INTERAKCJE LEKOWE

między cytostatykami a składnikami żywienia pozajelitowego i dojelitowego

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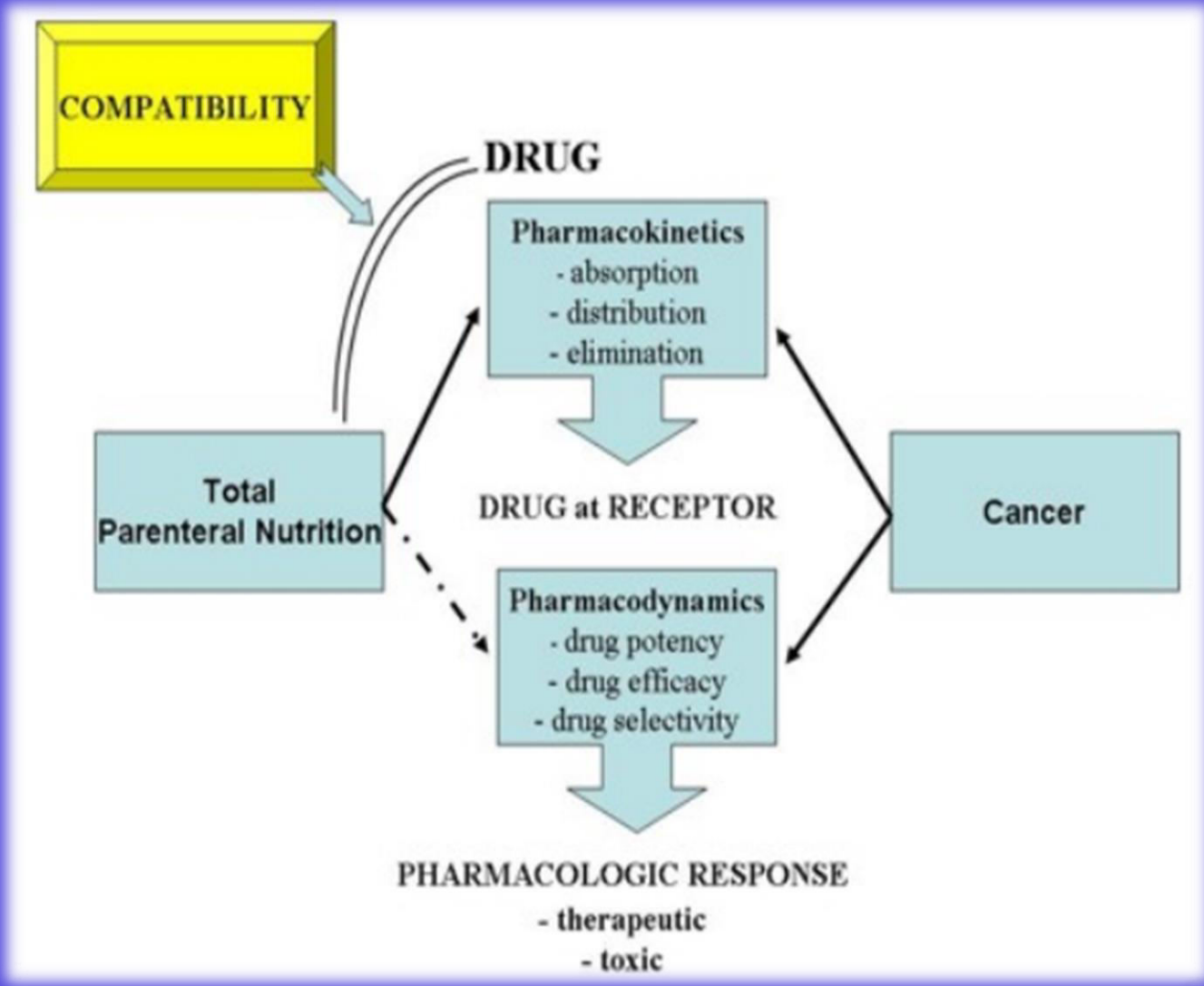
Żywienie i leczenie



Drug/Nutrients Interaction in Neoplastic Patients Requiring Nutritional Support. Practical Advice with Special Focusing on Pancreatic Cancer

Ilaria Uomo, Adele Savoia

JOP. J Pancreas 2008; 9(4):370-374

Działanie niepożądane występujące wskutek niezgodności lekowej wiąże się z wydłużeniem okresu hospitalizacji i zwiększonym łącznym kosztem leczenia.

Przykłady komplikacji wywołanych przez Niezgodność lekową	Ciężkość	Leczenie Kliniczne	Czas pobytu w szpitalu	Dodatkowe Koszty
Uszkodzenie Wielonarządowe; Poważna Dysfunkcja Wątroby; Wstrząs Toksyczny; Uszkodzenie Narządu	Duża	Pełne leczenie na OIOM-ie (Leczenie/Monitorowanie/Żywienie itd.)	4-30 dni OIOM + 4-30 dni Oddział	7,556 € - 56,670 €
Miejscowy Czop Zatorowy; Ogólnoustrojowe Reakcje Alergiczne; Zapalenie Mięśnia Sercowego; Niewielki Uszkodzenie Narządu; Trudności z Oddychaniem	Średnia Duża	OIOM / Leczenie na Oddziale (Obserwacja/Monitorowanie/Leczenie)	1-7 dni RICU + 1-7 dni Oddział	1,136 € - 7,952 €
Zakrzepica; Ogólnoustrojowe Reakcje Alergiczne	Średnia	Przedłożenie Leczenia Klinicznego (Obserwacja/Monitorowanie)	0 dni RICU + 1-3 dni Oddział	382 € - 1,146 €
Zakrzepowe Zapalenie Żył; Zapalenie Żyły	Średnia Niska	Leczenie Miejscowe (Bez dodatkowego monitorowania)	0 dni RICU + 0-1 dzień Oddział	0 € - 382 €
Miejscowy Regres	Niska	Brak komplikacji dla pacjenta	0 dni RICU + 0 dni Oddział	0 €

References
[1] Gianino et al. 2007, Bertolini et al. 2005

NIEZGODNOŚCI

Niezgodność to reakcja niepożądana występującą pomiędzy lekiem i roztworem, pojemnikiem lub innym lekiem.

Dwa typy niezgodności związanej z dożylnym podawaniem leków to niezgodność fizyczna i chemiczna.

Josephson 2006, RCN 2005, Douglas et al. 2001

Mogą wystąpić na etapie przygotowywania, przechowywania oraz podawania.

Kompletna mieszanina odżywcza

Makroskładniki
- Aminokwasy
- Glukoza
- Emulsja tłuszczowa
- Woda

Elektrolity
- Sód
- Potas
- Magnez
- Wapń
- Fosforany

Mikroskładniki
- Pierwiastki śladowe
- Witaminy

Substancje specjalne
- Dipeptyd glutaminy
- Kwasy omega -3
- leki

LEK WYSOKIEGO RYZYKA!

