



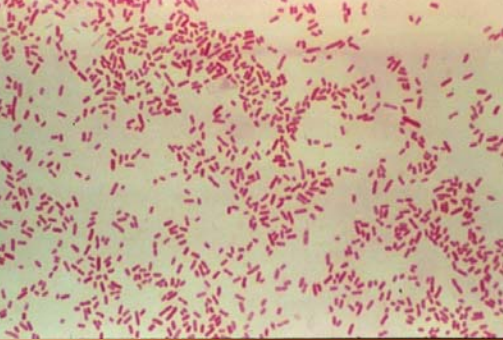
Epidemiology of Salmonella serovars in a poultry operation after the introduction of an inactivated Salmonella vaccine

Peter Groves¹ & Tony Pavic²

1 Zootechny Pty Ltd

2 Birling Avian Laboratories (Baiada Poultry Pty Limited)





Salmonella in Poultry

- Mainly a public health concern.
- One species, *Salmonella enterica*, of which there are over 2500 serovars
- Australian situation is unique.
 - Major serovar found is *S. Sofia*
 - *S. Sofia* is of low human health significance
- Vertical transmission makes control at all breeding levels important.

Salmonella - Vertical transmission

- True vertical transmission
 - Transovarian
 - Occurs with non-motile, serogroup D Salmonellae
- “Paravertical” transmission
 - Occurs via egg shell contamination (cloacal or nest box)
 - Paratyphoid Salmonellae - motile







Non - motile Salmonellae

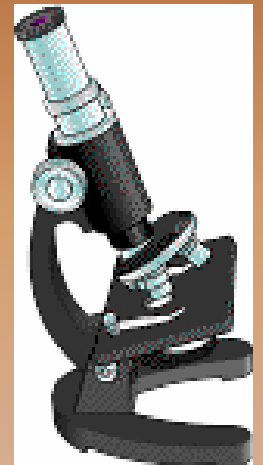
- Serogroup D
- Includes
 - *S. Pullorum* (BWD)
 - *S. Gallinarum* (Fowl Typhoid)
 - *S. Enteritidis*
- Not present in the commercial chicken industry in Australia

Motile Salmonellae

- Paratyphoid Smooth types - Serogroups:
 - B e.g. *S. Typhimurium*, *S. Agona*, *S. Kiambu*
 - C e.g. *S. Mbandaka*, *S. Infantis*, *S. Livingstone*
 - E e.g. *S. Orion* , *S. Zanzibar*, *S. Senftenberg*
- Rough types
 - Defective lipopolysaccharide
 - Regarded as much lower in pathogenicity.

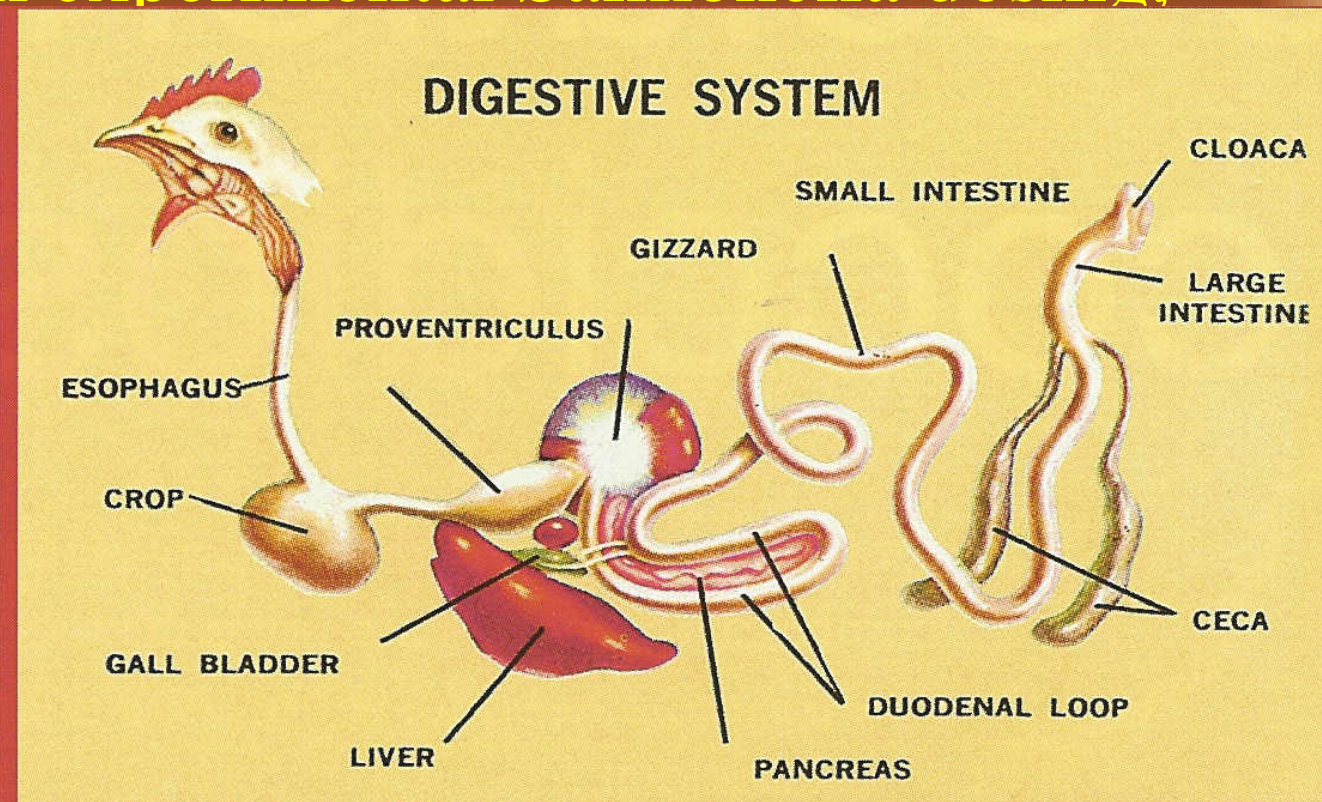
Industry Monitoring

- All breeder flocks monitored
 - Cull & dead chicks in first 10 days – visceral culture
 - Environmental sampling (drag swabs) every 4-6 weeks throughout life.



