Group B Streptococcus: The Facts for Health Professionals

This booklet gives information on group B Streptococcus (GBS) and the bacteria’s effects on babies in the period around birth (the neonatal period). The information comes from a number of sources and has been checked for medical accuracy by our medical advisory panel (listed on page 44).

At present, there is no standard of practice in the UK for stopping GBS infections in newborn babies, despite most neonatal GBS infection being preventable. As a result, many babies who become sick or die from GBS infection unnecessarily.

Adopting the recommendations set out in this paper could prevent at least 60% of all GBS infection in newborn babies. Up to 90% of early-onset GBS infection would be preventable if intravenous antibiotics were offered in labour to all GBS carriers identified by universal sensitive testing late in pregnancy plus to the mothers of babies in the recognised higher risk situations. The recommendations are, we believe, the most appropriate in the light of all currently available data and are specifically aimed at Britain. Other approaches to the prevention of GBS infection are possible but above all else we want to promote the implementation of a rational and consistent policy in all institutions where babies are born.

One of the key objectives of Group B Strep Support is to help inform health professionals about group B Strep prevention and to raise awareness amongst the families in their care. Please help by putting our posters on appropriate notice boards in hospitals, GP’s surgeries, etc. They are freely available from our website or contact us for copies. (We waive copyright on our materials – you may make as many copies as you like.)

Group B Strep Support is a UK charity and offers information and support to families affected by GBS, informs health professionals and other interested individuals how to prevent most GBS infection in babies, provides an up-to-date information centre on GBS and in the future will offer continued support for research into GBS prevention. The charity relies on grants and donations from the public and from organisations with no commercial links to the charity to fund its activities.

Please contact us if you would like to:

- make a donation;
- join Group B Strep Support, be kept up to date with developments and receive our annual newsletter; or
- receive more information.

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preventing GBS infection in newborn babies

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1. WHAT IS GROUP B STREPTOCOCCUS?

Group B streptococcus (GBS), also called Streptococcus agalactiae, is one class of bacteria within the Streptococcus family. There are a number of streptococci that are classified into Lancefield types of beta haemolytic streptococci – beta haemolytic means that the organisms digest the red blood cells completely (other organisms, such as streptococcus pneumoniae, which is the most common bacterial cause of pneumonia in adults, partially digest red blood cells and these are alpha haemolytic).

The main Lancefield types of beta haemolytic streptococci are: group A (the streptococcus that causes sore throats), group B (the subject of this paper), and groups C, D, and F (which are usually harmless normal body commensals). Other groups tend to cause animal infection and there are yet other streptococci that do not fit into any group.

GBS is sometimes called “beta haemolytic strep” or “haemolytic strep,” “strep B” and “beta strep.”

1.1 GBS colonisation

GBS is a very common, naturally occurring bacterium found in males and females of all ages, from babies to the elderly. GBS “colonisation” is when the bacteria live in the body without causing any harm or symptoms. People who have the bacteria in their bodies in this way are described as being colonised or as being carriers.

GBS colonise the intestines of around a third of humans with no symptoms at all: it is a normal body commensal (usually harmless bacteria or other organisms that normally live in or on the body). GBS normally cause no harm or symptoms to the carrier and, therefore, colonisation does not need treatment. It is not possible to eradicate intestinal carriage reliably with antibiotics.

In women, the bacteria often also colonise the vagina. Less frequently, the back of the throat may become colonised. GBS colonisation may be intermittent—there one time and not the next, and then back again—and the duration of carriage is unpredictable (though research has shown that, if using optimal tests, the results are highly predictive of colonisation status for a period of five weeks or more). In locations outside the intestines, GBS colonisation may appear to be cleared by antibiotics but they will usually become recolonised.

Substantial variation in the incidence of GBS colonisation has been reported. Reports from the USA suggest there may be some differences in the colonisation rates among ethnic groups, geographic locations and by age. For example, individuals of Afro-Caribbean descent have been found to be slightly more likely to carry the GBS bacteria than Caucasians, and women of Oriental background less likely, although why this is so is not known. However, colonisation rates are similar for pregnant and non-pregnant adults. On average, it is carried in the gastrointestinal tract of 1 in 3 people, and in the vagina of 1 in 4 women.

Since GBS is often found in the vagina and rectum of colonised women, one of the ways in which they can colonise another individual is through sexual contact. GBS does not cause genital symptoms or discomfort—GBS is not a sexually transmitted disease, nor is it a sign of ill health or poor hygiene. It is still relatively common (13-17%) in adults who have never been sexually active.

Despite so many people being carriers, only 1 in 10 adults possess immunity (antibodies) to GBS.

1.2 GBS infection

GBS infection is when the bacteria are actively causing disease directly by damage to cells or indirectly by the toxins they release. GBS occasionally cause infection, most commonly in newborn babies before, during or shortly after birth and in a small number of adults. About half of all GBS infections occur in babies under 1 month.
old and nearly all of the remainder occurs in adults (typically women during pregnancy or after birth, the elderly and people with serious underlying medical conditions which impair the immune system).

The most common infections in adults caused by GBS are blood, urine, bone, eye and soft tissue infections.

1.3 GBS infection in newborn babies

Group B Streptococcal infections, unlike infections caused by other bacteria within the Streptococcus family are most prevalent amongst newborn babies, within the first days of life. GBS infection in newborns can be classed as early onset or late onset. Early onset GBS infection is classified as those cases which present within the first 6 days of life. Late onset infection, on the other hand, is those cases which occur after 7 days (and usually by age 3 months). The graph below shows the age of onset for GBS in the UK in 2004 and clearly shows that early onset GBS infection is far more prevalent than late.

Graph taken from Heath, 2009

Early onset and late onset GBS infections are acquired in different ways. Early onset GBS infection occurs after the bacteria have passed from mother to baby either before or during delivery. The GBS bacteria causing late onset GBS infection can come from a number of sources after birth – including the skin and respiratory tracts of carriers. Early and late onset infection show different clinical symptoms. Whilst early onset GBS infection is most likely to present with breathing problems and pneumonia, late onset GBS infection is more likely to present with meningitis and septicaemia. Once symptoms are present, the condition can be difficult to treat, and the mortality rate as a result of infection is approximately 1 in 10.4.

Currently there is no vaccination for GBS. However, preventative measures can be taken to drastically reduce the rate of early onset GBS infection by up to 90%\textsuperscript{5}. The most effective preventative measure is intravenous antibiotic prophylaxis during labour, which minimises the risk of the baby acquiring the infection as he/she passes through the vagina during delivery. The difficulty is in knowing which women should be treated with antibiotics, and which should not – it is not desirable to treat women who are not at risk, as any antibiotic treatment can have side effects. Current UK guidelines use risk factors for determining which women should be treated. Several risk factors, such as previously having had a GBS infected baby, maternal fever during pregnancy and prolonged rupture of membranes, mean that the risk of GBS infection in the baby is substantially higher. However, a significant number of at-risk women will be missed by using risk factors alone. A reliable test exists which can determine the carriage status of women, thereby determining if her baby is likely to acquire GBS through vertical transmission.
Routine screening of pregnant women is performed in many counties, including USA, Canada, Australia, Belgium, France, Spain, Germany, Italy, Bulgaria, Czech Republic, Slovenia, Argentina and Kenya. Published evidence has shown universally falling incidences of GBS infection in these countries following introduction of these screening-based preventative measures.

Unfortunately, the test is not routinely offered in the UK, and the number of GBS infections as a result is rising.

1.4 Current UK Guidelines

1.4.1 National Institute for Clinical Excellence (NICE)

NICE'S Guidelines CG6 “Antenatal Care – Routine care for health pregnant women”, October 2003 recommend that “pregnant women should be offered evidence based information and support to enable them to make informed decisions regarding their care … addressing women’s choices should be recognised as being integral to the decision making process.” The guidelines also recommend antenatal appointments for all pregnant women at 36 weeks’ gestation – which would be ideal for sensitive testing for GBS colonisation. However, NICE does not recommend such testing, saying, “evidence of its clinical effectiveness and cost effectiveness remains uncertain.” However, the evidence of similar screening studies clearly demonstrates the clinical effectiveness of testing pregnant women for GBS and offering intravenous antibiotics in labour to women whose babies are at increased risk. Countries which have introduced such programmes have seen in their incidence of GBS infection fall dramatically, including the USA, Australia, New Zealand, Belgium, France, Spain and Italy19, . Cost effectiveness issue is less clear-cut though a study published in September 200712,14 indicated testing low risk women, plus antibiotics given to high-risk women and those found to carry GBS was more cost-effective than current practice- indeed routine testing for GBS could save the Government up to £37 million a year.

Further research has also found screening to be more cost effective than risk factors15,16. The result is that information on GBS is not being routinely given to pregnant women – most women are not informed about GBS as part of their routine antenatal care, nor are most involved in deciding whether they should be tested for GBS carriage – they are simply not told it is possible. A survey conducted by Pregnancy & Birth magazine found only 5% of the 1,000 pregnant women and new mothers surveyed had been informed about GBS either at an ‘antenatal class’ or ‘by their GP’. Further research has also found screening to be more cost effective than

Disappointingly, and despite requests by clinicians, health professionals’ organisations and by GBSS, no significant updates were made to the sections relating to GBS in the March 2008 review17 of the guidelines; and in the May 2011 review, no changes whatsoever were made to the guidelines. The next review will be in 2014 at the earliest.

1.4.2 Royal College of Obstetricians & Gynaecologists (RCOG)

RCOG issued their Green Top Guideline No 36 "Prevention of early onset neonatal Group B streptococcal disease" in November 200323. This document is currently under review, and updated guidelines are due later in 2011. This important document is similar in many respects to the guidelines GBSS was promoting in 1996, in that they quote likely incidences of GBS infection based on the presence of recognised risk factors and recommend intravenous antibiotics in labour for women in higher risk groups. However, the guidelines use minimum incidence figures from a surveillance study undertaken in 2000-118 and, therefore, not only underestimate the true incidence of GBS infection but, inevitably, also underestimate the risks to babies from GBS infection. GBS infection in babies has increased in England, Wales and Northern Ireland since 2003 (when the guideline was introduced) – voluntarily reported cases from the CDR/HPA show 0.48 cases per 1000 live births in 2003, which increased to 0.64 per 1000 in 200919,20.

GBSS was happy to endorse the RCOG guidelines that, if fully implemented in the UK, would prevent the majority of lethal cases of GBS infection in newborn babies. We are working with national bodies to refine and improve the
recommendations - GBSS views the guidelines as a key starting position as even more GBS infections could be prevented through adopting a culture-testing approach to GBS prevention as described below.

In 2007, RCOG published the findings of their audit to evaluate practice in UK obstetric units against their recommendations\(^21\). The audit started out by comparing international guidelines for early onset GBS disease: highlighting the fact that, in contrast to the UK and New Zealand guidelines, most of the other countries surveyed recommended identifying women for intravenous antibiotics in labour by offering sensitive tests to all pregnant women. The audit reviewed hospitals’ protocols against GBS infection in newborn babies – of the 161 UK units, which submitted their protocol, four units did not even have a protocol for GBS, of those that did, 35% did not mention the RCOG guideline, and only a minority of units had protocols that were entirely consistent with the guideline.

The audit reviewed hospitals’ practice, identifying significant variation in practice between different hospitals, the three professions (obstetrics, midwifery, and neonatology), and even clinicians in the same unit. Variation was found in all aspects of the care offered to pregnant women, particularly with regard to which risk factors were used to identify who would be offered a bacteriological swab for GBS; the timing of swabs and the site(s) from which it/they are taken; which risk factors were used to identify who should be offered intravenous antibiotics in labour; and which antibiotics and in what doses/timings are used and how newborn babies at risk of early onset GBS disease are managed. Most staff did not know if their laboratories used the Enriched Culture Medium (ECM) method of processing the swabs taken to detect GBS colonisation – recognised as optimal by both the RCOG and the Health Protection Agency. At GBSS, we know of only and handful of NHS hospitals using the ECM method, although the number is growing and we know of a number which are actively looking at this issue.

It is very disappointing that, in the years since the RCOG Green Top Guideline on preventing early onset GBS infection was published, more hospitals have not incorporated the recommendations into their protocols. The audit report made a series of recommendations to improve the situation, but unfortunately, no detail as to how these would be achieved.

Further UK research published in 2010\(^22\) looked at the opportunities for prevention amongst cases of early onset group B Strep infection in babies following introduction of the RCOG Guideline. They found that, in the 48 cases of GBS during 2004 to 2007 (0.52/1000 live births), only 19% of the mothers in whom risk factors were present were given adequate intravenous antibiotics in labour. The researchers stated that, “if all women with risk factors received prophylaxis, 23 cases (48%) may have been prevented.” The researchers also stated that “In this audit, an effective risk-based strategy which targets women with one or more risk factors has the potential to prevent approximately 50% of all EO GBS cases. IAP administration to women with two or more risk factors (as favoured in the RCOG guidelines) might prevent approximately 30% of EO cases ... it is clear that the existence of national guidelines on GBS prevention has not yet been translated into significant IAP use for mothers with risk factors for EO GBS.” All the evidence points to the fact that the risk-based strategy is not working effectively.

\subsection{1.4.3 National Screening Committee}

The National Screening Committee’s current policy position on group B Strep is that screening should not be offered (www.screening.nhs.uk/groupbstreptococcus). This policy was reviewed in November 2008 but no significant changes were made. It is being considered again in 2012.

In May 2006, the UK National Screening Committee launched their GBS online learning package. This learning package was developed to raise awareness of GBS amongst health care professionals. Developed by the Women’s Health Specialist Library (part of the National Library for Health), the learning package is based upon the current UK guidelines published by the Royal College of Obstetricians & Gynaecologists. It is divided into three sections – antenatal, delivery and postnatal. Within each section, there is the option to access an introduction to GBS, different clinical scenarios, a series of quiz questions to test knowledge and a FAQs section. Each section is self-contained, allowing individuals to work through relevant sections at their preferred pace. The GBS learning pack, which is primarily aimed at health care professionals, is at http://www.gbs-learning-tool.co.uk/gbs/.
1.5 Tests for GBS carriage

Colonisation of the vagina with GBS produces no symptoms and can be intermittent. Carrying GBS in the vagina does not automatically mean a baby will develop GBS infection. To predict with greatest accuracy the chances of carrying GBS at delivery, the best time to test for it is between 35–37 weeks of pregnancy\(^7\). Many more GBS infections in newborn babies could be prevented by offering all pregnant women sensitive testing at 35-37 weeks and offering intravenous antibiotics to carrying GBS\(^6\). **GBS testing of pregnant women is not routinely offered in the UK.**

1.5.1 Test Methods

The method used for GBS detection is critical for obtaining accurate results for GBS carriage. When done properly, antenatal GBS screening can give a very good indication as to the carriage status of the mother at delivery.

Sample Collection

GBS tests are performed by using a swab test. Swabs are ideally taken from the lower vagina and rectum at 35-37 weeks of pregnancy\(^7\). They can be taken by healthcare professionals, or by the mother, following simple instructions\(^24\). Once taken, the swabs are packaged appropriately and sent off for testing immediately. Recent research showed that swab tests at this late stage in pregnancy were broadly acceptable amongst pregnant women\(^15\).

Testing before 35 weeks of pregnancy is not as good at predicting GBS colonisation at delivery. Testing later than 37 weeks of pregnancy increases the chance that the baby will be born before the result is available\(^23\). If done within five weeks of delivery, this test is very sensitive: research has shown that a positive results means there is an 87% chance that a woman will carry GBS at delivery\(^6\). Similarly, a negative result is 96% predictive that a woman will not be carrying GBS at delivery. It is important that the health professional receives a copy of the test results.

