

Breastfeeding: *Evidence-base and physiological insights.*

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Community Birth Services Breastfeeding Seminar, 11 Sep 2013

Talk Overview

1. Introduction

(why am I giving this talk?)

2. Evidence-based decision-making

(research design, ethical considerations etc. – short activity)

3. Overview: Benefits of breastfeeding

(claims, trends, history)

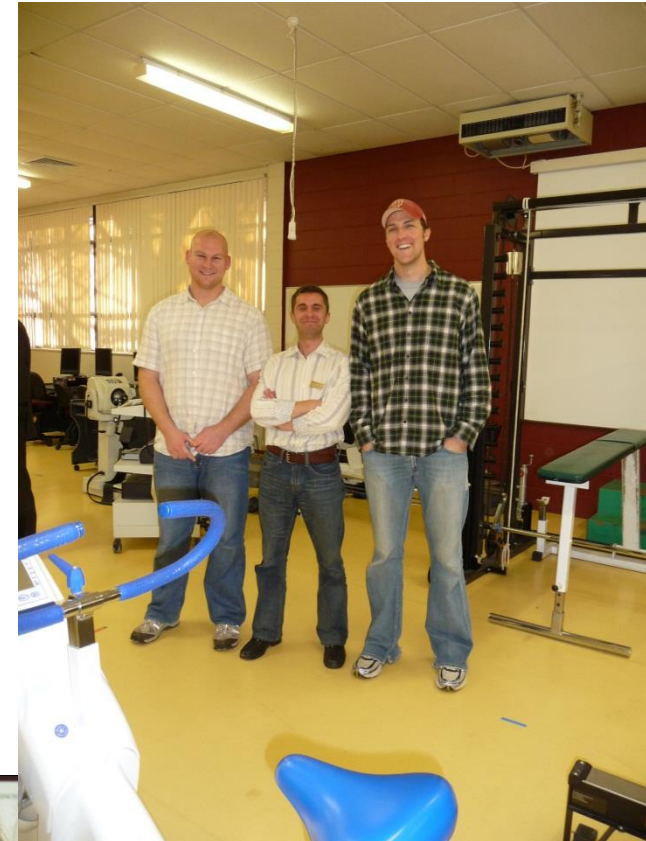
4. Physiological insights

(contact, feeding, development, short quiz)

5. Summary

(have you learnt anything?)

Introduction



Introduction



Talk Overview

2. Evidence-based decision-making

Question

How do you know that breastfeeding is “right”?

Research vs. Marketing



Validity of Research (Design)

1. Cross-sectional observation
2. Randomized-control trial
3. Cross-over study
- ...
4. *Ethical Considerations?*
 - Risks vs. benefit
 - Informed consent
 - Confidentiality

Small-Group Activity

- 6 groups, 5-10 mins
- Each group:
 - Read study abstract
 - Identify main results ('take-home message')
 - Elect spokesperson to relay these

Pre-Term Formula vs. Milk

	<i>Three centre study</i>	<i>Two centre study</i>
Centres	Cambridge, Ipswich, King's Lynn	Norwich, Sheffield
No randomised	502	424
Neonatal diets assigned randomly		
<i>Trial A:</i> Diets used as sole enteral feed (mother chose not to provide her EBM)	BBM <i>v</i> PTF	TF <i>v</i> PTF
<i>Trial B:</i> Diets used as supplements to mother's EBM	BBM (+EBM) <i>v</i> PTF (+EBM)	TF (+EBM) <i>v</i> PTF (+EBM)
Follow up periods		
9 Months post-term	Pilot follow up completed Developmental outcome data reported (3)	No pilot follow up
18 Months post-term	Follow up completed Developmental outcome data reported in this paper	Follow up completed Developmental outcome data reported ¹ . Data from trial A included also in this paper for comparison
7.5–8 years	Follow up complete by 1993 (unpublished)	Follow up complete by 1993 (unpublished)

Randomised trial developmental outcome data for 7.5–8 years unreported, but epidemiological (non-randomised) developmental data on the first 300 children seen at 7.5–8 years were analysed according to whether mother provided her own expressed breast milk (EBM) or not and reported previously.¹³

BBM=banked (donated) breast milk; PTF=preterm formula; TF=standard term formula.

