

A review of microorganisms that can cross intact fetal membranes to inform and guide pregnancy management

James A. McGregor^{1,2}, Marti Perhach¹

1) Group B Strep International 2) LA Best Babies Network

Background

Various microorganisms are known to cross intact fetal membranes, commonly known as the “bag of waters,” and infect babies in utero. The fact that microorganisms can cross intact fetal membranes is not widely recognized.

Objective

To bring attention to the various microorganisms that can cross intact fetal membranes and the mechanisms involved to promote better understanding and prevention of prenatal infection and inform and guide pregnancy management.

Methods

We conducted an internet search (Medline, PubMed and Google) of available literature.

“Anything in the vagina can appear to cross the fetal membranes.”

James A. McGregor, MDCM

Results

We found:

- 1) references to multiple microorganisms that could cross intact fetal membranes and potentially harm unborn babies (Galask et al 2008, Segal et al 2019, Waites et al 2005)
- 2) up to 24% of stillbirths in developed countries have been attributable to infection (McClure et al 2010)
- 3) infection is suggested to contribute to nearly half of the stillbirths in developing countries (McClure, Goldenberg 2009)

Discussion

Providers may elect to use knowledge that multiple microorganisms can cross intact membranes to consider whether or not to perform cervical exams or strip membranes.

“Keep your fingers out”

James A. McGregor, MDCM

Conclusion

Further research is needed to determine the burden of stillbirths caused due to microorganisms that can cross intact fetal membranes. Implementation of the World Health Organization’s International Classification of Disease – Perinatal Mortality (ICD-PM) may help to more accurately determine this burden especially if fetal death records are universally updated with final diagnosis.

Medical students, perinatal providers and pregnant women may benefit from further education and awareness regarding microorganisms that can cross intact fetal membranes to help reduce the burden of fetal infection.

Microorganisms that can cross intact fetal membranes

Microorganism	Potential Acquisition	Routine Testing In Urine Culture	Routine Prenatal Testing	Symptomatic	Mechanisms Used to Cross Intact Membranes
Group B Strep	Naturally-occurring in gut; also sexually-transmissible	Yes	Yes @ 35-37 weeks	Not usually, but can cause vaginitis and UTI symptoms	Virulence factors Note: 60% to 80% prevention at birth to 1 week of age with universal screening & indicated IV ABX treatment during labor & delivery
<i>E. coli</i>	Naturally-occurring	Yes	No	Not usually	Presumed virulence factors
Group A Strep	Naturally-occurring	No	No	No	Virulence factors
Beta-hemolytic streptococci	Naturally-occurring	If indicated	No	No	Virulence factors
<i>Streptococcus faecalis</i> aka Group D Strep	Environment	Yes	No	Not studied	Not fully studied
Staphylococci	Naturally-occurring	Yes	No	No	Toxins and proteases
Anaerobic cocci	Naturally-occurring	No	No	No	Not fully studied
<i>Bacteroides fragilis</i>	Naturally-occurring	No	No	No	Not fully studied
<i>Candida albicans</i>	Naturally-occurring	Varies	No	Usually asymptomatic but can cause pruritis (itching), burning and white discharge	Not fully studied
Herpes simplex virus	Sexual contact and naturally-occurring	No	No	Usually asymptomatic but can cause burning and blistering sores	Not fully studied
<i>Clostridium perfringens</i>	Stool contact	No	No	No	Not fully studied
<i>Proteus</i>	Naturally-occurring	Yes; causes UTIs	No	No	Virulence factors
<i>Klebsiella</i>	Naturally-occurring	Yes; causes UTIs	No	No	Virulence factors
<i>Pseudomonas</i>	Naturally-occurring	Yes; causes UTIs	No	No	Virulence factors
<i>Chlamydia</i>	Sexual contact (STI)	Yes possible	No	Discharge	Not fully studied
<i>Trichomonas vaginalis</i>	Sexual contact (STI)	No	No; test of cure after treatment	Yes; itching and burning	Virulence factors
Mycoplasmas/ Ureaplasmas	Sexual contact	No	No	No symptoms	Not fully studied

“It appeared that group B streptococci had a greater capacity to attach and invade than did *E. coli*, whereas *N. gonorrhoeae* predictably failed to attach.”
(Galask et al 1984)

Further studies are needed regarding gonorrhea