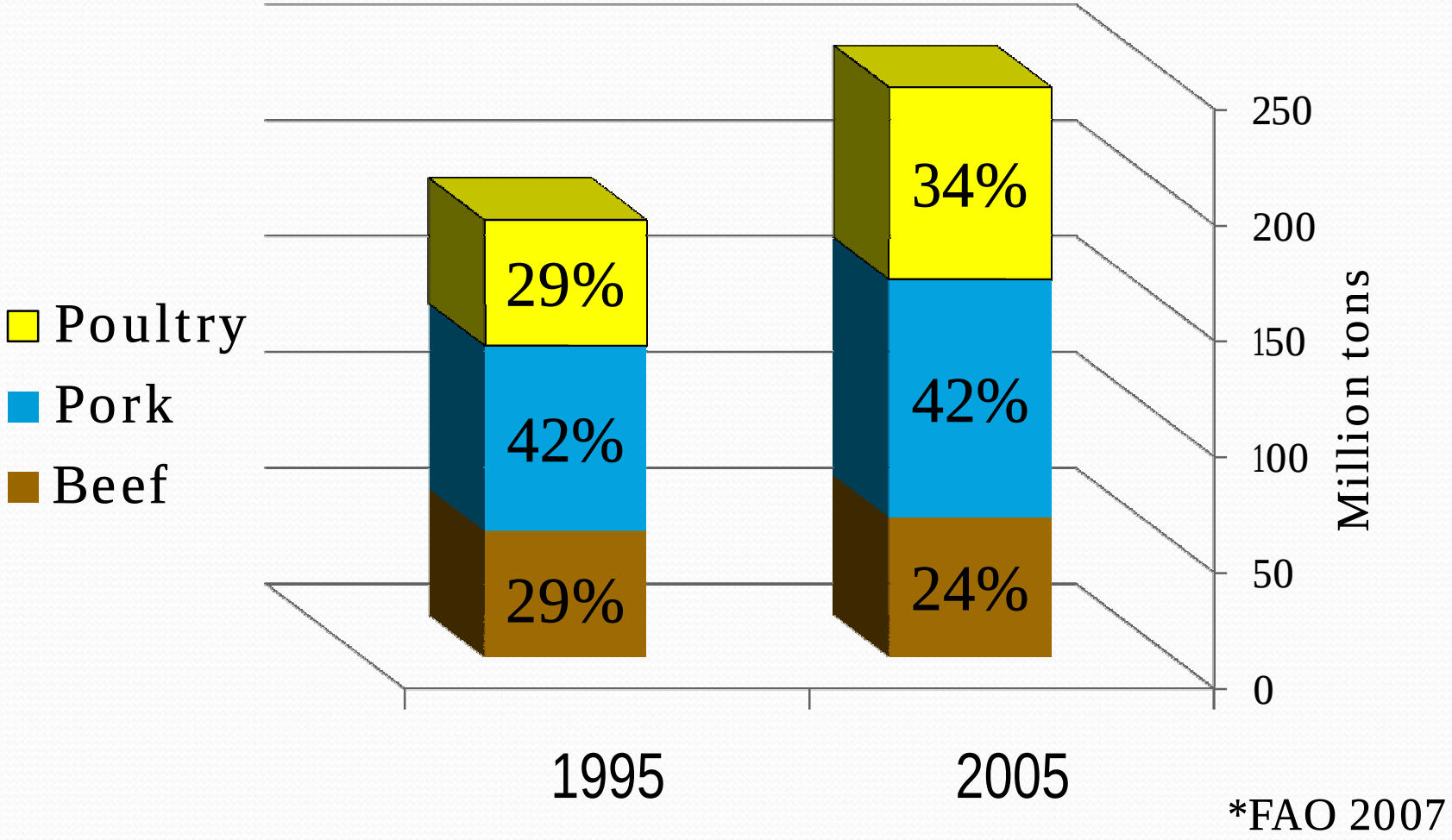
Daniel Salmon D.V.M.

Poultry: The bad and the good

- Poultry is a significant source of *Salmonella* infections in humans. (Probably also of *Campylobacter*)

- Avian Influenza

Global production of meat in 1995 and 2005 (million tons)*



*FAO 2007

Poultry: The bad and the good

- How much grain is needed to produce a kg. of meat?
  - Beef: 7 kg.
  - Pork: 3.5 kg.
  - Poultry: 2 kg.

- FAO: “Poultry keeping is making an important contribution to the livelihoods of the most vulnerable rural households in developing countries. Chickens, ducks, geese, guinea fowl all provide a source of income and improved nutrition”.
- Poultry meat is “healthier” than pork or beef
- Poultry meat (and eggs) is the best, cheapest and least damaging to the environment of all the animal proteins!

Salmonella in poultry

- *Salmonella* very rarely causes disease in adult poultry
  - Carrier state.
- *Salmonella* infrequently causes disease in very young poultry.
- The diagnostic laboratories of the Israel Veterinary services (in conjunction with the Israel egg and poultry board) spend 1/3 of their budget on *Salmonella* surveillance and control.
- *Salmonella* in poultry is a public health problem not an immediate veterinary problem.