PROBIT

Age	Total n	Total %	17 046 randomized mother-infant pairs recruited during postpartum hospital stay	
PROBIT I				
Birth	17 046	100	8865 Mother-infant pairs enrolled to intervention	8181 Mother-infant pairs enrolled to control
			Mother-infant pairs attended	Mother-infant pairs attended:
1 m	16 760	98.3	8679	8081
2 m	16 523	96.9	8535	7988
3 m	16 685	97.9	8658	8027
6 m	16 481	96.7	8562	7919
9 m	16 176	94.9	8403	7773
12 m	16 492	97.0 ^a	8569 Mother-infant pairs attended	7923 Mother-infant pairs attended
			276 Did not attend	230 Did not attend
			20 Died	28 Died
PROBIT II				
6.5 y	13 889	81.9 ^b	7108 Attended	6781 Attended
			1717 Did not attend	1354 Did not attend
			20 Died	18 Died
PROBIT III				
11.5 y	13 879 ^d	81.9 ^c	7405 Attended	6474 Attended
			1200 Did not attend	1445 Did not attend
			214 Refused	211 Refused
			6 Died	5 Died
11.5 y	13 545	79.9 ^e	7226 with assay data	6319 with assay data



Talk Overview

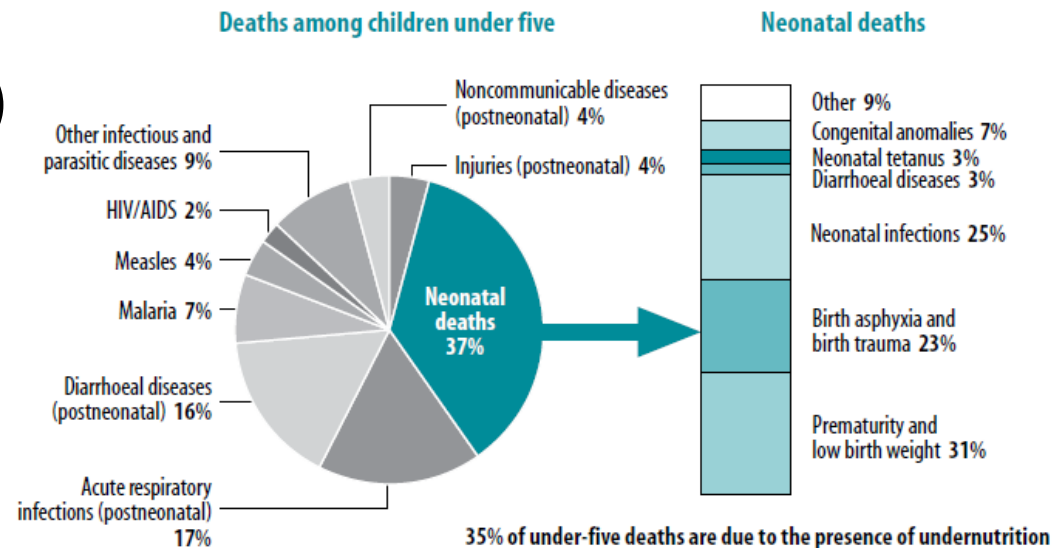
3. Overview: Benefits of breastfeeding

The Importance of Feeding

In 2006, 9.5 million deaths <5y

- 67% occurred in <1y
- 35% due to poor nutrition
- >10% due to sub-optimal (non-exclusive) breastfeeding

Major causes of death in neonates and children under five in the world, 2004



Consequences of Malnutrition

(first 2 years of life)