Processing

GBS carriage is detected by growing the swab samples on laboratory plates to determine if the GBS bacteria are present.

Direct Plating Method

If the swabs are processed directly on to laboratory plates, a positive result is very reliable. However, the method is particularly susceptible to giving false negative results - this can be as high as 50% of samples\(^7\), leaving up to half of the pregnant women who were carrying GBS at the time the swab with taken under the false impression that they are not carrying GBS and their baby is not at risk.

Enriched Culture Medium

To reduce the number of false negative tests, the laboratory can take an extra step to improve the accuracy of the test. This involves growing the samples in an enriched medium to improve the viability of the GBS in the sample versus that of the other naturally occurring bacteria that might otherwise swamp the GBS. This usually takes 24-48 hours. Following this, the sample is plated as before, to determine whether GBS is present.

This enriched culture medium (or ECM) method is the “Gold Standard” of GBS testing and is the best GBS test currently available\(^10\). It may miss a very small number of women who carry GBS, although it will not give a false positive result. It is the method described by the Health Protection Agency’s BSOP58, Processing swabs for group B Streptococcal carriage and is available from a handful of NHS hospitals and privately (around £32 for a UK-wide postal service).

The ECM test costs more than the direct plating method, due to the extra step involved, and would require a change both in practice in antenatal care and in what is available from laboratories serving the NHS. However, none of the constituent parts for ECM tests is difficult to obtain or expensive, so to implementation of standardised ECM testing nationally is certainly a viable option.

PCR Testing and Intrapartum Testing
No tests are currently available which are both accurate enough and fast enough to recommend their use for detecting GBS once labour has started. Plating of swab samples requires time for the bacteria to proliferate, meaning it is unsuitable as an intrapartum test. Another method exists, however, called the Polymerase Chain Reaction (or PCR) method, which is much faster than growing the sample on a laboratory plate, and still can give an accurate result as to GBS carriage status\(^3\). However, the PCR method requires specialist equipment that is not commonly available in hospitals, and is significantly more expensive than current testing methods.

The greatest potential advantage here would be that potentially testing for GBS carriage could be performed when a woman presents in labour\(^3\). Were the method perfected, this would give the most accurate diagnosis of GBS carriage at the onset of labour\(^2\). Currently, however, there are many issues to overcome — including the need for specialist equipment, staffing issues, issues of consent during labour, the risk that realistic turnaround times may be insufficient to give adequate prophylaxis and that the PCR test has not yet been validated for use in the UK. All this means PCR testing is unlikely to be an acceptable or cost effective alternative to antenatal culture testing\(^9\) for the foreseeable future. The PCR technology needs to be simplified and speeded up to be a useful point-of-care test. When available, such technology may further reduce the incidence of early onset GBS infection in countries already screening\(^27\)

At present, culture for GBS (using enriched culture medium) at 35–37 weeks to define an at-risk group is the most cost-effective strategy currently practicable.

1.5.2 Why test?

Testing is not essential, but it is the only way to find out if a woman is carrying GBS. If she is, then her baby is at raised risk of developing GBS infection and prevention measures can be considered. She can be offered intravenous antibiotics in labour to minimise the risk of GBS infection in her newborn baby. Whether she chooses to have the antibiotics or not, knowledge of her carriage status can inform the management of her labour and the baby’s first hours of life.

Up to 40% of babies who develop early onset GBS infection will be born to women whose only risk factor was carriage of GBS around delivery\(^1\). GBS carriage is asymptomatic and therefore, without testing, these women whose babies are at increased risk cannot be identified.

Research has shown that significantly more early onset GBS infections can be prevented by using a testing strategy, rather than a risk-factor strategy alone\(^3 \& 3\).

1.5.3 Private Testing

If a woman would like to have a private ECM test for GBS carriage, testing kits are available UK-wide through the post. The pregnant woman requests a GBS Testing Pack from the company, which usually sends it out the same day by first-class post. Once received, then the woman (following instructions in the pack) or her health professional takes the vaginal and rectal swabs at 35–37 weeks of pregnancy. The health professional may charge for this service. Swabs can be taken earlier but then they may not be as reliable in predicting GBS carriage at delivery. They can be done later, but there is an increasing chance that the baby will be born before the result is available.

Once taken, the swabs should be sent immediately to the laboratory (with payment) in the envelope provided with the GBS Testing Pack – ideally, there should be less than 48 hours between taking the swabs and the processing of the samples. When the laboratory receives the swabs, they process them following the Health Protection Agency’s National Standard Method BSOP58 “Processing Swabs for Group B Streptococcal Carriage.” The laboratory has the results available within three working days of receipt of the swabs and posts out the results on that day to you and your health professional (provided you supply this information) or, if requested, sends the results by text and/or email.

The private test kits for the GBS-specific Enriched Culture Medium (ECM) test are available free of charge, although they charge approximately £32 for processing the swabs and sending out the results. [Please note that GBSS simply provides contact details of laboratories – we do not have the resources to check their performance in terms of speed or accuracy. If anyone would like to provide us with feedback on the services provided, please contact us so we can collect the information for future users.] To obtain an ECM test kit from a
company which follows the Health Protection Agency’s BSOP58 to process swabs for group B Strep carriage, contact:

Blue Horizon Medicals  Tel: 0800 098 8751  E-mail: info@bluehorizonmedical.co.uk
The Doctors Laboratory  Tel: 020 7307 7373  E-mail: gbs@tdipathology.com or text GBS to 88020
Medisave  www.medisave.co.uk/group-streptococcus-screening-test-p-7896.html
Mumstuff  www.mumstuff.co.uk/acatalog/Group-B-Streptococcus-Screening-Test-Kit.html

We know of two private laboratories which provide a more personal service for GBS testing, whilst still following the Health Protection Agency’s BSOP58. You can make an appointment to see them and they can take the swabs for you (or you can do this yourself) and will send you the results by post, email or text. These are:

Alpha Health Diagnostic Test Centre, 19 Blackfen Parade, Sidcup, KENT DA15 9LU.  Tel: 020 8301 4930.  
Email: info@alphabhealthchecks.com
The Doctors Laboratory, Patient Reception, 55 Wimpole Street, London, W1G 8YL.  Tel: 020 7307 7383.  
Email: tdl@tdipathology.com

For the latest information on the availability of tests which follow the HPA’s BSOP58 methodology, visit www.gbss.org.uk/test

1.6 Future Prevention

GBS has been a recognised cause of serious infection in babies since the 1960s in the USA and the 1970s in Europe. Research in the decades following has shed considerable light on how GBS causes this particular type of infection and how most of these infections can be prevented now and are likely to be prevented in the future.

1.6.1 Testing at 35–37 weeks of pregnancy

Babies at greatest risk of developing GBS disease are those born to women who carry GBS during labour. Testing women during pregnancy for GBS is not currently done in the UK, largely because of the costs and logistics involved. Research has shown that testing pregnant women, using the more sensitive ECM tests, and giving antibiotics in labour to those carrying GBS and to high-risk women, was significantly more cost-effective than using a risk-factor approach. One research paper calculated an expected net benefit to the Government of such an approach to be around £37 million a year, compared with the current RCOG approach.13,14

Testing for GBS, using sensitive culture methods (not routinely available on the NHS at present, though recognised as optimal by the Royal College of Obstetricians & Gynaecologists and described by the Health Protection Agency’s national standard BSOP58) at 35–37 weeks’ gestation and offering intravenous antibiotics from the onset of labour or waters breaking to all women whose babies are at raised risk of GBS infection, is more effective at preventing GBS infection in newborn babies than relying on risk factors alone. One paper estimated that a risk-factor approach would prevent 50–60% of GBS infection in babies, whereas a testing approach giving intravenous antibiotics in labour to women found to be GBS positive, plus to those delivering prematurely or with a history of GBS infection, would prevent 80–90% of GBS infection in babies.

Testing for GBS colonisation, with the culture of vaginal and/or rectal swabs taken at 35–37 weeks of gestation is practised in many countries and the incidence of GBS infection in newborn babies has fallen dramatically as a result.
The above graph clearly shows the rapidly falling incidence of early onset GBS infection and the constant incidence of late onset GBS infection in the US during 1990-2008. Since the American College of Obstetricians & Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) statements on preventing GBS infection and the introduction of the Center for Disease Control (CDC) Consensus guidelines (which gave healthcare providers a choice of either offering women sensitive testing for GBS at 35-37 weeks of pregnancy or using a risk factor approach to determine which women should be offered intravenous antibiotics from the start of labour and at intervals until delivery) the reduction in GBS infection incidences has decreased dramatically. After revised guidelines CDC guidelines were released in 2002 (which recommend that all women should be offered sensitive ECM testing during pregnancy), it can be seen that the low level of GBS infection has since been consistently maintained. A 2009 paper stated that the reduced incidence in their study population “matched a conservative estimate of what universal screening was expected to achieve” and looked at the feasibility of decreasing the incidence still further. CDC guidelines were further revised in 2010 and can be found at [http://www.cdc.gov/mmwr/pdf/rr/rr5910.pdf](http://www.cdc.gov/mmwr/pdf/rr/rr5910.pdf).

In the US, the proportion of pregnant women screened for GBS colonisation before delivery increased from 48.1% in 1998-1999 to 85.0% in 2003-2004. Amongst these women screened in 2003-2004, a total of 98.4% had the test results available at labour. 24.2% of screened women were documented as being carriers of GBS (similar to UK carriage rates). The proportion of women in the US with an indication for antibiotic prophylaxis who received them also increased substantially, from 73.8% in 1998-1999 to 85.1% in 2003-2004.

**These figures from the US clearly show that increased awareness of the risks of GBS infection by healthcare professionals and implementation of simple preventative measures can result in a dramatic reduction in the number of newborn babies infected with group B Strep.**
The above graph shows the number of reported GBS infections in infants in England and Wales during 2000-2010. The potentially preventable cases are those in blue, occurring in the first 6 days of life. The introduction of guidelines by RCOG in 2003 has done little to reduce the number of GBS infections amongst newborns; the number of infections has increased since 2003. GBS infect a relatively small number of newborn babies in the UK and, historically the cost of an antenatal testing programme for all pregnant women has not been seen as economically justifiable. However, in light of a rising incidence of GBS infection in the UK and the reducing costs of sensitive testing, the situation has changed, and new research shows moving to a sensitive testing strategy, with antibiotic prophylaxis during labour would result in around £37 million being saved yearly.

GBSS believes that sensitive testing should be offered to all low-risk women late in their pregnancy, with intravenous antibiotics being offered in labour to women whose babies are at raised risk of developing GBS infection. Until it is, the charity recommends a risk-factor approach that if implemented, although not as effective as a testing approach, would still prevent the majority of GBS infections developing in newborn babies.
1.6.2 Testing in labour

There are currently no tests for GBS carriage that are both accurate enough and fast enough to recommend their use in labour – the tests that are sufficiently accurate take too long to recommend their use in labour. In-labour PCR testing for GBS carriage could in future be sufficiently sensitive to guide offering of antibiotics in labour, but the technique needs to be improved and made simpler in order for the method to become a cost effective option.

Testing women for GBS colonisation using vaginal and/or rectal swabs taken at 35–37 weeks of gestation and culturing them in enriched media – as practised in many countries – is not quite as sensitive as a PCR test in labour would be at predicting whether the pregnant woman will be carrying GBS during labour, but allows antibiotics to be started on admission to the labour ward. The PCR technology needs to be simplified and speeded up to be useful as a point-of-care test.

At present, culture for GBS (using enriched culture medium) at 35–37 weeks to define an at-risk group is the most cost-effective strategy currently practicable.

1.6.3 GBS Vaccine

This paper focuses on stopping the majority of GBS infection in babies that can be prevented. However, GBS infection also strikes babies who appear not to be ‘at risk’ at birth – approximately 40% of all cases of early onset GBS infection in newborn babies occur where there are no apparent risk factors, apart from GBS colonisation of the mother16,18. GBS can also cause late onset GBS infection, presenting after the first 6 days of life and usually by age 3 months. With risk based prophylaxis, the incidence of late onset GBS infection accounts for approximately 25% of all GBS infection in babies1;29 and, at present, there are no known ways to prevent it.

Significant effort worldwide is going into the development of a vaccine, which, one day, will prevent almost all GBS infections in babies. A vaccine could prevent not only those in ‘high-risk’ babies, but also those that may not be prevented with antibiotics in labour: preterm babies and those developing late onset GBS infections, as well as preventing the less common adult GBS infection in mothers around delivery, in the elderly and people with suppressed immune systems.

Considerable advances have been made in the vaccine field32 but a vaccine is not ready for use: all existing candidates have significant technical problems associated with them: GBS are classified based on type-specific capsular carbohydrates - nine serotypes have been identified: Ia, Ib, II, III, IV, V, VI, VII and VIII 33. The predominant serotypes have changed over time, vary in different geographic regions, and can be associated with different forms of the disease, so it is important for a vaccine to be effective against all or at least most of the most virulent serotypes.

It may however be that science is not the major obstacle for developing a GBS vaccine – there may also be concern about litigation, which could make potential funders reluctant to sponsor the research. A paper by the Medical Screening Society's Working Group on GBS disease demonstrates the strong case for a vaccine against GBS, calling for a trial to be undertaken with all urgency34, a view GBSS fully supports.

A recent paper by Heath35 describes how current research for a GBS vaccine is mainly focussed on surface exposed proteins and capsular carbohydrates for the most common and virulent serotypes of GBS. Vaccines against four of the most virulent serotypes have been safely administered to pregnant mice, and successfully protecting the mouse pups against the corresponding strains. Testing of the vaccine in humans has so far been limited to either monovalent or bivalent vaccines (protecting against one or two serotypes respectively), with mixed success. The optimal strategy in reducing GBS infection in neonates is to administer the vaccine during pregnancy. This would ensure that the highest levels of antibodies are present at delivery, and therefore in the baby. Alternatively, a vaccine could be given along with routine vaccines for adolescent females, although the main drawback here is the duration of protection the vaccine offers. A GBS vaccine would also be very important for the protection of other high-risk groups, such as the elderly, or those with underlying health disorders.
Despite the on-going research, the search for a safe and effective vaccine against GBS is still in the preliminary testing stages. Widespread availability of a vaccine is still many years away – estimates vary, but the likelihood of one being readily available for a pregnant woman in the UK within the next 10 years is we believe slim. Therefore, until a vaccine is widely and routinely available, the best protection against GBS infection in newborns is administration of intrapartum antibiotic prophylaxis to mothers whose babies are at higher risk.

1.7 Antibiotics

Taking antibiotics should not be done lightly – they can have side effects that need to be considered in relation to the potential benefits. The three main concerns about taking antibiotics are a) the pregnant woman having an allergic reaction to the antibiotic, b) antibiotic resistance developing which may affect the mother or her baby and c) increased risk of allergies for the baby in later life.

1.7.1 Allergic Reaction

The risk of a major allergic reaction is very small, but the consequences can be devastating which is why it is so important that the health professionals be informed if the pregnant woman has ever had an allergic reaction to penicillin or any other antibiotic.

Although good data is hard to find on this subject, the generally quoted estimated risks of having an allergic reaction to penicillin are:

- 1 in 10 of the pregnant woman developing a mild allergic reaction, such as a rash;
- 1 in 10,000 of the pregnant woman developing a severe allergic reaction (anaphylaxis); and
- 1 in 100,000 of the pregnant woman developing fatal anaphylaxis, resulting in her death.

