

CENTER FOR DRUG EVALUATION AND RESEARCH

Approval Package for:

APPLICATION NUMBER:

020262Orig1s048

Trade Name: **Taxol**

Generic Name: **paclitaxel**

Sponsor: **Bristol-Myers Squibb Company**

Approval Date: **08/13/2010**

Indications: TAXOL is indicated as first-line and subsequent therapy for the treatment of advanced carcinoma of the ovary. As first-line therapy, TAXOL is indicated in combination with cisplatin

TAXOL is indicated for the adjuvant treatment of node-positive breast cancer administered sequentially to standard doxorubicin-containing combination chemotherapy.

TAXOL is indicated for the treatment of breast cancer after failure of combination chemotherapy for metastatic disease or relapse within 6 months of adjuvant chemotherapy. Prior therapy should have included an anthracycline unless clinically contraindicated.

TAXOL, in combination with cisplatin, is indicated for the first-line treatment of non-small cell lung cancer in patients who are not candidates for potentially curative surgery and/or radiation therapy.

TAXOL is indicated for the second-line treatment of AIDS-related Kaposi's sarcoma.

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**CENTER FOR DRUG EVALUATION AND
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APPROVAL LETTER



NDA 020262/S-048

SUPPLEMENT APPROVAL

Bristol-Myers Squibb Company
Attention: Beatrice Anduze-Faris, M.D.
Group Director, Mature Products, Global Regulatory Sciences
Bristol-Myers Squibb
P.O. Box 4000 (Mailstop D12-02)
Princeton, NJ 08543-4000

Dear Dr. Anduze-Faris:

Please refer to your supplemental new drug application dated November 21, 2007, received November 21, 2007, submitted under section 505(b) of the Federal Food, Drug, and Cosmetic Act (FDCA) for Taxol® (paclitaxel) for Injection 30 mg, 100 mg, and 300 mg.

We also refer to your submission dated May 14, 2010.

This “Changes Being Effected” supplemental new drug application provides for

- revised statement regarding TAXOL use with inducers, substrates, or inhibitors for cytochrome P450 isoenzymes in PRECAUTIONS: Drug Interactions section
- added statement regarding monitoring of cardiac function when TAXOL is used with Doxorubicin in PRECAUTIONS: Cardiovascular section
- updating of the ADVERSE REACTIONS: Respiratory, Neurologic, Renal, Gastrointestinal, and Other Events subsections with new information
- added statements regarding opportunistic infections, and elevated liver function tests and renal toxicity in Kaposi’s sarcoma patients to ADVERSE Event Experiences by Body System section;
- added additional adverse events when TAXOL is combine with other chemotherapy, notably anthracyclines, in ADVERSE REACTIONS: Adverse Event Experiences by Body System – Cardiovascular and Other Clinical Events section;
- added safe handling of primary package to the HOW SUPPLIED: Handling and Disposal section
- updating of the REFERENCES
- added test to PATIENT INFORMATION section
- minor editorial changes were made to the package insert
- removal of Bristol-Myers Squibb Oncology logo

We have completed our review of this supplemental application, as amended. It is approved, effective on the date of this letter, for use as recommended in the enclosed, agreed-upon labeling text.

As soon as possible, but no later than 14 days from the date of this letter, submit, using the FDA automated drug registration and listing system (eLIST), the content of labeling [21 CFR 314.50(l)] in structured product labeling (SPL) format, as described at <http://www.fda.gov/ForIndustry/DataStandards/StructuredProductLabeling/default.htm>, that is identical to the enclosed labeling (text for the package insert, text for the patient package insert) and include the labeling changes proposed in any pending “Changes Being Effectuated” (CBE) supplements. Information on submitting SPL files using eLIST may be found in the guidance for industry titled “SPL Standard for Content of Labeling Technical Qs and As” at <http://www.fda.gov/downloads/DrugsGuidanceComplianceRegulatoryInformation/Guidances/UCM072392.pdf>.

The SPL will be accessible from publicly available labeling repositories.

Also within 14 days, amend all pending supplemental applications for this NDA, including pending “Changes Being Effectuated” (CBE) supplements, for which FDA has not yet issued an action letter, with the content of labeling [21 CFR 314.50(l)(1)(i)] in MS Word format that includes the changes approved in this supplemental application.

Submit final printed labeling, except with the revisions listed above, as soon as they are available, but no more than 30 days after they are printed. The final printed labeling (FPL) must be identical to the enclosed labeling (package insert, patient information), and must be in the “Drug Facts” format (21 CFR 201.66), where applicable.

The final printed labeling should be submitted electronically according to the guidance for industry titled “Providing Regulatory Submissions in Electronic Format – Human Pharmaceutical Product Applications and Related Submissions Using the eCTD Specifications (October 2005)”. Alternatively, you may submit 12 paper copies, with 6 of the copies individually mounted on heavy-weight paper or similar material. For administrative purposes, designate this submission “Final Printed Labeling for approved NDA 020262/S-048.” Approval of this submission by FDA is not required before the labeling is used.

You may request advisory comments on proposed introductory advertising and promotional labeling. To do so, submit, in triplicate, a cover letter requesting advisory comments, the proposed materials in draft or mock-up form with annotated references, and the package insert(s) to:

Food and Drug Administration
Center for Drug Evaluation and Research
Division of Drug Marketing, Advertising, and Communications
5901-B Ammendale Road
Beltsville, MD 20705-1266

As required under 21 CFR 314.81(b)(3)(i), you must submit final promotional materials, and the package insert(s), at the time of initial dissemination or publication, accompanied by a Form FDA 2253. For instruction on completing the Form FDA 2253, see page 2 of the Form. For more information about submission of promotional materials to the Division of Drug Marketing,

Advertising, and Communications (DDMAC), see
<http://www.fda.gov/AboutFDA/CentersOffices/CDER/ucm090142.htm>.

If you decide to issue a letter communicating important safety-related information about this drug product (i.e., a “Dear Health Care Professional” letter), we request that you submit, at least 24 hours prior to issuing the letter, an electronic copy of the letter to this NDA, to CDERMedWatchSafetyAlerts@fda.hhs.gov, and to the following address:

MedWatch
Food and Drug Administration
Suite 12B-05
5600 Fishers Lane
Rockville, MD 20857

We remind you that you must comply with reporting requirements for an approved NDA (21 CFR 314.80 and 314.81).

If you have any questions, call Lisa Skarupa, Regulatory Project Manager, at (301) 796-2219.

Sincerely,

{See appended electronic signature page}

Amna Ibrahim, M.D.
Deputy Director
Division of Drug Oncology Products
Office of Oncology Drug Products
Center for Drug Evaluation and Research

ENCLOSURE(S):
Content of Labeling

Application Type/Number	Submission Type/Number	Submitter Name	Product Name
NDA-20262	SUPPL-48	BRISTOL MYERS SQUIBB CO PHARMACEUTICA L RESEARCH INSTITUTE	TAXOL (PACLITAXEL) INJ

This is a representation of an electronic record that was signed electronically and this page is the manifestation of the electronic signature.