Dodatek leków do ŻP

Podanie leku w mieszaninie musi być poprzedzone badaniami :

- **stabilności fizykochemicznej w ciągu 24h**
- **biodostępności podczas ciągłego wlewu**
- **wpływu na strukturę emulsji tłuszczowej.**

Z zasady nie nalezy dodawać:

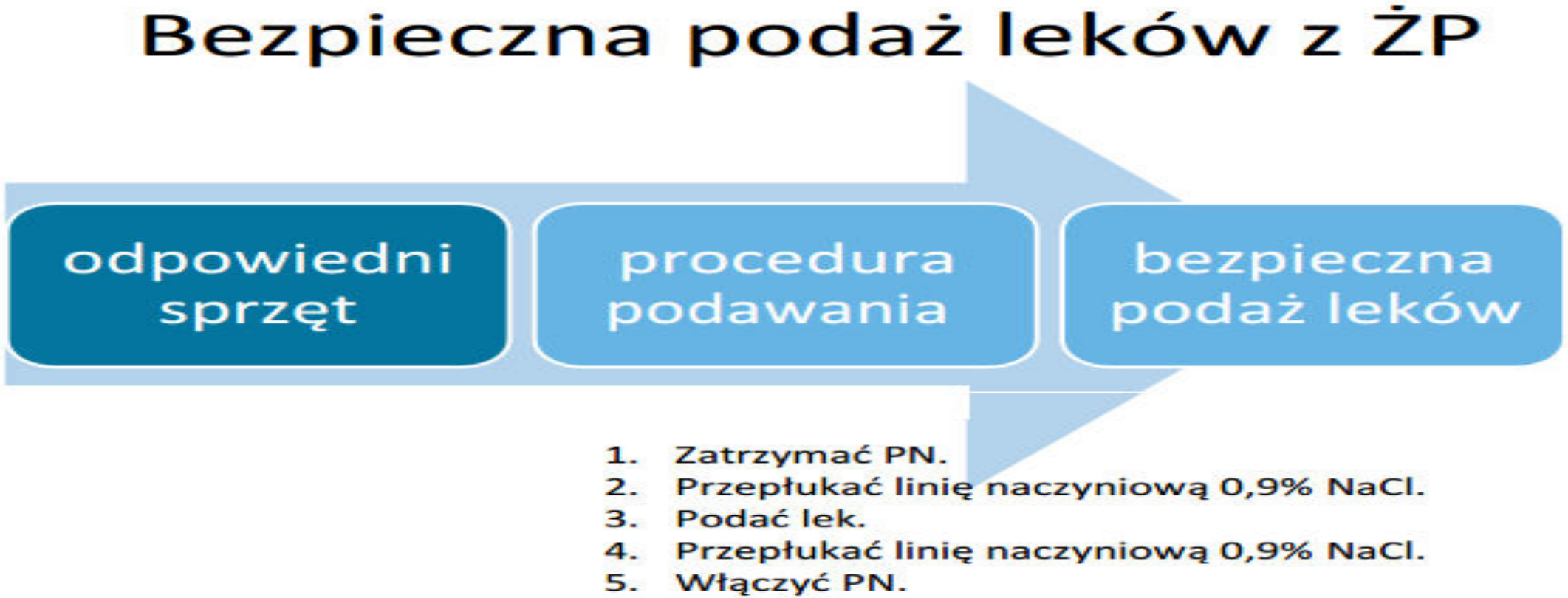
- **Leków w postaci liofilizatów (trwałość)**
- **Soli Ca i Mg**
- **Leków o niskim i wysokim pH**
- **Leków o dużej lipofilności, liposomy**
- **Leków o niskim indeksie terapeutycznym!**
- **Leków o krótkim t 0,5**

UWAGA na interakcje substancji pomocniczych ze składnikami mieszaniny oraz z opakowaniem!!!

NIE WOLNO ŁĄCZYĆ CYTOSTATYKÓW Z ŻYWIENIEM POZAJELITOWYM W JEDNYM POJEMNIKU!

Równoczesna podaż ŻP i leków

Z zasady nie powinno się podawać równocześnie ŻP i leków



Równoczesna podaż ŻP i leków

- Jeżeli jest to możliwe używać innego dostępu.
- Jeżeli nie, cewniki wieloświatłowe.
- Jeżeli nie, rozgałęzienia Y lub kraniki.

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Format: Abstract

J Vasc Access. 2010 Oct-Dec;11(4):335-41.

Double-lumen central venous port catheters: simultaneous application for chemotherapy and parenteral nutrition in cancer patients.

Teichgräber UK[1], Nagel SN, Kausche S, Streitparth F, Cho CH.

Author information

Abstract

PURPOSE: This study was designed to evaluate the clinical benefit of low-profile double-lumen port catheters in patients receiving simultaneous chemotherapy and parenteral nutrition (PN). Potential advantages, complications, and the durations of simultaneous and single use of the catheter were assessed.

METHODS: At a university teaching hospital, 10 patients received a double-lumen port catheter (5 men, 5 women; mean age 61.5 ± 12 years). All port implantations were performed under ultrasonographic and fluoroscopic guidance in the radiologic interventional suite. Procedure-related immediate, early, and late complications were recorded until removal of the device, patient's death, or completion of follow-up period. Application times and durations for chemotherapy or PN were determined.

RESULTS: No immediate complications were observed. First use of the port system for chemotherapy was within 12 days (± 25 days, range 0-84 days) and within 17 hours (± 22 hours, range 0-72 hours) for PN on average. During the application of PN, no delay or interruption of chemotherapy was observed. The port catheter was used for the simultaneous application of chemotherapy and PN for a total of 1,216 hours. One port catheter was removed after 30 days due to suspected port infection.

CONCLUSION: Central venous double-lumen port systems as a therapeutic option in patients requiring chemotherapy and PN can increase safety during those simultaneous applications, while offering improved patient comfort.