The epidemiology of *Salmonella* Enteritidis in table egg layers

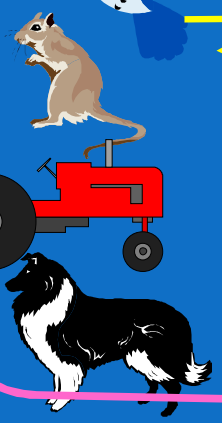
Breeding flock(s) ♂ and ♀

Fertile eggs and the hatchery

Vertical transmission

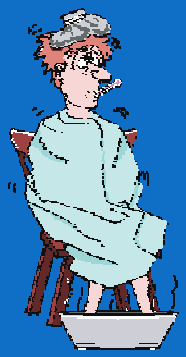
Pullets ♀

Layers ♀



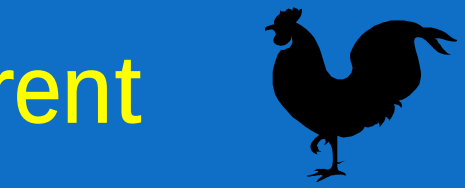
Horizontal transmission

Table eggs



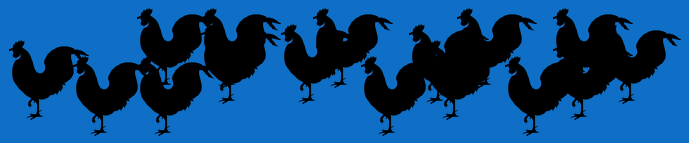
Chicken meat production

One grandparent

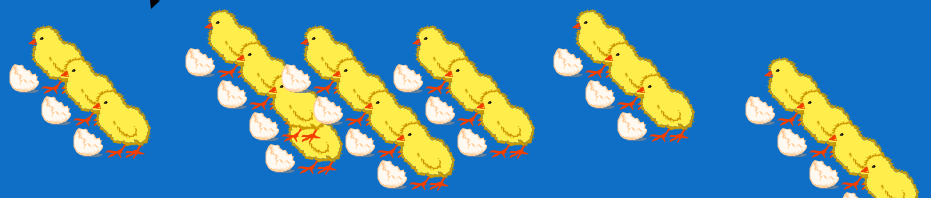


Breeders

30 parents

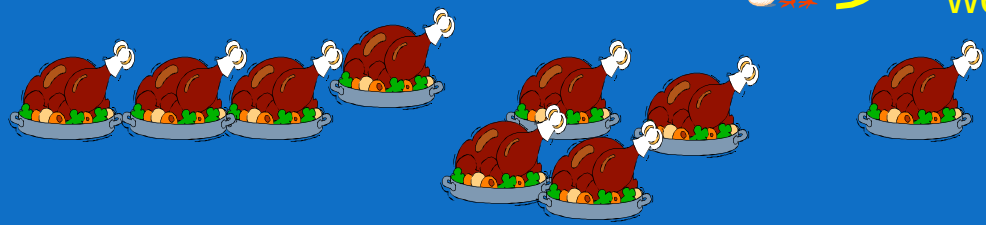


3,000 broilers

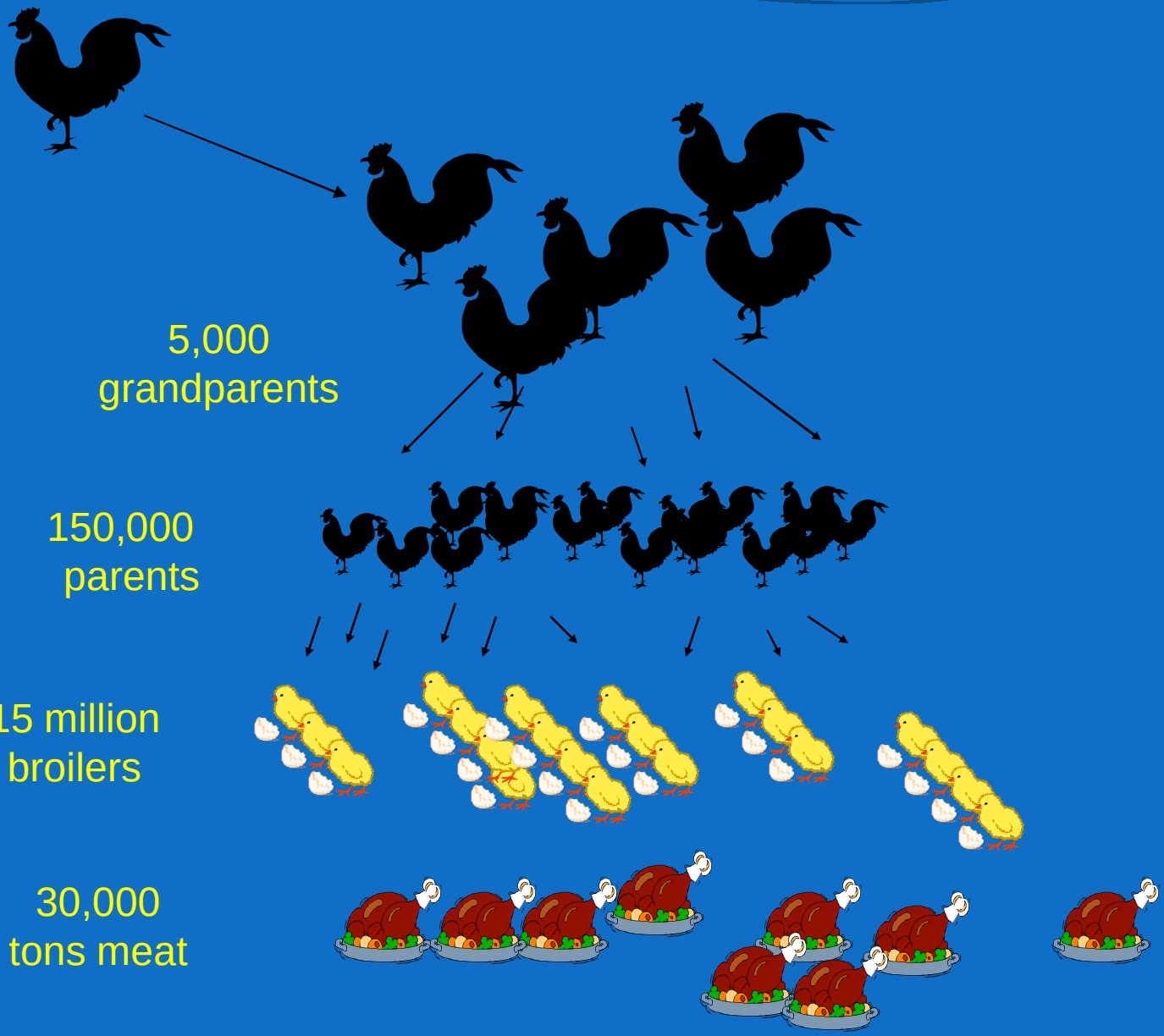


Broilers (the chickens we eat)