/s/

AMNA IBRAHIM
08/13/2010

**CENTER FOR DRUG EVALUATION AND
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APPLICATION NUMBER:
020262Orig1s048

LABELING

TAXOL[®] (paclitaxel) INJECTION

(Patient Information Included)

WARNING

TAXOL[®] (paclitaxel) should be administered under the supervision of a physician experienced in the use of cancer chemotherapeutic agents. Appropriate management of complications is possible only when adequate diagnostic and treatment facilities are readily available.

Anaphylaxis and severe hypersensitivity reactions characterized by dyspnea and hypotension requiring treatment, angioedema, and generalized urticaria have occurred in 2 to 4% of patients receiving TAXOL in clinical trials. Fatal reactions have occurred in patients despite premedication. All patients should be pretreated with corticosteroids, diphenhydramine, and H₂ antagonists. (See **DOSAGE AND ADMINISTRATION.**) Patients who experience severe hypersensitivity reactions to TAXOL should not be rechallenged with the drug.

TAXOL therapy should not be given to patients with solid tumors who have baseline neutrophil counts of less than 1500 cells/mm³ and should not be given to patients with AIDS-related Kaposi's sarcoma if the baseline neutrophil count is less than 1000 cells/mm³. In order to monitor the occurrence of bone marrow suppression, primarily neutropenia, which may be severe and result in infection, it is recommended that frequent peripheral blood cell counts be performed on all patients receiving TAXOL.

DESCRIPTION

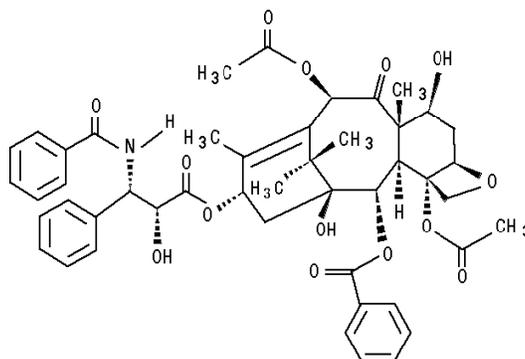
TAXOL (paclitaxel) Injection is a clear, colorless to slightly yellow viscous solution. It is supplied as a nonaqueous solution intended for dilution with a suitable parenteral fluid prior to intravenous infusion. TAXOL is available in 30 mg (5 mL), 100 mg (16.7 mL), and 300 mg (50 mL) multidose vials. Each mL of sterile nonpyrogenic solution contains 6 mg paclitaxel, 527 mg of purified Cremophor[®] EL* (polyoxyethylated castor oil) and 49.7% (v/v) dehydrated alcohol, USP.

Paclitaxel is a natural product with antitumor activity. TAXOL (paclitaxel) is obtained via a semi-synthetic process from *Taxus baccata*. The chemical name for paclitaxel is 5 β ,20-Epoxy-

*Cremophor[®] EL is the registered trademark of BASF Aktiengesellschaft.
Cremophor[®] EL is further purified by a Bristol-Myers Squibb Company proprietary process before use.

1,2 α ,4,7 β ,10 β ,13 α -hexahydroxytax-11-en-9-one 4,10-diacetate 2-benzoate 13-ester with (2*R*,3*S*)-*N*-benzoyl-3-phenylisoserine.

Paclitaxel has the following structural formula:



Paclitaxel is a white to off-white crystalline powder with the empirical formula $C_{47}H_{51}NO_{14}$ and a molecular weight of 853.9. It is highly lipophilic, insoluble in water, and melts at around 216–217° C.

CLINICAL PHARMACOLOGY

Paclitaxel is a novel antimicrotubule agent that promotes the assembly of microtubules from tubulin dimers and stabilizes microtubules by preventing depolymerization. This stability results in the inhibition of the normal dynamic reorganization of the microtubule network that is essential for vital interphase and mitotic cellular functions. In addition, paclitaxel induces abnormal arrays or “bundles” of microtubules throughout the cell cycle and multiple asters of microtubules during mitosis.

Following intravenous administration of TAXOL, paclitaxel plasma concentrations declined in a biphasic manner. The initial rapid decline represents distribution to the peripheral compartment and elimination of the drug. The later phase is due, in part, to a relatively slow efflux of paclitaxel from the peripheral compartment.

Pharmacokinetic parameters of paclitaxel following 3- and 24-hour infusions of TAXOL at dose levels of 135 and 175 mg/m² were determined in a Phase 3 randomized study in ovarian cancer patients and are summarized in the following table.

TABLE 1
SUMMARY OF PHARMACOKINETIC PARAMETERS—MEAN VALUES

Dose (mg/m ²)	Infusion Duration (h)	N (patients)	C _{max} (ng/mL)	AUC _(0-∞) (ng•h/mL)	T-HALF (h)	CL _T (L/h/m ²)
135	24	2	195	6300	52.7	21.7
175	24	4	365	7993	15.7	23.8
135	3	7	2170	7952	13.1	17.7
175	3	5	3650	15007	20.2	12.2

C_{max}=Maximum plasma concentration

AUC_(0-∞)=Area under the plasma concentration-time curve from time 0 to infinity

CL_T=Total body clearance

It appeared that with the 24-hour infusion of TAXOL, a 30% increase in dose (135 mg/m² vs 175 mg/m²) increased the C_{max} by 87%, whereas the AUC_(0-∞) remained proportional. However, with a 3-hour infusion, for a 30% increase in dose, the C_{max} and AUC_(0-∞) were increased by 68% and 89%, respectively. The mean apparent volume of distribution at steady state, with the 24-hour infusion of TAXOL, ranged from 227 to 688 L/m², indicating extensive extravascular distribution and/or tissue binding of paclitaxel.

The pharmacokinetics of paclitaxel were also evaluated in adult cancer patients who received single doses of 15 to 135 mg/m² given by 1-hour infusions (n=15), 30 to 275 mg/m² given by 6-hour infusions (n=36), and 200 to 275 mg/m² given by 24-hour infusions (n=54) in Phase 1 and 2 studies. Values for CL_T and volume of distribution were consistent with the findings in the Phase 3 study. The pharmacokinetics of TAXOL in patients with AIDS-related Kaposi's sarcoma have not been studied.

In vitro studies of binding to human serum proteins, using paclitaxel concentrations ranging from 0.1 to 50 µg/mL, indicate that between 89 to 98% of drug is bound; the presence of cimetidine, ranitidine, dexamethasone, or diphenhydramine did not affect protein binding of paclitaxel.