*Severe complications can occur in the unborn baby even when the anaphylaxis developed by the mother is not life threatening, although this risk is probably overstated.

These figures are generally accepted as being a significant over-estimate of the risk. A recent paper stated that, in the US between 1997 (the year after the CDC recommended intravenous antibiotics in labour for women whose babies were at increased risk of developing GBS infection) and 2001, an estimated 1.8 million women were given penicillin in labour and no deaths occurred. Given this, an estimate of a 1 in 100,000 risk of death from penicillin anaphylaxis seems very high.

1.7.2 Antibiotic Resistance

Whenever antibiotics are taken, there are always risks of antibiotic resistance developing. When antibiotics are given to pregnant women, such antibiotic resistant bacteria could affect either or both the mother and her baby. The drugs recommended in this document have been chosen both because of their effectiveness against GBS and their relatively narrow spectrum to reduce the risk as far as possible of antibiotic resistant bacteria developing. GBS can sometimes be resistant to clindamycin, although there is no evidence of GBS becoming resistant to penicillin at present (in 2009, 8% of the GBS isolates tested for this by the UK’s Health Protection Agency were resistant to clindamycin).

Although this is an extremely small risk to an individual pregnant woman and her baby, it is important that antibiotics are not used unnecessarily since, the more they are used, the more likely it is that antibiotic resistance will develop.

1.7.3 Risk of Allergies

When antibiotics are given around birth and in the early weeks of life, there is the chance they may increase the likelihood of the baby developing allergies. Although a lot of press space is given to this, unfortunately, data is lacking on whether the antibiotics cause the allergies, or whether there are other reasons (for example, genetics, environment, disease, etc.). This is another area where we need more research.

Bearing all this in mind, the pregnant woman needs to weigh up whether she considers the risks are acceptable in comparison with the potential benefits and, if so, in what circumstances she would want to be offered antibiotics.
GBS has been recognised, since the 1970s in Europe, as the primary cause of bacterial infection causing illness and death in newborn babies. GBS infection in newborn babies is as common as other medical conditions that pregnant women are regularly told about, such as spina bifida and muscular dystrophy, yet GBS remain relatively unknown to women. Preventative measures can be successful in the majority of cases.

2.1 How are GBS colonisation and infection diagnosed?

GBS does two very different things – it colonises humans (the bacteria live in the body without causing any harm or symptoms) and causes infection (the bacteria are actively causing disease, either directly by damage to cells or indirectly by the poisonous proteins they release).

Mothers whose babies have been affected by GBS sometimes feel guilty because they carry the bacteria. GBS is just one of a number of types of bacteria which normally live in our bodies and most babies are not affected by exposure to them. Carrying these bacteria is perfectly natural and normal - there’s no need for anyone to feel guilty about it.

2.1.1 Diagnosing GBS colonisation

GBS colonisation (or carriage) is without symptoms. However, it is possible to detect GBS carriage by taking vaginal and rectal swabs from which cultures are grown (usually taking 24 to 48 hours). A GBS positive culture result means the woman is colonised with GBS in her vagina and/or rectum at the time the swab was taken - not that she or, if she is pregnant, her baby, will become ill.

To detect GBS colonisation most effectively during pregnancy, a special enrichment technique is needed to grow cultures from both vaginal and rectal swabs. Because cultures of specimens taken from the vagina and rectum are more sensitive than specimens from the cervix, pelvic examination or visualisation of the cervix by speculum examination should not be performed for collection of cultures for testing.

In the UK, the special enrichment technique needed to grow GBS cultures is not routinely available, despite the fact the November 2003 Green Top Guideline No 36 published by the Royal College of Obstetricians & Gynaecologists recognises this method as being optimal for identifying vaginal and rectal GBS carriage, and the Health Protection Agency’s National Guideline BSOP58 describes this method for processing swabs for GBS carriage. Unfortunately, the tests widely used in the UK – using the direct plating method - are relatively insensitive, missing up to half of all carriers. Using the direct plating tests, up to 50% of pregnant women colonised with GBS at the time the swabs were taken would be incorrectly told they are not carriers.

Sensitive Enriched Culture Medium (ECM) tests for GBS carriage are available in the UK, albeit only from a small although growing number of NHS trusts and privately (see Private Testing on page 8). This GBS-specific test is much more sensitive and has been specifically designed for the isolation of GBS. It should be performed at 35-37 weeks’ gestation to best predict colonisation with GBS at delivery. Research shows that, if performed within 5 weeks of delivery, the sensitive test giving a negative result is 96% predictive of GBS not being carried at delivery (4% of women acquired carriage between test and delivery) and a positive result is 87% predictive of carrying GBS at delivery (13% of women lost carriage between test and delivery). For more information about testing for GBS carriage, see page 8.

There is no evidence to support giving antibiotics to clear vaginal or rectal GBS carriage during pregnancy (i.e. before labour starts or waters break) will effectively prevent GBS infection in newborn babies. Even if the antibiotics were to clear the vagina of GBS, they will not clear the bacteria from the intestines from which recolonisation will occur. Antibiotics are however known to be effective in preventing most GBS infection in newborn babies when given intravenously as soon as possible after the onset of labour or waters breaking and at intervals until delivery.
2.1.2 Diagnosing GBS infection

GBS infection is diagnosed when GBS bacteria are grown from usually sterile body fluids, such as blood, urine or spinal fluid. These cultures normally take 24-48 hours to grow the organism. The Polymerase Chain Reaction or PCR test to detect GBS bacterial protein may be available in some institutions and is more rapid. It is important to understand that none of these tests in newborn babies is completely reliable. Occasionally the tests for GBS give “false negative” results even though the baby has signs of infection and other blood tests indicate the presence of infection (so called inflammatory markers which may include a high or very low white blood cell count, a low platelet count or a raised C-reactive protein).

Early onset GBS infection may be mistaken for RDS39 (respiratory distress syndrome) as the symptoms are similar, and in X-rays of the chest may be indistinguishable. Features assisting the diagnosis of early onset GBS infection include a background of obstetric complications, the baby being in a poor condition at birth with a low Apgar score, neutropaenia (insufficiency of a form of white blood cell in the blood), normal echocardiography, a pleural effusion and relatively compliant lungs with ventilation.

2.2 GBS infection in babies

GBS is the most common cause of septicaemia40 (rapid multiplication of bacteria and the presence of bacterial toxins in the blood, a condition commonly known as blood poisoning) and meningitis41 (inflammation of the membranes that cover the brain and spinal cord that usually results from infection by any of several micro-organisms) in newborn babies. GBS is also a frequent cause of newborn pneumonia (inflammation of the lungs due to infection). Babies who develop GBS infection can require long stays in hospital.

What the incidence of GBS infection in newborn babies would be in the UK without preventative medicine is unclear and it is unlikely now that we will ever know the true figure, given the difficulty both of obtaining full incidence data and of knowing how much prevention is already occurring to reduce the number of GBS infections in babies. However, realistic estimates of this are needed so that sensible estimates of the risks of newborn babies developing GBS infection can be made.

The British Paediatric Surveillance Unit of the Royal College of Paediatricians and Child Health undertook a study18 to determine the number of babies born in the UK and Republic of Ireland who developed GBS infection at under age 90 days between 1st February 2000 and 28th February 2001. This found 0.7 per 1,000 babies born in the UK and Republic of Ireland developed culture-proven GBS infection, although the researchers admit their figures under-reported the situation by up to 21-40%, suggesting a true incidence of culture-proven cases of at least 0.9/1000 babies born (voluntarily reported cases reported to the Health Protection Agency found in the following year, 2004, an incidence of just 0.48/1000, a figure that has now risen to 0.64/1000). Another London study42 estimated the incidence of culture-proven plus suspected cases of GBS infection to be 3.6 per 1,000 babies born, increasing the incidence of infection significantly – and both of these studies were conducted at a time when increasingly hospitals either had or were introducing protocols against GBS infection in babies.

The incidence of GBS infection in newborn babies has increased in England, Wales and Northern Ireland since 200110,19 – the number of voluntarily reported cases from the CDR/HPA increased by over 52% from 0.42 cases per 1,000 live births in 2001 to 0.64 cases per 1,000 live births in 2009. This increase comes at a time of greater awareness of GBS amongst the relevant health professionals and the implementation of prevention strategies in UK hospitals.

The GBSS medical advisory panel has looked at the available data for the UK and considers an underlying incidence of GBS infection in newborn babies, where no preventative action is taken, of 1 in every 1,000 babies born to be a conservative estimate of the UK situation. Assuming an annual birth rate of approximately 700,000 babies for the UK, then without preventative action, GBS causes infection in at least 700 babies each year in the UK.
Even without preventative medicine, in the UK only approximately 1 in every 300 babies exposed to the bacteria is susceptible and develops GBS infection and it is not fully understood exactly why only certain babies are susceptible while others are not. Each year (based on around 700,000 births in the UK when no preventative medicine is given) approximately\(^1\):\(^2\):\(^11\): 
- 230,000 babies are born to women who carry GBS;  
- 88,000 babies (1 in 8 of all babies) become colonised with GBS;  
- 700 babies develop severe GBS infection, including pneumonia, septicaemia and meningitis;  
- an estimated 75 babies die as a result of GBS infection, but this could be as high as 100;  
- the majority of babies recover from their GBS infection with no long-term damage; but  
- up to a half of the survivors of GBS meningitis suffer permanent mental and/or physical problems, ranging from mild to severe learning disabilities, impaired sight, impaired hearing and lung damage.

Approximately one out of every 10 babies who develop severe GBS infection dies\(^1\):\(^2\):\(^22\). Babies born prematurely are the most common fatalities since their immature immune systems are unable to fight off the bacteria. Some babies (full and preterm) seem healthy at birth but become severely ill with GBS infection very rapidly after some hours or days. Death may occur within hours of the baby first showing any sign of illness.

GBS infection is usually apparent at or shortly after birth (early onset GBS infection), but may also develop after the baby is 6 days old (late onset GBS infection).

2.2.1 Early onset GBS infection

Early onset GBS infection is GBS infection occurring within the first 6 days of life. With the current risk based strategy for the administration of antibiotic prophylaxis, this accounts for around 75% of all GBS infections\(^29\). However, it is thought that without any prevention, the underlying rate would be as high as 90%. An independent Cochrane review has shown that antibiotic prophylaxis reduces the infection rates due to early onset GBS infection\(^43\). Up to 11% of babies who develop early onset GBS infection die\(^18\), with another 7%\(^34\) sustaining permanent mental and/or physical disabilities, but most suffering no long-term damage.

Early onset GBS infection is characterised by the rapid development of breathing problems (respiratory distress) and/or blood poisoning (septicaemia). In at least 60% of babies who develop GBS infection, signs are apparent at birth\(^44\). Typical signs of early onset GBS infection include:

- grunting  
- lethargy  
- irritability  
- low blood sugar  
- abnormal (fast or slow) breathing rates with blueness of the skin due to lack of oxygen (cyanosis). 

Typically at delivery or within a few hours, an infected baby shows symptoms of mild respiratory distress and needs additional oxygen; the baby’s oxygen requirements increase, the baby stops breathing and needs a breathing machine (artificial ventilation). Early onset GBS infection may very closely mimic the clinical presentation and chest X-ray appearance of respiratory distress syndrome (RDS)\(^39\).

Early onset GBS infection is most common after obstetric complications, such as low birth weight, prematurity, prolonged rupture of membranes and maternal fever.

At least 60% of early onset GBS infection is preventable using the risk based prevention strategy recommended by our medical advisory panel, and up to 90% of early-onset GBS infection would be preventable if intravenous antibiotics were offered in labour to all GBS carriers identified by universal sensitive testing late in pregnancy plus to the mothers of babies in the recognised higher risk situations.
Late onset GBS infection

Late onset GBS infection is responsible for around 2-3\% in every 10 cases of GBS infection in babies and has a lower mortality rate to babies who develop early onset infection - approximately 8% of babies\(^1\) (1 in 12 babies) who develop late onset GBS infection will die as a result.

Occurring after the baby is 6 days old, with the incidence declining with age, late onset GBS infection is uncommon after the baby is 1 month old and very rare after the baby is 3 months old.

Up to 90%\(^4\) of late onset GBS infections include meningitis with sepsicaemia, although focal infections and pneumonia also occur. Meningitis is a very serious condition, and, as well as the high mortality rate\(^4\), around 21% of late onset GBS infections will be left with permanent mental or physical disabilities\(^3\)(including mild to moderate disabilities the rate has been found to be as high as 50%\(^4\)).

Late onset GBS infection in newborn babies is associated with prematurity, prolonged rupture of membranes, multiple births and the mother carrying GBS. Until a vaccine is developed, there are no known methods for preventing late onset GBS infection in babies.

Typical symptoms of late onset GBS infection (excluding meningitis) are\(^6\):

- fever;
- poor feeding and/or vomiting; and
- impaired consciousness.

Typical symptoms of meningitis in babies, including GBS meningitis (any of these could develop but some may not be present at all) include\(^4\):

- fever, which may include the hands and feet feeling cold, and/or diarrhoea;
- refusing feeds or vomiting;
- shrill or moaning cry or whimpering;
- dislike of being handled, fretful;
- tense or bulging fontanelle (soft spot on the head);
- involuntary body stiffening or jerking movements;
- blank, staring or trance-like expression; altered breathing patterns;
- floppy body;
- abnormally drowsy, difficult to wake or withdrawn;
- turns away from bright lights; and
- pale and/or blotchy skin.

Late onset GBS infection may also present as:

- inflammation of the middle ear (otitis media);
- inflammation of the joints (septic arthritis);
- inflammation of the bone (osteomyelitis);
- inflammation around a bone in the nose (ethmoiditis);
- inflammation of the membrane covering the front of the eye (conjunctivitis);
- inflammation of facial tissue (facial cellulitis); and
- inflammatory infection that kills connective tissue (necrotising fasciitis).

If a baby shows signs consistent with GBS infection or meningitis, the GP should be called immediately. If unavailable, the baby should be taken straight to the nearest PAEDIATRIC Accident & Emergency Department. Early diagnosis and treatment are essential to combat late onset GBS infection — delay can be fatal.
2.3 Pre-birth Complications & GBS

2.3.1 Stillbirth and late miscarriage

Along with many other bacteria found in the vagina, GBS can cause infection in a baby whilst still in the womb, which can cause stillbirth. GBS can live in amniotic fluid and from here can spread into the baby’s lungs and, from there, into the baby’s bloodstream where they may cause infection, which can result in the baby’s death. Some evidence suggests GBS may be a rare cause of late miscarriage⁴⁶, but studies have not been done to establish this.

These complications are uncommon and are usually caused by a variety of factors other than GBS: genetic defects, gynaecological problems, other infections, etc. If a woman has had any of these problems in the past, these should be investigated fully by a consultant obstetrician at booking (or before) regardless of whether or not she carries GBS.

2.3.2 Preterm labour and delivery

GBS is an acknowledged cause of preterm (before 37 completed weeks of pregnancy) labour and delivery. It is assumed that the GBS cause a local infection in the amniotic membranes, which surround the baby, and this induces preterm labour; there are a number of other organisms which can have a similar effect. However, other reasons for preterm delivery are more common than GBS; see Women at increased risk of premature labour and birth on page 22.