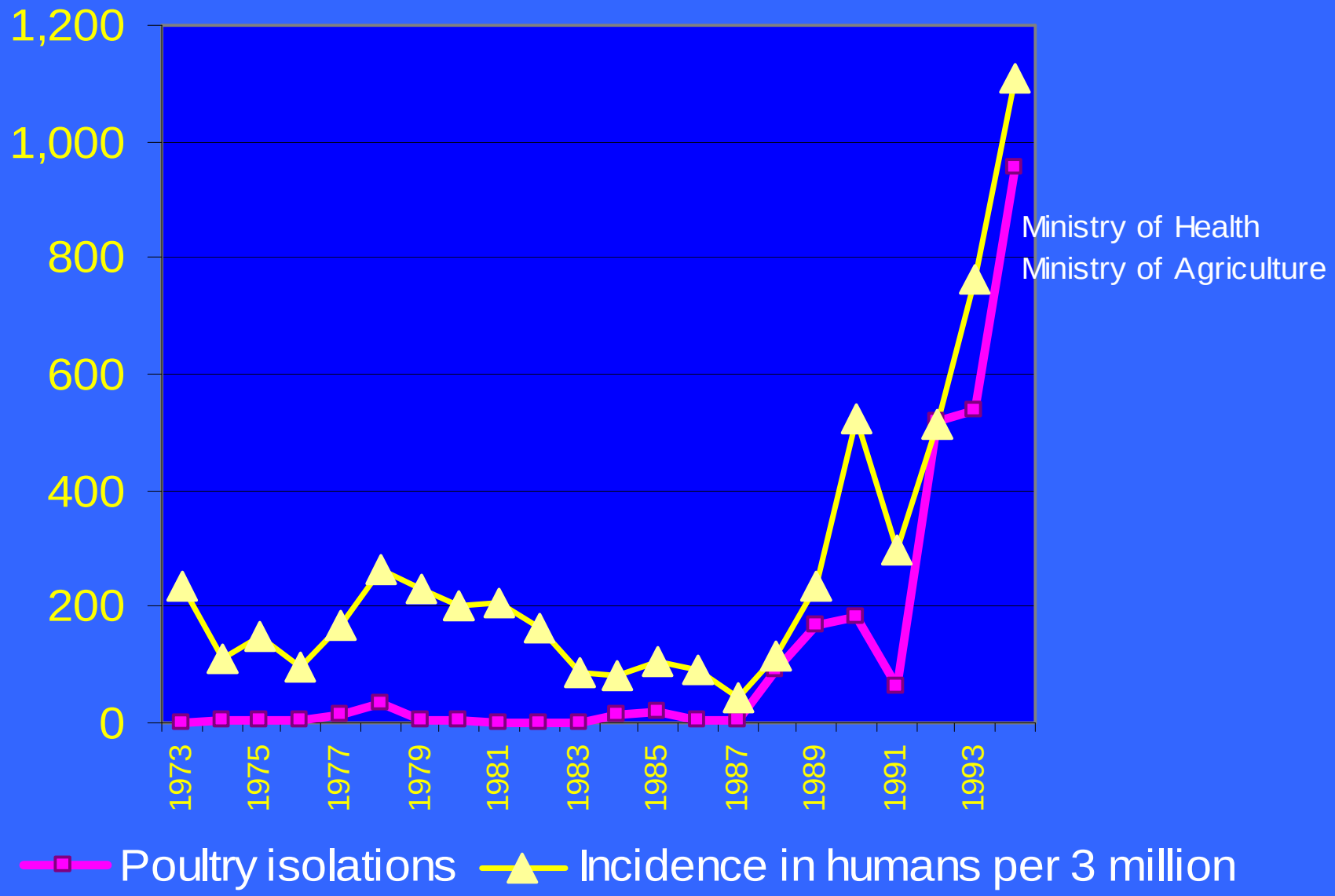
6,000 kg. poultry meat



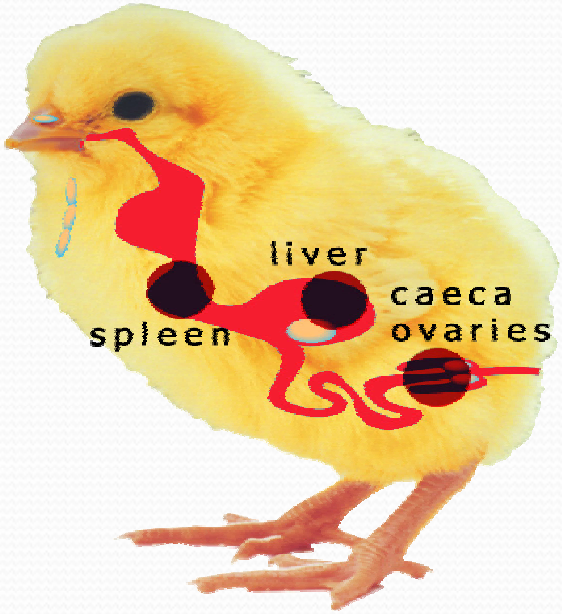
One bird infected with
Salmonella Enteritidis



Salmonella Enteritidis in