After intravenous administration of 15 to 275 mg/m² doses of TAXOL as 1-, 6-, or 24-hour infusions, mean values for cumulative urinary recovery of unchanged drug ranged from 1.3% to 12.6% of the dose, indicating extensive non-renal clearance. In 5 patients administered a 225 or 250 mg/m² dose of radiolabeled TAXOL as a 3-hour infusion, a mean of 71% of the radioactivity was excreted in the feces in 120 hours, and 14% was recovered in the urine. Total recovery of radioactivity ranged from 56% to 101% of the dose. Paclitaxel represented a mean of 5% of the administered radioactivity recovered in the feces, while metabolites, primarily 6α-hydroxypaclitaxel, accounted for the balance. *In vitro* studies with human liver microsomes and

tissue slices showed that paclitaxel was metabolized primarily to 6 α -hydroxypaclitaxel by the cytochrome P450 isozyme CYP2C8; and to 2 minor metabolites, 3'-*p*-hydroxypaclitaxel and 6 α , 3'-*p*-dihydroxypaclitaxel, by CYP3A4. *In vitro*, the metabolism of paclitaxel to 6 α -hydroxypaclitaxel was inhibited by a number of agents (ketoconazole, verapamil, diazepam, quinidine, dexamethasone, cyclosporin, teniposide, etoposide, and vincristine), but the concentrations used exceeded those found *in vivo* following normal therapeutic doses. Testosterone, 17 α -ethinyl estradiol, retinoic acid, and quercetin, a specific inhibitor of CYP2C8, also inhibited the formation of 6 α -hydroxypaclitaxel *in vitro*. The pharmacokinetics of paclitaxel may also be altered *in vivo* as a result of interactions with compounds that are substrates, inducers, or inhibitors of CYP2C8 and/or CYP3A4. (See **PRECAUTIONS: Drug Interactions.**)

The disposition and toxicity of paclitaxel 3-hour infusion were evaluated in 35 patients with varying degrees of hepatic function. Relative to patients with normal bilirubin, plasma paclitaxel exposure in patients with abnormal serum bilirubin ≤ 2 times upper limit of normal (ULN) administered 175 mg/m² was increased, but with no apparent increase in the frequency or severity of toxicity. In 5 patients with serum total bilirubin > 2 times ULN, there was a statistically nonsignificant higher incidence of severe myelosuppression, even at a reduced dose (110 mg/m²), but no observed increase in plasma exposure. (See **PRECAUTIONS: Hepatic and DOSAGE AND ADMINISTRATION.**) The effect of renal dysfunction on the disposition of paclitaxel has not been investigated.

Possible interactions of paclitaxel with concomitantly administered medications have not been formally investigated.

CLINICAL STUDIES

Ovarian Carcinoma

First-Line Data: The safety and efficacy of TAXOL followed by cisplatin in patients with advanced ovarian cancer and no prior chemotherapy were evaluated in 2, Phase 3 multicenter, randomized, controlled trials. In an Intergroup study led by the European Organization for Research and Treatment of Cancer involving the Scandinavian Group NOCOVA, the National Cancer Institute of Canada, and the Scottish Group, 680 patients with Stage II_{B-C}, III, or IV disease (optimally or non-optimally debulked) received either TAXOL 175 mg/m² infused over 3 hours followed by cisplatin 75 mg/m² (Tc) or cyclophosphamide 750 mg/m² followed by cisplatin 75 mg/m² (Cc) for a median of 6 courses. Although the protocol allowed further

therapy, only 15% received both drugs for 9 or more courses. In a study conducted by the Gynecological Oncology Group (GOG), 410 patients with Stage III or IV disease (>1 cm residual disease after staging laparotomy or distant metastases) received either TAXOL 135 mg/m² infused over 24 hours followed by cisplatin 75 mg/m² or cyclophosphamide 750 mg/m² followed by cisplatin 75 mg/m² for 6 courses.

In both studies, patients treated with TAXOL (paclitaxel) in combination with cisplatin had significantly higher response rate, longer time to progression, and longer survival time compared with standard therapy. These differences were also significant for the subset of patients in the Intergroup study with non-optimally debulked disease, although the study was not fully powered for subset analyses (**TABLES 2A** and **2B**). Kaplan-Meier survival curves for each study are shown in **FIGURES 1** and **2**.

TABLE 2A
EFFICACY IN THE PHASE 3 FIRST-LINE OVARIAN CARCINOMA STUDIES

	Intergroup (non-optimally debulked subset)		GOG-111	
	T175/3 ^a c75 (n=218)	C750 ^a c75 (n=227)	T135/24 ^a c75 (n=196)	C750 ^a c75 (n=214)
• Clinical Response ^b	(n=153)	(n=153)	(n=113)	(n=127)
—rate (percent)	58	43	62	48
—p-value ^c		0.016		0.04
• Time to Progression				
—median (months)	13.2	9.9	16.6	13.0
—p-value ^c		0.0060		0.0008
—hazard ratio (HR) ^c		0.76		0.70
—95% CI ^c		0.62–0.92		0.56–0.86
• Survival				
—median (months)	29.5	21.9	35.5	24.2
—p-value ^c		0.0057		0.0002
—hazard ratio ^c		0.73		0.64
—95% CI ^c		0.58–0.91		0.50–0.81

^a TAXOL dose in mg/m²/infusion duration in hours; cyclophosphamide and cisplatin doses in mg/m².

^b Among patients with measurable disease only.

^c Unstratified for the Intergroup Study, Stratified for Study GOG-111.

TABLE 2B
EFFICACY IN THE PHASE 3 FIRST-LINE OVARIAN CARCINOMA INTERGROUP STUDY

	T175/3 ^a c75 (n=342)	C750 ^a c75 (n=338)
• Clinical Response ^b	(n=162)	(n=161)
—rate (percent)	59	45
—p-value ^c		0.014
• Time to Progression		
—median (months)	15.3	11.5
—p-value ^c		0.0005
—hazard ratio ^c		0.74
—95% CI ^c		0.63–0.88
• Survival		
—median (months)	35.6	25.9
—p-value ^c		0.0016
—hazard ratio ^c		0.73
—95% CI ^c		0.60–0.89

^a TAXOL dose in mg/m²/infusion duration in hours; cyclophosphamide and cisplatin doses in mg/m².

^b Among patients with measurable disease only.

^c Unstratified.

