THE IMPORTANCE OF GIVING VITAMIN K TO THE BABY AT BIRTH

Four Information sources have been selected as follows.

1. From Parenting and Child Health
2. From the Better Health Channel - Victorian Government
3. From the Cochrane Library 2005
4. Joint Statement from

The NH&MRC (National Health & Medical Research Council
The Paediatric Division of the Royal Australasian College of Physicians
The Royal Australian and New Zealand College of Obstetricians and Gynaecologists
The Royal Australian College of General Practitioneers
Australian College of Midwives Inc

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CHILDREN, YOUTH AND WOMEN'S HEALTH SERVICE
Parenting and Child Health
Child and Youth Health

Vitamin K

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Vitamin K is needed by humans to cause blood to clot. Without vitamin K small cuts can go on bleeding for a long time, small injuries can cause a lot of bruising, and bleeding can occur in many parts of the body, including in the brain, causing a stroke. Vitamin K is mostly made by bacteria in our gut because humans are unable to make vitamin K themselves. These bacteria do not cause illness. Only a small amount comes from food.

Vitamin K at birth

All newborn babies have low levels of vitamin K. Only a little vitamin K goes through the placenta to the baby, and at birth a babys gut is sterile (there are no bacteria in the gut). After birth there is little vitamin K in breast milk and breast fed babies can be low in vitamin K for several weeks until the gut bacteria start to make it. Infant formula has added vitamin K, but even formula fed babies also have very low levels of vitamin K for several days.

Why is it given?

Babies are given extra vitamin K soon after birth to prevent the bleeding that can occur in very young babies, or later when they are a few months old, when their vitamin K levels are low. This bleeding is rare even when babies are not given extra vitamin K, but it can cause severe harm to a baby, including death or severe brain damage. This bleeding problem is called Haemorrhagic Disease of the Newborn (HDN). (Sometimes it is called Vitamin K Deficiency Bleeding).

Concerns about vitamin K

For about 30 years all newborns in Australia, and in many other countries, have been given vitamin K at birth by injection. This has been found to be very safe and Haemorrhagic Disease of the Newborn did not occur in Australian babies who had this injection. However, although babies were getting the injection, many parents were not given any information about the injection and why it was given. In about 1999 some research was published in an international journal that suggested that giving vitamin K by injection might not be totally safe. A lot of research was done world wide which showed that there were no health risks and that giving vitamin K by

injection very successfully and safely prevented HDN. Although it was proven to be safe, there was considerable anger that babies were being given these injections without parents being aware of them, and **without their consent**.

Changes in practice

After the first report, until it was shown that injections of vitamin K were totally safe and effective, parents were given information about vitamin K, and informed about why giving it by injection was still strongly recommended. Parents of healthy newborns were offered the choices of:

giving vitamin K by injection (one injection very soon after birth)
giving it by mouth (three doses, one at birth, the next at about 3 to 5 days after birth and a third (for breast fed babies) in the 4th week) not having vitamin K. During this time many parents selected to have oral doses. Also during this time several babies were severely affected by HDN, probably because they did not get enough vitamin K. No cases of HDN had occurred in Australia since the program of giving vitamin K by injection was started, but there were several children affected by HDN when it was given orally.

Recommendations

The current recommendations from many specialist organizations such as the National Health and Medical Research Council and the Health Policy Unit of the Royal Australasian College of Physicians and the World Health Organisation is that **all newborn children receive vitamin K at birth by injection, but that parents also be given information about the injection and reasons for it,** and that the injection is recorded in the baby's health record. All babies can have vitamin K, even if they are premature or ill. Parents can refuse the injection but they need to be well informed, to be clear that giving vitamin K orally does not provide as good protection as injections, and also be very clear about how they will ensure that their baby gets the oral doses needed. They also need to be aware that babies who are ill or premature need vitamin K by an injection as they will not be able to absorb an oral dose. Some babies whose mothers have been taking some medications (such as some antibiotics and treatment for epilepsy) during pregnancy will also not be able to get a protective level of vitamin K orally, and need an injection to be protected.

