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Ersetzt der 3-Kammerbeutel den Apotheker im Ernährungsteam?

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Layout

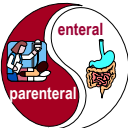
- PN and its (pharmaceutical) challenges
- The clinical nutrition process: pharmacist's role
- Stability aspects in AiO admixtures
- 3-Chamber bags: industrial AiO premixes
- Tasks of the NST's pharmacist
- Conclusions

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Route of Clinical Nutrition

If the gut works use it (enteral nutrition).



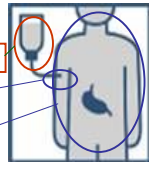
but if the enteral route does not allow sufficient ingestion, digestion, and absorption of nutrients
parenteral nutrition has to be provided

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(Pharmaceutical) Challenges in PN

1. Formulation of parenteral nutrients
2. Volume limitation: hypertonic solutions
3. (Central) Venous access (catheters)
4. Practicability, efficacy & safety of long-term PN
5. Asepsis during compounding & administration
6. Prevent/correct metabolic, physico-chemical disturbances



1, 2, 5, 6

2, 4, 5

4, 5, 6

S.J. Dudrick. Early developments & Clinical applications of TPN. JPEN 2003;27(4):291-9 Mühlebach 4

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PN: Complex Pharmaceutical Mix

Tissue Metabolism Rebuilding

i.v. Nutrients

Fluids Electrolytes

Triglycerides (o/w emulsion)

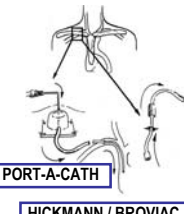
Glucose

Amino Acids

Trace Elements

Vitamins

i.v. Access: CVA




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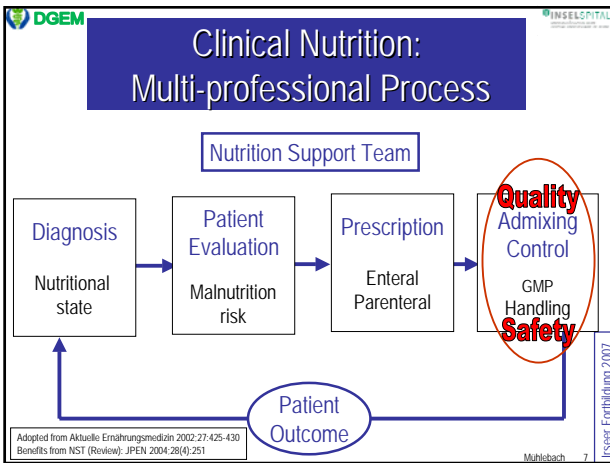
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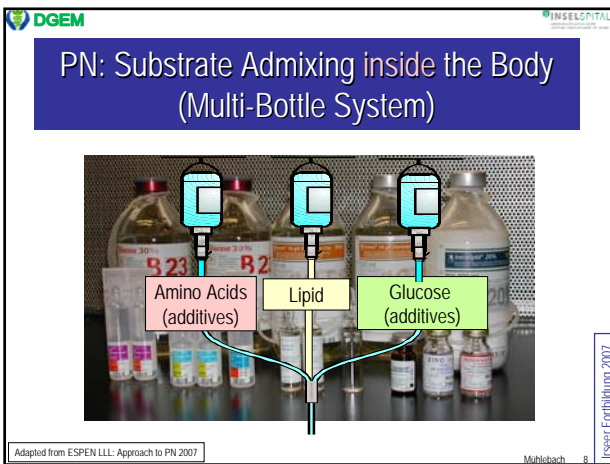
PN: Risk-Benefit