WHO 2009

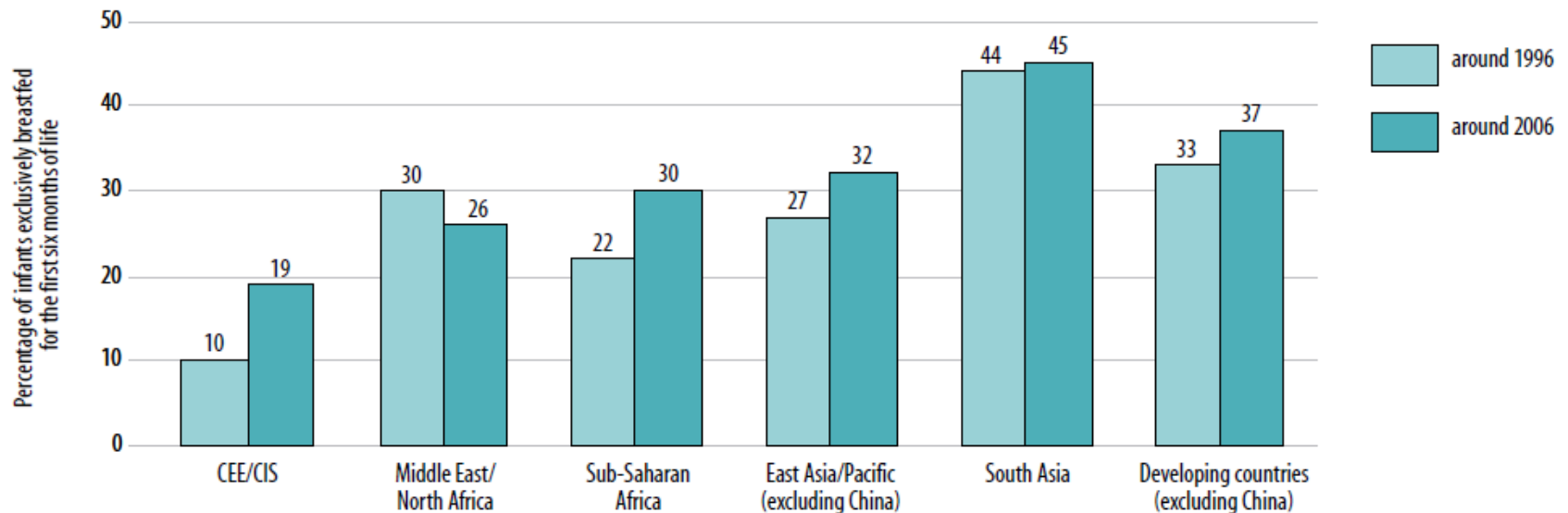
1. Stunted height
2. Impaired IQ
3. Reduced physical work capacity
4. Malnourished females:
 - Affected reproductive capacity
 - More complicated delivery
 - Their infants have LBW
5. When malnourishment is widespread, national development is affected

Breastfeeding vs. Not

1. Infants 20 times more likely to die *Bahl et al. 2005*
 - Diarrhoea
2. Increased risk of immunological disease-basis
 - Asthma/atopy condition *Oddy et al. 2004*
 - Juvenile diabetes *Sadauskaite-Kuehne et al. 2004*
3. More likely to be overweight *Harder et al. 2005*
 - Decreased cardiovascular health
4. Reduced IQ *Andersen et al. 1999*
5. Mother has increased risk of:
 - Postpartum hemorrhage *Chua et al. 1994*
 - Breast/ovarian cancer *Robenblatt et al. 1993*

The Trend of Feeding

Trends in exclusive breastfeeding rates (1996–2006)



Source: UNICEF. *Progress for children: a world fit for children. Statistical Review, Number 6.* New York, UNICEF, 2007.