2.3.3 Pre-labour rupture of membranes

Some studies suggest that carriage of GBS in the vagina and urinary tract may cause pre-labour rupture of the membranes⁴⁷,⁴⁸ (waters breaking before the onset of labour), although other studies do not support these findings⁴⁹. Although GBS may be a rare cause of pre-labour rupture of membranes, as can other organisms, other, as yet unidentified, causes are far more common (see also our experts’ view on Prelabour & preterm rupture of membranes on page 21).

2.4 How should GBS infection in babies be treated?

GBS infection in babies needs to be treated promptly and aggressively. High doses of intravenous antibiotics should be administered and therapy should not be stopped prematurely. Given this, most babies who develop GBS infection can be treated successfully with antibiotics⁵⁰, although some will require all the expertise of full intensive care and ventilatory support as provided in a neonatal intensive care unit. Not all hospitals have such a facility and so some ill babies have to be transferred to one with these specialised facilities. Sadly, even with full intensive care, approximately 1 out of every 8 infected babies will die from their GBS infection.

The minimum recommended length of intravenous antibiotic treatment for babies who develop GBS infection is 10 days if meningitis is not present, 14 days if meningitis is present. The dosage required will depend upon the baby’s condition.

Before discharge, a full work up needs to be done for a baby who has recovered from his/her GBS infection comprising:

<table>
<thead>
<tr>
<th>BABY SEPSIS WORK UP TESTS</th>
<th>FBC (full blood count) and differential</th>
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<tr>
<td></td>
<td>CRP (C reactive protein) – 2 tests, 12-24 hours apart</td>
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<td></td>
<td>Blood culture; and</td>
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<td></td>
<td>Deep ear swab</td>
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<tr>
<td>OPTIONAL</td>
<td>Chest X-ray</td>
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<td>(depending on clinical indication)</td>
<td>Lumbar puncture</td>
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<td></td>
<td>Gastric aspirate</td>
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<td>Antigen test</td>
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Any other medical problems the baby has in addition to GBS infection, for example prematurity, will also need to be treated (e.g. by providing additional oxygen, assisted ventilation, etc.).
2.5 How does a baby become infected with GBS?

A baby develops GBS infection after he/she has been exposed to the bacterium. Where this exposure comes from may vary: if a baby has symptoms within first six days of birth (early onset GBS infection), the bacteria will most probably have been passed from the mother to her baby before or during delivery\(^2\). Such transmission occurs if the woman is carrying GBS in her vagina, and the bacteria either crossed the amniotic membranes or was passed to the baby during delivery.

Approximately 50% of babies born to women carrying GBS in the vagina at delivery will become colonised themselves. One in every 125 of these colonised babies will develop GBS infection, typically early onset infection, although many late onset infections may also be due to the baby’s exposure to GBS during birth. The primary source of the bacteria that cause GBS infection in newborn babies is the mother’s vagina before or, less frequently, during or after delivery.

The 3 ways in which a baby becomes infected with GBS are:

2.5.1 Before birth

There are physical and chemical barriers to keep bacteria from getting inside the baby, including the cervical canal, the mother’s immune system and the amniotic fluid. If GBS get inside the baby, they will normally be attacked by the baby’s immune system, although GBS can sometimes foil this immunological attack. In pregnant women who carry GBS, the bacteria can travel from the mother’s vagina into the baby’s bloodstream. To do this, they cross the cervix and have an enzyme, called hyaluronate lyase\(^5\), which can punch microscopic holes in apparently intact amniotic membranes, normally without causing any sign or symptom of these rupturing. Unlike many bacteria, GBS can live in amniotic fluid and from here spread into the baby’s lungs and into the baby’s bloodstream, where they may set up an infection\(^4\). At each stage of the journey, the bacteria come up against the mother’s or baby’s natural defences and, the vast majority of times, invasion is prevented. However, when infected with GBS before birth, none of these natural defences has protected the baby, who develops early onset infection.

Once an infection has developed, this can lead to shock (a dangerous reduction of blood flow throughout the body tissues that, if untreated, may lead to collapse, coma and death. Shock in this sense is physiological shock - different from the mental distress that may follow a physically or emotionally traumatic experience), pneumonia and meningitis, each of which is life threatening.

Having a Caesarean section does not eliminate the risk of a baby developing GBS infection.

2.5.2 During birth

The baby comes into contact with GBS when passing through the vagina. GBS may then enter the bloodstream and, in most cases, the baby’s immune system will successfully fight off the bacteria. However, a small number of babies are susceptible to the bacteria and go on to develop GBS infection. It is not known why some babies do develop infection and others don’t.

2.5.3 After birth

The baby is exposed to the bacteria after birth and, if susceptible, develops late onset GBS infection. Some research showed that at least 50%\(^1\) of cases of late onset GBS infection were the same strain of GBS that the mother was carrying. Where the rest come from is not clear.

GBS can be found on the hands and in the respiratory tract of a colonised person. Therefore everyone, whether they know they are colonised or not, should wash and dry their hands thoroughly before handling a newborn baby.

2.6 What are the chances of a baby developing a GBS infection?

The following are estimates of the chances a baby in the UK will become infected with GBS when no preventative measures are taken and no other risk factors are present:
• 1 in 1,000* where the pregnant woman is not known to carry GBS;
• 1 in 400 where the pregnant woman is carrying GBS during the pregnancy;
• 1 in 300 where the pregnant woman is carrying GBS at delivery; and
• 1 in 100 where the pregnant woman has had a previous baby infected with GBS.

*This is our medical panel’s conservative estimate of the number of GBS infections in newborn babies that would occur were no preventative intravenous antibiotics given to women in labour and this estimate has been used throughout this document. Some UK research has suggested this may be a significant underestimate of the incidence of GBS infection in newborns, which could be as high as 3.6 per 1,000 babies born.

If a woman who carries GBS is given antibiotics during labour and at intervals until delivery in accordance with our medical advisory panel’s recommendations, the baby’s risk is reduced significantly:

• 1 in 8,000 where pregnant woman carries GBS during pregnancy;
• 1 in 6,000 where pregnant woman carries GBS at delivery; and
• 1 in 2,000 where pregnant woman has previously had a baby infected with GBS.

The vast majority pregnancies can be managed so that babies are protected and born free of GBS infection.

2.7 Are there known risk factors for neonatal GBS infection?

GBS can be present in a first pregnancy, second or in any subsequent pregnancy. It can be a threat to the baby during pregnancy, at the time of delivery and after birth. However, there are certain circumstances in which a baby is more likely to be exposed to the bacteria and, if susceptible, develop GBS infection.

2.7.1 Risk factors during pregnancy and labour for newborn babies

There are five situations where a baby is more likely to be exposed to GBS and run the risk of possible early onset GBS infection. Each of the risk factors shown in the panel below increases the risk of GBS infection in a newborn baby.

• The pregnant woman has had a previous baby infected with GBS – risk 10 times higher
• GBS has been found in the pregnant woman’s urine during this pregnancy – risk 4 times higher
• The pregnant woman has a raised temperature during labour* (37.8°C or higher) - risk 4 times higher
• GBS has been found on a vaginal or rectal swab during this pregnancy - risk 3 times higher
• Labour starts or waters break before 37 weeks of pregnancy - risk 3 times higher for each
• Waters break more than 18 hours before delivery - risk 3 times higher

*If a pregnant woman has an epidural, a slightly raised temperature may be of less significance than in a woman with no epidural.

The chance a newborn baby will develop GBS infection if it the mother is not known to carry GBS and where no preventative intravenous antibiotics are given to her in labour is around one in every 1,000 babies. Up to 60% of early onset GBS infection and resultant deaths follow deliveries with one or more of the above risk factors.

For a pregnant woman carrying GBS at delivery with no other risk factors who does not receive intravenous antibiotics in labour, the chance her baby will develop a GBS infection rises to around one in 300. If this same woman is given intravenous antibiotics from the start of labour and at intervals until delivery, that risk falls to less than one in 6,000.

Simply carrying GBS previously, without a positive test result during the current pregnancy, does not mean a woman should automatically be offered intravenous antibiotics in labour unless one or more other risk factor is also present.
2.7.2 Preterm babies

Preterm babies (babies born before 37 completed weeks of pregnancy) are especially at risk of developing GBS infection since their immune systems are poorly developed and less able to fight off the bacteria. A preterm baby’s birth weight - and, therefore, in most cases, the baby’s gestation - has a direct relationship with his or her susceptibility to GBS: the lower the birth weight, the higher the incidence of infection. Preterm babies are between 3 and 15 times more likely to develop GBS infection and to die as a result than full term babies. Research indicates that approximately 25% of all cases of GBS infection occur in preterm babies.

The lowest incidence of GBS infection is among full term babies, since their immune systems typically are better developed - but they are still at risk. Indeed, as there are many times more babies born full term than preterm, overall a higher number of full-term babies than preterm babies overall develop GBS infection.

2.8 Prelabour & preterm rupture of membranes

Prelabour and preterm rupture of membranes (PPROM) are not usually related to GBS but, as PPROM is a risk factor for GBS infection, the GBS risk must be addressed. Management of PPROM may be complex and requires the input and judgement of the obstetric team. It may or may not include the administration of antibiotics for reasons other than the prevention of GBS infections.

PPROM is a signal that the chance of the baby contracting GBS infection is increased. It is therefore recommended that the pregnant woman receive intravenous antibiotics at the onset of labour, which is the only time that research has demonstrated such intervention is effective. This may be in addition to other oral antibiotics given for other reasons.

This situation is a complex one medically where a number of different approaches can be taken. Our experts suggest the following as a typical approach against GBS infections developing in newborn babies for women whose membranes rupture without other signs of labour, based on their experience and available research, but other interventions may be more appropriate based on the individual case:

- Where the pregnant woman is at less than 36 completed weeks of pregnancy:
  - Give the pregnant woman intravenous penicillin as soon as a diagnosis of labour is made, continuing them at 4 hourly intervals for the next 48 hours, regardless of other oral antibiotics that may be administered;
  - Discontinue the intravenous penicillin after 48 hours if labour has stopped or the diagnosis turns out not to have been correct; and
  - Resume intravenous penicillin if any sign of infection appears or the pregnant woman is once again diagnosed to be in labour.

- Where the pregnant woman is at 36 or more completed weeks of pregnancy AND is known to carry GBS OR one or more clinical risk factors are present:
  - Administer intravenous penicillin to the pregnant woman immediately, continuing them until the baby is born; and

- Where the pregnant woman is at 36 or more completed weeks of pregnancy, is not known to carry GBS AND no other clinical risk factors are present:
  - As soon as it's apparent that the membranes will have been ruptured for more than 18 hours before delivery,
    - Recommend the induction of labour; and
    - Offer intravenous antibiotics to the pregnant woman.

If the pregnant woman is allergic to penicillin, then alternatives should be given as described in the prevention strategy (see 2.14) at the recommended doses.
2.9 Women at increased risk of premature labour and birth

Along with many other bacteria found in the vagina, GBS can cause infection of the baby in the womb, which can result in preterm birth, stillbirth and late miscarriage. However, these are usually caused by a variety of factors other than GBS: genetic defects, gynaecological problems, other infections, etc. If a woman has had any of these problems in the past, she should ensure these are investigated fully by a consultant obstetrician at booking (or before) regardless of whether or not she has a history of GBS. GBS is a rare cause of these complications.

Can anything be done during a subsequent pregnancy for women who have delivered preterm, where this may have been caused by GBS? No antibiotics tested so far can prevent a woman going into premature labour for any reason, including because of GBS. Current opinion is that a substantial proportion of premature labours may be associated with infection, including perhaps as many as 40%\(^1\) of spontaneous labours (i.e. when the baby is not being delivered prematurely for medical reasons). However, it appears that almost any of the many organisms that can normally live in the vagina can cause this problem. There is no way of 'sterilising' the vagina, or knowing in advance which organism will cause trouble, which may explain why antibiotic treatment has not been shown to be effective – we don’t know which antibiotic to give in any specific case, before the infection has actually occurred. Techniques to improve the ability of the cervix to keep infection out (e.g. special stitching techniques) may prove more effective in future.

Most obstetricians would agree that a woman who has had a premature labour that may have been caused by infection (with symptoms such as silent dilation or spontaneous premature rupture of membranes) and not caused by other unrelated complications (e.g. severe hypertension, placental abruption, etc.) is at raised risk of having another premature delivery in a future pregnancy. On a theoretical basis, a short course of antibiotics during pregnancy when the baby is at its most vulnerable may be beneficial. The idea that antibiotics may reduce vaginal colonisation with GBS and so reduce the risk of GBS causing preterm labour seems logical since studies suggest a relationship between heavy vaginal colonisation and preterm labour. However, there is actually no data to support this. Indeed, a large UK study, the ORACLE trial\(^{47,48}\) produced no evidence that oral antibiotics prevent preterm labour. [The exception to this is erythromycin given to women whose waters ruptured prematurely: in this circumstance, the erythromycin both delayed delivery and reduced adverse outcomes in the babies.] Research suggests that oral antibiotics given for periods of longer than a week may be harmful to the mother and her baby, increasing antibiotic resistance and colonisation by resistant bacteria. However, there is no evidence that oral antibiotics given for up to a week are harmful\(^2\).

So, in theory, it may be possible to reduce vaginal colonisation with GBS – if a woman wants to try this during the period when the baby may be at greatest risk then, in agreement with her doctor, a one-week course of oral antibiotics may be considered. Appropriate drugs include erythromycin (250 mg 4 times a day, max 7 days) or, amoxicillin\(^1\) (500 mg 3 times a day, max 7 days). There is no evidence this will be effective, but neither is there any evidence that this will be harmful to the pregnant woman or her baby.

The ORACLE trial was a randomised, multicentre trial to establish whether oral antibiotics for women in spontaneous preterm labour or with preterm prelabour rupture of membranes would have health benefits for the babies. The ORACLE trial found amoxiclav increased the risk of necrotising enterocolitis, a serious bowel disease, in babies and this antibiotic is therefore not recommended during pregnancy. Amoxiclav is a combination of amoxycillin and clavulanic acid. It is the combination that appears to cause problems, there is no evidence at present to suggest that amoxycillin on its own is harmful in this way\(^{47,48}\).

2.10 Multiple births

When a baby who is one of a multiple birth develops a GBS infection, his or her twin (or triplets, etc.) is at increased risk of developing GBS infection. The other baby (or babies) will usually have been exposed to the same bacteria as the sick baby, although may not necessarily also be susceptible to developing infection. However, the other baby/ies should be given intravenous antibiotics as prophylaxis until it can be established no GBS infection is present.
2.11 Reinfection in babies

A baby who has recovered from a GBS infection is at low but slightly increased risk of re-infection (around 1-3%). There is no evidence to recommend any specific treatments to prevent recurrent GBS infection. A few practitioners may prescribe a daily penicillin dose for the baby for the first 3 months of life in the belief that it may prevent GBS infection. There is no evidence to support this practice, although penicillin given in this way has been shown to reduce the risk of infection with another related bacterium, called pneumococcus, in individuals who have lost their spleens.

2.12 Age of the baby

As a baby gets older, his or her immune system develops and the likelihood of developing GBS infection recedes. Most GBS infection (approximately 60%) is apparent at birth. GBS infection becomes uncommon after the baby is 1 month old and is extremely rare after the baby is 3 months old.

2.13 How can GBS infection in babies be prevented?

Prevention is clearly better than treating a sick baby. As yet, there are no known methods for preventing late onset GBS infections, developing after age 6 days. However, many early onset GBS infections can be prevented. Early onset GBS infection is usually acquired while the baby is still in its mother’s womb, so antibiotics given after birth, although useful for treatment, are unlikely to prevent most early onset GBS infections. Until a maternal vaccine has been developed, giving the pregnant woman intravenous antibiotics once labour starts or waters break and at intervals until delivery so that these cross to her unborn child is the the most effective way of preventing early onset GBS infection.

