Should parenteral nutrition solutions for preterm infants be photoprotected?

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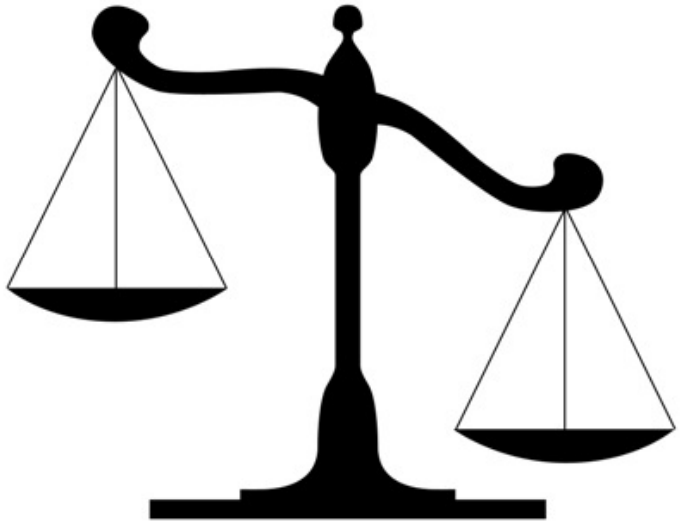
Introduction (1)

Weak anti oxidant system

- Immaturity
- Low maternal milk intakes



Preterm infant

High oxidant load

- O_2
- Transfusion
- Sepsis
- Parenteral Nutrition

Introduction (2)

- Light induces oxidation and peroxidation of parenteral nutrition solutions *(Neuzil 1995)*.
- Multivitamines are the main source of peroxides in parenteral nutrition solutions(*Lavoie 1997)*
- Peroxides are cytotoxic and bactericid in vitro

Introduction (3)

- Photoprotection of parenteral nutrition solutions
  1. peroxides content *(Lavoie 1997, Laborie 1998)*
  2. biochimical benefices *(Lavoie 2002, Chessex 2010)*
  3. nutritional benefices *(Khashu 2006),*
  4. histological benefices in an animal model *(Lavoie 2004)*
  5. no effect on bronchopulmonary dysplasia or death in very low birth weight infants *(Laborie 2014)*

Hypothesis and aim

- Hypothesis :
- For some preterm infants, death is induced by the imbalance between the oxidant load and the antioxidant defenses.
- Photoprotection may decrease mortality in very low birth weight infants.

- Aim : To evaluate the consequences of photoprotection of parenteral nutrition solutions on mortality of very low birth weight infants.

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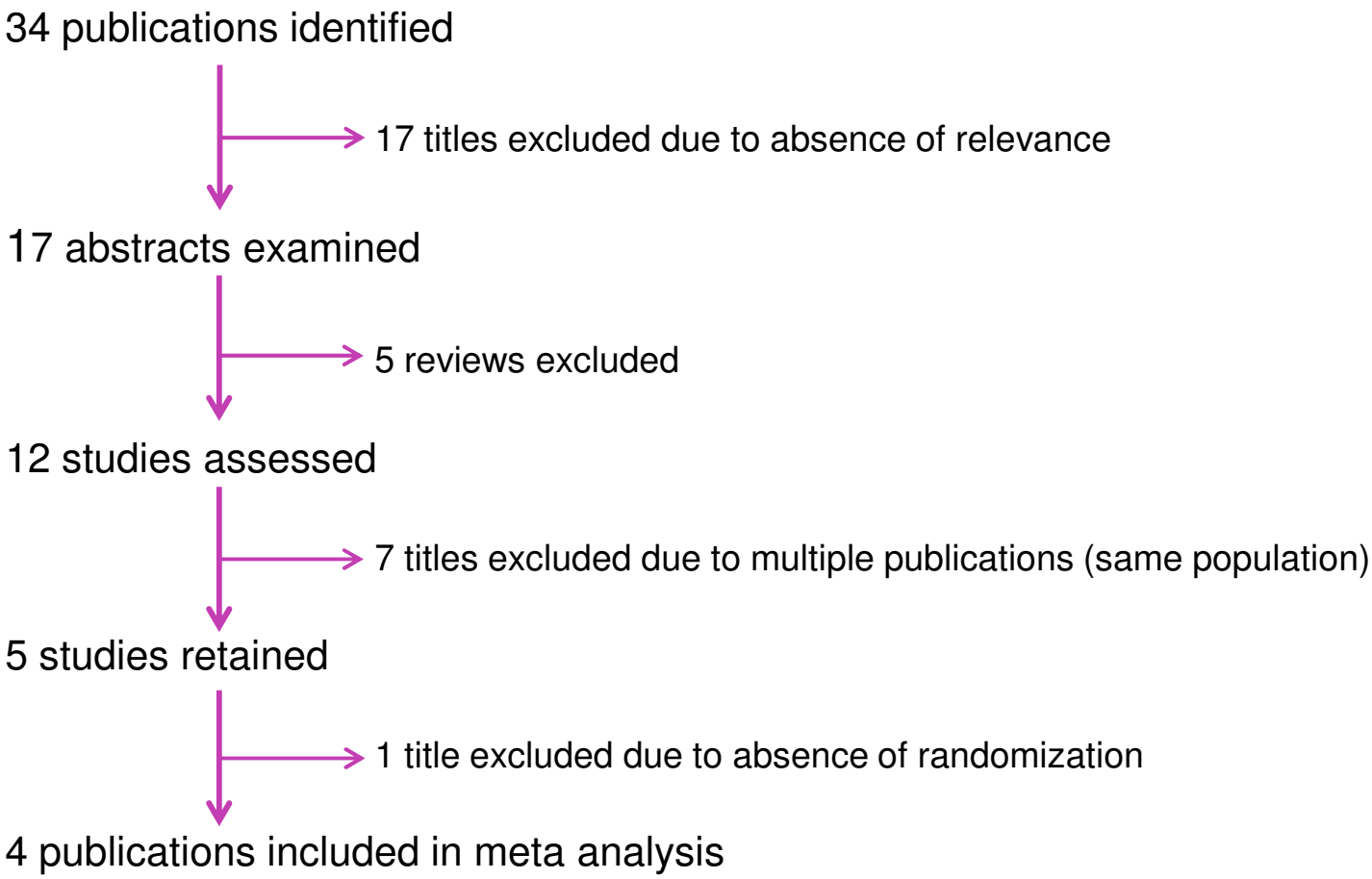
Methods