A parent's choice

Parents do not have to allow their child to have vitamin K by injection or orally, but it is very strongly recommended that they do allow it. If they chose not to give consent for vitamin K to be given they need to understand that this exposes their baby to a serious and preventable health problem. Parents who decide not to give their baby vitamin K need to watch closely for signs of bleeding. Bleeding and bruising are not normal in the first months of life. Any young baby which has bleeding or bruising should be checked by a doctor. Research, and practice over 30 years has shown that giving vitamin K by injection at birth is safe and effective. Giving vitamin K orally does not give as good protection to a baby, and not giving it at all means that a baby is at risk of getting a severe, preventable health problem. Having the injection does not cause any health problems but some babies have a slight swelling or soreness at the site of the injection for a day or two.

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National Health and Medical Research Council Joint statement and recommendations on Vitamin K administration to newborn infants to prevent vitamin K deficiency bleeding in infancy. National Health and Medical Research Council, Paediatric Division of the Royal Australasian College of Physicians, Royal Australian and New Zealand College of Obstetrics and Gynaecology, Royal Australian College of General Practitioners, Australian College of Midwives Inc (October 2000)
http://www.nhmrc.gov.au/publications/fullhtml/jointk.htm

Royal Australasian College of Physicians, Health Policy Unit
Vitamin K for Newborn Babies: Information for Parents http://www.racp.edu.au/hpu/paed/vitkinfo.htm
Joint Statement and Recommendations on Vitamin K Administration to Newborn Infants to Prevent Vitamin K Deficiency Bleeding in Infancy http://www.racp.edu.au/hpu/paed/vitk/index.htme

2. Information from Better Health Channel - Victorian Government

Vitamin K and newborn babies

Vitamin K is needed by humans for blood clotting. Older children and adults get most of their vitamin K from bacteria in the gut, and some from their diet. Without enough vitamin K, small cuts can go on bleeding for a very long time and big bruises can happen from small injuries. Bleeding can also occur in other parts of the body, such as the brain (causing one type of stroke).

Babies have very little vitamin K in their bodies at birth. Vitamin K does not cross the placenta to the developing baby, and the gut does not have any bacteria to make vitamin K before birth. After birth, there is little vitamin K in breast milk and breastfed babies can be low in vitamin K for several weeks until the normal gut bacteria start making it. Infant formula has added vitamin K, but even formula-fed babies have very low levels of vitamin K for several days.

With low levels of vitamin K, some babies can have very severe bleeding - sometimes into the brain, causing significant brain damage. This bleeding is called haemorrhagic disease of the newborn (HDN).

Informed consent

For more than 20 years, all newborn babies have been given vitamin K at birth, by injection. This has been found to be very safe, and HDN was not seen in Australian babies. However, although the program was in place to give the injections, most parents did not get any information about the injection and why it was given. When some concern about its safety was published in an international journal, there was a considerable outcry - not so much about its safety (it was quickly shown to be both extremely safe and extremely effective), but about the fact that parents were not given information about the need for the injection, or given the opportunity to make an informed decision about an injection given to their baby.

Injections or drops

For a short time, when concerns were first raised about the safety of vitamin K injections, parents were given information to make an informed decision and they were offered the opportunity to have their babies given vitamin K by drops, rather than injection. Two doses of drops were needed for all babies (one at birth and one 3 to 5 days later), and another in the fourth week, if the baby was breastfed.

During the time that many babies were getting vitamin K by drops, several babies in Australia had severe episodes of bleeding, which were probably due to HDN. It seemed very clear that getting vitamin K by one injection is far safer and more effective than by three sets of drops.

It's your choice

Parents do not have to allow their baby to have a vitamin K injection, but it is very strongly recommended that they do give permission for it. Vitamin K injections have been routinely given in Australia for over 20 years, with no ill effects at the time of the injection, or later. Some babies have a slight soreness for a day or so at the injection site. Vitamin K injections remain the best preventive measure for reducing the risk of haemorrhagic disease of the newborn.

Child Health Record

When a baby is given vitamin K by injection or oral dose, this needs to be recorded in the child's Health Record. The Victorian Child Health Record is given free of charge to parents after the birth of their baby.

Where to get help

Your doctor
Maternity hospital
Maternal and Child Health nurse.

Things to remember

Vitamin K is needed for blood clotting. Newborn babies are given vitamin K injections to prevent a serious disease called haemorrhagic disease of the newborn (HDN). Vitamin K can be given by mouth if preferred, but oral doses aren't as effective.