Israel, Incidence in humans and number of isolations in the poultry diagnostic laboratories



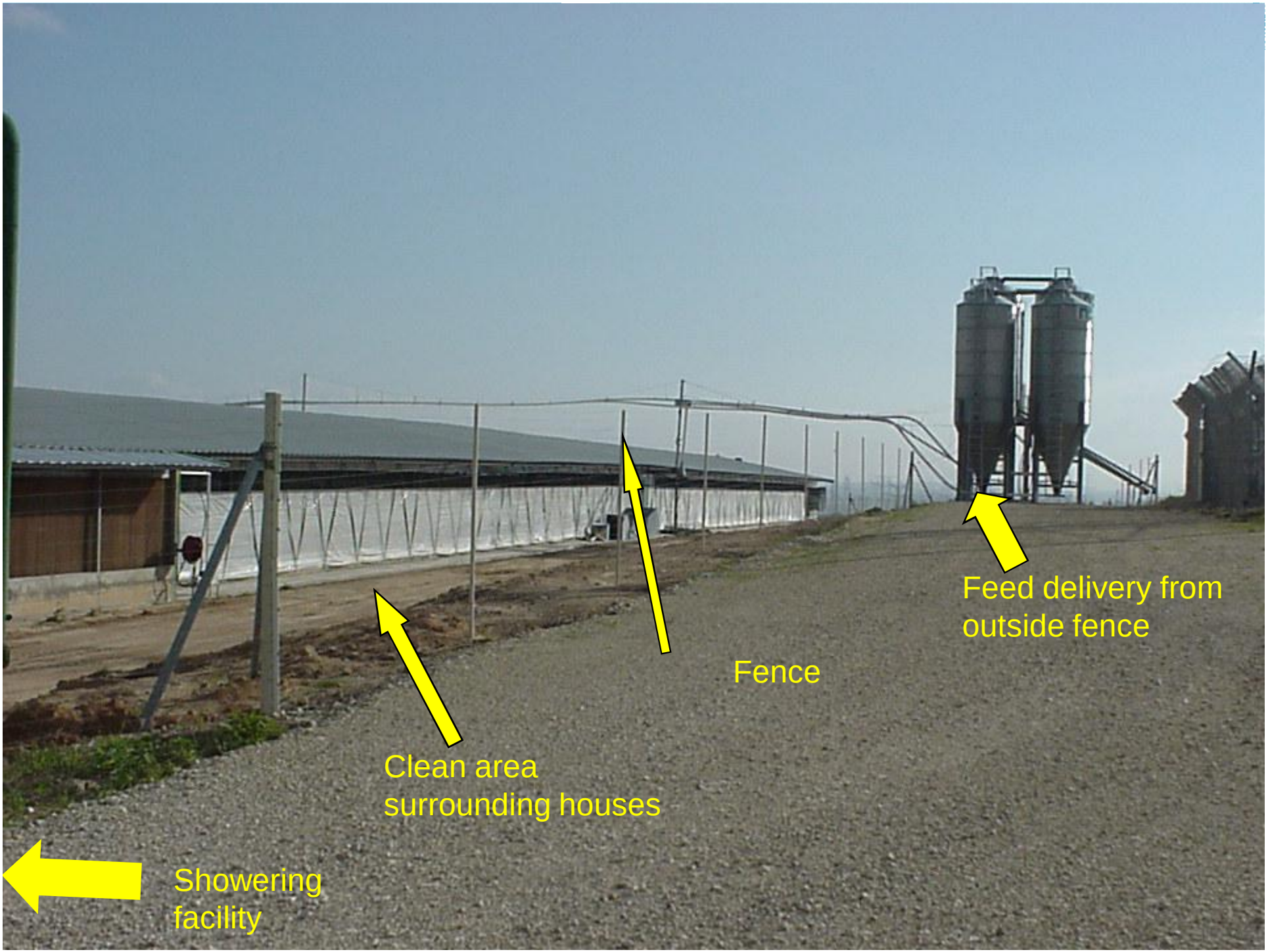
Why did *Salmonella* Enteritidis infection increase?