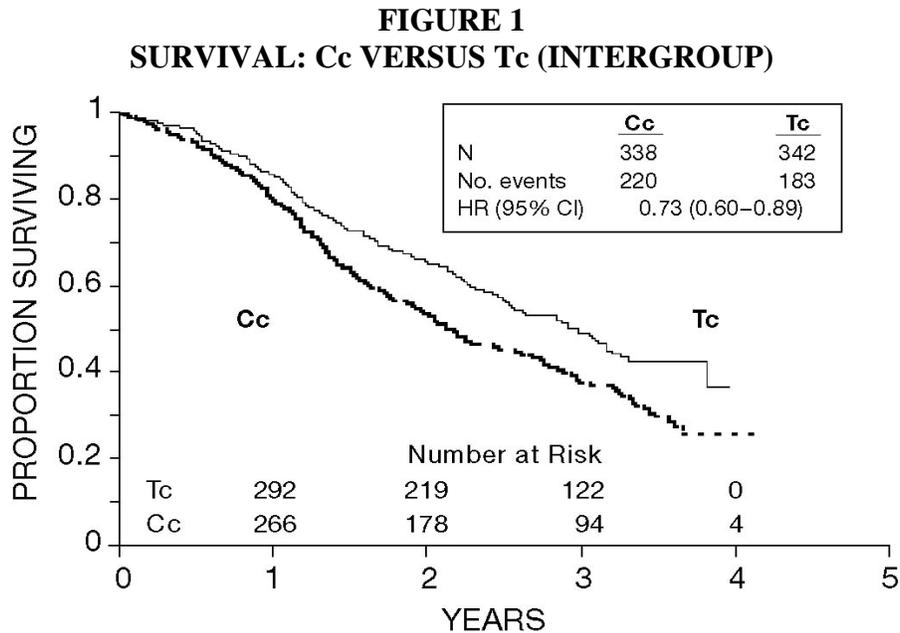
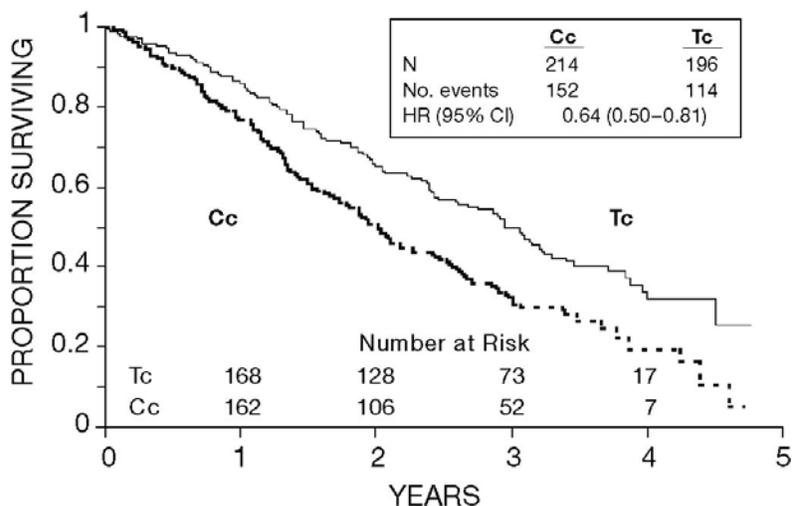


FIGURE 2
SURVIVAL: Cc VERSUS Tc (GOG-111)



The adverse event profile for patients receiving TAXOL in combination with cisplatin in these studies was qualitatively consistent with that seen for the pooled analysis of data from 812 patients treated with single-agent TAXOL in 10 clinical studies. These adverse events and adverse events from the Phase 3 first-line ovarian carcinoma studies are described in the **ADVERSE REACTIONS** section in tabular (**TABLES 10** and **11**) and narrative form.

Second-Line Data: Data from 5, Phase 1 and 2 clinical studies (189 patients), a multicenter randomized Phase 3 study (407 patients), as well as an interim analysis of data from more than 300 patients enrolled in a treatment referral center program were used in support of the use of TAXOL in patients who have failed initial or subsequent chemotherapy for metastatic carcinoma of the ovary. Two of the Phase 2 studies (92 patients) utilized an initial dose of 135 to 170 mg/m² in most patients (>90%) administered over 24 hours by continuous infusion. Response rates in these 2 studies were 22% (95% CI, 11–37%) and 30% (95% CI, 18–46%) with a total of 6 complete and 18 partial responses in 92 patients. The median duration of overall response in these 2 studies measured from the first day of treatment was 7.2 months (range, 3.5–15.8 months) and 7.5 months (range, 5.3–17.4 months), respectively. The median survival was 8.1 months (range, 0.2–36.7 months) and 15.9 months (range, 1.8–34.5+ months).

The Phase 3 study had a bifactorial design and compared the efficacy and safety of TAXOL (paclitaxel), administered at 2 different doses (135 or 175 mg/m²) and schedules (3- or 24-hour infusion). The overall response rate for the 407 patients was 16.2% (95% CI, 12.8–20.2%), with 6 complete and 60 partial responses. Duration of response, measured from the first day of

treatment was 8.3 months (range, 3.2–21.6 months). Median time to progression was 3.7 months (range, 0.1+ to 25.1+ months). Median survival was 11.5 months (range, 0.2 to 26.3+ months).

Response rates, median survival, and median time to progression for the 4 arms are given in the following table.

TABLE 3
EFFICACY IN THE PHASE 3 SECOND-LINE OVARIAN CARCINOMA STUDY

	175/3 (n=96)	175/24 (n=106)	135/3 (n=99)	135/24 (n=106)
• Response				
—rate (percent)	14.6	21.7	15.2	13.2
—95% Confidence Interval	(8.5–23.6)	(14.5–31.0)	(9.0–24.1)	(7.7–21.5)
• Time to Progression				
—median (months)	4.4	4.2	3.4	2.8
—95% Confidence Interval	(3.0–5.6)	(3.5–5.1)	(2.8–4.2)	(1.9–4.0)
• Survival				
—median (months)	11.5	11.8	13.1	10.7
—95% Confidence Interval	(8.4–14.4)	(8.9–14.6)	(9.1–14.6)	(8.1–13.6)

Analyses were performed as planned by the bifactorial study design described in the protocol, by comparing the 2 doses (135 or 175 mg/m²) irrespective of the schedule (3 or 24 hours) and the 2 schedules irrespective of dose. Patients receiving the 175 mg/m² dose had a response rate similar to that for those receiving the 135 mg/m² dose: 18% versus 14% (p=0.28). No difference in response rate was detected when comparing the 3-hour with the 24-hour infusion: 15% versus 17% (p=0.50). Patients receiving the 175 mg/m² dose of TAXOL had a longer time to progression than those receiving the 135 mg/m² dose: median 4.2 versus 3.1 months (p=0.03). The median time to progression for patients receiving the 3-hour versus the 24-hour infusion was 4.0 months versus 3.7 months, respectively. Median survival was 11.6 months in patients receiving the 175 mg/m² dose of TAXOL and 11.0 months in patients receiving the 135 mg/m² dose (p=0.92). Median survival was 11.7 months for patients receiving the 3-hour infusion of TAXOL and 11.2 months for patients receiving the 24-hour infusion (p=0.91). These statistical analyses should be viewed with caution because of the multiple comparisons made.

TAXOL remained active in patients who had developed resistance to platinum-containing therapy (defined as tumor progression while on, or tumor relapse within 6 months from completion of, a platinum-containing regimen) with response rates of 14% in the Phase 3 study and 31% in the Phase 1 and 2 clinical studies.