Environmental versus Bird sampling

- Salmonellae shed intermittently
- Even with experimental Salmonella dosing, rectal swabs are not sensitive
- Caecal culture is more sensitive than sacrifice
- Environmental sampling is more sensitive than present studies
- Techniques for environmental sampling



European experience



- Use of Salenvac[®] in the European poultry industry has been associated with a major decline in the presence of *S. Enteritidis* in many countries.
- A combined *S.E* and *S. Typhimurium* vaccine has been released.
- There are indications this also provides cross protection with other B group *S.* serovars

Efficiency



- Salenvac® is given to broiler parents
 - Inactivated vaccine provides circulating antibody
 - Antibody is transferred to the chick via the egg yolk
- Breeders are protected from colonisation
- Protection against colonisation and disease is provided by passive antibody for the broiler chick

Salmonella

Human England & Wales 2002

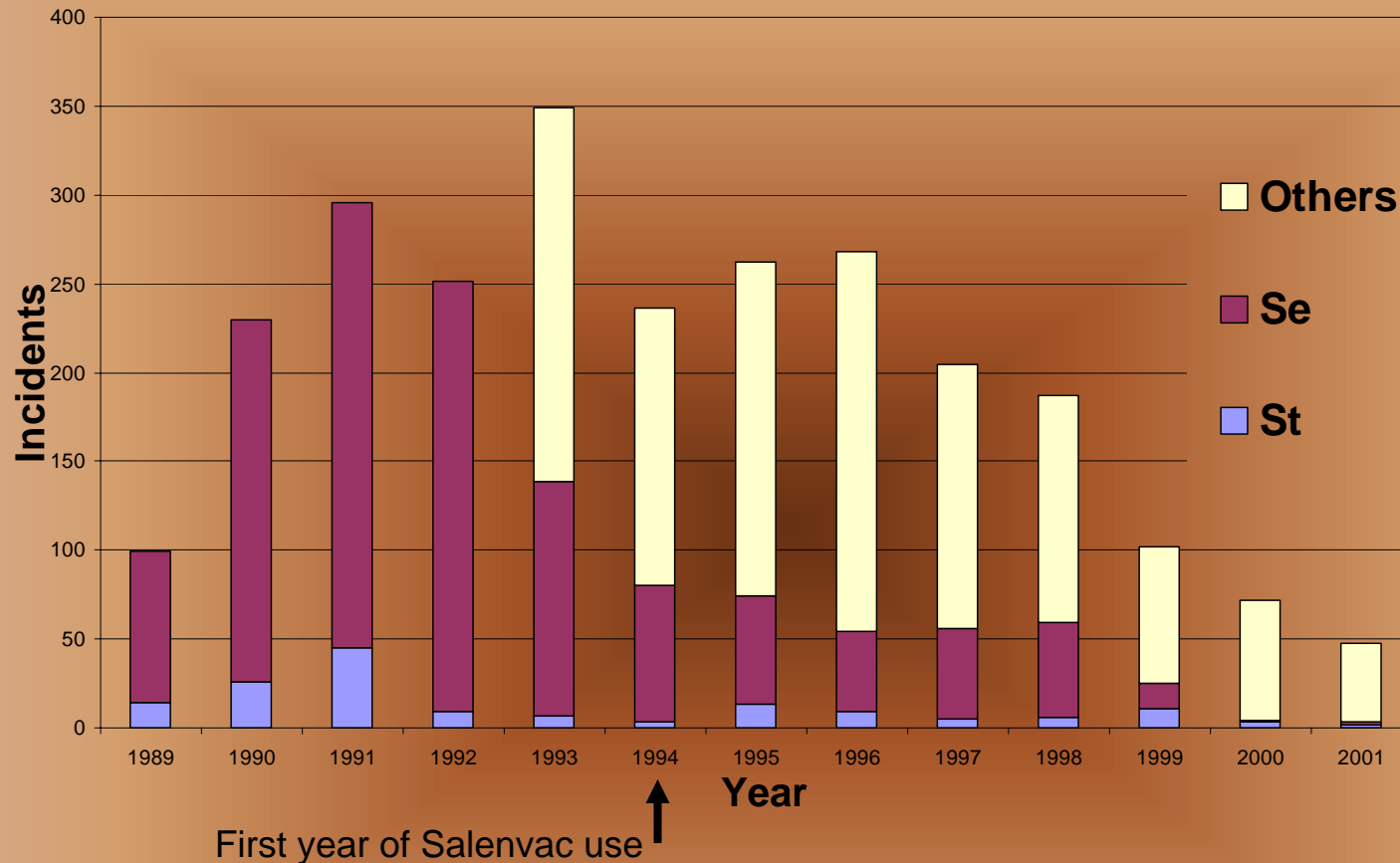
Rank	Serotype (Group)	Number	%
1	Enteritidis D	10106	66.3
2	Typhimurium B	1895	12.4
3	Virchow C	236	1.5
4	Hadar C	213	1.4
5	Agona B	168	1.1
6	Infantis C	165	1.1
7	Java B	160	1.1
8	Braenderup C	155	1.0
9	Newport C	126	0.8
10	Stanley B	99	0.6
Total 10 serotypes		13323	87.3
LEP provisional data	Remaining serotypes	1914	12.7
Total		15237	100.0

Human Salmonellosis Australia

<i>Salmonella</i>	Group	2001	2002	2003
Typhimurium	B	33.6%	30.6%	26.1%
Bovismorbificans	C	11.3%	10.3%	8.6%
Enteritidis	D	6.4%	8.7%	8.6%
Heidelberg	B	5.3%	8.2%	4.4%
SubSp 16:1,v:-	?			4.2%

