TREATMENT GUIDELINES

• Antibiotic prophylaxis must be adapted to specific resistance patterns of each hospital environment.
• Patients with cardiac defects at risk for developing bacterial endocarditis following gastrointestinal surgery should receive appropriate antibiotic prophylaxis. This is not addressed in the present guide: please refer to the card focusing on the treatment of bacterial endocarditis.

Prophylaxis NOT RECOMMENDED
Low-risk gastroduodenal surgery
Low-risk biliary surgery

Prophylaxis RECOMMENDED
Contaminated surgery
• Colorectal surgery
• Appendectomy (perforated, necrotic or gangrenous appendix must be treated)
• Oesophageal surgery in presence of obstruction and occasionally in the following situations:
  - oesophageal dilation and oesophageal varix sclerotherapy
  - oesophageal surgery in general, regardless of the level of risk
• High-risk gastroduodenal surgery in the following situations:
  - reduced gastric acidity (including use of antacids or acid-reducing agents)
  - decreased gastroduodenal motility (obstruction, mural obesity)
  - cancer, digestive hemorrhage, gastric ulcer
• certain surgical procedures: gastric or biliopancreatic bypass pancreatectoduodenectomy (Whipple’s procedure), percutaneous gastrostomy
• Small intestine surgery
• High-risk biliary tract surgery:
  - age over 70 years, diabetes mellitus, obesity
  - acute cholecystitis, cholelithiasis or obstructive jaundice
  - nonfunctioning gallbladder (excluding non-urgent laparoscopic cholecystectomy in low-risk patients)
  - certain procedures: retrograde cholangiopancreatography
• Clean-contaminated surgery (entering the lumen)
Second-line prophylaxis

- Indications:
  - Documented allergies to β-lactams:
    - Patients having shown signs of anaphylaxis, urticaria or rash, within 72 hours of administering a β-lactam antimicrobial or patients having had a serious adverse reaction such as drug fever or toxic epidermal necrolysis.
  - Patients colonized with methicillin-resistant Staphylococcus aureus (MRSA) or with methicillin-resistant coagulase-negative staphylococci.

- Although Clindamycin has been extensively associated with the development of Clostridium difficile colitis, it has a more appropriate activity spectrum against pathogens encountered in several types of gastrointestinal surgery than Vancomycin, which is preferred for other types of surgery.

- Second-line regimens with gentamicin are preferred to regimens with ciprofloxacin, since certain data seems to link the use of quinolones with the emergence of C. difficile colitis. This information is to be interpreted in view of each hospital setting.

Timing of preoperative antibiotic administration

- At induction of anesthesia
- Variable (depending on recommended agent)

Dosage of antibiotic prophylaxis

- When antibiotic prophylaxis is recommended, a single dose is sufficient except in situations where antibiotic therapy must be continued (e.g. perforated appendix).
- For cefoxitin et cefazolin:
  - A single 2 g IV dose at induction may be used in patients > 80 kg.
  - A single 2 g IV dose during procedure if it lasts over 3 hours or if blood loss exceeds 1500 mL.
- For cefazolin, ceftepime, or ceftriaxone:
  - Dose range: 20–30 mg/kg
  - Maximal dose: 1 g
  - CESAR dose

Antibiotic administration

- Cefazolin, cefoxitin: direct IV over 3–5 minutes OR IV infusion over 15–30 minutes
- Clindamycin: IV infusion over 30–60 minutes (maximum of 30 mg/minute in adults)
- Gentamicin: IV infusion over 15–30 minutes
- Metronidazole: IV infusion over 30 minutes
- All dosages must be continued (e.g. perforated appendix).
- Documented allergies to β-lactams:
  - Patients colonized with methicillin-resistant Staphylococcus aureus (MRSA) or with methicillin-resistant coagulase-negative staphylococci.

Characteristics of pediatric antibiotic prophylaxis

- Few studies have evaluated the efficacy of antibiotic prophylaxis in children undergoing gastrointestinal surgery.
- Recommendations are based on adult population trials and may be adapted to local experience.