2.13.1 What preventative strategy should be adopted?

The effectiveness of intravenous antibiotics in labour against neonatal GBS infection has been proven, so the options to consider are which pregnant women should be offered these antibiotics. The three main strategies each have their own advantages and disadvantages:

Option 1: intravenous antibiotics to all pregnant women in labour
- **Plus:** Easy to implement, the highest reduction in the number of babies born with GBS infection and the most cost effective option
- **Minus:** Unacceptably high number of pregnant women would be given unnecessary antibiotics.

Option 2: intravenous antibiotics to selected pregnant women in labour
- **Plus:** Would dramatically reduce the number of babies born with GBS infection, while exposing a significantly smaller number of pregnant women to antibiotics unnecessarily.
- **Minus:** Would not eradicate all GBS infection in newborn babies, may mean a change in practice for some institutions where babies are born.

Option 2 (intravenous antibiotics offered to selected pregnant women) is our medical panel’s preferred approach.

2.13.2 Selection of pregnant women to be offered intravenous antibiotics

The next question is which pregnant women should be offered antibiotic in labour against GBS infection in their babies. Should this be based on antenatal testing to establish which women are GBS carriers, or should this be determined using risk factors alone?

Option 1: Antenatal testing for all pregnant women with all carriers offered intravenous antibiotics in labour

Offering sensitive testing for GBS to all women late in pregnancy to establish who are GBS carriers has been introduced in a number of countries; data from these countries shows that their incidence of GBS infection in
newborn babies has fallen dramatically since the introduction of such programmes – in the US by 70%. However, some pregnant women won’t receive antenatal care or will give birth before a test can be done. Using a testing-based approach, the babies of these women would be unprotected at birth.

This could prevent 80-90% of GBS infection in newborn babies, with around 25% of all women receiving intravenous antibiotics in labour.

Option 2: Risk factors alone
Fewer than 60% of all cases of early onset GBS infection occur in babies where one or more recognised risk factor is present. Using the risk factors listed on page 20, all women whose babies are known to be at increased risk of developing GBS infection could be offered preventative medicine regardless of whether they had received antenatal care or when they go into labour.

This could prevent 50-60% of early onset GBS infection and 70% of resultant deaths, with around 18% of all women receiving intravenous antibiotics in labour.

Option 3: Antenatal testing for all pregnant women, carriers with risk factors offered intravenous antibiotics
All women would be offered sensitive testing late in pregnancy, with those carrying GBS being offered intravenous antibiotics in labour only if an additional risk factor (listed on page 20) develops. This approach would incur the cost of universal testing but could only prevent a significantly smaller proportion of GBS infections.

This could prevent up to 50% of early onset GBS infection, with the fewer than 18% of women receiving intravenous antibiotics in labour.

Option 4: Antenatal testing for low-risk pregnant women, higher-risk women and others with risk factors offered intravenous antibiotics
Low-risk women should be offered a sensitive GBS test late in pregnancy. Those carrying GBS as well as those whose babies are known to be at increased risk (without testing) should be offered intravenous antibiotics in labour. This could prevent more than 80-90% of GBS infection in newborn babies, with around 27% of all women receiving intravenous antibiotics in labour.

Testing pregnant low-risk pregnant women using sensitive culture methods at 35-37 weeks’ gestation and then offering all GBS carriers intravenous antibiotics from the onset of labour or waters breaking, plus to those delivering prematurely or with a history of GBS, is more effective at preventing neonatal GBS infections than relying on risk factors alone. This, coupled with the moral and financial arguments for this approach, means that the charity’s view is that Option 4 should be introduced urgently.

Until sensitive testing is widely available, the risk factor approach (Option 2) forms the basis of GBSS’s recommendations as, although neither as clinically or as cost effective, it is both currently available and would still prevent most GBS infection in newborn babies.

Any GBS prevention strategy requires the coordinated efforts of both providers of obstetric care and providers of paediatric care. GBS infection may be considered a significant problem by paediatricians because it is well recognised among sick newborn babies, but prevention strategies need to be implemented by obstetricians, for whom GBS may be viewed as a rare complication.

2.14 Prevention strategies for early onset GBS infection
Babies who develop early onset GBS infection can require long stays in hospital, requiring expert and expensive care. Prevention strategies can prove both clinically and cost effective – not only can they stop babies suffering GBS infection and, in some cases, dying as a result, and can save hospitals money too.
Most early onset GBS infection in newborn babies can be prevented by giving intravenous antibiotics in labour until delivery to women who are at increased risk of their babies developing GBS infection. Randomised, controlled clinical trials conducted in the early 1980s clearly demonstrated the effectiveness of this preventative medicine.

So to prevent as many cases of GBS infection as possible, women with any risk factor would need to be given antibiotics during labour until delivery. However, some women will prefer not to receive antibiotics as this would inevitably complicate an otherwise natural birth. Additionally, the use of any drug, including antibiotics, is not without risk (potential downsides are discussed on page 13), so the options should be considered by the pregnant woman in conjunction with her healthcare professional to ensure that together they make the best decision for her and her baby. Clear and open communication between medical professionals and pregnant women is a critical component in preventing GBS infection in babies.

The data on the time it takes for the intravenous antibiotics to be effective is limited. Research shows that antibiotic penetration of the amniotic fluid seems only to reach a maximum at 2 hours and they need to reach therapeutic levels in the baby. Preferring to be conservative, the GBSS medical panel therefore recommends at least 4 hours of the intravenous antibiotics before delivery, where possible and, ideally, the pregnant woman will have received 2 or more doses before delivery. However, lesser times have proved beneficial: something is better than nothing. If only 2 hours administration is possible, this may be sufficient and should give considerable reassurance.

2.14.1 Recommended risk-factor prevention strategy against early onset GBS infection

Conservative estimates, based on clinical trials, predict that adopting the following recommendations could prevent at least 6 out of every potential 10 cases of early onset GBS infection in babies even without offering routine sensitive testing of pregnant women for group B Strep carriage. (There are currently no available methods of preventing late onset GBS infections, developing after the baby is 6 days old.)

Our medical advisory panel's key recommendations for preventing early onset GBS infection are:

1. Pregnant women whose babies are at risk of GBS infection ("risk factors" for infection are explained on page 20 above)
   - High Risk – Pregnant women should be strongly advised to have intravenous antibiotics in labour until delivery. At high risk means:
     - Pregnant women who have previously had a baby infected with GBS.
     - Pregnant women carrying GBS this pregnancy with another risk factor.
     - Pregnant women who don’t know if they carry GBS who have two or more other risk factors.
     - Pregnant women where GBS has been found in their urine this pregnancy.
     - Pregnant women who have a fever during labour.
   - Increased Risk – Pregnant women should be offered intravenous antibiotics in labour until delivery. At increased risk means:
     - Pregnant women known to carry GBS with no other risk factor.
     - Pregnant women who don’t know if they carry GBS this pregnancy but have one of premature labour, waters breaking prematurely or waters broken more than 18 hours before birth.

2. Treatment in labour
   - Intravenous antibiotics should be given to pregnant women immediately at start of labour and then at intervals until delivery to prevent GBS infection in the newborn baby. The Royal College of Obstetricians and Gynaecologists recommends the antibiotics should be given for a minimum of 2 hours before delivery. GBSS considers this the absolute minimum, with a period in excess of 4 hours being ideal.
• Intravenous antibiotics recommended for pregnant women in labour and at intervals until delivery are:
  o Penicillin G: 3g (or 5MU) at first and then 1.5g (or 2.5MU) at 4-hourly intervals; or
  o Clindamycin 900 mg every 8 hours for pregnant women allergic to penicillin.

Where infection of the membranes is diagnosed or suspected (called “Chorioamnionitis”), or where there is premature prolonged rupture of membranes, broad-spectrum intravenous antibiotics should be given which include adequate GBS cover.

If a woman is allergic to Penicillin or any other antibiotic, she MUST tell her health professionals. Using any antibiotic carries risks, so this should be discussed with the health professionals.

3. Care after birth

• Babies born at increased/high risk to mothers who HAVE received antibiotics for more than 2 hours before delivery should be:
  ▪ Carefully assessed by an appropriately trained Paediatrician or Advanced Neonatal Nurse Practitioner.
  ▪ If completely healthy, no antibiotics for the baby are required.
  ▪ A period of monitoring (12-24 hours) may be appropriate for those at highest risk of infection.
  ▪ Parents should be made aware of the early signs of infection and given a handout about GBS.

• Babies born at increased/high risk to mothers who HAVE received antibiotics for less than 2 hours before delivery should be:
  ▪ Examined thoroughly and investigated by a Paediatrician as appropriate.
  ▪ Observed for a minimum of 12 hours, ideally 24 hours.
  ▪ If completely healthy, no antibiotics for the baby are required (antibiotics should be administered if there is any doubt).

• Babies whose gestational age is less than or equal to 36 completed weeks of pregnancy and are born by Caesarean section (not in labour, no broken waters) and antibiotics given to the mother for less than 2 hours before delivery should be:
  ▪ Examined thoroughly by a Paediatrician and a full sepsis work up done.
  ▪ Started on intravenous antibiotics unless a robust examination determines baby is completely healthy.
  ▪ Reviewed at 48 hours.

• For well babies at highest risk of infection, monitoring (12-24 hours) may be appropriate and this should be undertaken as a minimum if the baby is not screened and treated for infection.

If there’s any doubt about whether an infection is present, the baby should be started on intravenous antibiotics until it is known that he/she is not infected.

Implementing these recommendations could reduce GBS infection in newborn babies by 60% and deaths from GBS in babies by 70%

The recommendations for the prevention of early onset GBS infection will need periodic reappraisal to incorporate advances in technology, new research or other refinements.
2.14.2 Post-Delivery Prevention – Early onset GBS infection

With any policy that involves treating some women with antibiotics following the start of labour to prevent GBS infection, a strategy for the subsequent management of the newborn baby required. Below is GBSS’s recommended paediatric prevention strategy against early-onset GBS infection:

- Baby examined thoroughly by a paediatrician
- Sepsis work up
- Intravenous antimicrobial therapy

**Signs of possible infection in baby or mother**

- Baby’s gestational age less than or equal to 35 completed weeks of pregnancy AND baby born by Caesarean section (not in labour, no broken waters)

**Baby examined thoroughly by a paediatrician**
- Sepsis work up
- Intravenous antimicrobial therapy UNLESS a robust examination determines baby is completely healthy

**One or more risk factor present AND duration of intravenous antibiotics given to Mum in labour before delivery LESS THAN two hours**

**Baby examined and investigated by a paediatrician as appropriate**
- Observed for a minimum of 12 (ideally 24) hours
- If completely healthy, no antibiotics for baby are required (antibiotics should be administered if there is any doubt)

**One or more risk factor present AND duration of intravenous antibiotics given to Mum in labour before delivery AT LEAST two hours AND no signs of infection**

**Baby carefully assessed by an appropriately trained Paediatrician or Advanced Neonatal Nurse Practitioner**
- If completely healthy, no antibiotics for baby are required
- A period of monitoring (12-24 hours) may be appropriate for those at highest risk of infection
- Parents should be made aware of the early signs of infection and given a handout on GBS

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**Most common risk factors:**
- Prematurity (<34 weeks of pregnancy)
- PROM > 18 hours
- Maternal GBS colonisation

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**Baby sepsis work up tests:**

**Essential:**
- Full Blood Count (FBC) and differential;
- C Reactive Protein (CRP) – 2 tests, 12-24 hours apart;
- Blood Culture; and
- Deep Ear Swab

**Optional (depending on clinical indication):**
- Chest X-Ray
- Lumbar Puncture
- Gastric Aspirate
- Antigen Test

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**If there’s any doubt about whether an infection is present, baby should be started on intravenous antibiotics until it is known that he/she is not infected**
GBSS recommends at least 4 hours of intravenous antibiotics before delivery, where possible. The Royal College of Obstetricians and Gynaecologists recommends the antibiotics should be given for a minimum of 2 hours before delivery. GBSS considers this the absolute minimum, with a period in excess of 4 hours being more ideal, although if only 2 hours is possible, this may be sufficient and should give considerable reassurance.

Using the above risk-factor strategy, the mothers of most babies at increased risk of developing GBS infection would be offered preventative antibiotics, which would stop most early onset GBS infection developing. At the same time, a relatively limited number of women and their babies would be exposed to antibiotics unnecessarily.
3 FREQUENTLY ASKED QUESTIONS

3.1 Pre-Pregnancy

3.1.1 Is strep throat caused by the same bug as GBS?

No. Strep throat is caused by group A Streptococcus (GAS or Streptococcus pyogenes) which, although it has a similar name and is from the same family of bacteria, is a bug with very different characteristics. Group A Strep is carried by many perfectly healthy people and most commonly causes mild sore throats or skin infections (impetigo), although for every thousand such mild infections there are one or two that are more serious and can affect pregnant or recently delivered women – for example, toxic shock syndrome or necrotising fasciitis. Fortunately, these severe conditions are very rare.

3.1.2 How many people carry GBS?

GBS is a normal bacterium, which is carried by up to 30% of adults, most commonly in the gut, but for up to 25% of women, in the vagina too. Not everyone carries GBS and pregnancy does not ‘bring it on’ or cause a ‘flare-up’ of group B Strep. It can be passed from mother to baby during labour and, although this causes no problems for most babies, for a small number it can be deadly, causing blood poisoning, pneumonia, and meningitis.

3.1.3 How do people become carriers of GBS?

GBS may be passed from one person to another through skin to skin contact - hand contact, kissing, close physical contact, etc. As GBS is often found in the vagina and rectum of colonised women, it is commonly passed through sexual contact.

There are no known harmful effects of carriage itself and, since the GBS bacteria do not cause genital symptoms or discomfort, GBS is not a sexually transmitted disease, nor is GBS carriage a sign of ill health or poor hygiene.

No-one should ever feel guilty or dirty for carrying GBS – it is normal.

3.1.4 Should women with a history of GBS have children?

Absolutely yes, if they want to - women should make their medical professionals aware of their history of GBS. The fact they carry GBS or that their baby was affected by GBS does not mean a future baby will be too. The intravenous antibiotics given to women in higher-risk situations when they go into labour or their waters break (whichever happens first) have been proven to be very effective at stopping GBS in babies.

3.1.5 Should I take antibiotics before I get pregnant to get rid of the GBS?

No antibiotics tested so far seem able to do this reliably. Antibiotics may temporarily eradicate vaginal colonisation with GBS, but colonisation in the intestines will remain and recolonisation of the vagina will occur. The time when antibiotics have been shown to be effective at stopping GBS infection in babies is when they are given to women in known higher risk situations in labour, not before.

3.1.6 I carry GBS in my vagina. Does my partner need to be tested?

No. Colonisation with GBS is normal and does not need treatment. A third of the adult population carries GBS, without symptoms – you do not need to be tested for it, nor do you (or he) need antibiotics for it. GBS is not a sexually transmitted disease. Carrying GBS is not a disease at all!
3.1.7 I have vaginal symptoms – are these caused by GBS?
A GBS positive result from a vaginal swab means the woman’s vagina was colonised with GBS when the swab was taken. GBS carriage is asymptomatic – it is not associated with symptoms. Just because GBS is isolated from a swab taken to investigate vaginal symptoms does not mean that GBS is the cause of those symptoms. We know of no publication that convincingly correlates GBS carriage with any vaginal symptom and researchers have specifically looked at this.