The History of Feeding

WHO *Bulletin* 1989

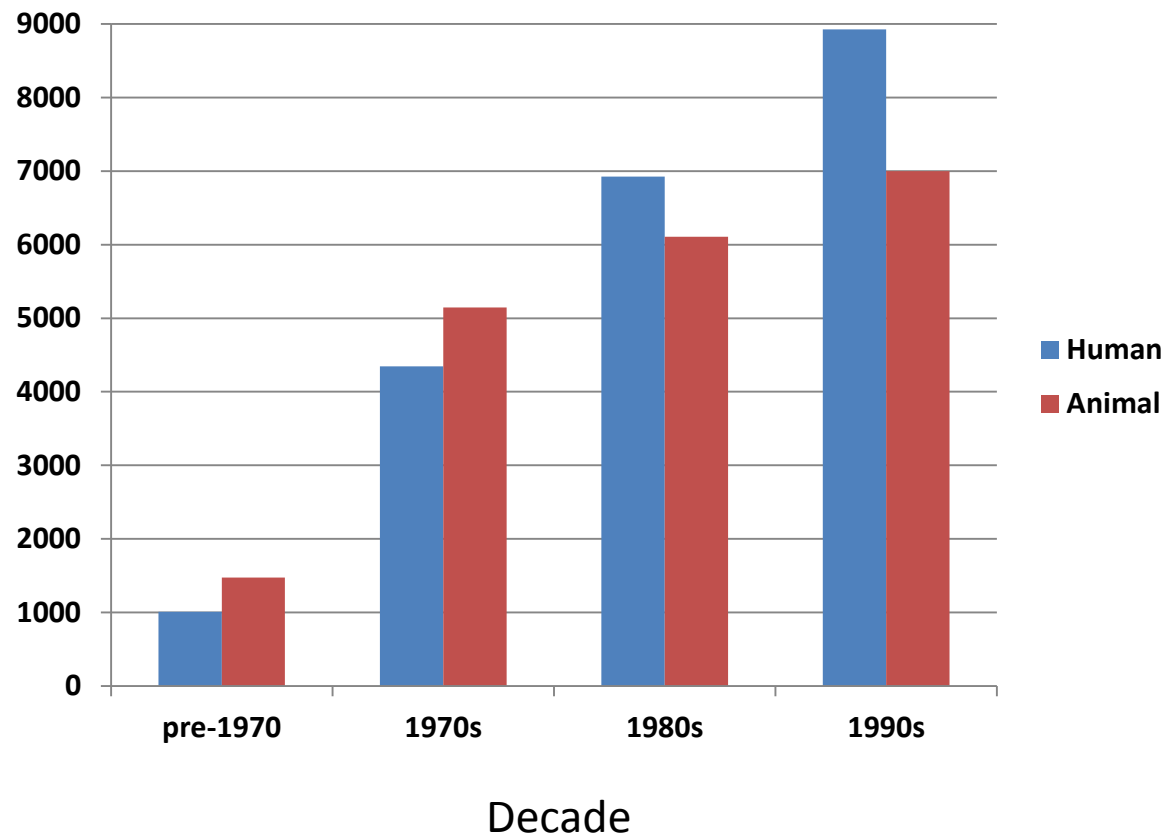
1. Breastfeeding has been a common feature of all cultures at all times
2. Late 1800s, science (biochemistry) changed perceptions in industrializing Europe/N. America
3. Challenges were changes in:
 - Lifestyle
 - Cultural values
 - Roles of mothers
4. Feeding became 'growth-focussed', therefore more/earlier \$\$\$

Research into Feeding

Humans vs. Commercially Exploited Animals!

Medline (PubMed)

Research Studies
Published



Talk Overview

4. Physiological insights

Early Contact

First hour of life of great importance, helps with:

- Initiating feeding
- Strengthening bonding
- Colonizes baby with mother's micro-organisms

The 'love hormone'

Oxytocin:

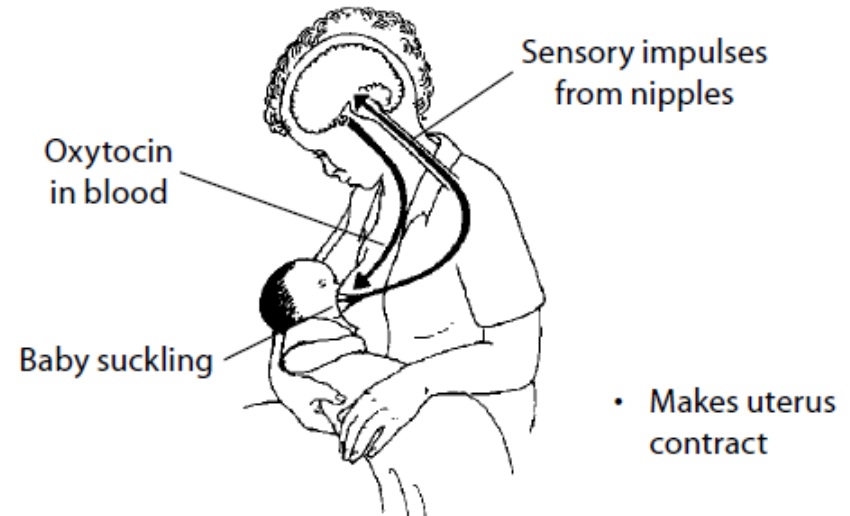
1. Let-down reflex
2. Uterine contraction (placenta)
3. Social behaviour
 - Reduces inflammation
 - Reduces anxiety, fear (stress)
 - Increased calmness, trust

Physiological Basis of Feeding

Post-partum

- Helps milk flow
- Reduces bleeding post-partum
- Increases affection towards infant
- Emotional bonding increased

Oxytocin



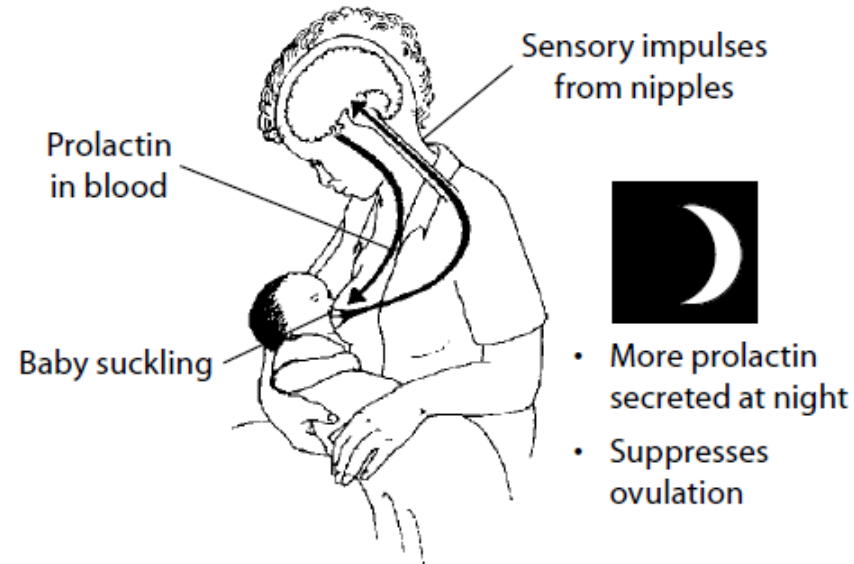
Works before or during a feed to make the milk flow

Physiological Basis of Feeding

Post-partum

- Helps milk flow
- Helps with relaxation and sleep
- ‘Contraceptive’

Prolactin



Secreted after feed to produce next feed

Physiological Basis of Feeding

Breastmilk

WHO 2009

1. Formula is made from industrially-modified cow milk or soy products
2. During manufacture, nutrients are adjusted to be *more* comparable to breastmilk
3. However:
 - Quality of fat/protein cannot be altered
 - Absence of anti-infective and bio-active remain
 - Non-sterile
 - Unsafe in many other ways
 - Soy contains phyto-oestrogens (male fertility, female puberty)

Breastmilk Quiz

True or False?