## Antibiotic Prophylaxis in Gastrointestinal Surgery

### THERAPY

#### ANTIBIOTIC PROPHYLAXIS*

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Adults</th>
<th>Children†</th>
<th>Cost per dose</th>
<th>Second-line therapy,†‡</th>
<th>Cost per dose</th>
<th>Second-line therapy,†‡</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gastrointestinal</strong></td>
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<tr>
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<tr>
<td></td>
<td>1 g IV</td>
<td>900 mg IV</td>
<td>25 mg/kg IV</td>
<td>Dose range: 20–30 mg/kg</td>
<td>Maximal dose: 1 g</td>
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<td>Gentamicin (Garamycin®)</td>
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<td>Dose range: 20–30 mg/kg</td>
<td>Maximal dose: 1 g</td>
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<td>25 mg/kg IV</td>
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<tr>
<td></td>
<td>1 g IV</td>
<td>900 mg IV</td>
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<td>Dose range: 20–30 mg/kg</td>
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<td>Gentamicin (Garamycin®)</td>
<td>$4</td>
<td>Clindamycin (Dalacin®)</td>
<td>$1</td>
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<tr>
<td></td>
<td>900 mg IV</td>
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<td>Dose range: 20–30 mg/kg</td>
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<td>900 mg IV</td>
<td>25 mg/kg IV</td>
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<tr>
<td><strong>Appendectomy</strong></td>
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<td>Metronidazole (Flagyl®)</td>
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<td>500 mg IV</td>
<td>25 mg/kg IV</td>
<td>Dose range: 1–2 g</td>
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<td>25 mg/kg IV</td>
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<tr>
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<td>AND</td>
<td>AND</td>
<td>AND</td>
<td>AND</td>
<td>AND</td>
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<tr>
<td><strong>Biliary tract</strong></td>
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<tr>
<td></td>
<td>900 mg IV</td>
<td>25 mg/kg IV</td>
<td>Dose range: 1–2 g</td>
<td>900 mg IV</td>
<td>25 mg/kg IV</td>
<td>Dose range: 1–2 g</td>
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<tr>
<td><strong>Rectal</strong></td>
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<td>Clindamycine (Dalacin®)</td>
<td>$3</td>
<td>Cefazolin (Ancef®)</td>
<td>$1</td>
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<tr>
<td></td>
<td>1 g IV</td>
<td>900 mg IV</td>
<td>25 mg/kg IV</td>
<td>Dose range: 1–2 g</td>
<td>900 mg IV</td>
<td>25 mg/kg IV</td>
</tr>
</tbody>
</table>

* Only one brand name product is listed although several manufacturers may market other brand names.
† Dose must be administered as a single intravenous bolus, except for particular situations requiring clinical judgment.
‡ Dose range: 20–30 mg/kg
§ Approximate cost negotiated for the healthcare facilities of the region of Québec (June 2005). Cost may vary with the region.
†† Dose must be administered at induction of anesthesia, except for particular situations requiring clinical judgment.
‡‡ Documentation must be administered as a single intravenous bolus, except for particular situations requiring clinical judgment.
§§ Approximate cost negotiated for the healthcare facilities of the region of Québec (June 2005). Cost may vary with the region.
¶† Few studies have evaluated the efficacy of antibiotic prophylaxis in children undergoing gastrointestinal surgery. Recommendations are based on adult population trials and may be adapted to local experience.
Second-line prophylaxis

- Indications:
  - Documented allergies to β-lactams:
    - Patients having shown signs of anaphylaxis, urticaria or rash, within 72 hours of administering a β-lactam antimicrobial or patients having had a serious adverse reaction such as drug fever or toxic epidermal necrolysis.
  - Patients colonized with methicillin-resistant Staphylococcus aureus (MRSA) or with methicillin-resistant coagulase-negative staphylococci.
- Although Clindamycin has been extensively associated with the development of Clostridium difficile colitis, it has a more appropriate activity spectrum against pathogens encountered in several types of gastrointestinal surgery than Vancomycin, which is preferred for other types of surgery.
- Second-line regimens with gentamicin are preferred to regimens with ciprofloxacin, since certain data seems to link the use of quinolones with the emergence of C. difficile colitis. This information is to be interpreted in view of each hospital setting.

Timing of preoperative antibiotic administration

- At induction of anesthesia
- Variable (depending on recommended agent)

Dosage of antibiotic prophylaxis

- When antibiotic prophylaxis is recommended, a single dose is sufficient except in situations where antibiotic therapy must be continued (e.g. perforated appendix).
- Cefoxitin et cefazolin:
  - A single 2 g IV dose at induction may be used in patients > 80 kg.
  - For cefoxitin, a single 2 g dose provides better coverage against enterobacteriaceae, even in adults < 80 kg.
  - Pediatric dose: measured in mg/kg with a maximum equivalent to the adult dose.
- Patients colonized with methicillin-resistant Staphylococcus aureus (MRSA) or with methicillin-resistant coagulase-negative staphylococci.