Source: IMVS, Adelaide

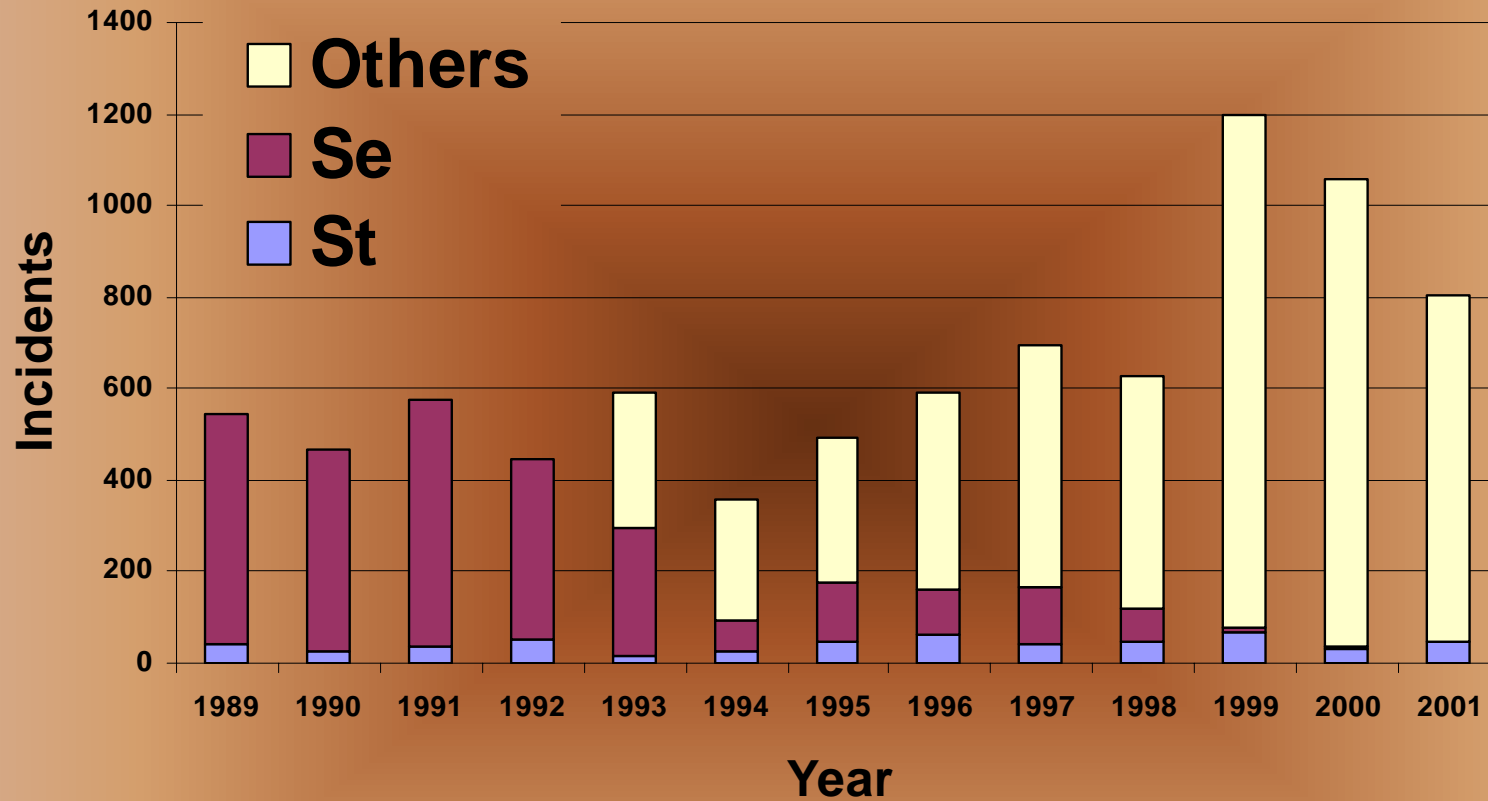
Salmonella in Broiler Breeders UK



Data for other serotypes not available for years 1989-1992

Ref: **Howard Hellig**, Industry Consultant and Past President of the British Veterinary Association, The Salmonella Control Forum, London, 2003.

Salmonella in Broilers UK



Data for other serotypes not available for years 1989-1992

Ref: **Howard Hellig**, Industry Consultant and Past President of the British Veterinary Association, The Salmonella Control Forum, London, 2003.

Rationale for our use of an inactivated *Salmonella* vaccine

- *S. Enteritidis* (serogroup D) is absent from the Australian poultry industry
- Other group D *Salmonellae* (*S. Pullorum* and *S. Gallinarum*) are also absent from the industry
- *S. Typhimurium* (serogroup B) represents the most important food safety *S.* species in Australia.
- Other *S.* serovars are commonly isolated from Australian flocks. These are a varied lot, most commonly *S. Sofia* (B), but C and E group species are frequently found.

Inactivated Salmonella Vaccine in Australian flocks

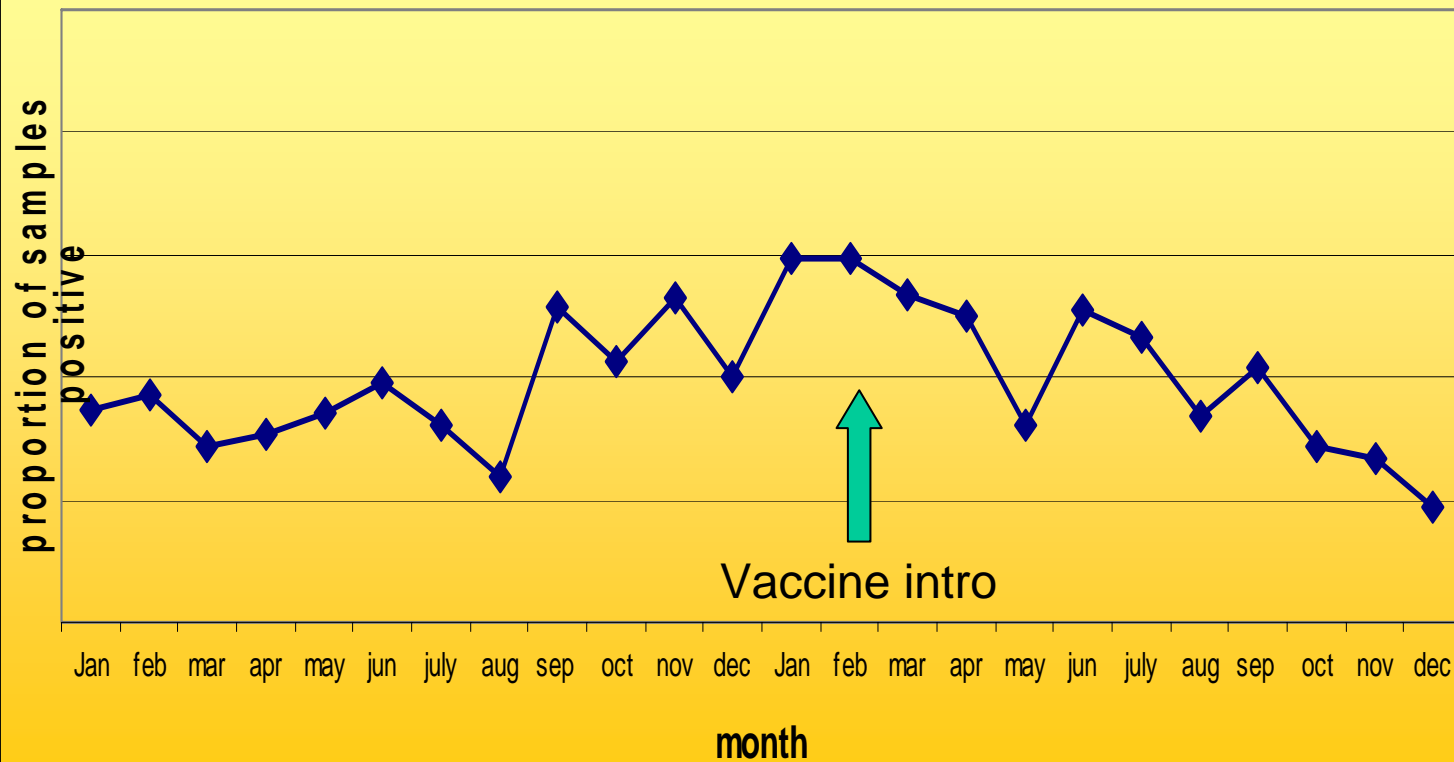
- Produced by Intervet Australia (autogenous)
- Salenvac[®] technology (similar product to the European S.E inactivated vaccine)
- Contains 3 Salmonella serovars as antigens (different serogroups): B, C & E
- Does not contain D group antigens