- The bacteria developed the ability to infect the egg <u>before</u> it is laid (ovarian infection)! (Mutation?)
- Vertical infection from the breeding flock to the broilers or layer pullets
  - Egg treatment will not prevent infection
- Infection of table eggs despite good egg handling

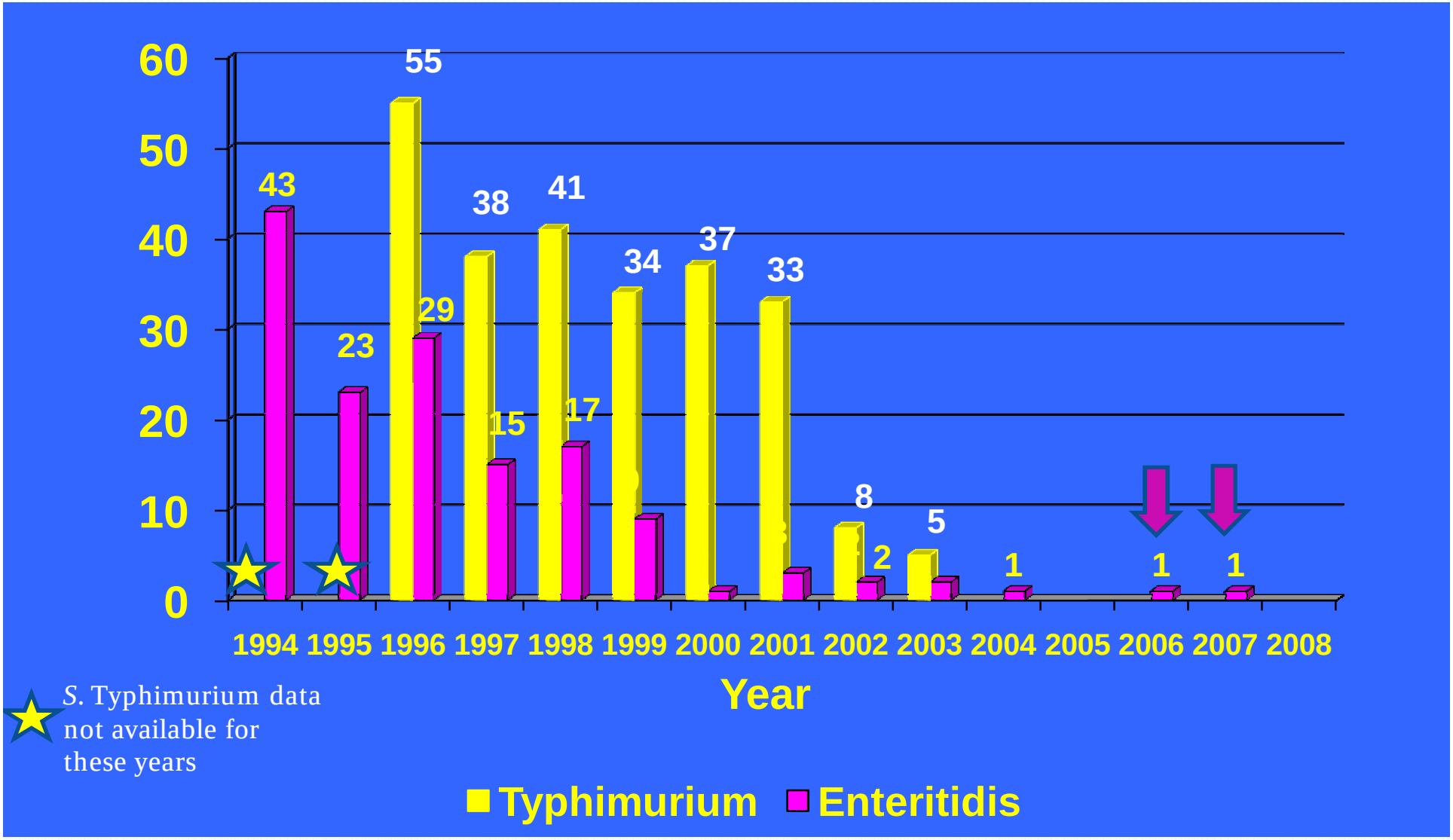
Steps taken by the Israel Veterinary Services to control *Salmonella* in poultry (and humans)

