

A JOINT INITIATIVE OF

**DOCTOR**

**URCPA**

The Royal College of Pathologists of Australasia

# COMMON SENSE PATHOLOGY

## LABORATORY DIAGNOSIS OF UTI

### Contents

- Diagnostic criteria
- Laboratory investigations
- Case studies

# A fresh chance at life for chronic hepatitis C patients

**REBETRON™**  
(interferon alfa-2b, recombinant + ribavirin)



**REBETRON COMBINATION THERAPY Indications:**

Chronic hepatitis C in alfa interferon treatment naive patients and in patients relapsed following alfa interferon monotherapy; patients must be >18 yrs and have compensated liver disease.

**Contraindications:** Hypersensitivity to ribavirin/alfa interferon/any components of Rebetron; pregnancy, pregnancy in partner; lactation; severe cardiac disease; haemoglobinopathies; renal impairment; epilepsy, compromised CNS function; decompensated hepatic cirrhosis; concomitant immunosuppressives (excluding short-term corticosteroids); autoimmune disease (especially hepatitis); immunosuppressed transplant recipients; uncontrolled thyroid disease; severe psychiatric disorder (or history), especially if severe depressed/suicidal.

**Precautions:** Rebetol not to be used alone; *ribavirin teratogenic risk: Extreme care must be taken to avoid pregnancy in female patients and in partners of male patients on Rebetron therapy. Do not initiate therapy until a report of a negative pregnancy test has been obtained. Women of childbearing potential and men must use two forms of effective contraception during treatment and for six months post-treatment. Routine monthly pregnancy tests must be performed during this time.*

BEFORE PRESCRIBING, PLEASE REVIEW THE FULL REBETRON PRODUCT INFORMATION WHICH IS AVAILABLE FROM SCHERING-PLOUGH PTY LIMITED

*If pregnancy does occur during treatment/six months post-treatment, the patient must be advised of the significant teratogenic risk of ribavirin to the foetus. Haemolysis; debilitating medical conditions (pulmonary disease, diabetics); coagulation disorders, severe myelosuppression; m-cresol (preservative); liver function abnormalities; hypotension; fever (flu-like syndrome); pulmonary function impairment (concomitant use with Shosaikoto – Chinese herb); ocular changes; CNS effects (depression); cardiovascular disorders; psoriasis, auto-antibodies; thyroid abnormalities; regular blood tests (FBC, blood chemistry, pregnancy tests, etc) prior to and during therapy; children; elderly. **Drug Interactions:** NRTIs (zidovudine, stavudine, didanosine, abacavir); narcotics, hypnotics or sedatives; xanthine derivatives (theophylline). **Adverse Reactions:** Flu-like syndrome (include fatigue, fever, headache, malaise, myalgia/ arthralgia); asthenia; rigors; weight loss; dizziness; GI effects (abdominal pain, anorexia, diarrhoea, dyspepsia, nausea); musculo-skeletal pain; CNS/psychiatric effects (anxiety, impaired concentration, depression, insomnia, irritability); anaemia, other haematological changes; dyspnoea; Dermatological effects (alopecia, pruritus/rash, dry skin), others – see Product Information.*

**BIOTRAX**

A division of Schering-Plough Pty Limited

ABN 57 000 235 245. 11 Gibbon Road, Baulkham Hills, NSW 2153.

™Trademark 04/02 SCH1173/CIB

**DOCTOR**  
AUSTRALIAN

**RCPA**  
The Royal College of Pathologists of Australasia

**Dear Reader**

It is with great pleasure that the Royal College of Pathologists of Australasia and *Australian Doctor* present a new series of *Common Sense Pathology*.

The first series was well received and lauded as providing clear, concise information that is useful and necessary for GPs; indeed, back copies are still eagerly sought. *Common Sense Pathology* has been sorely missed since its demise in 1999 due to the cessation of a Federal Government funding initiative.

The college and *Australian Doctor* are delighted to have reached an agreement to produce a new series. Suitable topics to present on the appropriate use of pathology in the clinical setting abound, and we look forward to a productive association. We thank Dr Peter Clyne for reviewing each article.

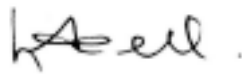
The 2002 series will consist of six articles, each of which will be published as a separate booklet and delivered with your *Australian Doctor*. In addition, the articles will be posted on the college web site, [www.rcpa.edu.au](http://www.rcpa.edu.au). It is hoped you will find this fifth article on laboratory diagnosis of UTI to be a valuable education and reference tool.