3.1.8 I have previously had a preterm birth, stillbirth or miscarriage which may have been caused by GBS
Since GBS can cross intact amniotic membranes and cause infection whilst the baby is still in the womb, the bacteria may cause preterm births, stillbirths or miscarriages\[54\]. However, these are usually caused by a variety of other factors: other infection, genetic defects, gynaecological problems, etc. If a woman has a history of any of these complications, she should be investigated fully, even if she is colonised with GBS. See our experts’ view on page 21 of this booklet.

3.1.9 I had a GBS infection after the birth of my last baby. Will any babies I have in the future be more at risk of GBS infection?
There is no research on which to answer this. Our medical panel’s view is that a postnatal GBS infection in a mother is unlikely to increase the risk of any future babies developing GBS infection above that of simply being a carrier. In this situation, they would recommend the pregnant woman to have a sensitive test for GBS carriage late in her next pregnancy to find out her GBS status at that time.

3.1.10 What are the potential risks of antibiotics?
See the section Antibiotics on page 13.

3.2 During Pregnancy

3.2.1 Should pregnant women be tested for GBS colonisation?
GBSS believes that all pregnant women should be offered testing for GBS colonisation at 35-37 weeks of pregnancy using sensitive tests, which are not yet widely available on the NHS although they are available privately. See Tests for GBS carriage on page 6.

Sensitive tests should be performed at 35-37 weeks’ gestation to best predict colonisation with GBS at delivery. Research has shown that, if performed within 5 weeks of delivery, the sensitive test giving a negative result is 96% predictive of GBS not being carried at delivery (4% of women acquired carriage between testing and delivery) and a positive result is 87% predictive of carrying GBS at delivery (13% of women lost carriage between testing and delivery)\[6\].

Any positive result (conventional, PCR or ECM) means a woman should be offered intravenous antibiotics as soon as possible after the start of labour to protect her baby from GBS infection.

[GBSS fully endorses the availability of sensitive prenatal GBS testing but has no links to nor receives any money from any particular laboratory. Indeed we hope many other laboratories will follow the private laboratories’ example in offering this test and, as they do, we’ll provide details of their service too.]

3.2.2 What should happen if a woman gets a negative sensitive GBS test result?
A mother who has previously had a baby who developed GBS infection should always be offered intravenous antibiotics in subsequent pregnancies, from the onset of labour and at intervals until delivery, regardless of any test results. Also, a woman who has had any positive test result (from the urine, vagina or rectum) during the current pregnancy should be offered intravenous antibiotics from the onset of her labour and at intervals until delivery.

A woman who has a negative sensitive (ECM or PCR) test result at 35-37 weeks of pregnancy does NOT need to be offered intravenous antibiotics in labour to prevent GBS infection in her baby (although antibiotics may be indicated for other reasons). Research has shown that, if performed within 5 weeks of delivery, a sensitive test giving a negative result
is 96% predictive of GBS not being carried at delivery (4% of women acquired carriage between testing and delivery) so the risk of acquiring carriage between doing the test and giving birth is very small.

If a woman has not had a sensitive test result OR the less sensitive conventional test has been negative during the pregnancy, she should still be offered intravenous antibiotics from the start of labour if one or more risk factors listed above are present.

3.2.3 **Will antibiotics get rid of GBS colonisation from my vagina?**

Evidence shows that taking antibiotics before labour does not reliably eradicate GBS colonisation in the vagina nor reduce the incidence of GBS infection in babies. Even when the antibiotics do eradicate GBS colonisation of the vagina, they will do so only temporarily - recolonisation will occur. Studies have shown no substantial difference in GBS carriage at delivery between women treated with antibiotics during pregnancy and those not treated. In one study, nearly 70% of colonised women treated with antibiotics for 12 to 14 days during the third trimester (28 to 40 weeks of pregnancy) were colonised three weeks later and again at delivery.

**Antibiotics during pregnancy for GBS carriage are not indicated.** GBS cultured from a vaginal swab show the vagina is colonised with GBS, not infected, and no treatment of the colonisation is required. Antibiotics have been proven highly effective at stopping GBS infections in newborn babies when given intravenously to the pregnant woman whose babies are at raised risk of developing GBS infection as soon as her waters break or labour has started.

3.2.4 **I’m at raised risk of premature labour. Should I take long-term antibiotics?**

For the antibiotics tested so far, their use throughout pregnancy has not been shown to prevent preterm delivery due to any cause, including GBS. In addition, the effects of long-term antibiotics on the baby during pregnancy have not been assessed, although we know that short courses of, for example, amoxycillin, seem to be exceptionally safe.

3.2.5 **Should GBS in the urine be treated?**

Yes at the time of diagnosis, though a full history to check for allergic reaction to penicillin or any other antibiotic must be taken. Urine is supposed to be sterile so, if GBS is found in the urine, the woman should be treated with oral antibiotics when diagnosed and treatment repeated until urine tests come back clear. A 5-day course would be appropriate and it is important to retest the urine after finishing the antibiotics.

Treatment for a GBS positive urine sample, whether the woman has symptoms of a urine infection or not, is essential during pregnancy since, if left untreated, such infections can cause kidney damage and have been linked to preterm labour. GBS found in the urine during pregnancy is also an indication that the woman should be offered intravenous antibiotics at the onset of labour or waters breaking until delivery.

3.2.6 **I carried GBS before this pregnancy (with no adverse effect on my previous babies); should I have intravenous antibiotics in future labours?**

GBS can quite naturally come and go from the vagina so the bacteria can be there one month and not the next ... and back again another time (though this is not a daily occurrence). There is currently no good data available that can predict carriage of GBS over periods of a year or more. However, since there may be some increased chance of a woman carrying GBS in a pregnancy if GBS has been isolated previously, our medical panel’s view is that, if possible the pregnant woman should be offered a sensitive test at 35-37 weeks of pregnancy to establish whether the pregnant woman is carrying GBS then. If she is, she should be offered intravenous antibiotics as soon as possible once labour has started and at intervals until the baby is born.

If a GBS-specific test result is not available and labour starts after 37 weeks of pregnancy, our medical panel’s view is that previous carriage status should be treated as an additional risk factor (increasing the risk of a baby developing GBS infection from an estimated 1 in 1,000 in the general population, to an estimated risk of approximately 1 in 500 for a woman whose current GBS status is unknown, but where GBS was isolated before the current pregnancy). Our medical
panel’s view is that the ‘previous carrier’ risk factor alone is insufficient to recommend offering intravenous antibiotics in labour against GBS infection in the baby, unless another clinical risk factor is also present.

3.2.7 I had a positive result early in my pregnancy. Should I be tested again?
If you have had a positive GBS test result (from the vagina or rectum) during the current pregnancy, you should be offered intravenous antibiotics from the onset of labour or membrane rupture and at intervals until delivery (antibiotics are also recommended at the time of diagnosis if the positive result was from the urine).

However, if the positive result was early in your pregnancy, you may have lost carriage by the time your baby is born. If you want to find out whether you are still carrying GBS, you can have a sensitive test at 35-37 weeks. If the sensitive test result is negative, then intravenous antibiotics are probably not indicated, since research has shown that a sensitive test giving a negative result within 5 weeks of delivery is highly predictive of not carrying GBS at delivery. The risk of acquiring carriage between doing the test and giving birth is very small.

3.2.8 Must I have intravenous antibiotics as GBS has been found this pregnancy?
No. If you have had any positive GBS test result from the vagina or rectum during the current pregnancy, you should be offered intravenous antibiotics from the onset of labour or waters breaking and at intervals until delivery. However, you may choose not to have them, particularly if there are no additional risk factors - only a small percentage of babies born to women carrying GBS at delivery will develop GBS infection. However, if you decide against antibiotics, it would be prudent for the baby to be observed by trained staff for at least 24 hours (ideally 48 hours). If the positive test was from the urine, this means that the GBS was more invasive, and so antibiotics may be recommended even if a vaginal swab is subsequently negative.

3.2.9 I don’t want antibiotics, what alternative treatments are available?
All of the information we supply is based upon medical research and/or the advice of our highly regarded medical advisory panel. The members of that panel are not persuaded that any therapy other than antibiotics in labour is effective in preventing early onset GBS disease.

Unfortunately, although there is much discussion on this subject, there are simply no natural, homeopathic or alternative medicines for which there has been good research and proof that they are effective at preventing group B Strep infection in newborn babies.

3.2.10 Is it OK for the health professionals to break my waters artificially if I’m carrying GBS?
Artificial rupture of membranes (AROM or amniotomy) is usually used to speed up labour, possibly shortening labour by about an hour, and usually resulting in contractions becoming stronger and more painful. We know of no contraindications for AROM where the pregnant woman is known to carry GBS although, as it’s normally done once labour has started, you should already be receiving the 4 hourly antibiotics before the AROM. The reason for the amniotomy should be discussed and consent should be given by the pregnant woman beforehand.

3.2.11 Are membrane sweeps safe for women who carry GBS?
Using a gloved finger passed through the cervix (neck of the womb) to separate the baby’s membranes from the lower part of the uterus is known as a ‘membrane sweep’. In women who are at or beyond the due date, it encourages spontaneous labour and can enable about 10% of women to avoid an artificial induction of labour.

There is currently no good evidence that membrane sweeps are harmful in women known to carry GBS. The results of trials of membrane sweeps don’t show any increase in problems caused by GBS in women having sweeps and it is highly likely these trials would have included many women carrying GBS at the time.
There remains a theoretical risk that a membrane sweep might occasionally introduce GBS into the uterus, and so our medical advisory panel advises caution in using a membrane sweep for women known to carry GBS when there are other acceptable alternatives (for example, induction of labour with prostaglandin gel introduced into the vagina).

3.2.12 I am on a course of antibiotics for a chest infection. Will that affect the results for the GBS test?

The antibiotics may make it more difficult to grow the GBS so, in an ideal world, you should not take the swabs for the GBS test until at least 7 days after you’ve finished the antibiotics; the longer the delay, the more reliable the result.

It should be remembered that even a negative result from a swab test done at 35-37 weeks of pregnancy can’t be 100% predictive that you won’t be carrying GBS at delivery (although it is highly likely you won’t), since a very small proportion of women will acquire carriage in the intervening weeks. A positive result however does mean that you should be offered the recommended intravenous antibiotics in labour.

3.2.13 I’m worried I won’t get 4+ hours of IV antibiotics before my baby is born.

A very small study⁵⁶ showed giving intramuscular penicillin eradicated GBS colonisation for at least six weeks in 75% of women known to carry GBS. So far, this very small study (50 of 78 women received intramuscular antibiotics) has not been repeated, so it is difficult to give advice based upon this data.

For women known to carry GBS where it is not expected that the intravenous antibiotics can be given for at least four hours before delivery, an intramuscular injection of 4.8 MU (2.9 g) of Penicillin G at about 35 weeks of pregnancy may be useful in addition to intravenous antibiotics given from the onset of labour or membranes rupturing at intervals until delivery to try to eradicate GBS colonisation until after the baby is born. Regardless of whether a woman has intramuscular antibiotics to try to eradicate GBS colonisation, it is recommended that all women whose babies are at increased risk be offered intravenous antibiotics from the onset of labour or waters breaking and at intervals until delivery. There are downsides of intramuscular penicillin - the injection is painful, there is a small risk of an allergic reaction and of antibiotic resistance developing (see below). These risks are repeated with the intravenous antibiotics given in labour.

For intramuscular antibiotics, there are no known alternatives to penicillin for penicillin-allergic women.

3.2.14 I’ve requested a private GBS test pack, but neither my GP nor my midwife will take the swabs – what can I do?

Where possible, it’s better that your health professional is involved with taking the swabs so that, not only do they know that you’re being tested, but also they can provide you with the appropriate information and support when you and they receive the results.

Having said that, there is no reason why you cannot take the swabs yourself – research has shown that swabs taken by women instructed in how to do this give just as reliable results as those taken by healthcare professionals²⁴.

The pack the private laboratory sends out contains instructions on how to take the swabs: firstly, you mark up the swab tubes with your name, date of birth, and location of the swab (one for your vagina, the other for your rectum) and ‘GBS culture’. Then you take one of the long cotton buds, wipe it round the front, sides, back of the lower vagina, and put that swab in the appropriate tube. You then take the second swab and insert it 1-2cm into the rectum. You withdraw it and place it in the second tube.

You will need to complete and return the Group B Strep Request & Payment Form and send off your cheque/credit card details, together with the swabs for culture, in the envelope provided. The form requires your midwife or consultant’s name and contact details, as well as yours. You need to consider carefully who to put here – clearly your antenatal team (midwife or consultant) need to know your result so they can discuss with you the use of antibiotics during labour against GBS infection in your baby if the test is positive. If you are having your baby in hospital, then the
labour ward will also need to know when you are admitted, and the neonatologists when the baby is born. So arguably, the result should go to all of these too! This is not very practicable, so your best bet would be to find out whom you should discuss a positive result with (if you get one) and arrange for them to receive the result. You might also like to take a photocopy of the results and keep a copy or two with your hand-held notes, so you can make sure anyone else looking after you can see them too.

You can opt to receive a text or email of the result as well as a postal version, in which case you will need to state your mobile phone number and/or email address. The results come as a “GBS GREEN” (negative) result, which means no intravenous antibiotics in labour are indicated against GBS infection in the baby or as a “GBS RED” (positive) result, which means intravenous antibiotics in labour against GBS infection in the baby should be discussed with you.

3.2.15 I carry GBS. Should I be induced, with the intravenous antibiotics starting as I’m induced?

Our medical advisers do not recommend induction as a way of combating GBS infection in babies. Carrying, or being at risk of, GBS is not a reason to be induced.

If a woman lives a long way from the hospital or has a history of very fast labours, then being induced is one way to ensure sufficient intravenous antibiotics in labour. However, induction is not risk-free, especially before the due date. The potential risks and benefits should be discussed with the obstetrician, because they will vary dependent upon personal circumstances.

If a woman needs to be induced for an obstetric or medical reason, the recommended intravenous antibiotics should be started as soon as possible once labour has started or waters have broken (either naturally or artificially) and should be repeated 4-hourly until delivery, with ideally her having received them for at least 4 hours before delivery.

3.2.16 Is there anything else that can be done during pregnancy to protect against GBS infection in the baby?

One small study showed that giving intramuscular penicillin eradicated GBS colonisation for a period of 6 weeks or more in 75% of women carrying GBS. This is only one small study (only 50 of 78 women received intramuscular antibiotics), which so far has not been repeated, so it is difficult to make recommendations based upon this data.

For women who have previously had a baby who developed GBS infection, an injection of intramuscular Penicillin G at around 35 weeks of pregnancy may be useful to try to eradicate GBS colonisation until after delivery. (They may also be worth considering earlier in the pregnancy for women with a history of preterm labour where GBS may have been a factor, and for women who carry GBS who have a history of fast labours where it is unlikely intravenous antibiotics can be given for at least 4 hours before delivery.)

There are downsides of the intramuscular penicillin, not least that it is painful and there is a small risk of an allergic reaction (see page 9). This risk is repeated with the intravenous antibiotics recommended during labour.

Regardless of whether a pregnant woman receives intramuscular antibiotics in an effort to eradicate GBS colonisation, our medical advisers would recommend she should be offered the intravenous antibiotics from the onset of labour or waters breaking and repeated at 4 hourly intervals until delivery.

There are no known alternatives to the intramuscular penicillin for women known to be allergic to penicillin.