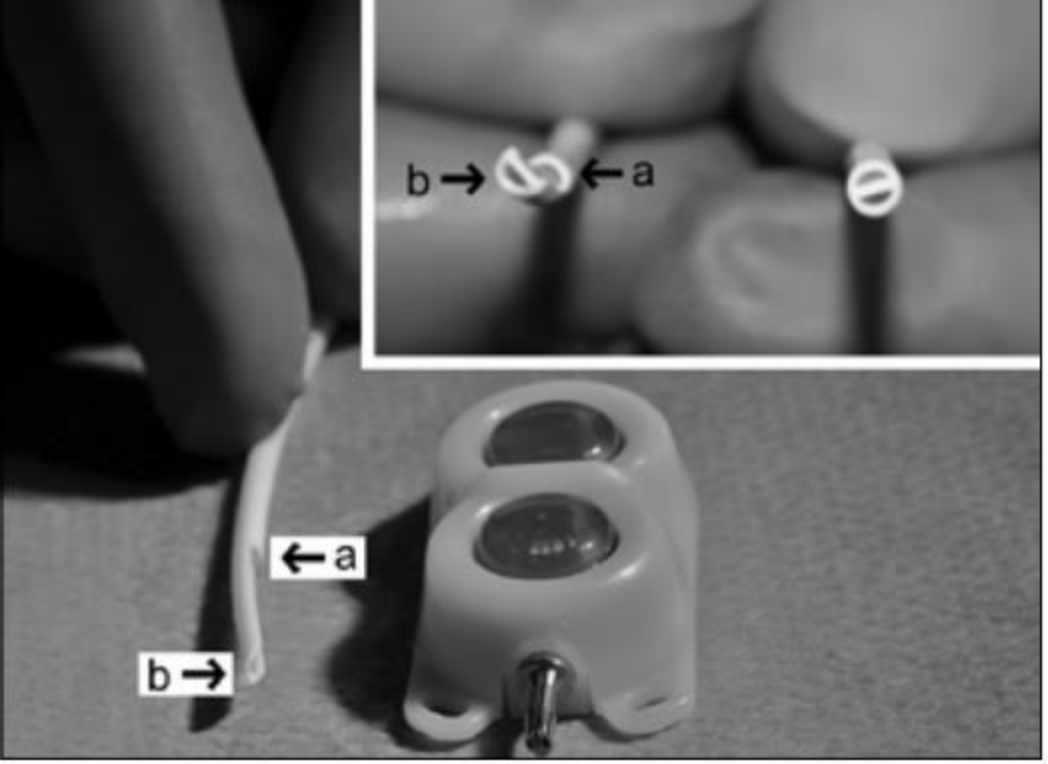


Fig. 1 - *Shows the low-profile double-lumen port catheter: a) points at the proximal catheter tip orifice, b) at the distal. The distance between the orifices is 10 mm. In the upper right image, the proximal part of the catheter and the septum that separates the lumina are shown. The connector at the port reservoir has 2 independent outflow nozzles for each chamber. Between these nozzles is a notch for the catheter septum.*

Reference : U. Teichgräber, S. Nagel, S. Kausche, F.Streitparth, Ch. Hee Cho
Double-lumen central venous port catheters: simultaneous application for chemotherapy and parenteral nutrition in cancer patients, J Vasc Access 2010; 11 (4): 335-341

TABLE II - OVERALL DURATION OF THE CLINICAL APPLICATIONS

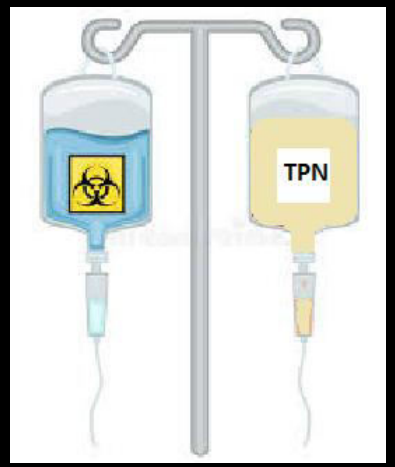
Purpose	Overall duration (hours)
Chemotherapy	1,321
Parenteral nutrition	20,824
Simultaneously	1,216

TABLE III - DETAILS ON TREATMENT, SIMULTANEOUS PORT CATHETER USAGE, AND COMPLICATIONS

Patients*	Indwelling time (days)	Chemotherapy	Radiation therapy (total dose)	Parenteral nutrition	Simultaneous use	Port-related complications	Development of esophagitis†
1	180	5-Fluorouracil Epirubicin Cyclophosphamide	30 Gy	SK‡	144 hours	-	3
2	90§	5-Fluorouracil Epirubicin Oxaliplatin	27 Gy	SK‡	168 hours	-	-
3	175§	5-Fluorouracil	27 Gy	SK‡	240 hours	-	-
4	180	Cisplatin	32 Gy	SK‡	6 hours	-	-
5	173§	5-Fluorouracil Gemcitabine	64 Gy	SK‡	168 hours	-	-
6	180	5-Fluorouracil Cisplatin	45 Gy	SK‡	120 hours	-	-
7	180	5-Fluorouracil Cisplatin Docetaxel	27 Gy	SK‡	240 hours	-	-
8	180	Cisplatin	32 Gy	SK‡	6 hours	-	-
9	30‖	5-Fluorouracil Cisplatin Docetaxel	45 Gy	SK‡	120 hours	Suspected port infection	-
10	34§	Gemcitabine	-	SK‡	4 hours	-	-

*Patients sorted by time of catheter placement
†According to Common Terminology Criteria for Adverse Events v.3.0
‡StructoKabiven; Fresenius Kabi AG, Bad Homburg, Germany
§Patient died
‖Complication led to explantation