The adverse event profile in this Phase 3 study was consistent with that seen for the pooled analysis of data from 812 patients treated in 10 clinical studies. These adverse events and adverse events from the Phase 3 second-line ovarian carcinoma study are described in the **ADVERSE REACTIONS** section in tabular (**TABLES 10** and **12**) and narrative form.

The results of this randomized study support the use of TAXOL at doses of 135 to 175 mg/m², administered by a 3-hour intravenous infusion. The same doses administered by 24-hour infusion were more toxic. However, the study had insufficient power to determine whether a particular dose and schedule produced superior efficacy.

Breast Carcinoma

Adjuvant Therapy

A Phase 3 Intergroup study (Cancer and Leukemia Group B [CALGB], Eastern Cooperative Oncology Group [ECOG], North Central Cancer Treatment Group [NCCTG], and Southwest Oncology Group [SWOG]) randomized 3170 patients with node-positive breast carcinoma to adjuvant therapy with TAXOL or to no further chemotherapy following 4 courses of doxorubicin and cyclophosphamide (AC). This multicenter trial was conducted in women with histologically positive lymph nodes following either a mastectomy or segmental mastectomy and nodal dissections. The 3 x 2 factorial study was designed to assess the efficacy and safety of 3 different dose levels of doxorubicin (A) and to evaluate the effect of the addition of TAXOL administered following the completion of AC therapy. After stratification for the number of positive lymph nodes (1–3, 4–9, or 10+), patients were randomized to receive cyclophosphamide at a dose of 600 mg/m² and doxorubicin at doses of either 60 mg/m² (on day 1), 75 mg/m² (in 2 divided doses on days 1 and 2), or 90 mg/m² (in 2 divided doses on days 1 and 2 with prophylactic G-CSF support and ciprofloxacin) every 3 weeks for 4 courses and either TAXOL 175 mg/m² as a 3-hour infusion every 3 weeks for 4 additional courses or no additional chemotherapy. Patients whose tumors were positive were to receive subsequent tamoxifen treatment (20 mg daily for 5 years); patients who received segmental mastectomies prior to study were to receive breast irradiation after recovery from treatment-related toxicities.

At the time of the current analysis, median follow-up was 30.1 months. Of the 2066 patients who were hormone receptor positive, 93% received tamoxifen. The primary analyses of disease-free survival and overall survival used multivariate Cox models, which included TAXOL administration, doxorubicin dose, number of positive lymph nodes, tumor size, menopausal status, and estrogen receptor status as factors. Based on the model for disease-free survival, patients receiving AC followed by TAXOL had a 22% reduction in the risk of disease recurrence

compared to patients randomized to AC alone (Hazard Ratio [HR]=0.78, 95% CI, 0.67–0.91, p=0.0022). They also had a 26% reduction in the risk of death (HR=0.74, 95% CI, 0.60–0.92, p=0.0065). For disease-free survival and overall survival, p-values were not adjusted for interim analyses. Kaplan-Meier curves are shown in **FIGURES 3** and **4**. Increasing the dose of doxorubicin higher than 60 mg/m² had no effect on either disease-free survival or overall survival.

FIGURE 3
DISEASE-FREE SURVIVAL: AC VERSUS AC+T

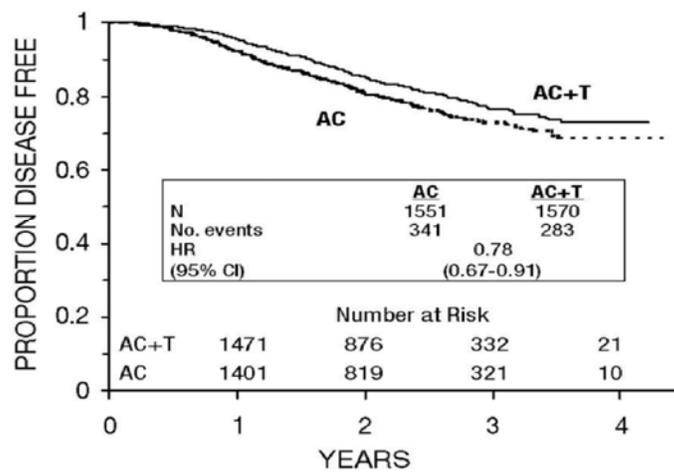
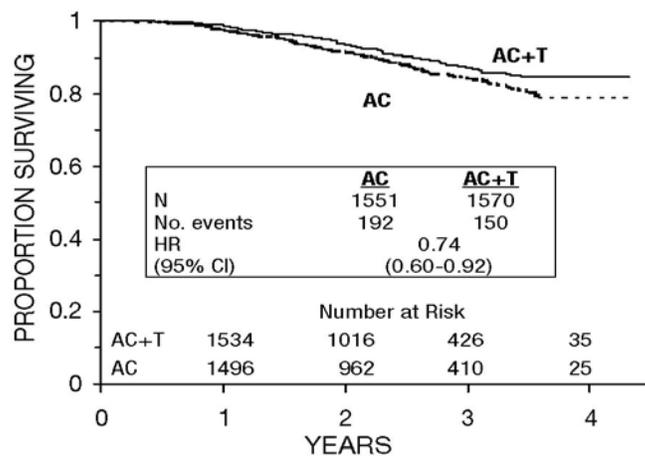


FIGURE 4
SURVIVAL: AC VERSUS AC+T



Subset analyses. Subsets defined by variables of known prognostic importance in adjuvant breast carcinoma were examined, including number of positive lymph nodes, tumor size, hormone

receptor status, and menopausal status. Such analyses must be interpreted with care, as the most secure finding is the overall study result. In general, a reduction in hazard similar to the overall reduction was seen with TAXOL (paclitaxel) for both disease-free and overall survival in all of the larger subsets with one exception; patients with receptor-positive tumors had a smaller reduction in hazard (HR=0.92) for disease-free survival with TAXOL than other groups. Results of subset analyses are shown in **TABLE 4**.

TABLE 4
SUBSET ANALYSES—ADJUVANT BREAST CARCINOMA STUDY

Patient Subset	No. of Patients	Disease-Free Survival		Overall Survival	
		No. of Recurrences	Hazard Ratio (95% CI)	No. of Deaths	Hazard Ratio (95% CI)
• No. of Positive Nodes					
1–3	1449	221	0.72 (0.55–0.94)	107	0.76 (0.52–1.12)
4–9	1310	274	0.78 (0.61–0.99)	148	0.66 (0.47–0.91)
10+	360	129	0.93 (0.66–1.31)	87	0.90 (0.59–1.36)
• Tumor Size (cm)					
≤2	1096	153	0.79 (0.57–1.08)	67	0.73 (0.45–1.18)
>2 and ≤5	1611	358	0.79 (0.64–0.97)	201	0.74 (0.56–0.98)
>5	397	111	0.75 (0.51–1.08)	72	0.73 (0.46–1.16)
• Menopausal Status					
Pre	1929	374	0.83 (0.67–1.01)	187	0.72 (0.54–0.97)
Post	1183	250	0.73 (0.57–0.93)	155	0.77 (0.56–1.06)
• Receptor Status					
Positive ^a	2066	293	0.92 (0.73–1.16)	126	0.83 (0.59–1.18)
Negative/Unknown ^b	1055	331	0.68 (0.55–0.85)	216	0.71 (0.54–0.93)

^a Positive for either estrogen or progesterone receptors.