Both the college and *Australian Doctor* are pleased to be able to provide this resource to the medical fraternity.

Yours sincerely



Dr Matthew Meerkin  
Editor  
*Common Sense Pathology*



Dr Kerri Parnell  
Medical Editor  
*Australian Doctor*

*Common Sense Pathology* is a joint initiative of *Australian Doctor* and The Royal College of Pathologists of Australasia.

It is published by Reed Business Information  
Tower 2, 475 Victoria Ave, Locked Bag 2999  
Chatswood DC NSW 2067.

Ph: (02) 9422 2999 Fax: (02) 9422 2800  
E-mail: [mail@australiandoctor.com.au](mailto:mail@australiandoctor.com.au)  
Web site: [www.australiandoctor.com.au](http://www.australiandoctor.com.au)  
(Inc in NSW) ACN 000 146 921  
ABN 47 000 146 921  
ISSN 1039-7116

© 2002 by The Royal College of Pathologists of  
Australasia [www.rcpa.edu.au](http://www.rcpa.edu.au)  
CEO Dr Debra Graves  
E-mail: [debrag@rcpa.edu.au](mailto:debrag@rcpa.edu.au)

*Common Sense Pathology* editor

Dr Matthew Meerkin  
E-mail: [mmeerkin@ozemail.com.au](mailto:mmeerkin@ozemail.com.au)

*Australian Doctor*

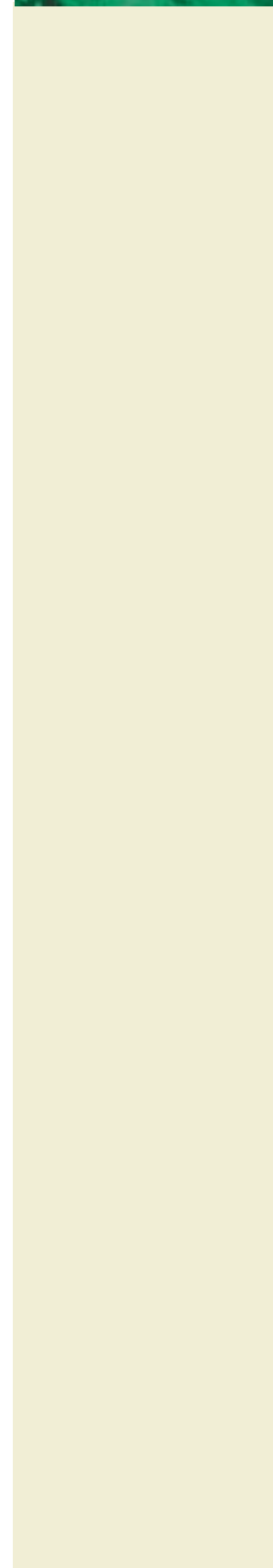
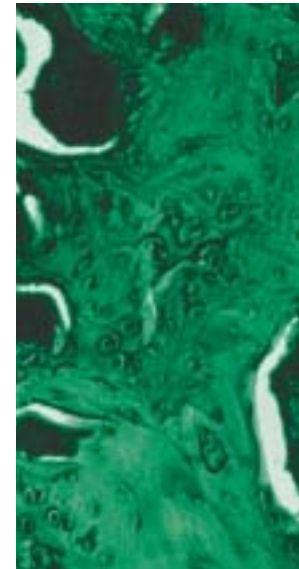
Editor: Nadine Meehan  
E-mail: [nadine.meehan@reedbusiness.com.au](mailto:nadine.meehan@reedbusiness.com.au)

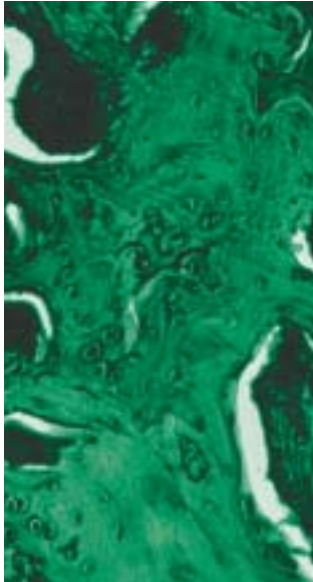
Medical editor: Dr Kerri Parnell  
E-mail: [kerri.parnell@reedbusiness.com.au](mailto:kerri.parnell@reedbusiness.com.au)