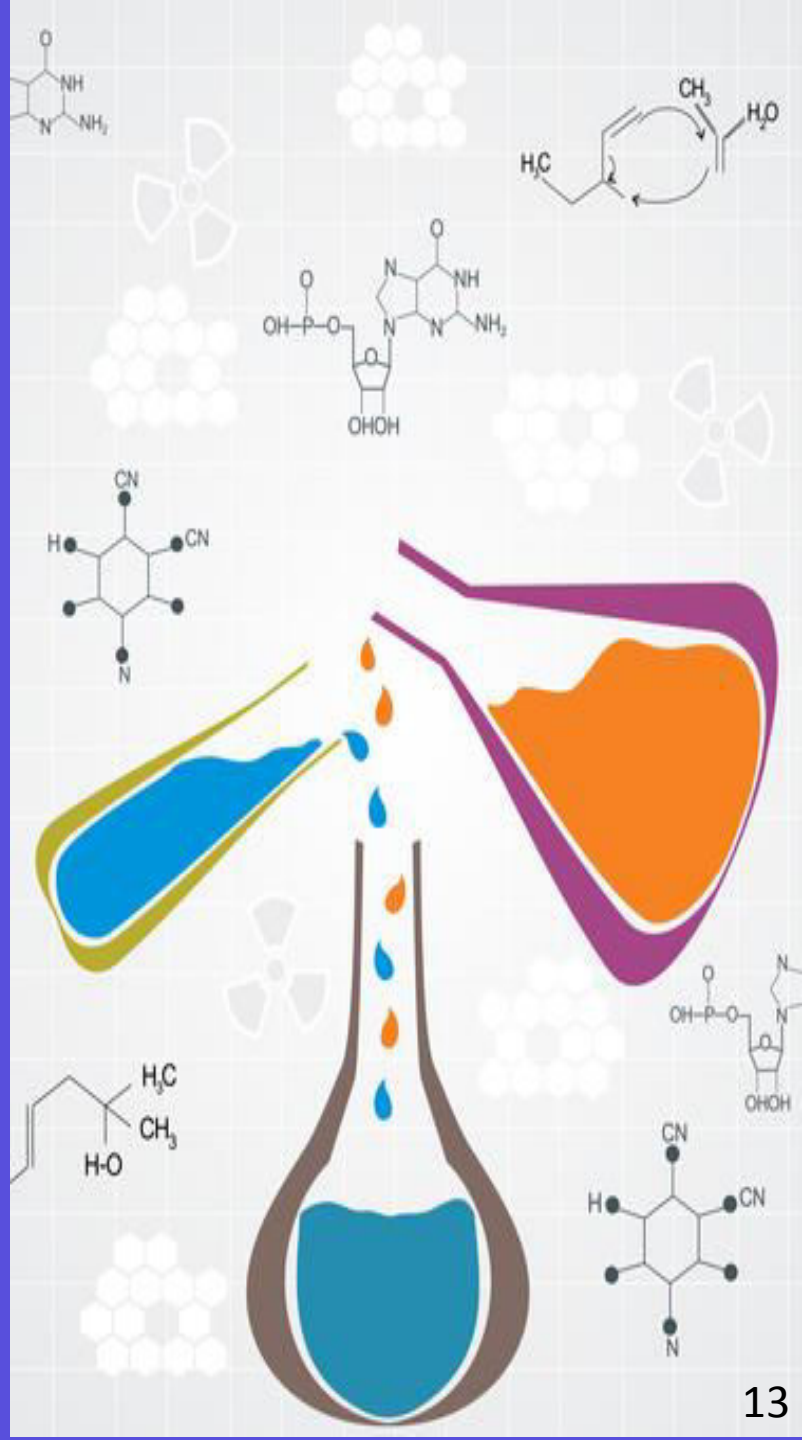
INTERAKCJE ŻYWIENIE POZAJELITOWE/ CYTOSTATYKI

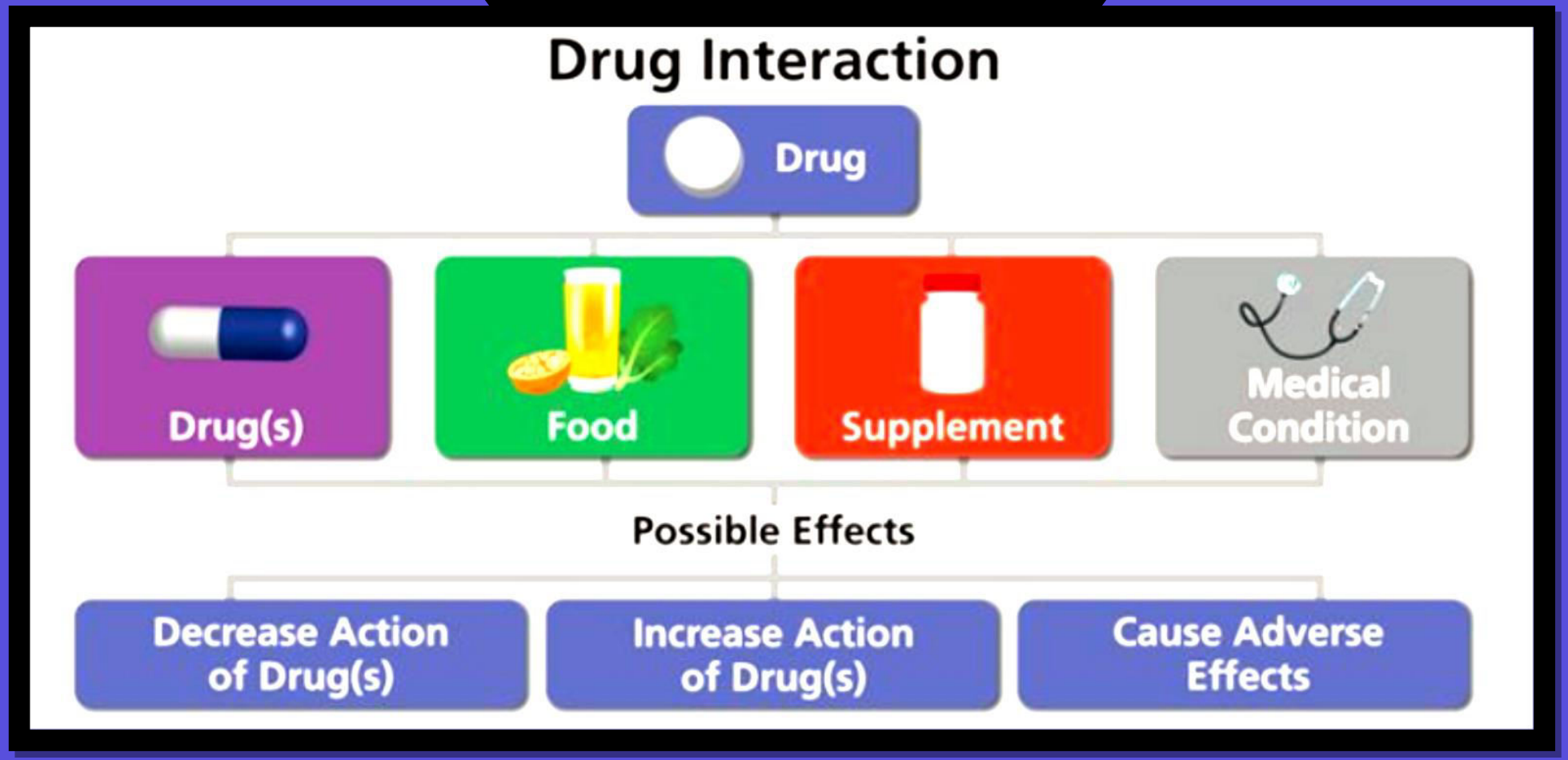


INTERAKCJE

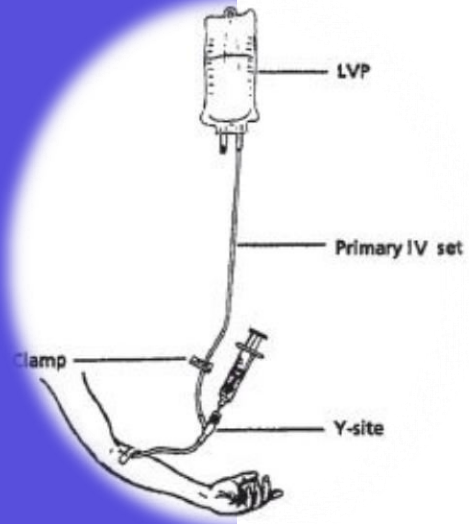
Interakcja lekowa opisuje zmianę w efekcie działania leku spowodowana działaniem innej substancji (np. lek, substancja chemiczna, żywność) skutkująca tym, że przedmiotowy roztwór nie jest już, po zmieszaniu substancji, optymalny dla pacjenta.