^b Negative or missing for both estrogen and progesterone receptors (both missing: n=15).

These retrospective subgroup analyses suggest that the beneficial effect of TAXOL (paclitaxel) is clearly established in the receptor-negative subgroup, but the benefit in receptor-positive patients is not yet clear. With respect to menopausal status, the benefit of TAXOL is consistent (see **TABLE 4** and **FIGURES 5–8**).

FIGURE 5
DISEASE-FREE SURVIVAL—RECEPTOR STATUS NEGATIVE/UNKNOWN
AC VERSUS AC+T

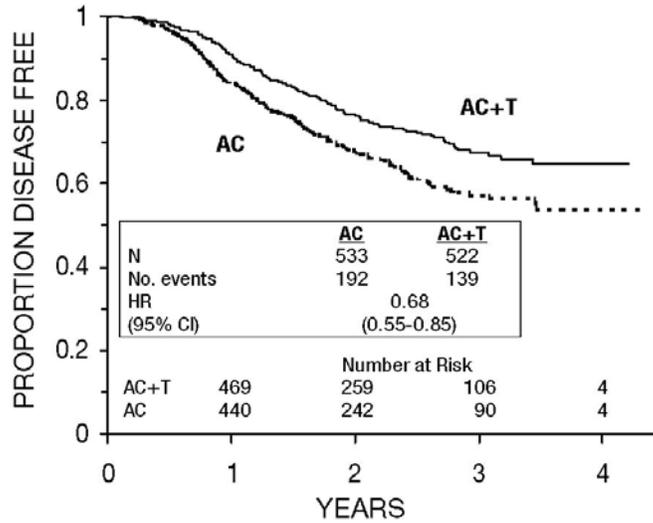


FIGURE 6
DISEASE-FREE SURVIVAL—RECEPTOR STATUS POSITIVE
AC VERSUS AC+T

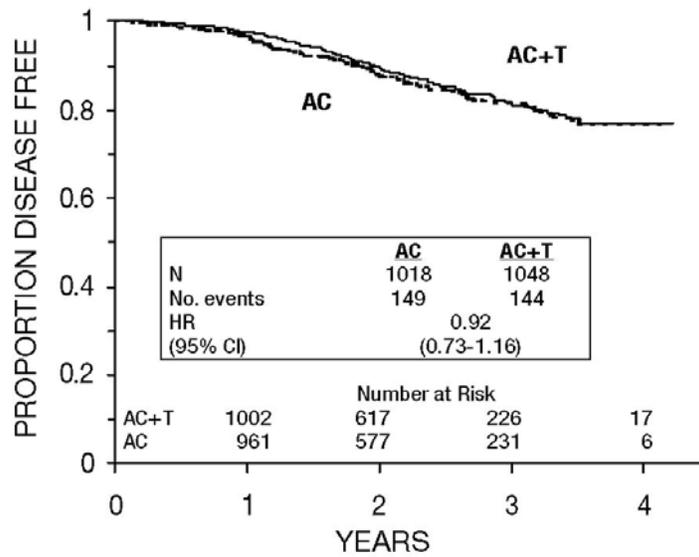


FIGURE 7
DISEASE-FREE SURVIVAL—PREMENOPAUSAL
AC VERSUS AC+T

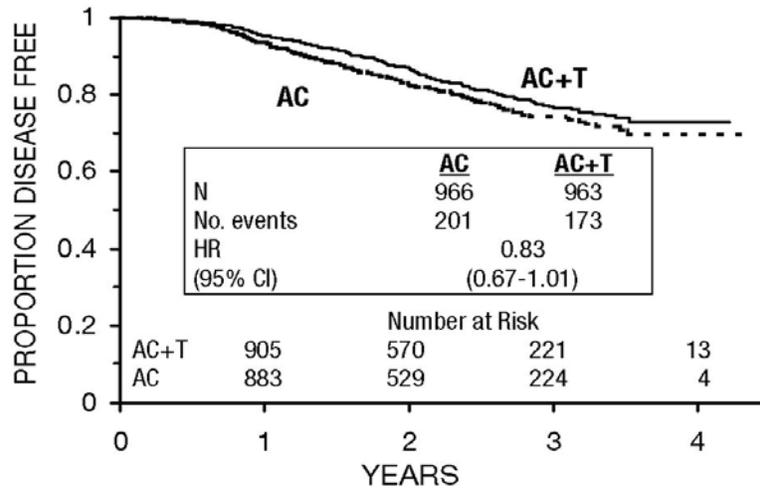
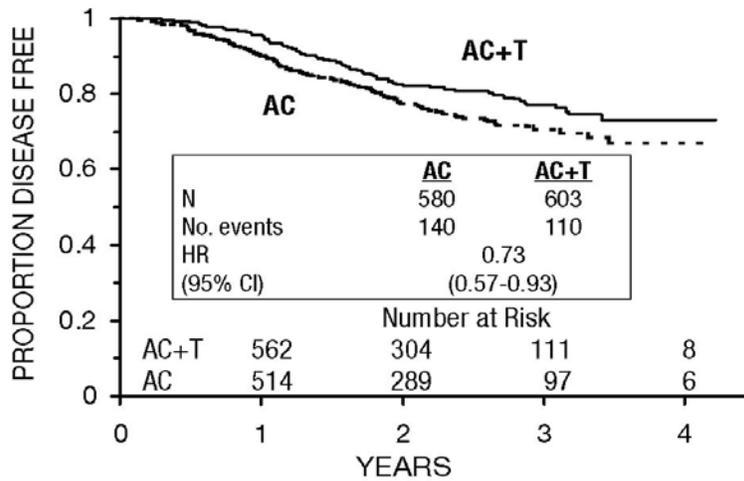


FIGURE 8
DISEASE-FREE SURVIVAL—POSTMENOPAUSAL
AC VERSUS AC+T



The adverse event profile for the patients who received TAXOL subsequent to AC was consistent with that seen in the pooled analysis of data from 812 patients (**TABLE 10**) treated with single-agent TAXOL in 10 clinical studies. These adverse events are described in the **ADVERSE REACTIONS** section in tabular (**TABLES 10** and **13**) and narrative form.

After Failure of Initial Chemotherapy

Data from 83 patients accrued in 3, Phase 2 open-label studies and from 471 patients enrolled in a Phase 3 randomized study were available to support the use of TAXOL in patients with metastatic breast carcinoma.