Sales director, healthcare: Mandy Eyles  
E-mail: [mandy.eyles@reedbusiness.com.au](mailto:mandy.eyles@reedbusiness.com.au)

Marketing manager, healthcare: John La Rosa  
E-mail: [john.larosa@reedbusiness.com.au](mailto:john.larosa@reedbusiness.com.au)

Production manager: Kirsty Milenkovic  
E-mail: [kirsty.milenkovic@reedbusiness.com.au](mailto:kirsty.milenkovic@reedbusiness.com.au)





# Laboratory Diagnosis of UTI

Associate Professor Rosemary Munro  
Microbiologist  
South Western Area Pathology Service, Liverpool NSW

Dr Ian Chambers  
Microbiologist  
Douglas Hanly Moir, North Ryde NSW

## Defining and diagnosing urinary tract infection

### *Specimen quality*

The accuracy and consistency of testing for UTI can be confounded by lack of attention to specimen quality. A specimen of urine, even if well collected, is easily contaminated with bacteria. Unless transported quickly to the laboratory at an appropriate temperature, the urine will act as a culture medium for both contaminant and pathogen.

### *Urine dipstick testing*

The nitrite test is used as a surrogate marker of bacteriuria, a positive nitrite test indicating that nitrate has been reduced to nitrite by bacteria, most commonly members of the enterobacteriaceae family such as *Escherichia coli*. However, some significant uropathogens such as *Staphylococcus saprophyticus* and enterococci do not reduce nitrate.

The leucocyte esterase test is used as an indicator of pyuria.

While these tests have been shown to correlate well with high-bacterial-count UTI<sup>1</sup>, they miss significant numbers when lower counts are present in acutely symptomatic young women.<sup>2,3</sup>

The diagnosis of UTI may be missed in up to 20% of patients if a negative urinalysis is used to rule out a UTI. See Table 1, next page.

### *Urine microscopy*

Red blood cells, white blood cells and epithelial cells are examined on an uncentrifuged specimen of urine for microscopy and culture. The number and morphology of the red blood cells can be useful in the assessment of renal disease, as can the presence of certain types of casts, and the presence of epithelial cells is a marker of perineal or vaginal contamination.

Significant pyuria has been variously defined, but generally more than  $8 \times 10^6/L$  is regarded as indicative of the presence of inflammation (in many laboratories this is rounded to  $10 \times 10^6/L$ ).

Pyuria is usually, but not always, associated with significant bacteriuria. However, infection may be present without pyuria, and the presence of pus cells may indicate non-infectious conditions such as calculus, renal disease, trauma, neoplasia.

### *Urine culture*

Urine in the bladder is normally sterile, but in the process of specimen collection contamination with bacteria from the distal urethra and periurethral area is common.

The benchmark definition of significant bacteriuria (established by Kass<sup>4</sup> in the 1950s) used a criterion of greater than or equal to  $10^8$  bacteria per litre to distinguish significant bacteriuria from that associated with contamination. This value was chosen because it had a high specificity for the diagnosis of true infection, even in asymptomatic people. It has a reported positive predictive value of 98%.<sup>5</sup>

However, its negative predictive value of only 65% is demonstrated in several studies which have established that about one-third of acutely symptomatic women have bacterial counts below this level.<sup>5,6</sup> In this group, the threshold for significant bacteriuria has been lowered to  $10^5$  bacteria/L, and there are other situations where low-count bacteriuria cannot be dismissed. Most laboratories

routinely take age, sex and clinical history into account when reporting the result of urine cultures.

It is important, therefore, to report counts of less than  $10^8$  bacteria/L in the appropriate clinical context to diagnose low-count UTIs.

**Microbiology of UTI**

The pathogenesis of UTI usually starts with colonisation of the periurethral and introital areas with organisms originating in the faecal flora. Ascending infection then takes place, influenced by anatomic features, such as the short urethra in females, sexual activity or instrumentation.

In community practice, as many as 80-90% of uncomplicated UTIs are caused by *E coli*, with *Staphylococcus saprophyticus*, enterococci and other enterobacteriaceae (such as *Proteus* species, *Klebsiella* species) making up the balance.

In a hospital setting, or in patients with complicated UTI or catheter-associated UTI, *E coli* accounts for about 50% fewer infections.