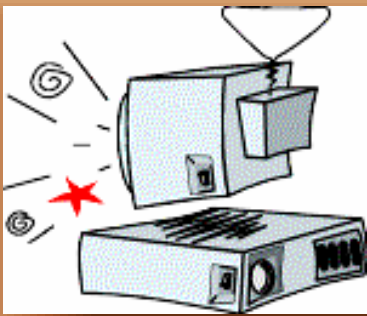
Salmonella Vaccine species

- The Salmonella vaccine contains inactivated cultures of:
 - *S. Typhimurium* (B)
 - *S. Mbandaka* (C)
 - *S. Orion* (E)
- Administered at 12 and 17 weeks of age (prior to lay)
- Only given to hens initially

Changes in prevalence of Salmonella spp isolation from breeder

2003 to 2004 Salmonella Detection rates from Breeders

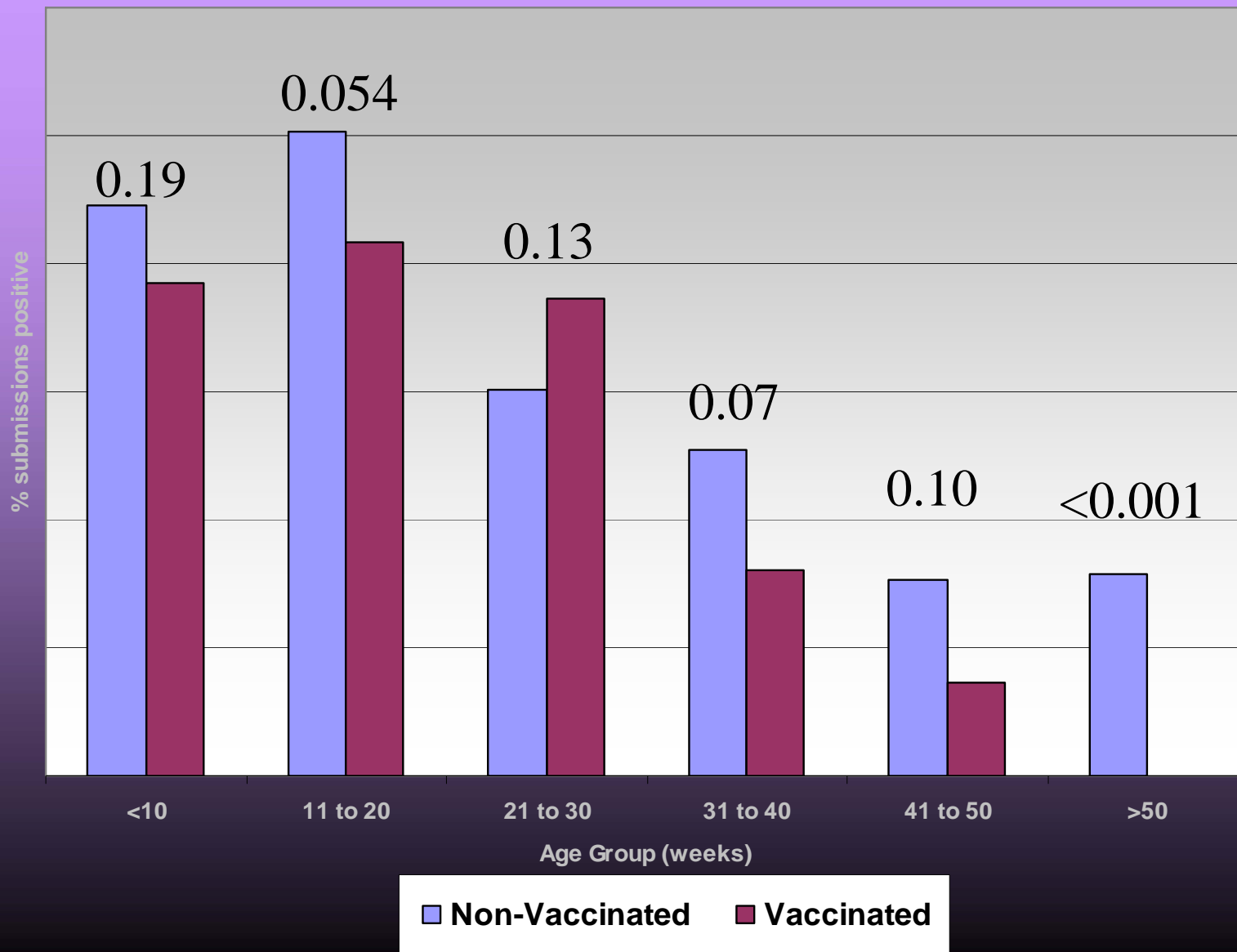




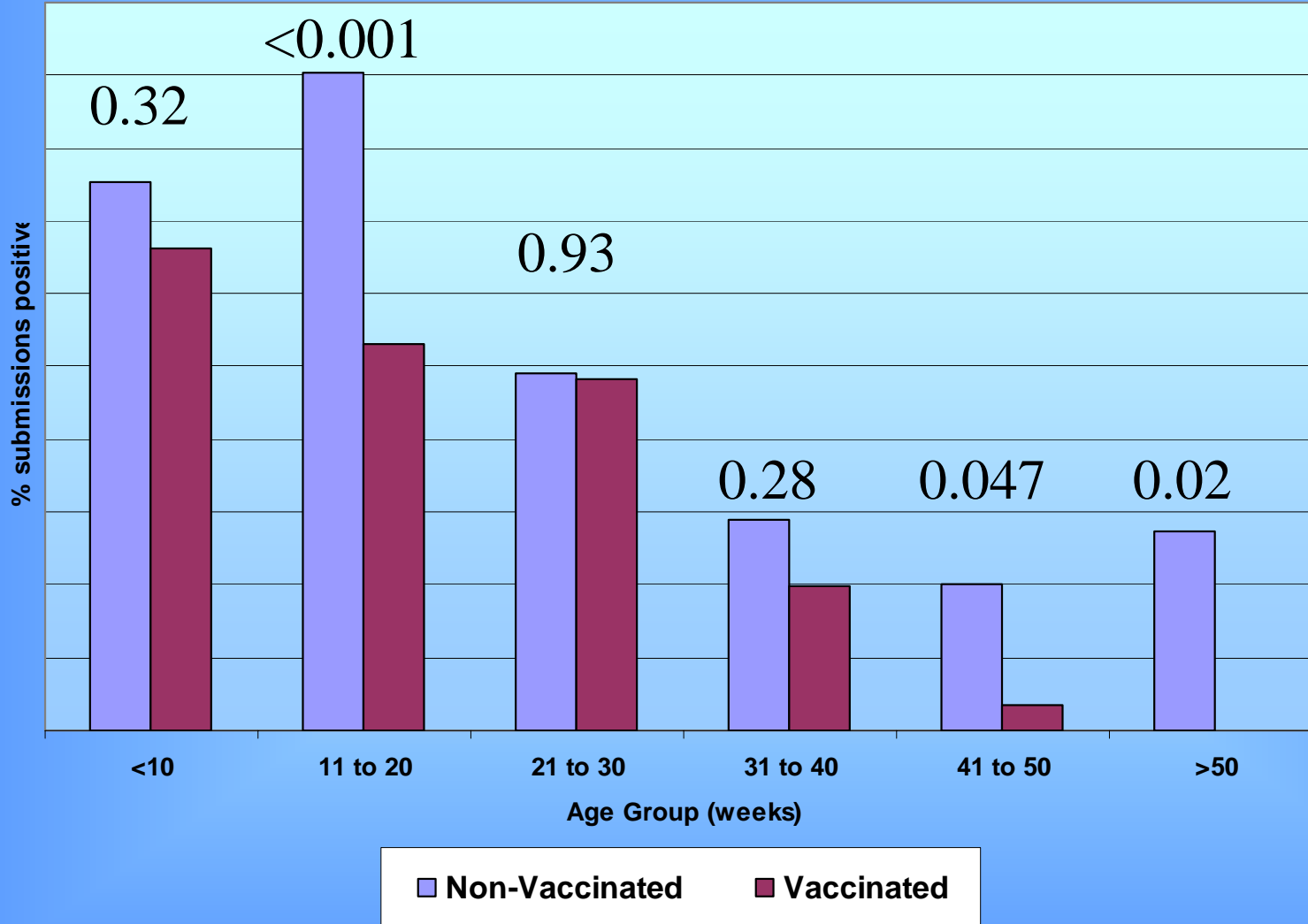
Constraints to analysis

- No contemporary comparisons (comparing previously unvaccinated flocks to vaccinated after a point in time)
- Environmental sampling – may not fully reflect what is contemporarily in the birds
- Males not vaccinated and may contribute to presence of serovars in the environment.