- Surveillance of all breeding flocks and hatcheries since 12/1994 (1st grandparents then parents)
- Culling (or treating) all flocks infected with *Salmonella* Enteritidis or *Salmonella* Typhimurium
- Improvement of biosecurity
- Improvement of infrastructure
- Extension
- Vaccination against *S.* Enteritidis and *S.* Typhimurium

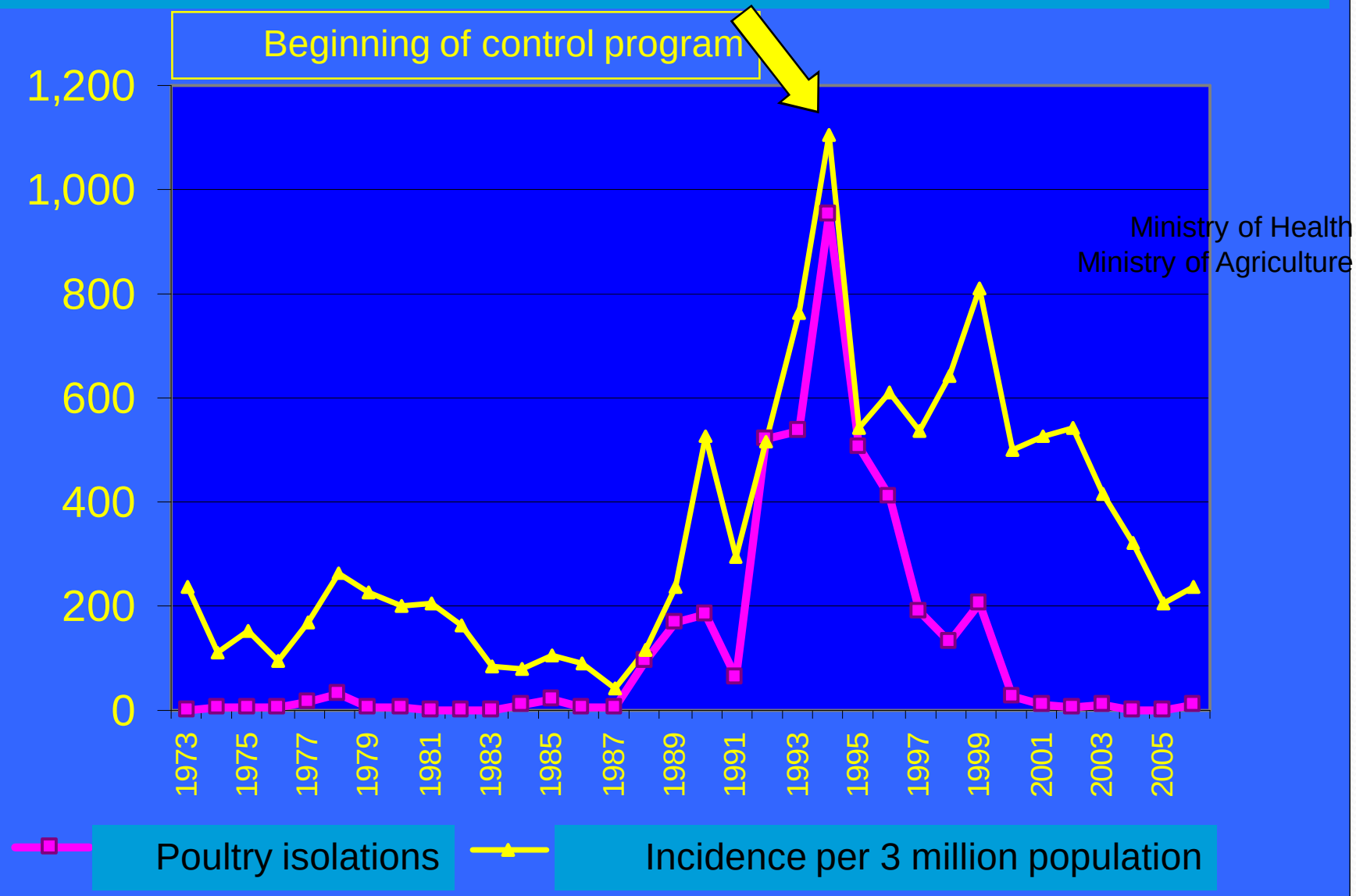

Feed delivery from outside fence
Fence
Clean area surrounding houses
Showering facility