3. From *The Cochrane Library, Issue 3, 2005*. Chichester, UK: John Wiley & Sons, Ltd. - All rights reserved.

Prophylactic vitamin K for vitamin K deficiency bleeding in neonates (Cochrane Review)

Puckett RM, Offringa M

ABSTRACT - What's new in this issue

A substantive amendment to this systematic review was last made on 06 August 2000. Cochrane reviews are regularly checked and updated if necessary.

Background: Vitamin K deficiency can cause bleeding in an infant in the first weeks of life. This is known as Hemorrhagic Disease of the Newborn (HDN). HDN is divided into three categories: early, classic and late HDN. Early HDN occurs within 24 hours post partum and falls outside the scope of this review. Classic HDN occurs on days one to seven; common bleeding sites are gastrointestinal, cutaneous, nasal and from a circumcision. Late HDN occurs from week 2-12; the most common bleeding sites are intracranial, cutaneous, and gastrointestinal. Vitamin K is commonly given prophylactically after birth for the prevention of HDN, but the preferred route is uncertain.

Objectives: To review the evidence from randomized trials in order to determine the effectiveness of vitamin K prophylaxis in the prevention of classic and late HDN. Main questions are: Is one dose of vitamin K, given after birth, able to significantly reduce the incidence of classic and late HDN? Is there a significant difference between the oral route and the intramuscular route in preventing classic and late HDN? Are multiple oral doses of vitamin K, given after birth, able to significantly reduce the incidence of classic and late HDN?

Search strategy: The standard search strategy of the Cochrane Neonatal Review Group was used.

Selection criteria: All trials using random or quasi-random patient allocation, in which methods of vitamin K prophylaxis in infants were compared to each other, placebo or no treatment, were included.

Data collection and analysis: Data were extracted independently by each author and were analysed with the standard methods of the Cochrane Collaboration and its Neonatal Review Group, using relative risk, risk difference and weighted mean difference.
Main results: Two eligible randomized trials, each comparing a single dose of intramuscular vitamin K with placebo or nothing, assessed effect on clinical bleeding. One dose of vitamin K reduced clinical bleeding at 1-7 days, including bleeding after circumcision, and improved biochemical indices of coagulation status. Eleven additional eligible randomized trials compared either a single oral dose of vitamin K with placebo or nothing, a single oral with a single intramuscular dose of vitamin K, or three oral doses with a single intramuscular dose. None of these trials assessed clinical bleeding. Oral vitamin K improved biochemical indices of coagulation status at 1-7 days. There was no evidence of a difference between the oral and intramuscular route in effects on biochemical indices of coagulation status. A single oral compared with a single intramuscular dose resulted in lower plasma vitamin K levels at two weeks and one month, whereas a 3-dose oral schedule resulted in higher plasma vitamin K levels at two weeks and at two months than did a single intramuscular dose.

Authors' conclusions: A single dose (1.0 mg) of intramuscular vitamin K after birth is effective in the prevention of classic HDN. Either intramuscular or oral (1.0 mg) vitamin K prophylaxis improves biochemical indices of coagulation status at 1-7 days. Neither intramuscular nor oral vitamin K has been tested in randomized trials with respect to effect on late HDN. Oral vitamin K, either single or multiple dose, has not been tested in randomized trials for its effect on either classic or late HDN.

Citation: Puckett RM, Offringa M. Prophylactic vitamin K for vitamin K deficiency bleeding in neonates. *The Cochrane Database of Systematic Reviews* 2000, Issue 4. Art. No.: CD002776. DOI: 10.1002/14651858.CD002776.

4. Joint statement and recommendations on Vitamin K administration to newborn infants to prevent vitamin K deficiency bleeding in infancy

- National Health and Medical Research Council
- Paediatric Division of the Royal Australasian College of Physicians
- Royal Australian and New Zealand College of Obstetrics and Gynaecology
- Royal Australian College of General Practitioners
- Australian College of Midwives Inc

ISBN 0 642 45067 6

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In December 1999 the Australian Drug Evaluation Committee (ADEC) approved the application by Roche Australia to register Konakion MM Paediatric, a new formulation of vitamin K (phytomenadione) containing 2 mg in 0.2 ml, for intramuscular (IM) and oral use. In this mixed micelles formulation naturally occurring substances sodium glycocholate (bile acid) and lecithin generate a stable colloidal micellar system capable of solubilizing the fat-soluble vitamin K in an aqueous medium.