3.2.17 Is vaginal disinfection effective against GBS infection in babies?

The idea that vaginal disinfection at the time of labour may eradicate GBS colonisation in the vagina (it would not affect rectal colonisation) has been investigated, particularly in Scandinavian countries. The advantages are that the potential risks associated with antibiotics are avoided whilst, at the same time, the vaginal disinfection may reduce neonatal colonisation with GBS. However, reduced neonatal colonisation would have no impact on the majority of babies who develop early onset GBS infections, since these babies are usually infected or colonised before they come through the
birth canal. A study of over 5,000 labouring women found that using maternal chlorhexidine vaginal wipes during labour and neonatal chlorhexidine wipes did not reduce death in the mother or baby, or sepsis in the baby. It is also questionable how acceptable using chlorhexidine would be to pregnant women - it is not an innocuous substance and could potentially be harmful to the baby, particularly if the waters have broken or the baby is preterm.\(^{58,59}\)

The members of our medical advisory panel are not persuaded that any therapy other than antibiotics in labour is effective in preventing early onset GBS disease.

3.2.18 What are the signs that GBS is affecting my unborn baby?

If your pregnancy is progressing normally, then there is no reason to suspect GBS is infecting your baby. If a GBS infection is present, you will usually go into labour or your membranes will rupture. That is the time to get to hospital as quickly as you can so that, if you want them, you can be given the intravenous antibiotics to minimise the risk of GBS infection in your baby.

3.2.19 Will a Caesarean prevent GBS infecting my baby?

Planned Caesareans are not recommended as a way to prevent GBS infection in babies. They reduce but do not eliminate the risk of GBS infection in babies and pose their own risks for both pregnant women and babies.

If your planned Caesarean is before your waters break and labour starts, then antibiotics against GBS infection are not recommended, as the risk of the baby developing GBS infection is so low. If labour has started or your waters have broken, then you should be treated as for a normal labour up until the time when an emergency Caesarean section becomes necessary, when you should be delivered immediately.

See 3.3.1 below for our medical panel’s more detailed recommendations regarding Caesareans.

3.3 Labour & Delivery

Having intravenous antibiotics shouldn’t prevent you from having the birth you’d originally planned.

What normally happens is that a cannula (a thin tube) is inserted into a vein, usually in the back of your hand, and remains there until after the baby is born. The antibiotics can then be given to you through this cannula at the required intervals, either by slow injection (over several minutes) or by drip (over half an hour or so).

You don’t have to be attached to a drip the whole time: when the antibiotics have gone through, the cannula can be detached from the drip and you’re free to move around as you wish and to have (almost) the birth you’d planned.

3.3.1 Caesarean sections

Caesarean sections are not recommended as a method of preventing GBS infection in the baby, although they do reduce the risk. The risk of GBS infection in the baby is not eliminated, since GBS can cross intact amniotic membranes to set up an infection in the baby. Furthermore, there are significant risks associated with Caesarean sections; plus the recommended intravenous antibiotics during labour are highly effective and low risk.

If a woman is having a Caesarean section, our medical panel’s recommendations with regard to GBS are as follows:

- **Elective Caesareans**

  There is no evidence to show intravenous antibiotics are indicated against GBS when a woman known to carry GBS or who previously had has a baby infected with GBS is having an elective Caesarean unless she is in labour or her membranes have ruptured. If a baby is at higher risk of developing GBS infection and the mother is having an elective Caesarean AND is in labour or her waters have broken, she should be offered the recommended intravenous antibiotics as soon as possible after the onset of labour, ideally for at least 4 hours before delivery.
The baby would only need intravenous antibiotics against GBS infection if born prematurely or if there are signs of possible infection in either the mother or the baby.

- **Emergency Caesareans**
  If a woman carries GBS or has previously had a baby infected with GBS and needs an emergency Caesarean, she should be treated as for an elective Caesarean – no intravenous antibiotics are indicated against GBS unless she is in labour. If she is in labour, she should be treated as for a normal labour up until the time when an emergency Caesarean section becomes necessary, when she should be delivered immediately.

The treatment of the baby for GBS would follow the charity’s normal paediatric recommendations.

### 3.3.2 Home births

Our medical advisory panel’s recommendations for stopping GBS infections in newborn babies are the same for home births as for hospital births - women whose babies are at increased risk of developing GBS infection should be offered intravenous antibiotics from the start of labour until delivery.

Home births are becoming increasingly popular and, if you want a home birth with intravenous antibiotics during labour until delivery, it may be possible for your midwife to give you intravenous antibiotics prescribed for you by your GP. Unfortunately, however, this is not available in all areas. Some areas simply won't permit intravenous antibiotics to be given at home - there is a very small risk that you would get a severe allergic reaction to the antibiotics (see page 13) and, obviously, there is no intensive care unit nearby. The risk is very small but your health professionals may be anxious. Of course, around 25% of women having home births probably carry GBS in their vagina at delivery without their knowing it. This issue needs to be discussed with your medical team.

Oral antibiotics are not recommended for women for GBS carriage during pregnancy or labour – there is no evidence that they prevent GBS infections in newborn babies. If you have set your heart on having a home birth, you may wish to consider having intramuscular antibiotics as outlined in 3.3.1 Is there anything else that can be done during pregnancy to protect against GBS infection in the baby? on page 34, though our medical advisory panel don’t recommend them in lieu of intravenous antibiotics during labour; they may be better than nothing if that is the only alternative.

### 3.3.3 Water birth

There are no known contra-indications for a woman known to carry GBS having a water birth. As for all women carrying GBS during the current pregnancy, women with a history of GBS, or women with risk factors, our medical advisory panel recommends they should be offered intravenous antibiotics from the onset of labour until delivery. It is not a good idea to get the cannula (which delivers the intravenous antibiotics to the mother) wet, but this can be managed - specially designed waterproof dressings are available which keep the site sterile and dry whilst still enabling the health professional to monitor the site visually.

### 3.3.4 I was GBS positive and had a water birth at home; can someone else “catch” GBS from the pool?

No. Research suggests that standard hygiene measures need to be taken in the cleaning of the pool before or after use by GBS carriers (and anyone else). So please do pass the pool onto your friend but – as you would anyway – please clean it properly before you do.

### 3.4 After delivery

#### 3.4.1 How does a baby get a GBS infection?

If a baby has symptoms within 6 days of birth (early onset GBS infection), the GBS bacteria will most probably have been passed from the mother to her baby before or during delivery. Such transmission occurs if the mother is carrying GBS in her vagina, and the bacteria either crossed the amniotic membranes or was passed to the baby during delivery.
If a baby’s GBS infection develops after age 6 days (late onset GBS infection), the bacteria may have been passed to the baby from the mother, but not necessarily. Some research showed that over 50% of cases of late onset GBS infection were the same strain of GBS as the mother was carrying. Where the rest came from was unclear, but since GBS may be passed from one person to another through skin to skin contact, someone who touched him/her will have exposed the baby to GBS.

Being exposed to GBS is perfectly normal and most babies exposed to GBS do not develop infection – they successfully fight off the bacteria. But there is no way of knowing which babies will be able to do this and which won’t.

### 3.4.2 What are the chances of my baby developing a GBS infection?

The following are estimates of the chances a baby in Britain will become infected with GBS if no preventative measures are taken and no other risk factors are present:

- 1 in 1,000 where the woman is not known to be a carrier of GBS;
- 1 in 400 where the woman is carrying GBS during the pregnancy;
- 1 in 300 where the woman is carrying GBS at delivery; and
- 1 in 100 where the woman has had a previous baby infected with GBS.

*This is a broadly accepted estimate of the number of GBS infections in newborn babies that would occur if no preventative intravenous antibiotics in labour are given and this estimate has been used throughout this document. However, recent UK research has suggested this may be a serious underestimate of the incidence of GBS infection in newborns, which could be as high as 3.6 per 1,000.*

If a woman who carries GBS is given antibiotics during labour in accordance with our medical advisory panel’s recommendations (see 2.14 on page 24), the baby’s risk is reduced significantly.

- 1 in 8,000 where the mother carries GBS during pregnancy;
- 1 in 6,000 where the mother carries GBS at delivery; and
- 1 in 2,200 where the mother has previously had a baby infected with GBS.

The vast majority of pregnancies can be managed so that babies are protected and born free of GBS infection.

### 3.4.3 I want to breastfeed my baby

Our medical advisory panel strongly recommends you should be encouraged to breastfeed your baby. Although there have been isolated cases describing GBS infection possibly related to breast milk contamination, the advantages of breastfeeding will, in our medical advisory panel’s opinion, greatly outweigh the remote risk of transmitting GBS via breast feeding. The breast milk of most women will naturally contain some bacteria, and around 10% will contain GBS. However, due to the fact that the bacterium remains within the gastrointestinal tract of the baby, GBS transmission in this way is particularly rare. High hygiene standards need to be maintained for all breastfeeding mothers, with the hands and nipple areas being kept clean.

The intravenous antibiotics recommended above (see 2.14 on page 24) for pregnant women during labour through to delivery to protect her unborn baby from GBS infection will already have passed in significant amounts to the baby while it was in the womb.

If you develop mastitis or a breast abscess, you should seek medical advice regarding breast-feeding.

### 3.4.4 Is it safe to breastfeed my baby just after birth, as my milk will contain antibiotics?

Any antibiotics that are safe to give to mothers during pregnancy are also safe in themselves in relation to breastfeeding. The intravenous antibiotics recommended above for pregnant women during labour through to delivery to protect their unborn babies from GBS infection will already have passed in significant amounts to the baby while it was in the womb,
and they provide important protection for the baby during labour and in the first few hours after birth. In comparison, the amounts passed in breast milk are small.

However, the continuing exposure to antibiotics in the milk can change the way the baby acquires its gut flora (the bugs the baby gets from its mother that help to digest food) and this can affect the way that the baby’s poo changes in the first days of life. So you should make sure your medical professionals know you intend to breastfeed your baby.

3.4.5 My friend and I have babies under 3 months old. Her baby carries GBS. Should I let my baby near her baby when I visit?

GBS bacteria may be passed from the hands so everyone (including the parents), whether they know they carry GBS or not, should wash their hands properly and carefully dry them before handling a baby for its first three months of life – this is good paediatric hygiene, irrespective of the issue of GBS.

Apart from this, there are no special precautions – GBS carriage is normal and most babies will be exposed to GBS from a variety of sources during their early weeks and months. Having said this, it is always good to err on the side of caution, and washing your baby’s hands before the little ones are put within reach of each other (and after nappy changes), would be good practice.

3.4.6 My last baby had GBS infection – should I have antibiotics in labour with my next baby and should he be given antibiotic after birth against GBS infection?

Babies born after an older sibling developed GBS infection are at raised risk of developing GBS infection themselves – it is estimated the risk increases perhaps ten-fold or more. In this circumstance, intravenous antibiotics are strongly recommended in any subsequent labour as being highly effective preventative medicine against early onset GBS infection in the baby.

Again, there is no evidence that continuing to give penicillin to a well baby after delivery is effective at preventing GBS infection after birth. However, where a family has suffered the trauma of a baby being seriously ill with GBS infection, a few practitioners may consider prescribing a daily penicillin dose for the baby, for the first 3 months of life in the belief that it may prevent GBS infection and so reduce understandable anxiety. There is no evidence to support this practice, although Penicillin given in this way has been shown to reduce the risk of infection with another related bacterium, called pneumococcus, in individuals who have lost their spleens.

3.4.7 Is GBS infection linked with cow’s milk intolerance?

Cow’s milk protein intolerance is increasingly recognised in babies and is a manifestation of immune “dysregulation.” Most of the immune cells of the body are in the linings of the gut. Immature immune cells in the gut of the newborn develop as a result of stimulation by “normal” gut flora, which live in harmony with each individual. Dysregulation means that the newborn immune system develops in an “unregulated” way, and so the gut does not become “tolerant” of “foreign” milk proteins such as those derived from cow’s milk. Emerging data suggests that there may be a link between antibiotic treatment of mothers and/or babies and immune dysregulation. This is not a confirmed link, just a possibility. It may be the result of exposure to antibiotics used to treat the infection, which alter the newborn baby’s gut flora, which consequently affects the generation of the “right” sort of immune responses. Alternatively, group B Streptococcus may be the “wrong” bacterium to stimulate normal immune development. This is an area where more research is needed.

Babies with suspected GBS infection should be given appropriate antibiotic treatment, as there could be far more serious consequences than milk intolerance, if infection is not promptly treated. Many babies who never had any antibiotic exposure either directly or via their mothers, also suffer milk protein intolerance. Babies will normally grow out of milk intolerance once the immune system matures, usually in the second 6 months of life.
4 GBS INFECTION IN ADULTS

4.1 Which adults are most at risk of GBS infection?

GBS infection in adults is rare. The incidence of invasive GBS disease in adults is considerably lower than that in babies. When GBS infection in adults does occur, it usually does so in:

- those with serious underlying medical conditions (such as diabetes mellitus, cancer or liver disease which reduce the effectiveness of the immune system);
- the elderly; and
- pregnant women;

The overall incidence of GBS infection in the population in England and Wales is rising – in 1990, there were 643 reports, which increased to 908 in 2000, 1249 in 2005 and 1571 in 2009.

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Between 2003 and 2009, the overall rate increased by over 28%. Although separate figures by age bands are not available, given the rate of GBS infection in babies increased during this period by almost 52%, then the increase in adults must have been significantly lower.

The overall rate of GBS infection per 100,000 population for 2009 was 2.8 per 100,000 population for England, Wales and Northern Ireland combined. Northern Ireland reported the highest incidence at 9.90 and Wales the lowest at 2.20, a pattern also seen in recent years.

![Graph from HPA Report](Image)
Rates of GBS infection were highly concentrated in babies under one year of age, with rates generally higher in males than females across most age groups, with the notable exception of 15-44 year olds (1.9 and 1.2 in females and males respectively). The incidence for males and females aged 75 plus is significantly higher than for all ages other than the under one year age group. Whether this higher GBS infection rate should be attributed to the greater likelihood of older people having chronic illness is unclear.

4.2 What infection does GBS cause in non-pregnant adults?

GBS infections in adults are usually skin and soft tissue infections (such as infection of skin ulcers caused by poor circulation and diabetes, or pressure sores in patients confined to bed), blood infection (septicaemia), pneumonia and urinary tract infections (such as kidney, bladder or prostate infections). GBS may also cause meningitis in adults as well as bone infections (osteomyelitis) and deep eye infections (endophthalmitis).

4.3 GBS infection in women during pregnancy and after delivery

Although GBS infection in neonates and in non-pregnant adults is usually serious, GBS infections in pregnant women and in women after giving birth usually respond quickly to antibiotic therapy. In rare cases, potentially fatal complications can occur. GBS can cause infections such as:

- infection of the ‘waters’ (chorionamnionitis - the most common symptoms include fever, increased heart rate in the mother and her unborn baby, tender or painful uterus, and/or a foul odour of the amniotic fluid);
- post-delivery endometritis (inflammation of the lining of the uterus following birth - the most common symptoms include general discomfort, uneasiness, or ill feeling, fever, uterine pain, abnormal vaginal bleeding, abnormal vaginal discharge, discomfort with bowel movement);
- post delivery septicaemia (blood poisoning - the most common symptoms include fever; feeling generally unwell; vomiting; lack of energy; aches and pains in muscles and joints; diarrhea; rash pinprick spots or larger purple spots which do not fade when pressed eg. under pressure from a drinking glass; cold feet and hands; rapid breathing; gasping or panting, and loss of consciousness);
- urinary tract infection (the most common symptoms include strong, constant urge to urinate, sharp pain or burning in the urethra during urination, inability to fully empty bladder, possible blood in urine, soreness in lower abdomen, back, or sides, back pain, chills, fever, nausea and/or vomiting); and
- infection following Caesarean sections.