Phase 2 open-label studies: Two studies were conducted in 53 patients previously treated with a maximum of 1 prior chemotherapeutic regimen. TAXOL was administered in these 2 trials as a 24-hour infusion at initial doses of 250 mg/m² (with G-CSF support) or 200 mg/m². The response rates were 57% (95% CI, 37–75%) and 52% (95% CI, 32–72%), respectively. The third Phase 2 study was conducted in extensively pretreated patients who had failed anthracycline therapy and who had received a minimum of 2 chemotherapy regimens for the treatment of metastatic disease. The dose of TAXOL was 200 mg/m² as a 24-hour infusion with G-CSF support. Nine of 30 patients achieved a partial response, for a response rate of 30% (95% CI, 15–50%).

Phase 3 randomized study: This multicenter trial was conducted in patients previously treated with 1 or 2 regimens of chemotherapy. Patients were randomized to receive TAXOL (paclitaxel) at a dose of either 175 mg/m² or 135 mg/m² given as a 3-hour infusion. In the 471 patients enrolled, 60% had symptomatic disease with impaired performance status at study entry, and 73% had visceral metastases. These patients had failed prior chemotherapy either in the adjuvant setting (30%), the metastatic setting (39%), or both (31%). Sixty-seven percent of the patients had been previously exposed to anthracyclines and 23% of them had disease considered resistant to this class of agents.

The overall response rate for the 454 evaluable patients was 26% (95% CI, 22–30%), with 17 complete and 99 partial responses. The median duration of response, measured from the first day of treatment, was 8.1 months (range, 3.4–18.1+ months). Overall for the 471 patients, the median time to progression was 3.5 months (range, 0.03–17.1 months). Median survival was 11.7 months (range, 0–18.9 months).

Response rates, median survival and median time to progression for the 2 arms are given in the following table.

TABLE 5
EFFICACY IN BREAST CANCER AFTER FAILURE OF INITIAL CHEMOTHERAPY OR WITHIN 6 MONTHS OF ADJUVANT CHEMOTHERAPY

	175/3 (n=235)		135/3 (n=236)
• Response			
—rate (percent)	28		22
—p-value		0.135	
• Time to Progression			
—median (months)	4.2		3.0
—p-value		0.027	
• Survival			
—median (months)	11.7		10.5
—p-value		0.321	

The adverse event profile of the patients who received single-agent TAXOL in the Phase 3 study was consistent with that seen for the pooled analysis of data from 812 patients treated in 10 clinical studies. These adverse events and adverse events from the Phase 3 breast carcinoma study are described in the **ADVERSE REACTIONS** section in tabular (**TABLES 10** and **14**) and narrative form.

Non-Small Cell Lung Carcinoma (NSCLC)

In a Phase 3 open-label randomized study conducted by the ECOG, 599 patients were randomized to either TAXOL (T) 135 mg/m² as a 24-hour infusion in combination with cisplatin (c) 75 mg/m², TAXOL (T) 250 mg/m² as a 24-hour infusion in combination with cisplatin (c) 75 mg/m² with G-CSF support, or cisplatin (c) 75 mg/m² on day 1, followed by etoposide (VP) 100 mg/m² on days 1, 2, and 3 (control).

Response rates, median time to progression, median survival, and 1-year survival rates are given in the following table. The reported p-values have not been adjusted for multiple comparisons. There were statistically significant differences favoring each of the TAXOL plus cisplatin arms for response rate and time to tumor progression. There was no statistically significant difference in survival between either TAXOL plus cisplatin arm and the cisplatin plus etoposide arm.

TABLE 6
EFFICACY PARAMETERS IN THE PHASE 3 FIRST-LINE NSCLC STUDY

	T135/24 c75 (n=198)	T250/24 c75 (n=201)	VP100 ^a c75 (n=200)
• Response			
—rate (percent)	25	23	12
—p-value ^b	0.001	<0.001	
• Time to Progression			
—median (months)	4.3	4.9	2.7
—p-value ^b	0.05	0.004	
• Survival			
—median (months)	9.3	10.0	7.4
—p-value ^b	0.12	0.08	
• 1-Year Survival			
—percent of patients	36	40	32

^a Etoposide (VP) 100 mg/m² was administered IV on days 1, 2, and 3.

^b Compared to cisplatin/etoposide.

In the ECOG study, the Functional Assessment of Cancer Therapy-Lung (FACT-L) questionnaire had 7 subscales that measured subjective assessment of treatment. Of the 7, the Lung Cancer Specific Symptoms subscale favored the TAXOL 135 mg/m²/24 hour plus cisplatin arm compared to the cisplatin/etoposide arm. For all other factors, there was no difference in the treatment groups.

The adverse event profile for patients who received TAXOL in combination with cisplatin in this study was generally consistent with that seen for the pooled analysis of data from 812 patients treated with single-agent TAXOL in 10 clinical studies. These adverse events and adverse events from the Phase 3 first-line NSCLC study are described in the **ADVERSE REACTIONS** section in tabular (**TABLES 10 and 15**) and narrative form.

AIDS-Related Kaposi's Sarcoma

Data from 2, Phase 2 open-label studies support the use of TAXOL (paclitaxel) as second-line therapy in patients with AIDS-related Kaposi's sarcoma. Fifty-nine of the 85 patients enrolled in these studies had previously received systemic therapy, including interferon alpha (32%), DaunoXome[®] (31%), DOXIL[®] (2%), and doxorubicin containing chemotherapy (42%), with 64% having received prior anthracyclines. Eighty-five percent of the pretreated patients had progressed on, or could not tolerate, prior systemic therapy.

DaunoXome[®] is a registered trademark of Gilead Sciences, Inc.

DOXIL[®] is a registered trademark of ALZA Corporation.

In Study CA139-174, patients received TAXOL at 135 mg/m² as a 3-hour infusion every 3 weeks (intended dose intensity 45 mg/m²/week). If no dose-limiting toxicity was observed, patients were to receive 155 mg/m² and 175 mg/m² in subsequent courses. Hematopoietic growth factors were not to be used initially. In Study CA139-281, patients received TAXOL at 100 mg/m² as a 3-hour infusion every 2 weeks (intended dose intensity 50 mg/m²/week). In this study patients could be receiving hematopoietic growth factors before the start of TAXOL therapy, or this support was to be initiated as indicated; the dose of TAXOL was not increased. The dose intensity of TAXOL used in this patient population was lower than the dose intensity recommended for other solid tumors.

All patients had widespread and poor-risk disease. Applying the ACTG staging criteria to patients with prior systemic therapy, 93% were poor risk for extent of disease (T₁), 88% had a CD4 count <200 cells/mm³ (I₁), and 97% had poor risk considering their systemic illness (S₁).

All patients in Study CA139-174 had a Karnofsky performance status of 80 or 90 at baseline; in Study CA139-281, there were 26 (46%) patients with a Karnofsky performance status of 70 or worse at baseline.