The active ingredient, phytomenadione (vitamin K1) has been marketed in Australia since the 1950s as a cremophor formulation for IM injection, Konakion 1 mg/ 0.5 ml, also containing propylene glycol, phenol and polyethylated castor oil. These latter components have been associated with anaphylaxis following IV use and local irritation when given IM. In 1992 Golding reported an association between intramuscular (but not oral) use of the cremophor formulation and childhood cancer. Subsequent studies of better methodological quality have not confirmed this, although a consistent small but non-significant trend towards an increased incidence of acute lymphoblastic leukaemia remained (reviewed by Von Kries 1998, Wariyar *et al* 2000). Although not licensed for oral use, the cremophor formulation has been used when

parents do not wish their infant to receive an intramuscular injection. Gastrointestinal irritation has been a problem with oral use. The production of the cremophor formulation has ceased.

The National Health and Medical Research Council (NHMRC) was requested to:

- **a. review research published since 1994 on the efficacy, safety and bioavailablity of the new vitamin K formulation, Konakion MM Paediatric when given orally or intramuscularly,**
- **b. consider the different needs of formula and breast fed infants for the administration of vitamin K,**
- **c. consider if a requirement for booster doses of vitamin K will have implications for the NHMRC Australian Standard Vaccination Schedule,**
- **d. prepare advice for health care workers and parents on the need and schedule for vitamin K administration,**
- **e. recommend areas for further research.**

A multidisciplinary Working Party was formed to address these issues.

Methods

The Working Party had two face to face meetings and two teleconferences. The detailed submission to ADEC by Roche Australia for the licensing of Konakion MM Paediatric was made available. In addition a systematic literature search was undertaken of MEDLINE (1994-2000) and the Cochrane Library for reports on the incidence of vitamin K deficiency bleeding and effectiveness of different forms of prophylaxis. This was supplemented by a search for unpublished, ongoing or planned studies through contact with Roche Australia and international experts in the field. The experts included Drs Shearer, Tripp, McNinch and Hey in the UK, Sutor and Von Kries in Germany and Greer in the USA.
A five week phase of full public consultation was undertaken following NHMRC endorsement of the Joint Statement and Recommendations as interim guidelines. The Working Party met to review the guidelines in light of the consultation submissions received.

Background

The term Îhaemorrhagic disease of the newbornâ was first used in 1894 (Townsend 1894) to describe bleeding in the newborn, which was not due to traumatic birth or to haemophilia. Later many cases were found to be associated with vitamin K deficiency. The term Îvitamin K deficiency bleedingâ (VKDB) has now been adopted (Sutor *et al* 1999). This is preferred since not all bleeding in the newborn is due to vitamin K deficiency and bleeding due to this cause is not confined to the newborn.

Vitamin K occurs in two forms, vitamin K1 whose source is dietary intake and vitamins K2 (menaquinones) that are produced by gut bacteria. All newborn infants have a relative vitamin K deficiency at birth (Shearer 1992). Vitamin K1 crosses the placenta poorly resulting in low fetal plasma concentrations of the vitamin, with a 30:1 maternal-infant gradient. After birth vitamin K status is related to dietary intake, being determined by the volume of milk ingested and the amount of vitamin K1 in the milk. Symptomatic VKDB can be precipitated in the first week of life by delayed or inadequate early feeding, or can occur later in the first six months as a result of inadequate oral absorption of vitamin K1. Human breast milk contains relatively low concentrations of vitamin K1 (1 to 2 μg/1), whereas infant formula milks are by law supplemented with additional vitamin K1 to a minimum concentration of 30 μg/1. Therefore exclusively breast-fed infants are at increased risk of developing VKDB, unless supplemental vitamin K is administered. Cholestatic liver disease also impairs absorption of vitamin K1 and increases the risk of VKDB. Hepatic menaquinones (vitamins K2) protect adults and older infants from developing VKDB even in the presence of vitamin K1 deficiency. Vitamins K2 cannot be detected in the livers of newborn infants but gradually accumulate in the first few months of life. The source of vitamins K2 in young infants is from synthesis by gut flora. Until adequate stores of hepatic menaquinones have accumulated young infants remain susceptible to the occurrence of VKDB.