Antibiotic Prophylaxis in Gastrointestinal Surgery

### Characteristics of pediatric antibiotic prophylaxis

- Few studies have evaluated the efficacy of antibiotic prophylaxis in children undergoing gastrointestinal surgery.
- Recommendations are based on adult population trials and may be adapted to local experience.

### Therapy

#### Antibiotic Prophylaxis*

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Adults</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gastrointestinal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-line therapy†</td>
<td>Cost per dose</td>
<td>Second-line therapy†</td>
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<tr>
<td>Cefazolin (Ancef®)</td>
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<td>$1</td>
</tr>
<tr>
<td>Cefoxitin (Mefoxin®)</td>
<td>1 g IV</td>
<td>$1</td>
</tr>
<tr>
<td><strong>High-risk gastrointestinal</strong></td>
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<td></td>
</tr>
<tr>
<td>Cefazolin (Ancef®)</td>
<td>1 g IV</td>
<td>$1</td>
</tr>
<tr>
<td><strong>Small intestine</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefazolin (Ancef®)</td>
<td>1 g IV</td>
<td>$1</td>
</tr>
<tr>
<td><strong>Colon</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefazolin (Ancef®)</td>
<td>1 g IV</td>
<td>$1</td>
</tr>
<tr>
<td>Metronidazole (Flagyl®)</td>
<td>500 mg IV AND Cefazolin (Ancef®)</td>
<td>1 g IV</td>
</tr>
<tr>
<td><strong>Appendectomy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefazolin (Ancef®)</td>
<td>1 g IV</td>
<td>$1</td>
</tr>
<tr>
<td>Metronidazole (Flagyl®)</td>
<td>500 mg IV AND Cefazolin (Ancef®)</td>
<td>1 g IV</td>
</tr>
<tr>
<td><strong>Military fistula open or high-risk procedure</strong></td>
<td></td>
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</tr>
<tr>
<td>Cefazolin (Ancef®)</td>
<td>1 g IV</td>
<td>$1</td>
</tr>
</tbody>
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‡ Cefazolin, cefoxitin: repeat preoperative dose during procedure if it lasts over 3 hours or if blood loss exceeds 1500 mL.

§ Approximate cost negotiated for the healthcare facilities of the region of Québec (June 2005). Cost may vary with the region.

¶ Few studies have evaluated the efficacy of antibiotic prophylaxis in children undergoing gastrointestinal surgery. Recommendations are based on adult population trials and may be adapted to local experience.

* Approximate cost of the lowest dosage for a 20 kg child.

** Approximate cost of the healthcare facilities of the region of Québec (June 2005). Cost may vary with the region.

Costs may vary with the region.
Antibiotic Prophylaxis in Gastrointestinal Surgery

TREATMENT GUIDELINES

• Antibiotic prophylaxis must be adapted to specific resistance patterns of each hospital environment.
• Patients with cardiac defects at risk for developing bacterial endocarditis following gastrointestinal surgery should receive appropriate antibiotic prophylaxis. This is not addressed in the present guide: please refer to the card focusing on the treatment of bacterial endocarditis.

Prophylaxis NOT RECOMMENDED

- Low-risk gastroduodenal surgery
- Low-risk biliary surgery

Prophylaxis RECOMMENDED

- Contaminated surgery
  - Colorectal surgery
  - Appendectomy (perforated, necrotic or gangrenous appendix must be treated)
  - Oesophageal surgery in presence of obstruction and occasionally in the following situations:
    - oesophageal dilation and oesophageal varix sclerotherapy
    - oesophageal surgery in general, regardless of the level of risk
  - High-risk gastroduodenal surgery in the following situations:
    - reduced gastric acidity (including use of antacids or acid-reducing agents)
    - decreased gastroduodenal mobility (obstruction, morbid obesity)
    - cancer, digestive hemorrhage, gastric ulcer
    - certain surgical procedures: gastric or biliopancreatic bypass pancreatoduodenectomy (Whipple’s procedure), percutaneous gastronomy
  - Small intestine surgery
  - High-risk biliary tract surgery:
    - age over 70 years, diabetes mellitus, obesity
    - acute cholecystitis, cholelithiasis or obstructive jaundice
    - nonfunctioning gallbladder (excluding non-urgent laparoscopic cholecystectomy in low-risk patients)
    - certain procedures: retrograde cholangiopancreatography
    - open biliary tract surgeries, regardless of the level of risk

REFERENCES

Zelenitsky S. Surgical prophylaxis. Hospital Pharmacy Practice 1996 ; 3(Suppl. 1).