**Table 1: Diagnostic tests for urinary tract infection in women with dysuria**

Test	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
<b>Dipstick</b>				
Leucocyte esterase	75-90	95	50	92
Nitrite	35-85	95	96	27-70
L. esterase + nitrite	75-90	70	75-93	41-95
<b>Microscopy</b>				
WBC $>8 \times 10^6/L$	91	50	67	83
<b>Culture</b>				
$>10^5$ bacteria/L	95	85	88	94
$>10^8$ bacteria/L	51	59	98	94

Sensitivity is the proportion of positive cases that are correctly identified as positive (positivity in disease)

Specificity is the proportion of negative cases that are correctly identified as negative (negativity in health)

Positive predictive value = percentage of cases with positive test results that are diseased

Negative predictive value = percentage of cases with negative test results that are non-diseased

**Case 1**

A two-month-old male is brought to see you with a three-day history of irritability and poor feeding. On examination he is febrile but has no localising signs. A bag urine submitted for microscopy and culture revealed the following:

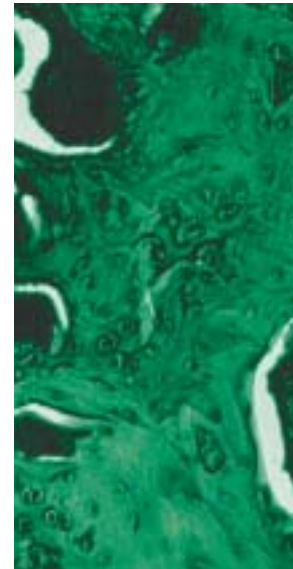
RBC	$<10 \times 10^6/L$
WBC	$10-100 \times 10^6/L$
Epithelial cells	$10-100 \times 10^6/L$
Culture	$10^8$ bacteria/L, Mixed growth of three different coliforms, no organism predominating.

**Question 1**

**Does this indicate a significant UTI?**

The collection of a clean, uncontaminated urine specimen from infants and young children is difficult. Bag specimens are prone to contamination and small numbers of contaminants have the chance, during transport, to multiply to apparently significant levels.

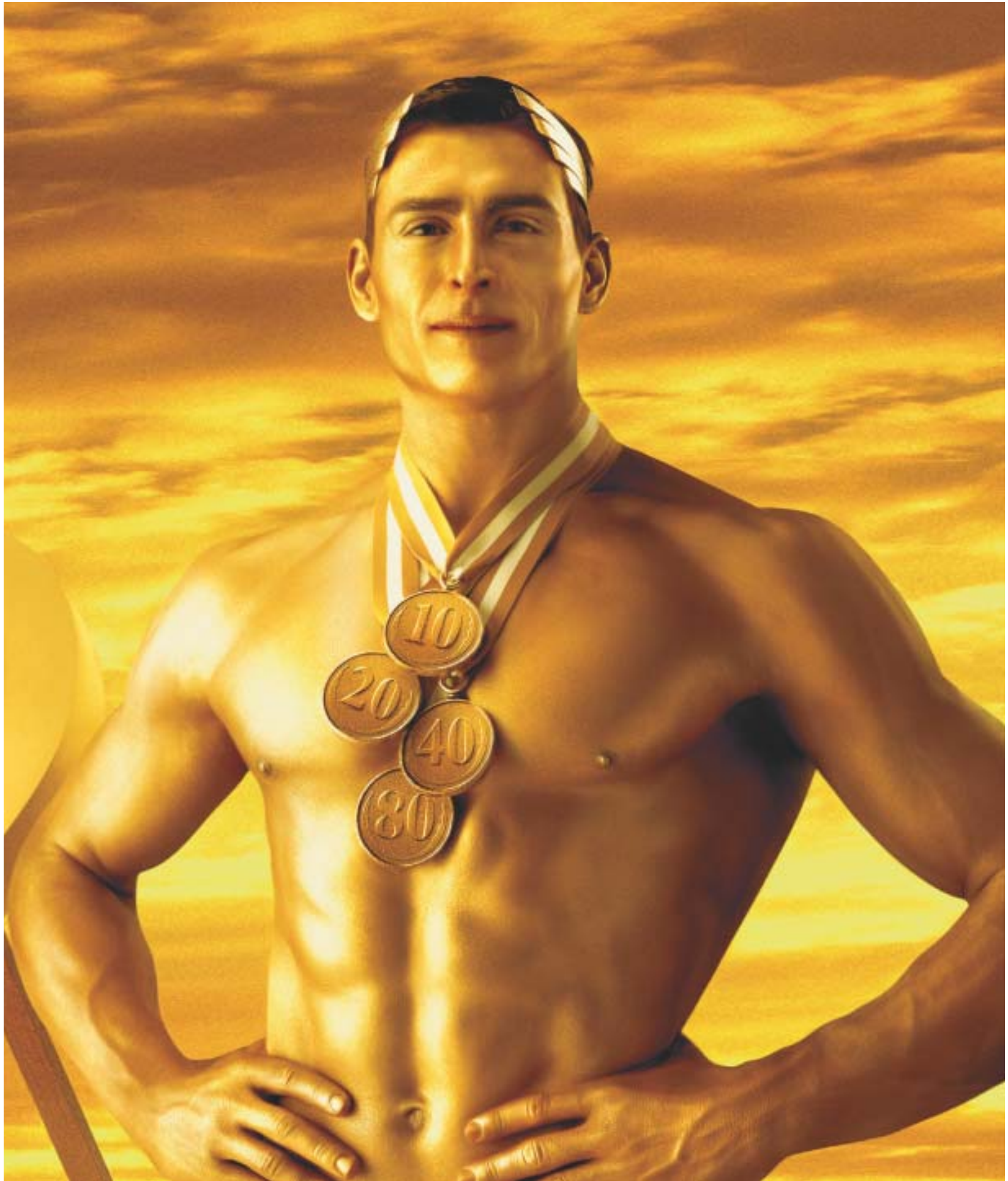
For this reason, the diagnosis of UTI should not be based solely on a positive result from this kind of specimen, but should be confirmed by another method such as a clean-catch specimen or bladder aspirate. On the other hand, a bag specimen which shows “no growth” is a good indicator of the absence of UTI.