All women should be tested for urine or bladder infections during pregnancy as many of these occur without any symptoms. 5-10% of these urine infections will be caused by GBS.

All urine and bladder infections during pregnancy must be treated but, in the case of GBS, this is also an indication for intravenous antibiotics to be offered to the pregnant woman from the start of labour or waters breaking until delivery.

4.4 Risk factors for GBS infection during pregnancy and after delivery

Factors that increase the risk of maternal GBS infection at or around birth include GBS colonisation, duration of membrane rupture greater than 6 hours, duration of internal monitoring greater than 2 hours and more than 6 digital internal examinations.
4.5 How should GBS infection in adults be treated

Early recognition and treatment is important for the successful treatment of GBS infection in adults. High doses of antibiotics such as penicillin should be given and therapy should not be stopped prematurely. In some cases, surgery may be necessary to drain infected sites and remove damaged tissue.

GBS infections, especially the more deep-seated ones, require expert care, prolonged courses of antibiotics and sometimes more than one antibiotic at the same time. Due to the varied nature of these infections, it is impossible to generalise about what is the most appropriate treatment.

Most GBS infection can be treated successfully, although some people will require all the expertise of intensive care facilities. Not all hospitals have such a facility and so some ill patients will have to be transferred to one with these specialised facilities.

4.6 How serious is GBS infection in adults?

Although uncommon, GBS infection in adults displays a whole spectrum of severity, from easily treated to very serious, particularly in non-pregnant adults. As with neonatal infection, the rate of adult GBS infection is also increasing. The risk increases with age, and is highest amongst adults over 65 years in age – affecting approximately 20-25 people per 100 000. The rate of infection is also nearly doubled in black people. Other risk factors for adult GBS include diabetes mellitus, cardiovascular disease and obesity.

Serious group B strep infections in adults can be fatal. The mortality rate varies significantly between studies, and values have been quoted as between 8% and 25% of adults with invasive group B strep infections (infections where the bacteria have entered a part of the body that is normally not exposed to bacteria) die. Risk of death is lower among younger adults, and adults who do not have other medical conditions.
5 USEFUL ADDRESSES

5.1 Pregnancy, childbirth & general

Tommy’s, the baby charity (0800 014 7800. www.tommys.org) Support and research into problem pregnancies.

5.2 Organisations linked to specific medical conditions

Contact-A-Family (0808 808 3555. www.cafamily.org.uk). For parents of children born with disabilities and rare and/or handicapping conditions. Links with local and national groups.
In-Touch Trust (029 2063 5660. www.touch-trust.org/touch-trust-charity-wales.asp). Provides individual links, contact, and information for parents of children with all special needs and rare medical conditions.
Meningitis Research Foundation (24-hour helpline: 080 8800 3344 www.meningitis.org).

5.3 Counselling, advice & support

AIMS Association for Improvements in the Maternity Service (0300 365 0663. www.aims.org.uk) Advice on rights, complaints procedures and choices in maternity care.
British Association for Counselling & Psychotherapy (01455 883300. www.itsgoodtotalk.org.uk). Information on where to get counselling locally.
Patients’ Association (0845 608 4455. www.patients-association.com). Charity providing patients with an opportunity to raise concerns and share experiences of healthcare.

5.4 For parents whose baby has died

Baby MPS (0845 703 4599 www.mpsonline.org.uk/bmps ) Baby MPS is a free service which allows you to register not to receive baby related mailings.
Bereavement Advice Centre (0800 634 9494 www.bereavementadvice.org) Bereavement Advice Centre supports and advises people on what they need to do after a death..
Child Death Helpline (0800 282 986 or 0808 800 6019. www.childdeathhelpline.org.uk). For anyone affected by the death of a child, staffed by bereaved parents (check website for times).
Cruse Bereavement Care (0844 477 9400. www.cruse.org.uk) Cruse is a bereavement support organisation for both adults and children in the UK. They provide one-to-one support to anyone who has suffered bereavement, together with a telephone helpline.
Compassionate Friends (0845 123 2304. www.tcf.org.uk) Supports parents whose child has died

Multiple Birth Foundation (020 3313 3519. www.multiplebirths.org.uk). Support for parents who have lost one or more of their babies from a multiple pregnancy or at birth.

National Association of Bereavement Services (020 7247 0617; referrals: 020 7247 1080). Counselling, support and referral locally for anyone bereaved.

Stillbirth & Neonatal Death Society (SANDS) (0207 436 5881. www.uk-sands.org). For parents whose babies die at or around the time of birth.

5.5 Organisations of faith

Asian Family Counselling Service (020 8571 3933 or 020 8813 9714. www.asianfamilycounselling.org.uk). Caring, personal and confidential counselling (not bereavement counselling) in the client's language with an awareness of their cultural and ethnic backgrounds.

Bereaved Parents Network (029 2081 0800. www.careforthefamily.org.uk/bpn/). Supports families and friends of a child who has died. Staffed by bereaved parents who, although committed Christians, provide support to people of all faiths and no faith.


Muslim Community Helpline (020 8904 8193 or 020 8908 6715. www.muslimcommunityhelpline.org.uk). Telephone counselling support for Muslim women.
6 GBSS’S MEDICAL ADVISORY PANEL

The information in this leaflet is based upon our medical advisory panel’s knowledge and on recent research (published and unpublished). This leaflet has been checked for medical accuracy by our medical advisory panel, comprising:

- **Prof Philip Steer** (Chairman), Emeritus professor at Imperial College and Consultant Obstetrician at the Chelsea and Westminster Hospital in London
- **Dr Christine McCartney OBE, FRCPath**, Executive Director of the Health Protection Agency’s Microbiology Services
- **Dr Alison Bedford-Russell MRCP**, Clinical Lead South West Midlands Newborn Network (SWMNN), Hon Associate Clinical Professor, Warwick Medical School and Neonatal Consultant Birmingham Women’s Foundation Trust.
- **Ms Philippa Cox**, Consultant Midwife / Supervisor of Midwives, Homerton University Hospital NHS Foundation Trust, London
7 GLOSSARY

ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CDC</td>
<td>Center for Disease Control and Prevention (US organisation)</td>
</tr>
<tr>
<td>ECM</td>
<td>Enriched Culture Medium (the ‘gold standard’ testing method for GBS carriage)</td>
</tr>
<tr>
<td>GBS</td>
<td>Group B Streptococcus</td>
</tr>
<tr>
<td>HPA</td>
<td>Health Protection Agency (UK agency)</td>
</tr>
<tr>
<td>IV</td>
<td>Intravenous (into a vein)</td>
</tr>
<tr>
<td>NICE</td>
<td>National Institute for Health and Clinical Excellence (UK NHS health authority)</td>
</tr>
<tr>
<td>PCR</td>
<td>Polymerase Chain Reaction (DNA amplification technique which can be used identify GBS)</td>
</tr>
<tr>
<td>(P)PROM</td>
<td>(Prelabour) Prolonged Rupture of Membranes</td>
</tr>
<tr>
<td>RCOG</td>
<td>Royal College of Obstetricians and Gynaecologists (UK O&amp;G association)</td>
</tr>
<tr>
<td>RDS</td>
<td>Respiratory Distress Syndrome (also called hyaline membrane disease)</td>
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KEYWORDS

- Amniotic: Relating to the fluid and membrane surrounding the fetus.
- Anaphylaxis: A severe and rapid allergic reaction, causing constriction of the trachea (airways).
- Apgar Score: Method used to assess the health of newborn babies.
- Capsular carbohydrate: Protective capsule surrounding the GBS bacterial cell.
- Carriage/Carrier/Colonised: Harmlessly carrying GBS within the vaginal/gastrointestinal system.
- Commensal: Naturally occurring bacteria, which cause no harm to the carrier.
- Chlorhexidine: An antiseptic wash.
- Focal Infection: Infection of a small area of the body that causes subsequent infection elsewhere.
- Intrapartum: During childbirth.
- Mastitis: Inflammation of the breast.
- Pneumonia: An inflammatory condition of the lung.
- Point-of-care: Testing at the site of patient care (here referring to testing during childbirth).
- Prophylaxis: Preventative medical treatment.
- Serotypes: Different types of capsular carbohydrates that identify the particular strain.
- Septicaemia: Blood poisoning; the presence of bacteria within the bloodstream.
8 MEMBERSHIP APPLICATION FORM

Please complete and return to Group B Strep Support, P O Box 203, HAYWARDS HEATH, West Sussex RH16 1GF. If you have any queries, phone us on 01444 416176, or e-mail us at info@gbss.org.uk.

Name(s)

Parent / Grandparent / Obstetrician / Paediatrician / Midwife / GP / Health Visitor / Other (please state)

Address

Postcode

Tel/Fax no:

E-mail address:

Please tick ☐ as appropriate:

☐ I/We enclose our cheque for my/our first year’s membership of the charity (see below)

☐ I/We would like to donate by Banker’s Order (please complete form on the reverse & return it to GBSS)

☐ I/We are the parents of a GBS baby

☐ Baby’s date of birth _____ / _____ / _____

☐ My baby developed GBS infection Yes/No

☐ I/We would like to speak to other parents about GBS

☐ Please send me/us volunteer guidelines on

☐ fund-raising ☐ raising awareness ☐ becoming a contact person

☐ I/We would like to help Group B Strep Support by:

We charge a minimum annual membership fee. For this, you receive our 6-monthly newsletter and any updates. If you can afford a larger donation to help us achieve our aims of informing and supporting more families; raising awareness and improving practice within the medical profession; and funding medical research, that would be greatly appreciated and it would be put to good use!

I/We enclose a cheque or postal order payable to Group B Strep Support for a year’s membership:

<table>
<thead>
<tr>
<th>£9.00</th>
<th>£15.00</th>
<th>£24.00</th>
<th>£...........................</th>
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<tbody>
<tr>
<td>student/unwaged</td>
<td>individual/family</td>
<td>overseas</td>
<td>voluntary donation</td>
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</table>

If you are a UK taxpayer, charities can claim back 28% of tax on donations made since April 2000, increasing our funds at the government’s expense! If you can help in this way, please tick the box and we will claim back some of your tax.

Signature

Date
9 LEAFLET ORDER FORM

To order leaflets, please complete this form and send it to GBSS, PO Box 203, Haywards Heath, West Sussex RH16 1GF, or e-mail it to info@gbss.org.uk or order on 01444 416176. All of our current leaflets can be downloaded free of charge from our website at www.gbss.org.uk. You are welcome to photocopy our leaflets, but please photocopy them in their entirety.

We don’t charge for our leaflets, but GBSS is a small charity and relies on donations to defray costs. The cost of each leaflet excluding postage & packing (including p&p in brackets) is shown below for one of each item:

<table>
<thead>
<tr>
<th>No Req.</th>
<th>INTRODUCTORY LEAFLETS:</th>
<th>Print Cost (Inc p&amp;p)</th>
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<tbody>
<tr>
<td></td>
<td>GBS &amp; pregnancy (introduction to GBS for pregnant women)</td>
<td>£ 0.06 (£ 0.67)</td>
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<tr>
<td></td>
<td>Bulk order of 50 leaflets</td>
<td>£ 3.00 (£ 6.50)</td>
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<td></td>
<td>Bulk order of 100 leaflets</td>
<td>£ 6.00 (£ 11.00)</td>
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<td></td>
<td>Bulk order of 200 leaflets</td>
<td>£12.00 (£18.50)</td>
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<tr>
<td></td>
<td>Protect babies from GBS infection (simpler intro to GBS+contacts for private lab)</td>
<td>£ 0.04 (£ 0.63)</td>
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<td></td>
<td>Bulk order of 50 leaflets</td>
<td>£ 2.00 (£ 4.75)</td>
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<td></td>
<td>Bulk order of 100 leaflets</td>
<td>£ 4.00 (£ 7.75)</td>
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<tr>
<td></td>
<td>Bulk order of 200 leaflets</td>
<td>£ 8.00 (£12.65)</td>
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<td></td>
<td>Congratulations on the safe arrival of your baby</td>
<td>(intro for parents where pregnant woman or baby is colonised with GBS and the baby is well)</td>
</tr>
<tr>
<td></td>
<td>Bulk order of 50 leaflets</td>
<td>£10.00 (£12.75)</td>
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<tr>
<td></td>
<td>Bulk order of 100 leaflets</td>
<td>£20.00 (£23.75)</td>
</tr>
<tr>
<td></td>
<td>Understanding your baby’s GBS infection (intro for parents of a GBS baby)</td>
<td>£0.20 (£ 0.85)</td>
</tr>
<tr>
<td></td>
<td>Bulk order of 50 leaflets</td>
<td>£10.00 (£12.75)</td>
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<td>Bulk order of 100 leaflets</td>
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<th>DETAILED LEAFLETS:</th>
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<tr>
<td>GBS: The Facts for Health Professionals (detailed 50+ page document, including medical reference list)</td>
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<tr>
<td>GBS: The Facts for Parents (detailed 40+ page document, for parents affected by GBS)</td>
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<th>POSTERS:</th>
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<tbody>
<tr>
<td>Poster – Pregnant? Find out about GBS and reduce the risk to your baby</td>
</tr>
<tr>
<td>Poster – Labour &amp; Delivery Prevention Guidelines for Neonatal Early Onset GBS Disease</td>
</tr>
<tr>
<td>Poster – Understanding your baby’s GBS infection. For Special Care Baby Units</td>
</tr>
<tr>
<td>Poster – Large “helping to save babies’ lives” poster (A3 size)</td>
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<th>OTHER MATERIALS:</th>
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<tr>
<td>Medical information pack (Folder containing small supply of introductory leaflets, GBS The Facts for health professionals, one of each poster, a sheet of stickers &amp; back issue of GBSS newsletter)</td>
</tr>
<tr>
<td>GBS Alert Stickers – 35 colour stickers for pregnant women’s notes</td>
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<tr>
<td>GBS Aware Stickers – 35 colour stickers for pregnant women’s notes</td>
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<tr>
<td>PowerPoint presentation for PC on CD – for health professionals (available to download from <a href="http://www.gbss.org.uk/healthprofs">www.gbss.org.uk/healthprofs</a>)</td>
</tr>
<tr>
<td>GBSS Balloons</td>
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Please provide your details overleaf.
Please tick all that apply:

- I enclose a donation of £…………….. for these leaflets
- Please send me a receipt
- I am a UK taxpayer. Please recover tax on my donation through Gift Aid.
- Please invoice me for these leaflets (including P&P costs)
- Please send me information about joining GBSS
- I am unable to contribute towards the cost of the leaflets
- Please add me to your mailing list

Name: ____________________________________________

Job Title: ____________________________________________

Delivery Address: ______________________________________

__________________________________________________________________________

__________________________________________________________________________

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__________________________________________________________________________

Post Code: ____________

Tel No: __________________________ Date: __________________________

E-mail address: ____________________________________________

Please share our information with others interested in GBS.

If you would like to provide us with any further information, or would like to make any comments, please do so here:

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
Reference List

(23) Yancey MK, Schuchat A, Brown LK, Ventura VL, Markenson GR. The accuracy of late an...


(51) Lamont RF. Infection in the prediction and antibiotics in the prevention of spontaneous preterm labour and preterm birth. BJOG 2003; 110 Suppl 20:71-75.