Craven et al. 2007a, Josephson 2006, Douglas et al. 2001,Nemec et al. 2008




Drug Interaction
Drug
Drug(s)
Food
Supplement
Medical Condition
Possible Effects
Decrease Action of Drug(s)
Increase Action of Drug(s)
Cause Adverse Effects

5-FU
Nutriflex Lipid special



LEK	STĘŻENIE	1:1 PO CZASIE 1	1:1 PO CZASIE 4
Fluorouracil	25, 50 mg/mL	niezgodne	niezgodne
Fluorouracil	<12,5 mg/mL	zgodne	zgodne
Ondansetron	2 mg/mL	zgodne	zgodne
Tropisetron	1 mg/ml	niezgodne	niezgodne

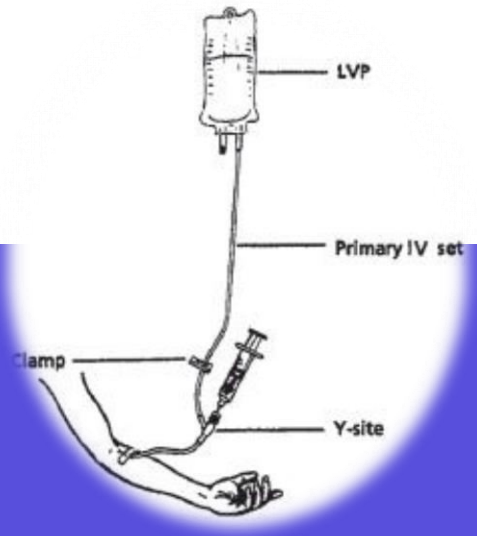
Compatibility of Intravenous Medications With Parenteral Nutrition : In Vitro Evaluation

L. Bouchoud, C. Fonzo-Christe, M. Klingmüller P. Bonnabry ,

JPEN J Parenter Enteral 2012

PREPARE

FLUOROURACYL

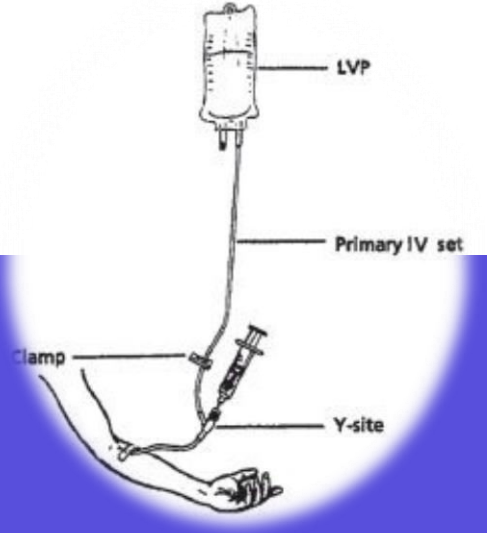


“2w1”	“emulsja tłuszczowa”	“3w1”
NIEZGODNE	ZGODNE/NIEZGODNE	ZGODNE/NIEZGODNE
Zmętnienie tworzy się natychmiast, małe kryształy, bursztynowe przebarwienie 1-4h	Bardzo mała ilość białego osadu tworzy się natychmiast w wybranych preparatach 3: 1	

Reference : Y-Site Compatibility of Medications with Parenteral Nutrition
Christine A. Robinson, Jaclyn E. Sawyer,
J Pediatr Pharmacol Ther 2009;14:48–56

PREPARE

DOXORUBICYNA

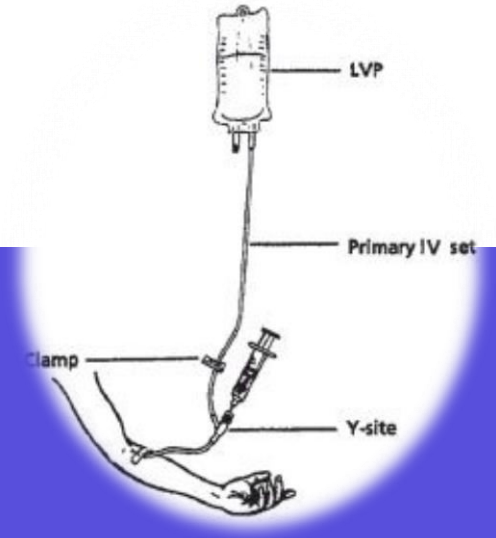


“2w1”	“emulsja tłuszczowa”	“3w1”
NIEZGODNE	NIEZGODNE	NIEZGODNE
Istotna utrata naturalnego zmętnienia występuje natychmiast	Rozkład emulsji następuje natychmiast.	

Reference : Y-Site Compatibility of Medications with Parenteral Nutrition
Christine A. Robinson, Jaclyn E. Sawyer,
J Pediatr Pharmacol Ther 2009;14:48–56

PREPARE

CISPLATYNA

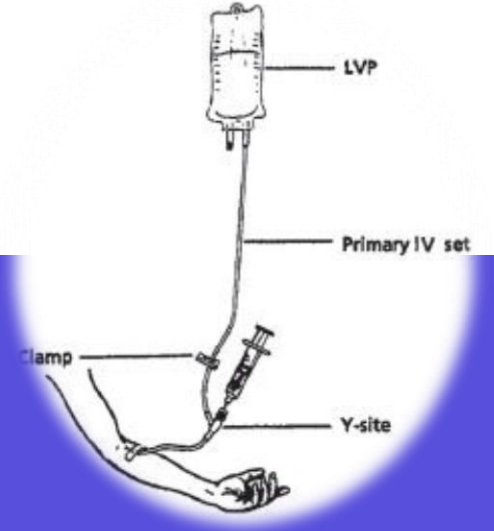


“2w1”	“emulsja tłuszczowa”	“3w1”
NIEZGODNE	ZGODNE	ZGODNE
Bursztynowe przebarwienia w 1 do 4 godzin.		