Diagnosis

VKDB includes spontaneous or excessive induced bleeding (eg venipuncture or surgery) at any site associated with decreased activity of the vitamin K dependent coagulation factors (II, VII, IX and X) with normal activity of vitamin K independent factors, fibrinogen levels and platelet count (Sutor *et al* 1999). Confirmation of the diagnosis requires that the coagulation disorder is rapidly reversed following vitamin K administration and that other causes of coagulopathy are excluded.

Classification

VKDB is classified into early, classical and late, based on the age of presentation (Sutor *et al* 1999, Von Kries 1999).
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Early VKDB, occurring on the first day of life, is rare and confined to infants born to mothers who have received medications that interfere with vitamin K metabolism. These include the anticonvulsants phenytoin, barbiturates or carbamazepam, the antitubercular drugs rifampicin or isoniazid and the vitamin K antagonists warfarin and phenprocoumarin. The reported incidence in infants of mothers who have received such medications without vitamin K supplementation is between 6 and 12 per cent (reviewed by Sutor *et al* 1999).

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Classical VKDB occurs from one to seven days after birth and is more common in infants who are unwell at birth or who have delayed onset of feeding. Bleeding is usually from the umbilicus, gastrointestinal tract, skin punctures, surgical sites and uncommonly in the brain. The incidence reported in the literature is variable, with rates of 0.25 to 1.5 per cent in early reports of both sick and well infants to 0 to 0.44 per cent in recent reviews predominantly of well infants. There is considerable uncertainty about the true rates of classical VKDB since full diagnostic criteria outlined above were seldom met.

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Late VKDB occurs from eight days to six months after birth, with most presenting at one to three months. It is almost completely confined to fully breast-fed infants. About half of the infants have underlying liver disease or occasionally other malabsorptive states. Serious intracranial haemorrhage occurs in about 30 to 50 per cent. Other sites of bleeding include skin, gastrointestinal tract, umbilicus or surgical sites. About 30 per cent have minor bruising or other signs of coagulopathy (warning bleeds), preceding the serious haemorrhage. Infants at risk may have signs of predisposing cholestatic liver disease such as prolonged jaundice, pale stools, and hepatosplenomegaly. The rate of VKDB in infants without prophylaxis has been reported as between five and 20 per 100,000 births. The mortality is about 30 per cent (Loughnan and McDougall 1993).

Prophylaxis

In Australia prophylaxis with a single IM injection of 1 mg Konakion (cremophor) was introduced in the early 1970s. This was initially given to Îsickâ infants such as those born preterm or following perinatal asphyxia, and later became routine for all infants.

At present over 95 per cent of approximately 260,000 newborn infants born in Australia each year receive IM vitamin K (cremophor formulation) prophylaxis at birth, most of the remainder receive either oral prophylaxis with repeated doses of the same formulation and a small number receive no prophylaxis (Australian Paediatric Surveillance Unit - unpublished). In 1994 the NHMRC recommended that all infants should receive prophylaxis and that the IM route was preferred for reliability of administration. Prophylaxis has been recently reviewed (Brousson *et al* 1996, Cornelissen *et al* 1997, Sutor *et al* 1999, Von Kries 1999) and these studies underpin the statements below.

Effectiveness of prophylaxis

There are no randomised-controlled trials that adequately address the effectiveness of prophylaxis in preventing VKDB. The results of surveillance systems in different countries, including Australia, have been used to infer effectiveness by recording the type of prophylaxis used in reported cases of VKDB (Cornelissen *et al* 1997).

Early VKDB can appear at birth and so it has been recommended that women who are taking medication known to interfere with vitamin K metabolism should receive 20 mg of vitamin K daily for at least two weeks before birth. Further, newborn infants born to such mothers should have intramuscular vitamin K immediately after birth (Fetus and Newborn Committee 1988).

Classical VKDB is virtually eliminated by the administration of a single dose of vitamin K given by any route on the day of birth.