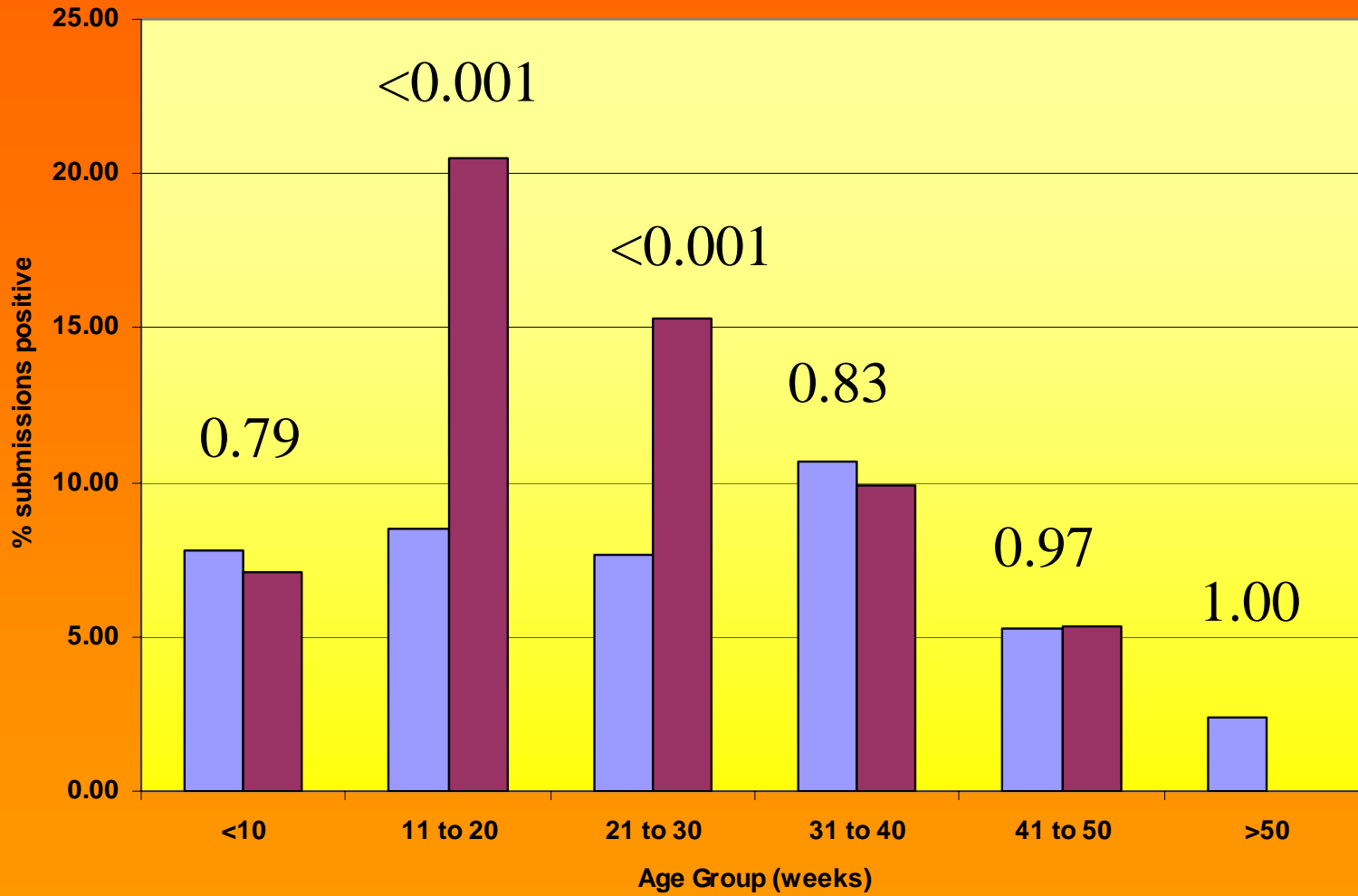
Salmonella Submissions 2003-2005



Smooth Salmonella isolates
2003-2005



Rough Salmonella isolations
2003-2005

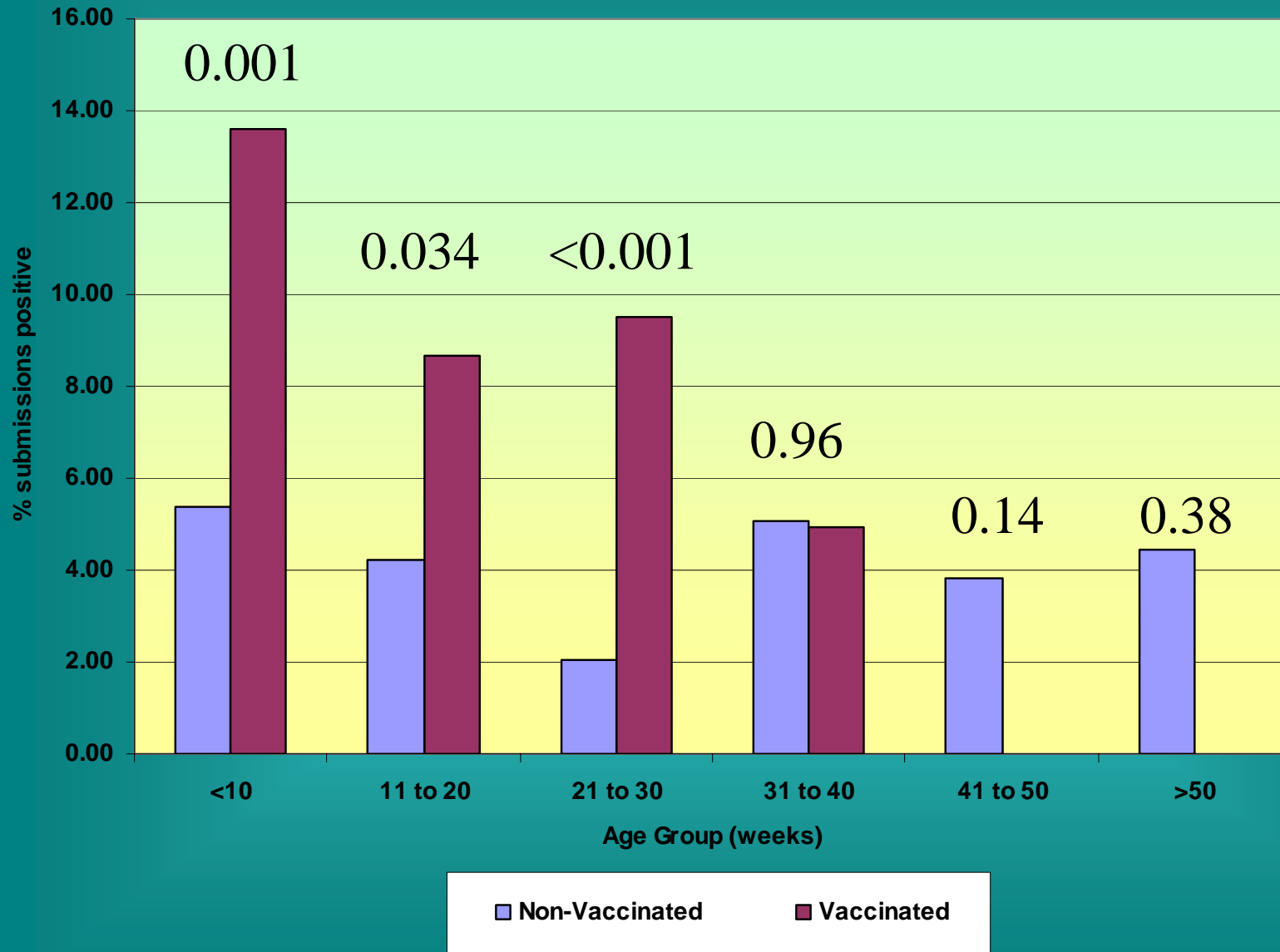