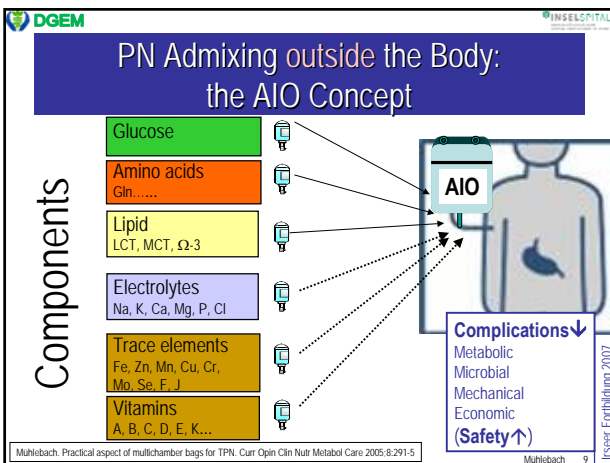
- Effective when indicated
- Complications risks
 - i.v. access
 - Patients partly more fragile (neonates, critically ill)
 - Aseptic preparation / admixing (ready-to-use individualisation)
 - Complex pharmaceutical formulation (disperse system with physico-chemical instabilities / incompatibilities)
 - High costs compared to EN
- Multi-professional skills needed (pharmaceutical expertise)

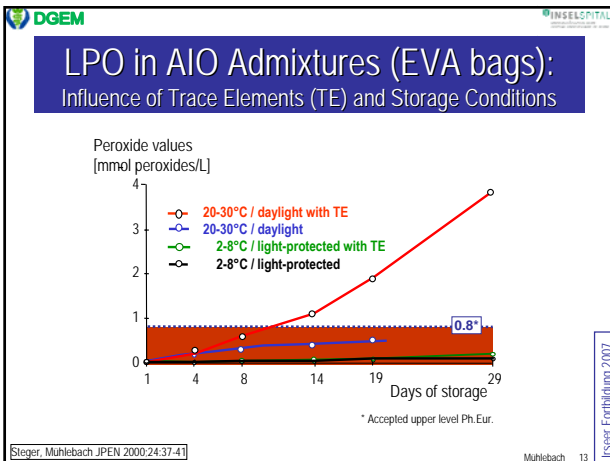


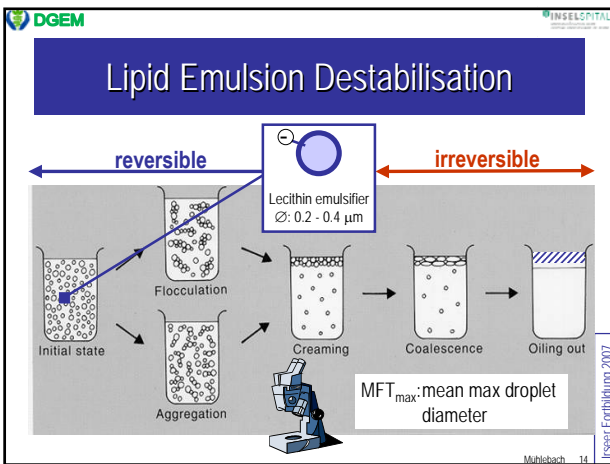
D. Discoll. Compounding TPN admixtures: then and now. JPEN 2003;27:433. Mühlebach 6