Late VKDB in the first six months of life is the main concern because, although rare, bleeding can be serious and life threatening and the incidence varies with different regimens of prophylaxis. Cornelissen *et al* (1997) and Von Kries (1999) summarised the results from different countries using various methods of administration. A single IM injection of 1 mg of Konakion (cremophor) has been the most reliable and effective form of prophylaxis with rates of less than 0.3 per 100,000 births reported. Regular oral dosing such as 25 μg daily (Netherlands) or 1 mg weekly (Denmark) requires parental diligence but is as effective as a single IM (cremophor) dose at birth. Formula feeding also supplies a regular dose and late VKDB is very rare in such infants.

Where the intended regimen is three oral doses of Konakion cremophor (usually on day one, later in the first week and at four to six weeks, the reported rates per 100,000 births have been 2.6 (Germany) and 2.5 (Australia). The rate for infants actually receiving the full course is lower at 1.8 and 1.5 respectively. In Germany an increased dose of Konakion cremophor to 2 mg at the three times was associated with a lower rate of 0.9 per 100,000 births (Von Kries 1999). A single oral dose of 1 to 2 mg of Konakion cremophor at birth is less effective, although the onset appears to be delayed (Loughnan and McDougall 1993) with reported rates per 100,000 births varying from 1.5 in the UK and Germany to 4.5 in Denmark and 6.5 in Switzerland.

Effectiveness of the new Konakion MM Paediatric (mixed micellar) preparation

Intramuscular injection of 1 mg of Konakion MM in adults results in a slow rise in blood vitamin K levels suggesting a depot effect. In newborns a similar depot effect has been observed although this has only been studied in the first eight hours after injection. Tween vitamin K1 formulation is used in a single IM dose in the USA and has a similar initial pharmacokinetic profile to that of Konakion MM following IM injection in adults. After a single IM dose of a Tween preparation of vitamin K1, adequate vitamin K1 levels at 56 days are found in about 70 per cent of infants (Greer *et al* 1998). The relationship between blood levels and risk of bleeding are unclear. The effectiveness of IM Konakion MM or the Tween formulation in preventing late VKDB is not known.

Konakion MM is well absorbed orally. With three single doses (administered at days one, seven and 30) blood levels of vitamin K1 are adequate in 89 per cent at 56 days (Greer *et al* 1998). Proteins that accumulate in the blood when there is a deficiency of vitamin K (PIVKAs) were not detected in the 79 infants who received oral prophylaxis with Konakion MM.

The only data on effectiveness of oral Konakion MM comes from Switzerland where since 1995, 93 per cent of infants have received it by this route. The intended regimen was two oral doses of 2 mg, the first on day one and the second on day four. Three years of surveillance data reported by Schubiger *et al* 1999 found one case of classical VKDB and 11 definite cases of late VKDB in 247,000 cases. Nine of these 11 were found to have underlying liver disease. Of the remaining two, one had no prophylaxis and the other had the recommended two oral doses.

Issues

The following issues were addressed by the Working Party when forming their recommendations:

a. The IM route of administration has been the preferred one in Australia. Use of the Konakion cremophor formulation has been shown to be effective in preventing late VKDB but will no longer be available in Australia by about October 2000. At present there are no data on the effectiveness of Konakion MM. A Tween preparation of vitamin K1 with absorption characteristics similar to Konakion MM is used in the USA and a single IM dose is recommended. The New Zealand draft recommendation is for a single IM dose of Konakion MM, and this is their preferred method of prophylaxis.

b. Oral prophylaxis can be as effective as IM but requires daily or weekly dosing.

c. There is not likely to be sufficient compliance to recommend this in Australia. Even with a two or three dose regimen there is significant non-compliance, as the Swiss case has demonstrated.

d. The new formulation is not presented in a user-friendly way. Intramuscular administration requires a 1 mg dose in a 0.1 ml volume of injection (half that in the ampoule) increasing the risk of dosage error. This problem is magnified for very pre-term infants who would receive 0.5 mg in 0.05 ml. For oral use, glass ampoules are not user friendly for parents. This creates important practical issues in regard to the third oral dose that will need to be considered on a local level. The Working Party has made this concern clear to the manufacturer.

e. As the duration of effect of oral or IM Konakion MM is not known, the Working Party considered the suggestion of a booster oral dose of 2 mg being given with the first immunisation. The purpose of this eight-week dose would be to prevent a small number of cases presenting late (about 12 per cent present beyond eight weeks of age). Data from Switzerland (Schubiger *et al* 1999) suggest that most of these late presenting cases will have associated liver disease and cholestasis.