Reference : Y-Site Compatibility of Medications with Parenteral Nutrition
Christine A. Robinson, Jaclyn E. Sawyer,
J Pediatr Pharmacol Ther 2009;14:48–56

PREPARE

CYTARABINA



“2w1”	“emulsja tłuszczowa”	“3w1”
NIEZGODNE	ZGODNE	ZGODNE
Istotna utrata naturalnego zmętnienia występuje natychmiast		

Reference : Y-Site Compatibility of Medications with Parenteral Nutrition
Christine A. Robinson, Jaclyn E. Sawyer,
J Pediatr Pharmacol Ther 2009;14:48–56

Zgodne z mieszaninami **“2w1”** oraz **“3w1”**

1	2	3	4	5
KARBOPLATYNA	**CYKLOFOSFAMID**	**IFOSFAMID**	**IDARUBICYNA**	**PACLITAXEL**

Reference : Y-Site Compatibility of Medications with Parenteral Nutrition
Christine A. Robinson, Jaclyn E. Sawyer,
J Pediatr Pharmacol Ther 2009;14:48–56

Podsumowanie

Nie należy dodawać cytostatyków bezpośrednio do mieszaniny.
Jeżeli jest to możliwe używać innego dostępu.
Jeżeli nie, stosować cewniki wieloświatłowe.
Jeżeli nie, przez rozgałęzienia Y można podawać leki o udowodnionej stabilności fizyko-chemicznej.

„3w1”

Karboplatyna,

Cyklofosfamid,

Ifosfamid,

Idarubicyna,

Paclitaxel,

„2w1”

Cytarabina,

Cisplatyna

ŻYWIENIE DOJELITOWE I CYTOSTATYKI

ZAGROŻENIA

1. **możliwość interakcji pomiędzy substancją czynną leku oraz dietą**
2. **możliwość interakcji pomiędzy lekami,**
3. **unieczynnienie substancji leczniczej lub znaczna zmiana siły jej działania na skutek zniszczenia jej struktury podczas przygotowania leku do podaży przez zgłębnik/przetokę odżywczą;**
4. **zamknięcie światła sondy/przetoki przez fragmenty sta- łych postaci leku/otoczki leku i problemy z utrzymaniem drożności światła sondy/przetoki, co może być elementem krytycznym terapii;**
5. **narażenie chorego na powikłania wynikające z podaży substancji leczniczej do niewłaściwego piętra przewodu pokarmowego**
6. **narażenie personelu medycznego na bezpośrednie toksyczne działanie substancji aktywnej uwolnionej z postaci farmaceutycznej leku.**

ZYWIENIE DOJELITOWE I CYTOSTATYKI

UWAGA!!!

Ze względu na narażenie na bezpośrednie toksyczne działanie substancji aktywnej uwolnionej z postaci farmaceutycznej co do zasady

LEKÓW CYTOTOKSYCZNYCH NIE NALEZY KRUSZYĆ ANI DZIELIĆ!!!

Gdy istnieje konieczność kruszenia/dzielenia do przygotowywania leków cytotoksycznych wymaga się wykorzystania loży laminarnej do pracy z lekami cytostatycznymi CSC (Cytotoxics Safety Cabinet) oraz odpowiednich środków ochrony indywidualnej,

Bicalutamide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Bicalutamide (Accord, Hikma, Kent, Lexon, Medac, Teva, Zentiva)	Tablet 50 mg, 150 mg	No specific data on enteral tube administration are available for this preparation.
Casodex (AstraZeneca)	Tablet 50 mg, 150 mg	Film-coated tablets.[2,3] The tablets do not disperse even when agitated for more than 5 minutes in 10 mL of water; the tablets do crush and mix well with water to form a milky suspension.[4] Contains lactose.[2,3]

Site of absorption (oral administration)

Specific site of absorption unknown. Bicalutamide is well absorbed following oral administration.[2,3]

Alternative routes available

None available for bicalutamide. Other antiandrogens such as buserelin, goserelin, leuprorelin and triptorelin are available as injections or implants.[1]

Interactions

There is no evidence of any clinically relevant effect of food on bioavailability.[2,3]

Health and safety

Protective clothing should be worn when crushing bicalutamide tablets to minimise exposure to dry powder and reduce risk of inhalation. Bicalutamide is a potent anti-androgen. Tablets should not be crushed and handled by pregnant women.

Suggestions/recommendations

- Where possible change to different drug, available in an injectable implantable formulation. If this is not possible and continuation of bicalutamide therapy is considered appropriate consider obtaining a liquid special. Crushing tablets should be considered a last resort and should be done using a closed system where possible (e.g. crushing syringe).
- A prolonged break in the enteral feeding regimen is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a suitable crushing syringe and crush to a fine powder.

4. Add a few millilitres of water and mix to form a paste
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Flush the medication dose down the feeding tube.
7. Draw another 15 mL of water into the syringe and stir to ensure that any remaining drug is rinsed from the container. Flush this via the feeding tube (this will rinse the syringe and ensure total dose is administered).
8. Finally, flush the enteral feeding tube with the recommended volume of water.
9. Re-start the feed, unless a prolonged break in feeding is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of bicalutamide. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67 (AstraZeneca), March 2014.
2. Casodex Tablets 50 mg (AstraZeneca), Summary of Product Characteristics; May 2012.
3. Casodex Tablets 150 mg (AstraZeneca), Summary of Product Characteristics; May 2012.
4. BPNG data on file, 2004.

Handbook of Drug Administration via Enteral Feeding Tubes

Rebecca White
Vicky Bradnam

Busulfan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Myleran (Alkopharma, previously GSK)	Film-coated tablet 2 mg	Cytotoxic; film coating protects the handler from exposure. GSK recommends that tablets should not be crushed or broken.[2] Extemporaneous preparation can be made: Busulfan suspension 2 mg/mL: Busulfan 2 mg tablets 30 tablets Simple syrup to 30 mL Expiry 30 days, stored in a refrigerator.[3] Any cytotoxic extemporaneous preparation should be made in facilities with suitable containment equipment.
Busulfan (Nova Labs)	Oral suspension	Manufactured 'special'; 1 month expiry. Viscosity is suitable for administration via feeding tube.[4]
Busilvex (Fabre)	Concentrate for infusion 6 mg/mL 10 mL vial	No specific data on enteral tube administration are available for this preparation.

Handbook of Drug Administration via Enteral Feeding Tubes

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Site of absorption (oral administration)

Specific site of absorption is not documented.[5]

Alternative routes available

Parenteral route available.

Interactions

No specific interactions with food are documented.[5]

Health and safety

Cytotoxic. Protective clothing should be worn. Dispose of contaminated disposable equipment as cytotoxic waste.

