Simultaneous carriage of multiple serotypes of Group B Streptococcus: a systematic review

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Background

Knowledge about the frequency of simultaneous carriage of more than one Group B Streptococcus (GBS) serotype is crucial to foresee the risk of potential horizontal genetic transfer and specifically capsular switching, as a capsular polysaccharide (CPS) vaccine might put a selective pressure on vaccine-serotype strains to evade vaccine coverage.

Objectives

1. How many GBS serotypes can be carried simultaneously?
2. What is the prevalence of co-carriage among GBS positive individuals at the same site and at different sites?
3. Which serotypes are the most often associated with co-carriage?

Methods

Search of electronic databases Medline (1946-2021), Embase (1974-2021) and Pubmed (1976-2021) with specific search terms.

Studies reporting epidemiological data on GBS carriage and whose design could have identified co-carriage at the same (multiple colonies serotyped in the same sample) or different (paired samples from the same individual, serotyped, with at least one positive sample) body sites were considered eligible using the Rayyan software and relevant data were abstracted in an Excel table by two independent reviewers.

A double-arcsine transformation and a random effects meta-analysis with DerSimonian and Laired method were conducted to weight the proportions using the R packages *meta* and *metafor* on the studies reporting the number of serotypeable samples and the number of co-carriage events.

The data for serotype distribution were harvested from the articles giving a detailed composition of each serotype combination in a specific group.

Results

17 articles met the inclusion criteria, representing at least 11,979 samples and paired samples from various populations (pregnant and non-pregnant women, children, female and male adults) from at least 14 countries, screened between 1973 and 2017. One article was unclear about reporting same or different site(s) co-carriage and is therefore not included in this poster.

Table 1. Summary of the studies reporting co-carriage events at the same body site.

Study	Body site(s)	Total samples	Total positive samples	Same site co-carriage
Baker et al., 1976	vagina	210	79	4
Anthony et al., 1978	cervix or urethra	1488	NA	4
Anthony et al., 1981	stool or rectum or genitals	743	134	2
Ferrieri et al., 2004	vagina or rectum	NA	173	4
Perez-Ruiz et al., 2004	vagina-rectum	NA	30	1
Taylor et al., 2007	vagina or anus	374	70	15
El Aila et al., 2009	vagina or rectum	150	36	11
Khatami et al., 2019	vagina	433	91	6
Foster-Nyarko et al., 2016	nasopharynx	1170	NA	2
Jisuvei et al., 2020	vagina or rectum	288	53	7

Table 2. Summary of the studies reporting co-carriage events at different body sites.

Study	Body sites	Total paired samples	Total positive paired samples	Different site co-carriage
Anthony et al., 1978	cervix, urethra	1488	NA	5
Maurer et al., 1979	throat, anus, vagina	415	47	2
Anthony et al., 1981	genitals, rectum	295	64	1
Anthony et al., 1981	rectum, stool	135	33	1
Anthony et al., 1981	genitals, stool	135	37	1
Hoogkamp-Korstanje et al., 1982	vagina, cervix, rectum	762	106	24
Ferrieri et al., 2004	vagina, rectum	NA	102	18
Whitney et al., 2004	cervix, vagina, urine	1308	128	1
Taylor et al., 2007	vagina, anus	374	70	12
El Aila et al., 2009	vagina, rectum	150	36	4
Palmeiro et al., 2010	rectum, urethra	NA	NA	1
Slotved et al., 2017	vagina, rectum	400	107	1
Furfaro et al., 2019	vagina, rectum	1373	337	35
Jisuvei et al., 2020	vagina, rectum	288	53	30

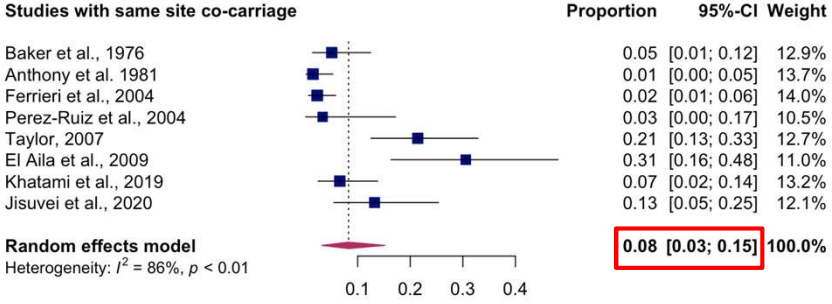

Figure 1. Meta-analysis of the proportion of co-carriage events among positives samples.

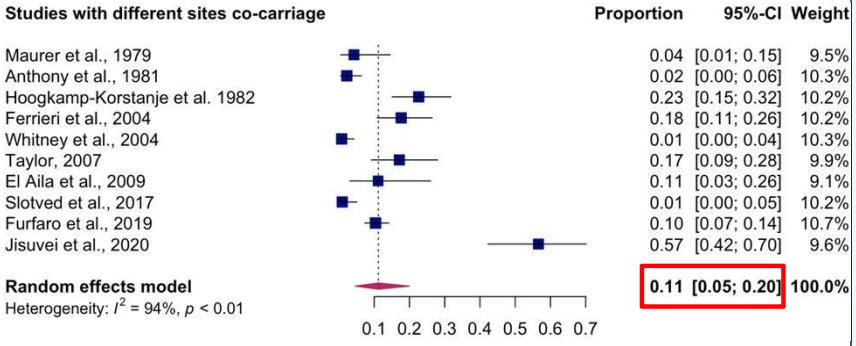

Figure 2. Meta-analysis of the proportion of co-carriage events among individuals who provided at least two samples, including at least one positive, from different body sites.

1. When reported, the number of serotypes simultaneously carried ranged from zero to three. In studies reporting both two and three serotypes carriage, two was more prevalent than three.
2. Of all the 666 positive samples in studies assessing same site co-carriage, 8% (95% CI:3-15) had more than one serotype (Figure 1). Of all the 1,120 pairs of samples from positive individuals in studies assessing different sites co-carriage, 11% (95% CI:5-20) had different serotypes (Figure 2).
3. The serotypes most often associated with co-carriage are Ia, III and V (data not shown).

Conclusions

Simultaneous carriage of multiple GBS serotypes is a minor but definite phenomenon in healthy adults. The possible detection of co-carriage needs to be taken into consideration in future GBS carriage surveillance in order to have quantitative, qualitative and dynamic information about serotype carriage, in order to estimate and evaluate vaccine impact and the potential for serotype replacement once CPS-vaccines are introduced. A similar study looking at the co-carriage of GBS strains with divergent alpha-like proteins could be conducted in regard of the potential licensure of protein-based vaccines.

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References: Poster "Specific Growth dynamics of GBS isolates in LIM broth", Barro et al., ISSAD Nov 2021; Bröker and Spellerberg, 2004; Bellais et al., 2012
For recent data about co-carriage: To et al., 2021