In the Australian Triple A Study, the LIPITOR 10-80 mg dosage range took the majority of patients to target, regardless of baseline cholesterol levels.<sup>†</sup> Start LIPITOR at the dose expected to achieve cholesterol targets.<sup>2</sup>

*Four powerful winners.*

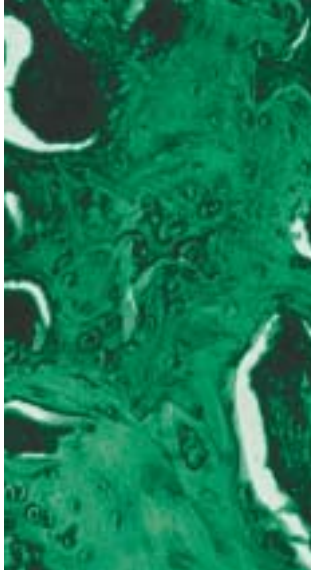
†Target of TC < 5.0 mmol/L. LIPITOR is indicated as an adjunct to diet for the treatment of patients with hypercholesterolaemia. Before prescribing, please review Approved Product Information. Full Approved PI is available on request from Pfizer. LIPITOR (atorvastatin calcium). Supplier: Pfizer Pty Limited, ABN 50 008 422 348, 38-42 Wharf Road, West Ryde NSW 2114. Indication: Hypercholesterolaemia (adjunct to diet). Contraindications: Active liver disease; unexplained persistent elevations of LFTs; pregnancy; lactation; hypersensitivity. Precautions: Liver disease history (monitor LFTs); excessive alcohol intake; myopathy (monitor CPK); risk factors for rhabdomyolysis; concomitant steroid hormone lowering agents, including ketoconazole, spironolactone, cimetidine; children. Adverse effects: Skeletal muscle pain/weakness; GI upset; headache; rash. Interactions: Caution with gemfibrozil; CYP3A4 inhibitors including ketoconazole/itraconazole; cyclosporin; erythromycin; OCs; digoxin. Dose: Individualise dosage; 10 mg to 80 mg once daily, with/without food. **Pfizer** Life is our life's work. References: 1. Barter PJ, O'Brien R. *Atherosclerosis* 2000;149(1):199-205. 2. LIPITOR Approved Product Information. LIPITOR® Reg. TM Warner-Lambert Export Limited. [www.pfizer.com.au](http://www.pfizer.com.au) 10/02 S&H PF1J4755.



**Lipitor**<sup>\*</sup>  
atorvastatin calcium

**10, 20, 40, 80 mg**

***Conquering cholesterol targets.***



### Question 2

#### Is the fact that no organism predominates important?

Mixed bacterial UTIs are rare, usually occurring in association with instrumentation or indwelling catheters.

Therefore, a mixed growth decreases the likelihood of a true UTI. Thus, if there is no predominant organism on culture, it is not possible for the laboratory to establish which isolate, if any, is the cause of a UTI, and the reporting of identification and antibiotic sensitivities is not warranted.