Suggestions/recommendations

- Use the manufactured special suspension when possible or prepare the extemporaneous suspension if suitable containment facilities are available.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of busulfan. Seek specialist advice regarding alternative therapy. Administer using the above method. Monitor for loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, GSK; 22 January 2003.
3. Allen LV. Busulfan oral suspension. *US Pharmacist* 1990; 15: 94–95.
4. Personal communication, Nova Labs; 22 April 2014.
5. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Cyclophosphamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cyclophosphamide (Pharmacia)	Tablet 50 mg	Sugar-coated tablet. Tablet may be difficult to crush owing to small size. Possible health risk from dust exposure.[2]
Cyclophosphamide (Pharmacia)	Injection 500 mg, 1 g	Can be used to prepare a solution for oral use.[2]
Cyclophosphamide (Nova Labs)	Solution 25–100 mg/5 mL	Manufactured 'special' with shelf-life of 15 days. Suitable for enteral tube administration.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour after oral dosing.[4]

Alternative routes available

Parenteral route available.

Interactions

No specific interaction with food is documented.

Health and safety

Cytotoxic. Avoid crushing tablets. Handle as cytotoxic. Treat all contaminated waste, (e.g. syringes) as cytotoxic waste.

Suggestions/recommendations

- Do not crush the tablets.
- Use the injection to prepare an oral solution. This should be undertaken in appropriate facilities.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of cyclophosphamide. Consideration should be given to using the parenteral route. Seek specialist advice. If clinically appropriate administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; 11 March 2003.
3. Personal communication, Nova Labs; 24 March 2005.
4. Cyclophosphamide Tablets (Pharmacia), Summary of Product Characteristics; March 2012.

Handbook of Drug Administration via Enteral Feeding Tubes

Rebecca White
Vicky Bradnam

Etoposide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Vepesid (BMS)	Capsule 50 mg, 100 mg	Oral dose is double the i.v. dose.[1] It is not appropriate to open capsules; the soft gelatin capsule contains liquid.[2]
Etopophos (BMS)	Injection 100 mg	Powder for reconstitution. No specific data on enteral tube administration are available for this preparation.
Etoposide (Medac GmBH, Teva)	Infusion concentrate 20 mg/mL	No specific data on enteral tube administration are available for this preparation.
Vepesid (BMS)	Injection 20 mg/mL (5 mL)	No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparation	Solution 10 mg/mL	*Extemporaneous etoposide solution 10 mg/mL:* Etoposide 20 mg/mL injection: 60 mL Sodium chloride 0.9% injection to 120 mL Stability data support 22-day expiry at room temperature,[3] however, as this solution does not contain a preservative, a shelf-life of 7 days may be considered more appropriate. This solution should be prepared in a suitable containment facility. The solution should not be refrigerated as this may lead to precipitation. It should be stored in a glass bottle.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2 hours after oral dosing. Absorption is incomplete (50%) and variable (25–80%).[4]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Etoposide is cytotoxic. Protective clothing should be worn. Etoposide should not be handled by pregnant women. Administration equipment, e.g. syringes, should be disposed of as cytotoxic waste.

Suggestions/recommendations

- Use an extemporaneously prepared solution preparation. This should be prepared in appropriate facilities.
- A prolonged break in feeding is not required.
- As it is cytotoxic a closed system should be used for administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water. Dispose of syringe as cytotoxic waste.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of etoposide. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Bristol-Myers Squibb; 24 January 2003.
3. McLeod HL, Relling MV. Stability of etoposide solution for oral use. *Am J Hosp Pharm* 1992; 49: 2784–2785.
4. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

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Finasteride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Finasteride (Actavis, Aurobindo, Accord, Consilient, Mylan, Niche, Teva, Wockhardt)	Tablet 1 mg, 5 mg	Film coated. No specific data on enteral tube administration are available for this preparation. Most brands contain lactose.
Proscar (MSD)	Tablet 5 mg	Film coated. Tablets disperse within 5 minutes when placed in 10 mL of water. The resulting pale blue, milky dispersion draws up and flushes easily via an 8Fr NG tube.[2] Contains lactose.[3]
Propecia (MSD)	Tablet 1 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[4]

Site of absorption (oral administration)

Specific site is unknown. Peak plasma concentration occurs 2 hours following oral dosing.[4]

Alternative routes available

None available.

Interactions

Bioavailability is unaffected by food.[3]

Health and safety

Women should not handle crushed or broken tablets if they are or may be pregnant owing to the potential risk to a male fetus.[3] For this reason a 'closed system' should be used to disperse tablet (see Chapter 9).

Suggestions/recommendations

- Tablets can be dispersed in water immediately prior to administration; a closed system should be used to minimise operator exposure.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of finasteride. Administer as above. Monitor efficacy and side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Proscar (MSD), Summary of Product Characteristics; October 2013.
4. Propecia (MSD), Summary of Product Characteristics; November 2013.

Hydroxycarbamide (Hydroxyurea)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Hydroxycarbamide (Medac)	Capsule 500 mg	No specific data on enteral tube administration are available for this preparation. Contains 25 mg lactose/capsule.[2]
Hydrea (Squibb)	Capsule 500 mg	Soluble 1 : 10 to 1 : 30 in water.[3] Excipients are not soluble. Contains 42.2 mg lactose/capsule.[3]
Siklos (Nordic Pharma)	Tablet 100 mg, 1 g	Film coated Tablets can be disintegrated immediately before use in a small quantity of water (5 mL).[4] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 0.5 to 2 hours after oral dosing.[3,4] Oral bioavailability is almost complete.[4]

Alternative routes available

None available for hydroxycarbamide.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Hydroxycarbamide is cytotoxic. Suitable protective clothing should be worn. Contaminated equipment should be disposed of as cytotoxic waste. Steps should be taken to minimise operator exposure to the powder.

Suggestions/recommendations

- Use Siklos tablets dispersed in water immediately before administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.

6. Draw another 10mL mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no specific information relating to the jejunal administration of hydroxycarbamide. Administer as above. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Hydroxycarbamide (Medac), Summary of Product Characteristics; October 2008.
3. Hydrea (Squibb), Summary of Product Characteristics; May 2012.
4. Siklos (Nordic Pharma), Summary of Product Characteristics; Oct 2012.

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Methotrexate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Methotrexate (Accord, Amdipharm, Hospira, Orion, Sandoz, Teva, Pharmacia/Pfizer (Maxtrex))	Tablet 2.5 mg, 10 mg	The tablets will disperse in water.[2,3]
Methotrexate (Hameln, Medac)	Injection 2.5 mg/mL, 25 mg/mL, 100 mg/mL	The injection can be diluted with water and administered orally.[4] The absorption from the solution gives similar plasma concentration to tablet preparation.[4] An extended expiry can be given if a preservative is used.[2]
Methotrexate (Nova Labs)	Suspension 2.5–50 mg/5 mL	Manufactured 'special'. Shelf life 1–3 months. The viscosity is such that the product remains suspended on standing, but viscosity reduces on shaking to facilitate administration. This should be suitable for administration via a feeding tube and is unlikely to cause blockage, although Nova Labs has no specific data.[5]

Site of absorption (oral administration)

Methotrexate is well absorbed from the GI tract by an active transport mechanism utilised by dietary folate. Peak plasma concentration occurs 1–5 hours following oral administration. Methotrexate also undergoes enterohepatic circulation.[6]

Alternative routes available

Parenteral route is available. Subcutaneous injections once weekly have been used for rheumatoid arthritis and Crohn's disease.