■ Non-Vaccinated ■ Vaccinated

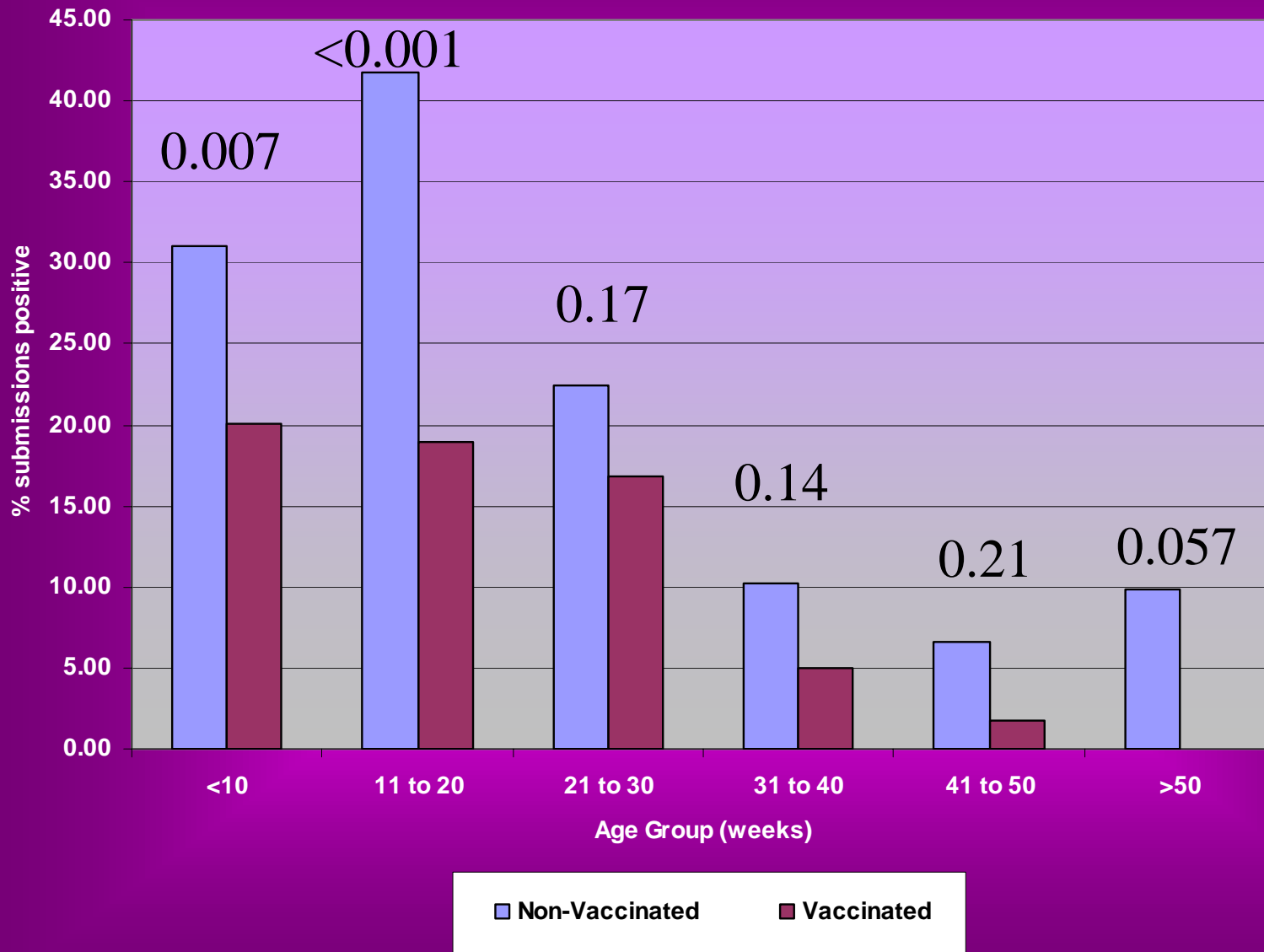
Change in Serogroups with Vaccination

Sero - group	% + in non-vaccin'd	% + in vaccin'd	Relative Risk	95% Conf Interval	P
B	22.9	14.0	1.63	1.16 – 2.29	0.003