### Question 3

#### What other investigations might be appropriate?

A repeat specimen, either a clean-catch or bladder tap, would be required to confirm or exclude the diagnosis of UTI.

UTI is seen in 2% of boys and 8% of girls by the age of 10.<sup>7</sup> In the first year of life, the incidence is considerably higher in boys but thereafter it declines in boys and increases in girls. In infants, UTI is often associated with abnormalities of the urinary tract and radiological investigations to exclude these are indicated.

## Case 2

A 28-year-old female presents with symptoms of frequency and dysuria. She has had three such episodes in the past year and relates the symptoms to sexual intercourse. She uses a diaphragm and spermicide for contraception.

A urine examination revealed the following:

Dipstick	Leucocyte esterase ++, Nitrite negative
RBC	10-100 x 10 <sup>6</sup> /L
WBC	>100 x 10 <sup>6</sup> /L
Epithelial cells	<10 x 10 <sup>6</sup> /L
Culture	10 <sup>5</sup> bacteria/L <i>Staphylococcus saprophyticus</i>

### Question 1

#### Does this suggest an underlying UTI? If so, why?

This is an example of a low-bacterial-count UTI. About one-third of young women presenting with acute onset of dysuria and frequency have bacterial counts lower than that traditionally held to represent significant bacteriuria. The organism isolated (*S saprophyticus*) is frequently implicated in young, sexually active women with UTI. This organism does not reduce nitrate to nitrite, hence the possibly misleading negative dipstick result.

Recurrent UTI in such patients is frequent and the onset of symptoms after sexual intercourse is a common association.

The presence of significant pyuria corroborates the significance of the low bacterial count. Had there been pyuria in the absence of significant growth (so-called “sterile pyuria”), the possibility of sexually transmitted infections such as *Chlamydia trachomatis*, *Neisseria gonorrhoea* or herpes simplex would need to be considered.

### Question 2

#### Could contraceptive practice be a contributing factor?

The use of diaphragm and spermicidal creams has been associated with recurrent UTI related to sexual intercourse.

### Case 3

An 81-year-old male resident in a nursing home has a micro-urine examination as part of an investigation of urinary incontinence. The patient is mildly demented and does not complain of symptoms suggestive of UTI.

The following results are obtained on micro-urine examination.

RBC	<10 x 10 <sup>6</sup> /L
WBC	10-100 x 10 <sup>6</sup> /c
Epithelial cells	<10 x 10 <sup>6</sup> /L
Culture	>10 <sup>8</sup> bacteria/L, pure growth of <i>E coli</i>

#### Question 1

**Are these results diagnostic of a UTI which should be treated?**

Asymptomatic bacteriuria becomes more frequent with age, occurring in up to 40% of elderly men and women.<sup>8</sup>

While up to 30% of these people may develop symptomatic UTI within six months, there is no evidence that treatment at an asymptomatic stage influences morbidity or mortality, or decreases the incidence of symptomatic UTI subsequently.

Together with this lack of proven benefit, the potential side effects of antibiotic treatment in the elderly and the possibility of inducing antibiotic resistance mean that treatment of asymptomatic bacteriuria is not recommended.

An exception is the pre-operative urine culture which shows significant bacteriuria; treatment may prevent bacteraemia and the infection of surgically implanted prostheses.

#### Question 2

**Could incontinence contribute to the development of a UTI?**

Incontinence is usually an indicator of other factors. The presence of obstruction, poor bladder emptying, dementia, a stroke, diabetes and cardiovascular disease place the elderly patient with bacteriuria at a higher risk of infection than elderly people without these abnormalities. Treatment may be indicated in this group.

### Case 4

A 23-year-old woman presents for her first antenatal checkup. She is asymptomatic but a routine micro-urine reveals the following:

RBC	<10 x 10 <sup>6</sup> /L
WBC	<10 x 10 <sup>6</sup> /L
Epithelial cells	10-100 x 10 <sup>6</sup> /L
Culture	>10 <sup>8</sup> bacteria/L mixed growth, predominantly group B streptococcus