SOFT BATH

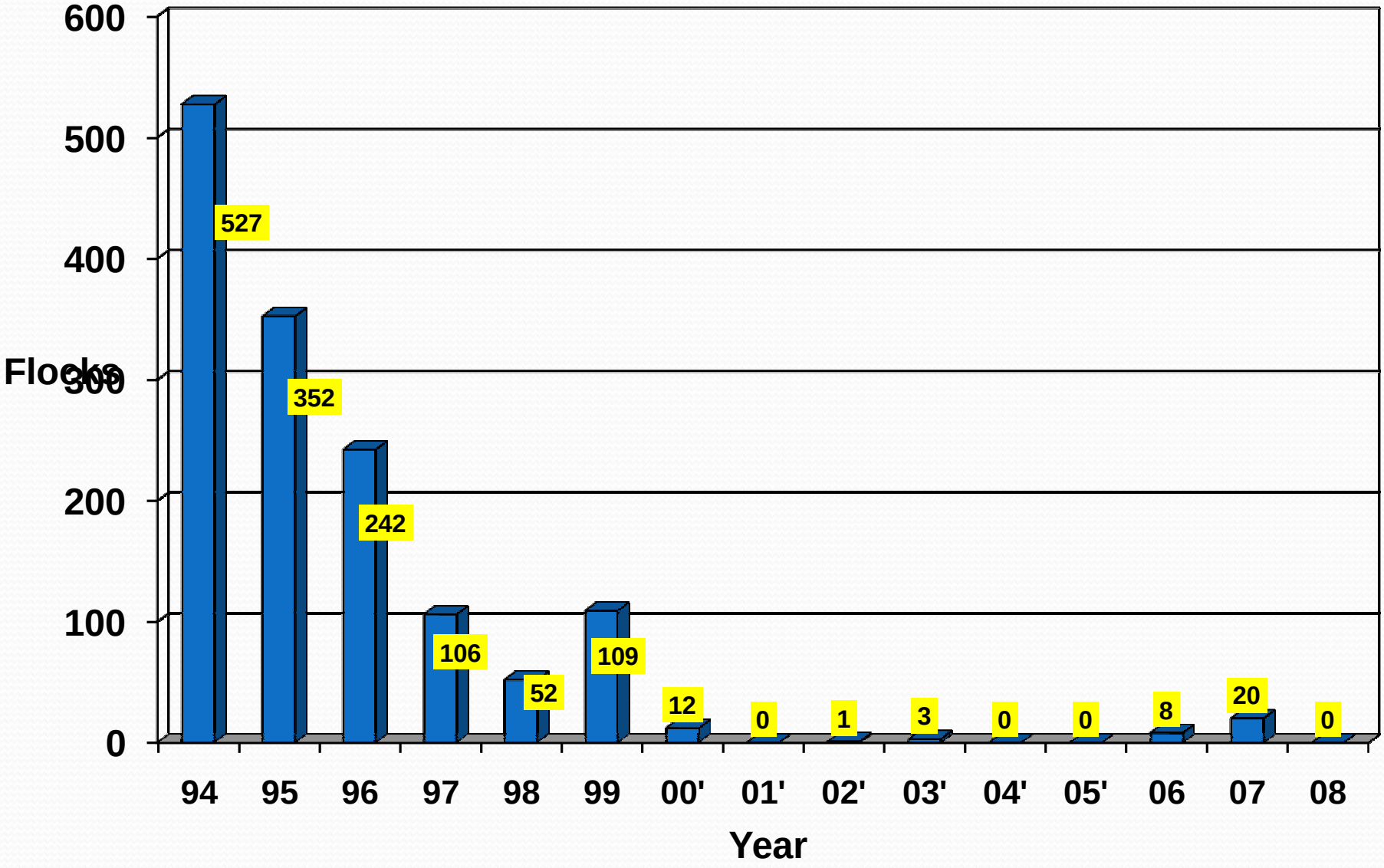
Number of Israeli breeding flocks infected with *S.* Enteritidis and *S.* Typhimurium by years



Salmonella Enteritidis in Israel, Incidence in humans and number of isolations in the poultry diagnostic laboratories



Number of Israeli broiler flocks infected with *Salmonella* Enteritidis by years



(Acts whose publication is obligatory)

REGULATION (EC) No 2160/2003 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 17 November 2003
on the control of salmonella and other specified food-borne zoonotic agents

New EU legislation on *Salmonella* control in poultry

Regulation (EC) No. 2160/2003

November 17, 2003

Poultry and swine

Regulation (EC) No. 1003/2005

June 30, 2005

Breeding flocks only

Regulation (EC) No. 1168/2006

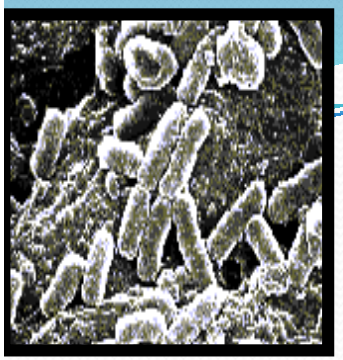
31 July 2006

Laying flocks

Regulation (EC) No. 646/2007

June 12, 2007

Broiler flocks



The 5 serotypes of *Salmonella* with the highest prevalence in humans in Israel (and Europe) in 2004

2004	2003	2002	2001	2000	**Serotype**
26.1	26.6	27.4	25.2	21.2	Enteritidis
16.2	18.3	17.8	17.6	22.2	Virchow
5.7	7.9	13.9	16.7	13.7	Typhimurium
2.5	6.2	7.5	3.5	0.2	Heidelberg
6.1	4.5	5.2	7.8	11.4	Hadar
3.5	4.2	2.9	4.3	4.3	Bredeney
3.6	3.2	2.1	1.9	2.9	Infantis

Article 1.