C	47.2	36.8	1.28	1.07 – 1.54	0.005
E	8.7	14.5	0.60	0.41 – 0.89	0.011
Rough	21.3	33.9	0.63	0.50 – 0.79	0.00009

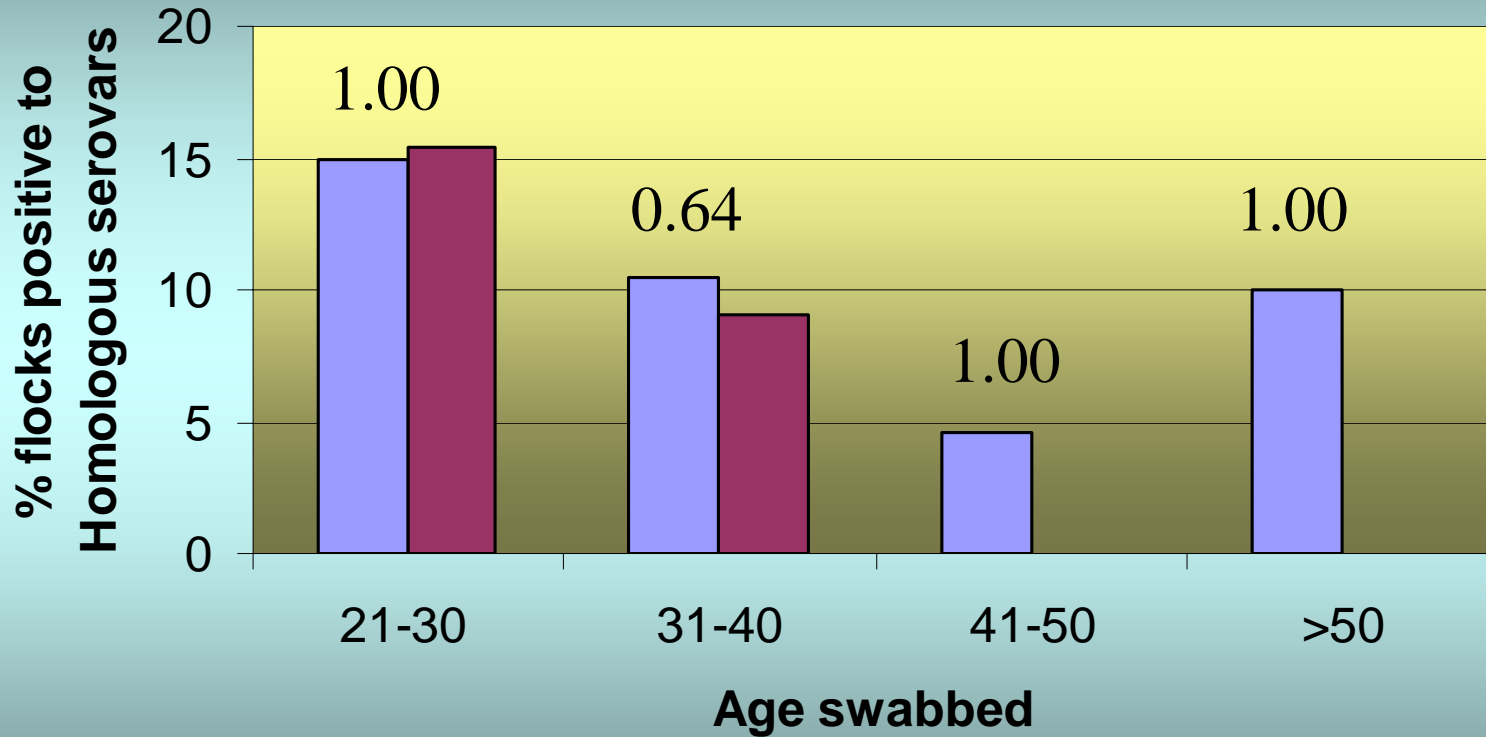
Homologous Salmonella isolates to vaccine strains