#### Question 1

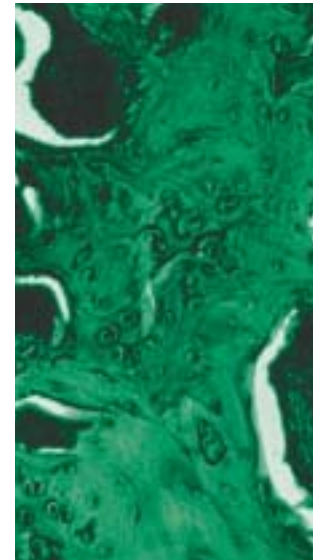
**In the absence of symptoms, would you regard this as a UTI?**

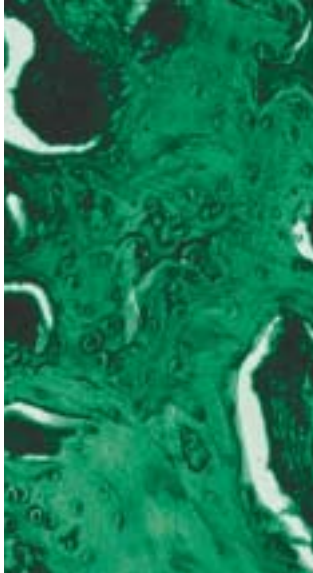
The presence of epithelial cells and a mixed flora, even though there is a predominant organism, suggests the specimen has been contaminated.

A repeat collection would be required to determine the presence of significant bacteriuria.

Between 2% and 10% of pregnant women develop significant bacteriuria, and if left untreated, this may proceed to pyelonephritis in 25-30% of these women.<sup>9</sup>

Because there is an association between pyelonephritis and low birthweight and prematurity, pregnant women should be screened for bacteriuria (by urine culture) at their first antenatal visit.





### Question 2

To determine whether group B streptococcus represents contaminating vaginal flora or significant bacteriuria, a repeat urine is collected. It yields a pure growth of  $>10^8$  bacteria/L group B streptococcus, with  $<10 \times 10^6$ /L epithelial cells. What are the implications of this finding?

Because this is a pure growth and there are no epithelial cells to suggest contamination, it can be concluded this patient does have significant bacteriuria and that treatment is indicated. If a repeat specimen had not shown bacteriuria, it remains this patient has group B streptococcus as part of her normal flora, and therefore will require intrapartum antibiotic prophylaxis to prevent neonatal infection which has been associated with group B streptococcus.

### Other components of the micro-urine examination

#### Red blood cell morphology

Some years ago, Failey et al<sup>10</sup> observed that red cells in the urine of patients with renal disease showed dysmorphic changes when examined by phase-contrast microscopy. The cells had a variety of shapes and sizes — some were fragmented and some had bizarre membrane protrusions.

These changes were thought to be the result of the cells passing through damaged glomeruli.

When haematuria is present at a significant level, the detection of dysmorphic changes in significant numbers of red cells may be useful in predicting a glomerular source.<sup>11</sup> However, the correlation is not perfect, and transport and storage conditions may induce artefactual changes which confuse the picture.

The specimen should be from the bladder, so a midstream urine is appropriate, preferably after the patient has not passed urine for several hours. The specimen should be stored and transported at 4°C.

#### Renal tubular casts

The presence of different types of cast, seen best in a gently centrifuged specimen of fresh urine, may indicate renal disease. Red cell, white cell and granular casts may be of pathological significance, while hyaline casts are less specific for glomerular disease.

#### Crystals

Crystalline elements are commonly seen in urine but instances where they are clinically significant are rare. Phosphates, urates and oxalates are especially common, occur in normal urine sediment and only develop as the urine cools — most will disappear when heated to 37°C. However, a few types may indicate important underlying disease, such as cystine.

#### References

1. Pezzlo, M. Detection of urinary tract infections by rapid methods. *Clinical Microbiology Reviews* 1988; 1:268-80.
2. Semeniuk, H, Church D. Evaluation of the leucocyte esterase and nitrite urine dipstick screening tests for detection of bacteriuria in women with suspected uncomplicated urinary tract infections. *Journal of Clinical Microbiology* 1999; 37:3051-52.
3. Van Nostrand JD, Junkins AD, Bartholdi RK. Poor predictive ability of urinalysis and microscopic examination to detect urinary tract infection. *American Journal of Clinical Pathology* 2000; 113:709-13.
4. Kass EH. Asymptomatic infections of the urinary tract. *Transactions of the Association of American Physicians* 1956; 69:53-63.
5. Orenstein R, Wong ES. Urinary tract infections in adults. *American Family Physician* 1999; 59:1225-37.
6. Stamm WE, et al. Diagnosis of coliform infection in acutely dysuric women. *New England Journal of Medicine* 1982; 307:463-68.
7. Roy LP. Childhood urinary infections. *Australian Prescriber* 1999; 22:40-43.
8. Nicolle LE. Asymptomatic bacteriuria in the elderly. *Infectious Disease Clinics of North America* 1997; 11:647-62.
9. Patterson TF, Andriole VT. Detection, significance and therapy of bacteriuria in pregnancy. *Infectious Disease Clinics of North America* 1997; 11:13-26.
10. Fairley KF, Birch DF. Haematuria: A simple method for identifying glomerular bleeding. *Kidney International* 1982; 21:105-08.
11. Schranek P, Georgopoulos M, Maier M. et al. Value of urinary erythrocyte morphology in assessment of symptomless microhaematuria. *Lancet* 1989; 1316.