1. Identification of eligible trials through electronic databases
2. Selection criteria: premature infants, newborn, TPN, photo-protection, clinical trials, mortality, death.
3. Meta-analysis of mortality data at 36 wks GA or hospital discharge

Néonatologie

votre santé, notre engagement

Results (3)



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Results : Population

	J Pediatr, 2007	JPGN, 2009	FRBM, 2010	JPEN, 2014
Randomization	+	+	+	+
Sample size (n)	77	80	56	587
Male sex (%)	56	54	53	50
Gestational age (wk)	27 ± 2	31 ± 2	26 ± 1	28 ± 1
Birthweight (g)	915 ± 240	1588 ± 366	775 ± 161	969 ± 238
Days of TPNa/PNb	*9 ± 8a*	*11 ± 8a*	*11 ± 1a*	*28 ± 14b*
Mechanical Ventilation (%)	*70*	*72*	*66*	*82*
Mortality at 36 weeks (%)	5	32	16	7

Results

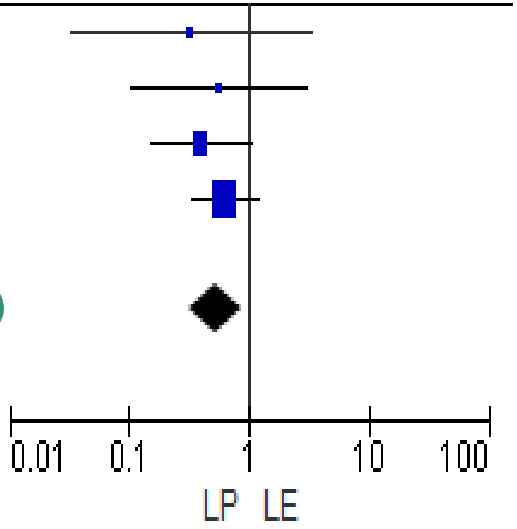
	Light exposed		Light protected	
At 36 weeks or hospital discharge	Dead	Alive	Dead	Alive
J Pediatr, 2007	3	36	1	37
JPGN, 2009	17	23	9	31
FRBM, 2010	7	31	2	16
JPEN, 2014	25	269	16	277
Total	52	359	28	361

Results

Study or Subgroup	LP Events	LP Total	LE Events	LE Total	Weight	Odds Ratio M-H, Fixed, 95% CI
J Pediatr 2007	1	38	3	39	6.6%	0.32 [0.03, 3.26]
Free Radic Biol Med 2010	2	18	7	38	9.2%	0.55 [0.10, 2.98]
J Pediatr Gastro Ntr 2009	9	40	17	40	30.2%	0.39 [0.15, 1.04]
JPEN 2014	16	293	25	294	54.1%	0.62 [0.32, 1.19]
Total (95% CI)		**389**		**411**	**100.0%**	**0.53 [0.32, 0.87]**
Total events	28		52			

Heterogeneity: Chi² = 0.77, df = 3 (P = 0.86); I² = 0%

Test for overall effect: Z = 2.51 (P = 0.01)

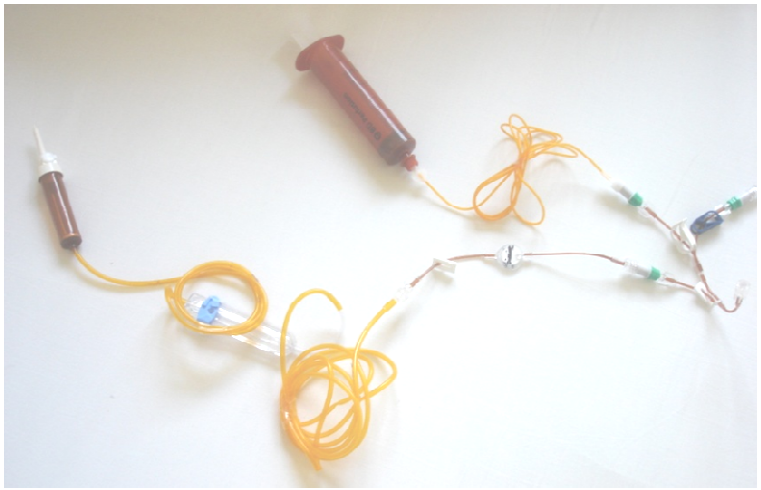


Discussion

- Udge decrease in mortality
- Mechanisms ?
  - Balance oxidant anti oxidant?
  - Bioavailability of nutrient and vitamins?
  - Direct toxicity?
- Long term outcome of survivors ?

Discussion
Methods

- Opposite with Sherlock study *(pediatrics,2009)*
  - Complete versus partial photoprotection
- Complexity of total photoprotection
  - Feasability?



Conclusion

- Is it ethical to infuse now unprotected parenteral nutrition solutions to the most immature preterm infant?
- What happened in other populations with compromised oxidant/antioxidant balance????

Perspectives

- Can we find a way to minimize the infused oxidant load which is less time counsumming and less expensive?

- Can we optimize the anti oxidant defenses of the most immature preterm infants?