f. Although there is one published report by Amedee-Manesme *et al* (quoted by Von Kries 1999), of good oral absorption of Konakion MM in the presence of cholestasis, this was in only three infants and a dose of 20 mg was used. An unpublished study of the effects of 2 mg given orally to a larger group of infants with cholestasis suggests that it is poorly absorbed (Shearer ö personal communication). Since a dose of 2 mg of oral vitamin K1 is unlikely to be effective in infants with cholestasis, and late presenting VKDB following prophylaxis is rare in healthy infants, the Working Party have not recommended *routine* administration at eight weeks of age. The administration of this fourth oral dose of Konakion MM should remain a discretionary issue for the parent and the clinician.

g. The amount of vitamin K1 in breast milk can be increased by maternal intake of supplemental vitamin K1 (Greer 1999). No data were found as to the effectiveness of this possible form of prophylaxis. The members of the working party were concerned that women might be discouraged from breastfeeding. Due to the large benefits both for the mother and infant the Commonwealth Government is committed to protecting, promoting and supporting exclusive breast feeding for at least the first four to six months of life (NHMRC 1996).

h. **The advantage of IM administration is that no subsequent dosage is required. The advantage of oral administration in three doses is that it is non-invasive and that if 100 per cent compliance is achieved it may be almost as effective as IM administration.**

i. There may be difficulty ensuring repeated oral doses of vitamin K in certain circumstances. Health Services need to take this into account when developing local protocols.

Recommendations

1. All newborn infants should receive vitamin K prophylaxis.

2. Healthy newborn infants should receive vitamin K either:

   a. By intramuscular injection of 1 mg (0.1 ml) of Konakion MM at birth. This is the preferred route for reliability of administration and level of compliance.

Or

   b. As three 2 mg (0.2 ml) oral doses of Konakion MM, given at birth, at the time of newborn screening (usually at three to five days of age) and in the fourth week. The last dose is not required in infants predominantly formula fed. It is imperative that the third dose is given no later than four weeks after birth as the effect of earlier doses decreases after this time. Undertaking this form of prophylaxis requires that the parent accepts responsibility and that clinicians support and advise them in the administration of the third dose.

   c. If the infant vomits or regurgitates the formulation within one hour of administration, the oral dose should be repeated. If at the time any oral dose is to be given the infant is sick, vomiting or unable to take it by mouth, then medical advice should be sought as to whether the intramuscular preparation should be given.

3. Newborns who are too unwell and are unable to take oral vitamin K (or whose mothers have taken medications that interfere with vitamin K metabolism) should be given 1 mg of Konakion MM by intramuscular injection at birth. A smaller intramuscular

dose of 0.5 mg (0.05ml) should be given to infants with a birth weight of less than 1.5 kg.

4. Parents should receive written information during the antenatal period about the importance of vitamin K prophylaxis, and the options of oral or intramuscular prophylaxis. Health practitioners and institutions should ensure that appropriate informed consent procedures are in place and are followed.

5. A mechanism should be in place to ensure that the decision made antenatally about the method of prophylaxis is communicated to staff caring for the mother during childbirth and post-natally.

6. Hospitals should have written protocols for medical and nursing staff to administer prophylactic vitamin K to infants. These should include that it be routine practice to record the date, dose and method of administration in the infantâs personal health record.

7. Child health workers and parents should be aware that unexplained bleeding or bruising in infants is uncommon and should be promptly investigated and treated. Information on unexplained bleeding should be included in the general information given to parents antenatally.

8. Further research should be undertaken into the implementation strategies for oral Konakion MM and for the efficacy of Konakion MM by any route. The possibility of prophylaxis via maternal supplementation to enhance levels of vitamin K in breast milk should also be investigated.

9. The Australian Paediatric Surveillance Unit should be supported to continue monitoring the incidence of VKDB.

These recommendations will be reviewed as further information becomes available.

The Konakion MM Paediatric Product Information is currently being updated to reflect the Joint Statement and Recommendations.

The NHMRC has developed information for parents.

These guidelines were endorsed at the 137th Session of Council, 13 October 2000.

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