# For the treatment of chronic hepatitis C

**REBETRON™**  
(interferon alfa-2b, recombinant + ribavirin)



**REBETRON COMBINATION THERAPY Indications:**

Chronic hepatitis C in alpha interferon treatment naïve patients and in patients relapsed following alpha interferon monotherapy; patients must be >18 yrs and have compensated liver disease.

**Contraindications:** Hypersensitivity to ribavirin/alpha interferon/any components of Rebetron; pregnancy, pregnancy in partner; lactation; severe cardiac disease; haemoglobinopathies; renal impairment; epilepsy, compromised CNS function; decompensated hepatic cirrhosis; concomitant immunosuppressives (excluding short-term corticosteroids); autoimmune disease (especially hepatitis); immunosuppressed transplant recipients; uncontrolled thyroid disease; severe psychiatric disorder (or history), especially if severe depressed/suicidal.

**Precautions:** Rebetol not to be used alone; ribavirin teratogenic risk: Extreme care must be taken to avoid pregnancy in female patients and in partners of male patients on Rebetron therapy. Do not initiate therapy until a report of a negative pregnancy test has been obtained. Women of childbearing potential and men must use two forms of effective contraception during treatment and for six months post-treatment. Routine monthly pregnancy tests must be performed during this time.

BEFORE PRESCRIBING, PLEASE REVIEW THE FULL REBETRON PRODUCT INFORMATION WHICH IS AVAILABLE FROM SCHERING-PLOUGH PTY LIMITED

™Trademark: 04/02 SCH1180/CJB

If pregnancy does occur during treatment/six months post-treatment, the patient must be advised of the significant teratogenic risk of ribavirin to the foetus. Haemolysis; debilitating medical conditions (pulmonary disease, diabetes); coagulation disorders, severe myelosuppression; m-cresol (preservative); liver function abnormalities; hypotension; fever (flu-like syndrome); pulmonary function impairment (concomitant use with Shosaikoto – Chinese herb); ocular changes; CNS effects (depression); cardiovascular disorders; psoriasis, auto-antibodies; thyroid abnormalities; regular blood tests (FBC, blood chemistry, pregnancy tests, etc) prior to and during therapy; children; elderly. **Drug Interactions:** NRTIs (zidovudine, stavudine, didanosine, abacavir); narcotics, hypnotics or sedatives; xanthine derivatives (theophylline). **Adverse Reactions:** Flu-like syndrome (include fatigue, fever; headache, malaise, myalgia/arthralgia); asthenia; rigors; weight loss; dizziness; GI effects (abdominal pain, anorexia, diarrhoea, dyspepsia, nausea); musculoskeletal pain; CNS/psychiatric effects (anxiety, impaired concentration, depression, insomnia, irritability); anaemia, other haematological changes; dyspnoea; Dermatological effects (alopecia, pruritus/rash, dry skin), others – see Product Information.

**BIOTRAX**

A division of Schering-Plough Pty Limited

ABN 57 000 235 245. 11 Gibbon Road, Baulkham Hills, NSW 2153.



## Eat our words.

The Dietitians Association of Australia (DAA) is the largest, professional nutrition-focused body in Australia. The DAA's mission is to support dietitians, and work towards better food, better health and better living for all Australians.

The DAA provides accurate and practical advice in all fields of nutrition – patient care, community nutrition and public health, food service and the food industry, research and teaching.

For further information on the DAA and nutrition for you or your patients, visit [www.daa.asn.au](http://www.daa.asn.au). To find an Accredited Practising Dietitian (APD) within the website, click onto 'Find a Dietitian'. Alternatively, phone 1800 812 942.



Better food, better health,  
better living for all.