Compared to substitutes (cow's milk, formula) breastmilk has:

1. Lower amounts of protein? **True**
2. Higher whey : casein ratio? **True**
3. Has lower levels of taurine? **False**
4. Lower in PUFAs (poly-unsaturated fatty acids)? **False**
5. No enzyme to help break down fat (lipase)? **False**
6. Contains less *L. bifidus*? **False**
7. Lower concentrations of minerals? **True**
8. Immunoglobulins and sugars that prevent bacteria from attaching? **True**

Breastmilk Composition and Functions

WHO 2009

1. Contains all the nutrients that an infant needs for 6 months
2. Easily digested, efficiently used
3. Components discussed:
 - Fats
 - Carbohydrates
 - Proteins
 - Vitamins and Minerals
 - Other (Immune, Growth Factors)

Fats

WHO *Bulletin* 1989
WHO 2009

1. 3.5g / 100 ml (>50% energy)
2. Contains long-chain PUFAs (DHA, ARA) not available in other milks
3. DHA aids in neurological development (myelinization)
4. ARA aids functions of digestion and host defence (prostaglandins)
5. Lingual/gastric lipases aid in digestion of fat, especially when bile salts are immature (pre-term)

Carbohydrates

WHO *Bulletin* 1989
WHO 2009

1. 7g / 100 ml (40% energy)
2. Lactose major CHO, although other oligosaccharides present, higher concentrations than other milks
3. Metabolised into:
 - Glucose (used for energy)
 - Galactose (develops nervous system, Ca/Fe absorption, *L. bifidus*)
4. Bifidus factor, not found in bovine milk
 - Helps acid environment, retarding pathogens
 - Bovine-based has higher pH, sugars fully digested (coliform, putrefactive)

Proteins

WHO *Bulletin* 1989
WHO 2009

1. 0.9g / 100 ml (little energy)
2. Lower nitrogen (waste) spares immature kidneys
3. Whey : casein = 80 : 20
 - Softer gastric curd
 - Lactose synthesis
4. Higher in free amino acids
 - Taurine (bile salts)
5. Anti-pathogenic factors:
 - Immunoglobulins
 - Lysozyme/lactoferrin

Vitamins/Minerals

WHO *Bulletin* 1989
WHO 2009

1. Fat-soluble vitamins:
 - A , D , E , K
2. Water-soluble vitamins:
 - B, C
3. Minerals:
 - Ca, Fe, P, Mg, Zn, K, F-
 - Concentrations lower, bioavailability higher
4. As above for trace elements

Other

WHO *Bulletin* 1989
WHO 2009

1. Immune Factors:

- Macrophages, protect against infection
- Stem cells, repair
- Cytokines, immune response

2. Growth Factors:

- Epidermal (intestinal mucosa)
- Insulin-Like (erythrocyte)
- Neutrotrophic (neurons)
- Vascular Endothelial (blood vessels)
- EPO

Talk Overview

5. Summary

Summary...

1. Relatively few “robust” studies on benefits of breastfeeding exist
 - The most comprehensive (PROBIT) is still on-going!
 - However, many previous beneficial claims are being supported e.g. reduced infection, improved IQ
2. Rates of exclusive breastfeeding need to be increased, affected by substitutes

...Summary

3. The importance of breastfeeding is apparent immediately post-partum
 - Mother's health
 - Bonding
 - Healthy micro-organisms
4. All substitutes have disadvantages and are sub-optimal
5. Breastmilk is a complete food that contains everything needed for infant development
 - Macro-/micro-nutrients
 - Bioactive compounds

Kia Ora

Questions?



References

- Breastfeeding 2001, Part 1: The evidence for breastfeeding. *Pediatric Clinics of North America*, **48**, 1-264, 2001.
- Breastfeeding updates for the paediatrician. *Pediatric Clinics of North America*, **60**, 1-318, 2013.
- Infant and young child feeding: Model chapter for textbooks for medical students and allied health professionals. ISBN 978 92 4 159749 4. World Health Organization, 2009.
- Infant feeding: the physiological basis. *Bulletin of the World Health Organization*, **67** (Supplement), 1989.