Heterologous Salmonella isolates to Vaccine strains



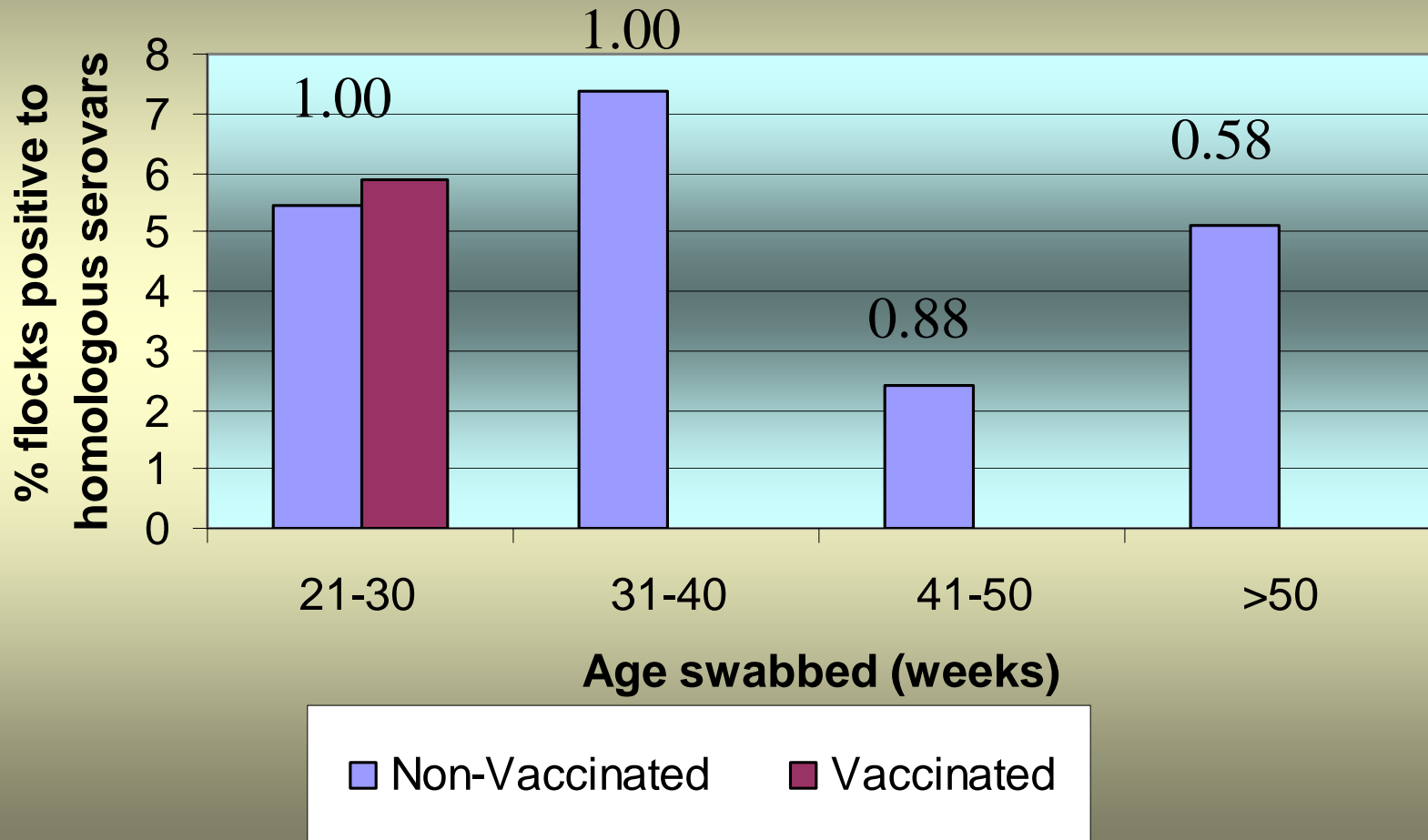
Flocks positive to Homologous serovars prior to 20 weeks of age



□ Non-Vaccinated

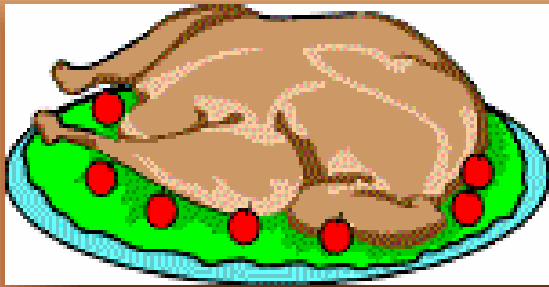
■ Vaccinated

Flocks Negative to Homologous serovars prior to 20 weeks of age



Conclusions

- Not a contemporary comparison; shows an “association” only
- Appears to be a species change of Salmonellae isolated from the environment following introduction of vaccination (less smooth, more rough types).
- If flock positive prior to completed vaccination, effect may be delayed
- Vaccination to be moved earlier in flock life (6 & 12 weeks).
- Outcome is encouraging.



Questions?