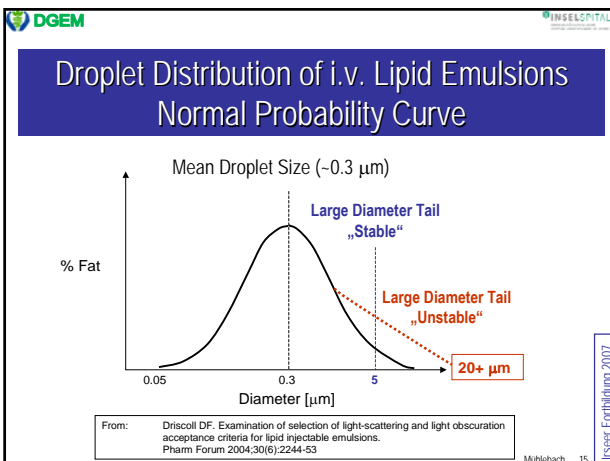


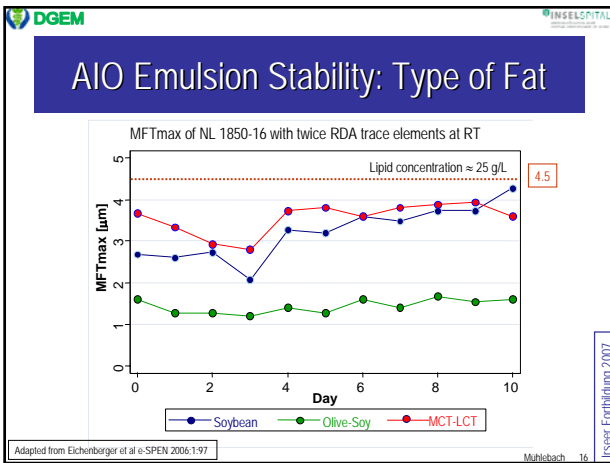


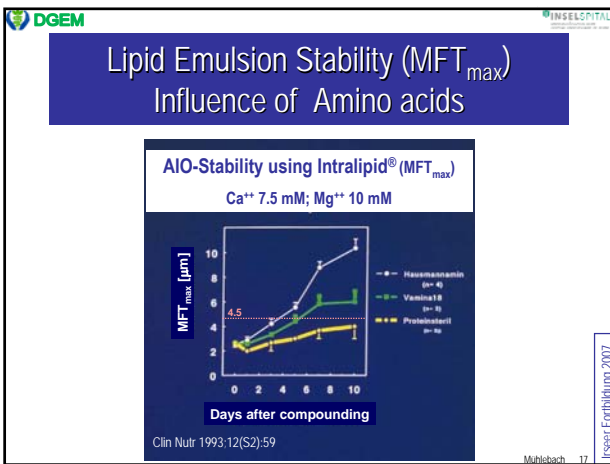












Lipid Emulsion Stability: Lipids and Amino Acids (ANOVA)

AIO PN: 5 g lipid/L; 6 g NL; 144 g dextrose /L; pH 4.9-5.3
Na⁺, K⁺ (60mM), P (19 mM), trace elements
Ca⁺⁺ (7.5 mM), Mg⁺⁺ (10mM)

	MCT vs Lipovenös		
	Amino Acids	Lipids	Amino Acids X Lipids
Hausmann-Amin vs Vamin	0.002	0.111	0.594
Vamin vs Proteinsteril	0.786	0.241	0.026
Hausmann-Amin vs Proteinsteril	0.011	0.934	0.005

ANOVA of MFT_{max} with repeated measures and two group factors
Significance over time (10 days): (p-values)

Schmutz C.W., Werner R, Keller U, Muhlebach S Clin Nutr 1993;12(S2):59

Drug Admixing in PN: Pharmaceutical Aspects

Good Manufacturing Practices
Asepsis
Documentation...

Drug
Active ingredient
Solvent

Vehicle
Infusion fluid
Container

Administration
Parenteral Access
Infusion time

AIO Admixture
Lipids
Glucose
Amino acids
Electrolytes
Trace elements
Vitamins

Adapted from „Basic in Clinical Nutrition“ 3rd edition, Galen (Prague), 2004

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From Pen to Patient: IT Support

Electronic prescription → **Electronic distribution** → **Patient-specific administration (Bar coding)**

- **Prescribing Errors** (0.3-1.9%?)
- **Distribution Errors** (up to 12.5%)
- **Administration Errors** (3-15%)

Taxis K, Dean BS, Barber ND PWS 1999:21:25(UK)

Code

A B C

E.JHP 2004;10(1):22-29 Systems of automatisaton

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PN: Pharmaceutical Tasks

- Selection and Documentation of Products**
- Acquisition and Delivery**
 - Purchase and/or preparation (!)
 - Distribution
- Drug use and administration**
 - Recommendations and guidelines (dosages, interactions, i.v. administration...)
- Monitor and Review**
 - Product quality
 - Handling (correctness, legality, CIRS, safety)
 - Analysis of indications, outcome
 - Cost
- Stock management, Waste**

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Clinical Nutrition (Checklist)

Patient's characterisation:

- age
- BMI
- GI functionality
- eating, appetite, weight loss

Nutritional status (NRF)

- clinical conditions:
- diseases (stress factors)
- malnutrition

Specific nutrient requirements:

- fluid volume
- electrolytes (organ function)
- energy (dextrose and lipid)
- protein
- vitamins
- trace elements

- The right nutrient
- In the right dose
- To the right patient
- In the right form (stability!)
- At the right time

Adapted from M. Skourouliakou et al. PWS 2005:27-305-10 Mühlbacher 31 Lissner, Ernährung 2007