Interactions

No interaction with feed is documented. Vitamin preparations containing folic acid or its derivatives may alter response to methotrexate.[7]

Health and safety

Cytotoxic drug. Do not crush the tablets. Use closed systems wherever possible. Protective clothing should be worn. Dispose of any contaminated syringes safely as cytotoxic waste.

Suggestions/recommendations

- Where practical, use a commercially prepared 'special' suspension. Alternatively, the tablets can be dispersed in water, using a closed system.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Tablet administration (closed system)

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed.

Intrajejunal administration

The absorption of methotrexate is unlikely to be reduced by jejunal administration. Administer using the above method.

Mercaptopurine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Puri-Nethol (Alkopharma)	Tablet 50 mg	GSK (previous licence holder) has no information on the administration of Puri-Nethol via enteral feeding tube.[2]
Mercaptopurine	Tablet 10 mg	Manufactured 'special'. No specific data on enteral tube administration are available for this preparation.
Xaluprine (Nova)[3]	Oral suspension 20 mg/mL	Gloves should be worn at all times when handling liquid preparation. Bottle should be shaken vigorously for 30 seconds before withdrawing dose. Bottle is provided with adapter and oral syringes; ensure dose can be safely transferred into enteral syringe.[3] Contains aspartame and sucrose.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 0.5–4 hours following oral administration.[4]

Alternative routes available

No alternative available.

Interactions

The dose should not be taken with milk or dairy products as this may contain xanthine oxidase which may reduce plasma concentrations of mercaptopurine.[4]

Health and safety

Cytotoxic drug. Do not crush tablets. Use closed systems wherever possible. Protective clothing should be worn. Dispose of the syringe safely as cytotoxic waste.

Suggestions/recommendations

- Use liquid preparation.
- Dose should be taken 1 hour before or 2 hours after milk/dairy-containing feeds.
- Dose should be administered in the evening.

Intragastric administration

1. Stop the enteral feed 2 hours before the dose
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly for 30 seconds to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush well with water following the dose.
8. Allow 1 hour before re-starting the feed.

Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information relating to jejunal administration of mercaptopurine. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Personal communication, GSK; 22 January 2003.
3. Xaluprine (Nova), Summary of Product Characteristics; February 2014.
4. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Ondansetron

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ondansetron (non-proprietary; Aurobindo Pharma-Milpharm, Wockhardt, Piva)	Tablet 4 mg, 8 mg	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.

Formulations available[1] *(continued)*

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ondansetron (non-proprietary; Hameln, Accord)	Injection 2 mg/ml (2 ml, 4 ml)	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Ondansetron (Focus Pharmaceuticals)	Oral liquid 4 mg/5 ml	Clear strawberry flavoured liquid. Shelf life is 28 days once opened.[2] Does not contain sorbitol; contains xylitol 210 mg/mL.[3]
Ondemet (Alliance)	Tablet 4 mg, 8 mg	Ondansetron (as hydrochloride dihydrate).[4] 4 mg tablet contains 84.5 mg lactose. 8 g tablet contains 169 mg lactose. No specific data on enteral tube administration are available for this preparation.
Setofilm (Norgine)	Orodispersible film 4 mg, 8 mg	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Zofran (GSK)	Tablet 4 mg, 8 mg	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Zofran Melt (GSK)	Oral lyophilisate 4 mg, 8 mg	No specific data on enteral tube administration are available for this preparation.
Zofran (GSK)	Syrup 4 mg/5 ml	Ondansetron (as hydrochloride). Sugar-free; contains sorbitol[5] 3 g/5 ml dose.[6]
Zofran (GSK)	Injection 2 mg/ml (2 ml, 4 ml)	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Zofran (GSK)	Suppository 16 mg	Rectal administration. Plasma levels are detectable 15–60 minutes following administration; peak plasma concentration occurs at 6 hours.[7]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur 1–1.5 hours following oral dosing.[8]

Alternative routes available

Parenteral formulation is available. Can be administered by i.v. or i.m. injection. Rectal formulation is available; once-daily dosing.

Interactions

Bioavailability of ondansetron is slightly enhanced by food.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider suppository formulation for rectal administration.
- Use a liquid formulation for administration via the feeding tube; consider the total sorbitol dose administered for high-dose regimens.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data on jejunal administration. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Ondansetron 4 mg/5 ml. Oral Liquid (Focus), Summary of Product Characteristics; 30 May 2013.
3. Personal communication, Focus Pharmaceuticals; 17 March 2014.
4. Ondemet 4 mg Tablets (Alliance), Summary of Product Characteristics; 6 April 2012.
5. Zofran Syrup (GSK), Summary of Product Characteristics; 5 December 2013.
6. Personal communication, GlaxoSmithKline; February 2005.
7. Zofran Suppositories (GSK), Summary of Product Characteristics; 20 September 2013.
8. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Handbook of Drug Administration via Enteral Feeding Tubes

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Podaż leków przez sztuczne dostępy odżywcze

Zasady

1. **Nie należy podawać leków bezpośrednio do diet.**
2. **Nie należy podawać jednocześnie kilku leków**
3. **Należy zrobić przerwę w podaży diety na co najmniej 30 minut przed- i po podaniu leku.**
4. **W przypadku, gdy interakcja leku z dietą jest potwierdzona i istotna, przerwa w podawaniu diety powinna wynosić co najmniej 1 godzinę przed i 2 godziny po podaniu leku.**
5. **Dostęp żywieniowy należy przepłukiwać objętością 10–30 ml wody lub innego zalecanego płynu zarówno przed, jak i po podaniu leku. Całkowitą objętość płynów podawanych do przepłukiwania dostępu należy doliczyć do dobowego bilansu płynowego.**

Podsumowanie

Nie należy dodawać cytostatyków bezpośrednio do mieszaniny.
Jeżeli to możliwe zamienić doustne formy na dożylne.
Jeżeli nie, przygotowanie leku do podazy przez zgłębnik musi odbywać sie w pracowni leku cytotoksycznego.
Brak danych na temat interakcji z zywieniem dojelitowym.
Należy zrobić przerwę w podaży diety na co najmniej 30 minut przed- i po podaniu leku.
Dostęp żywieniowy należy przepłukiwać objętością 10–30 ml wody lub innego zalecanego płynu zarówno przed, jak i po podaniu leku.

Cyklofofamid,

Metotrexat

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