The community target for the reduction of *Salmonella enteritidis, Salmonella hadar, Salmonella infantis, Salmonella typhimurium* and *Salmonella virchow* in breeding flocks of *Gallus gallus* shall be a reduction of the maximum percentage of adult breeding flocks comprising at least 250 birds remaining positive to 1% or less by 31 December 2009.

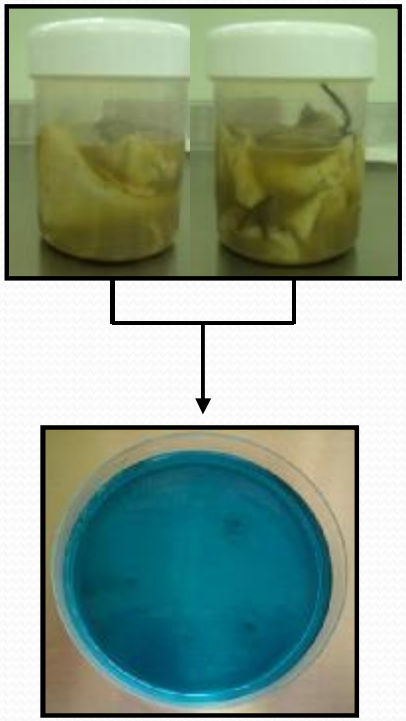
(3) Canada, Israel, Tunisia and the United States have submitted to the Commission their control programmes for *Salmonella* in breeding poultry of *Gallus gallus*, hatching eggs thereof and day-old chicks of *Gallus gallus* intended for breeding. These programmes were found to provide guarantees equivalent to the guarantees provided for in Regulation (EC) No 2160/2003 and should therefore be approved.

Environmental sampling

“Drag swabs”

MSRV = Modified semi-solid Rappaport-Vassiliadis Agar

Ø Pre-enrichment



Buffered peptone water

18±2 Hr at 37^0C

Ø Selective enrichment

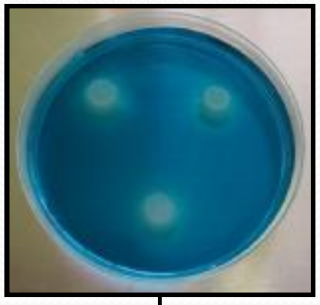
MSRV

MSRV = Modified semi-solid Rappaport-Vassiliadis Agar

Ø **Selective enrichment**

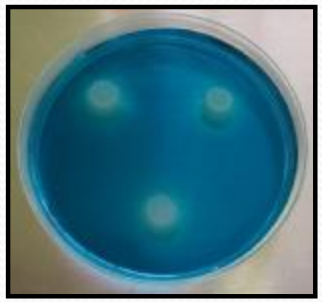
MSRV

24±3 Hr at 41.5^{0}C



Neg **Pos**

24±3 Hr at 41.5^{0}C



Neg **Pos**

MSRV cont.

Brilliant Green agar (BG)

Xylose Lysine Deoxycholate agar (XLD)

Ø Isolation

37°C שעות ב 24±3

Pos

Salmonella

Neg

E. coli

MSRV cont.

E. coli

Salmonella

New tube

Ø Confirmation

HY-Enterotest

Ø Serological identification

Group antisera: B,C,D,E and G group antisera

Final confirmation and serotyping by the National *Salmonella* Center, Central laboratories - Ministry of Health

Surveillance program in chicken breeders (different in turkey breeders)

- Tested by drag swabs twice during the pre-production phase
- All imported breeding flocks undergo a quarantine period of 18 weeks with additional testing
- During the one year production period they are tested twice a month by sampling done by the farmer
- In addition they are sampled 3 times by government officials

Results

- In 1999, *Salmonella* (all serotypes) was isolated from 52.3% of the breeding poultry houses tested
  - Testing frequency was 1/6th of the new program
  - Testing method: similar sensitivity
- 2009:
  - 21.1% positive for any *Salmonella*
  - 78.9% negative for all *Salmonella*

Results

- January – April 2009
  - 446 houses tested on 137 farms (2,395 submissions of 10 drag swabs each)
  - 30 houses positive for *S*. Infantis
  - 22 positive for *S*. Hadar
  - 1 positive for *S*, Virchow
  - 5 positive for *S*. Hadar + *S*. Infantis
  - All negative for *S*. Enteritidis and *S*. Typhimurium

The future

- Continue to reduce *Salmonella* in breeding flocks
- Surveillance and control in broiler flocks
- Improvement of the infrastructure of the table egg industry
- Surveillance and control in table egg layers

A poultry house is not a place where poultry is raised, but a place where food is produced for human consumption!

Thank you for your attention