TABLE 7
EXTENT OF DISEASE AT STUDY ENTRY
Percent of Patients

	Prior Systemic Therapy (n=59)
Visceral ± edema ± oral ± cutaneous	42
Edema or lymph nodes ± oral ± cutaneous	41
Oral ± cutaneous	10
Cutaneous only	7

Although the planned dose intensity in the 2 studies was slightly different (45 mg/m²/week in Study CA139-174 and 50 mg/m²/week in Study CA139-281), delivered dose intensity was 38 to 39 mg/m²/week in both studies, with a similar range (20–24 to 51–61).

Efficacy: The efficacy of TAXOL was evaluated by assessing cutaneous tumor response according to the amended ACTG criteria and by seeking evidence of clinical benefit in patients in 6 domains of symptoms and/or conditions that are commonly related to AIDS-related Kaposi's sarcoma.

Cutaneous Tumor Response (Amended ACTG Criteria): The objective response rate was 59% (95% CI, 46–72%) (35 of 59 patients) in patients with prior systemic therapy. Cutaneous responses were primarily defined as flattening of more than 50% of previously raised lesions.

TABLE 8
OVERALL BEST RESPONSE (AMENDED ACTG CRITERIA)
Percent of Patients

	Prior Systemic Therapy (n=59)
Complete response	3
Partial response	56
Stable disease	29
Progression	8
Early death/toxicity	3

The median time to response was 8.1 weeks and the median duration of response measured from the first day of treatment was 10.4 months (95% CI, 7.0–11.0 months) for the patients who had previously received systemic therapy. The median time to progression was 6.2 months (95% CI, 4.6–8.7 months).

Additional Clinical Benefit: Most data on patient benefit were assessed retrospectively (plans for such analyses were not included in the study protocols). Nonetheless, clinical descriptions and photographs indicated clear benefit in some patients, including instances of improved pulmonary function in patients with pulmonary involvement, improved ambulation, resolution of ulcers, and decreased analgesic requirements in patients with Kaposi’s sarcoma (KS) involving the feet and resolution of facial lesions and edema in patients with KS involving the face, extremities, and genitalia.

Safety: The adverse event profile of TAXOL administered to patients with advanced HIV disease and poor-risk AIDS-related Kaposi’s sarcoma was generally similar to that seen in the pooled analysis of data from 812 patients with solid tumors. These adverse events and adverse events from the Phase 2 second-line Kaposi’s sarcoma studies are described in the **ADVERSE REACTIONS** section in tabular (**TABLES 10** and **16**) and narrative form. In this immunosuppressed patient population, however, a lower dose intensity of TAXOL and supportive therapy including hematopoietic growth factors in patients with severe neutropenia are recommended. Patients with AIDS-related Kaposi’s sarcoma may have more severe hematologic toxicities than patients with solid tumors.

INDICATIONS AND USAGE

TAXOL is indicated as first-line and subsequent therapy for the treatment of advanced carcinoma of the ovary. As first-line therapy, TAXOL is indicated in combination with cisplatin.

TAXOL is indicated for the adjuvant treatment of node-positive breast cancer administered sequentially to standard doxorubicin-containing combination chemotherapy. In the clinical trial, there was an overall favorable effect on disease-free and overall survival in the total population of patients with receptor-positive and receptor-negative tumors, but the benefit has been specifically demonstrated by available data (median follow-up 30 months) only in the patients with estrogen and progesterone receptor-negative tumors. (See **CLINICAL STUDIES: Breast Carcinoma.**)

TAXOL is indicated for the treatment of breast cancer after failure of combination chemotherapy for metastatic disease or relapse within 6 months of adjuvant chemotherapy. Prior therapy should have included an anthracycline unless clinically contraindicated.

TAXOL, in combination with cisplatin, is indicated for the first-line treatment of non-small cell lung cancer in patients who are not candidates for potentially curative surgery and/or radiation therapy.

TAXOL is indicated for the second-line treatment of AIDS-related Kaposi's sarcoma.

CONTRAINDICATIONS

TAXOL is contraindicated in patients who have a history of hypersensitivity reactions to TAXOL or other drugs formulated in Cremophor[®] EL (polyoxyethylated castor oil).

TAXOL should not be used in patients with solid tumors who have baseline neutrophil counts of <1500 cells/mm³ or in patients with AIDS-related Kaposi's sarcoma with baseline neutrophil counts of <1000 cells/mm³.

WARNINGS

Anaphylaxis and severe hypersensitivity reactions characterized by dyspnea and hypotension requiring treatment, angioedema, and generalized urticaria have occurred in 2 to 4% of patients receiving TAXOL in clinical trials. Fatal reactions have occurred in patients despite premedication. All patients should be pretreated with corticosteroids, diphenhydramine, and H₂

antagonists. (See **DOSAGE AND ADMINISTRATION**.) Patients who experience severe hypersensitivity reactions to TAXOL should not be rechallenged with the drug.

Bone marrow suppression (primarily neutropenia) is dose-dependent and is the dose-limiting toxicity. Neutrophil nadirs occurred at a median of 11 days. TAXOL should not be administered to patients with baseline neutrophil counts of less than 1500 cells/mm³ (<1000 cells/mm³ for patients with KS). Frequent monitoring of blood counts should be instituted during TAXOL treatment. Patients should not be re-treated with subsequent cycles of TAXOL until neutrophils recover to a level >1500 cells/mm³ (>1000 cells/mm³ for patients with KS) and platelets recover to a level >100,000 cells/mm³.

Severe conduction abnormalities have been documented in <1% of patients during TAXOL therapy and in some cases requiring pacemaker placement. If patients develop significant conduction abnormalities during TAXOL infusion, appropriate therapy should be administered and continuous cardiac monitoring should be performed during subsequent therapy with TAXOL.

Pregnancy

TAXOL can cause fetal harm when administered to a pregnant woman. Administration of paclitaxel during the period of organogenesis to rabbits at doses of 3.0 mg/kg/day (about 0.2 the daily maximum recommended human dose on a mg/m² basis) caused embryo- and fetotoxicity, as indicated by intrauterine mortality, increased resorptions, and increased fetal deaths. Maternal toxicity was also observed at this dose. No teratogenic effects were observed at 1.0 mg/kg/day (about 1/15 the daily maximum recommended human dose on a mg/m² basis); teratogenic potential could not be assessed at higher doses due to extensive fetal mortality.

There are no adequate and well-controlled studies in pregnant women. If TAXOL is used during pregnancy, or if the patient becomes pregnant while receiving this drug, the patient should be apprised of the potential hazard to the fetus. Women of childbearing potential should be advised to avoid becoming pregnant.

PRECAUTIONS

Contact of the undiluted concentrate with plasticized polyvinyl chloride (PVC) equipment or devices used to prepare solutions for infusion is not recommended. In order to minimize patient exposure to the plasticizer DEHP [di-(2-ethylhexyl)phthalate], which may be leached from PVC infusion bags or sets, diluted TAXOL solutions should preferably be stored in bottles (glass,

polypropylene) or plastic bags (polypropylene, polyolefin) and administered through polyethylene-lined administration sets.

TAXOL should be administered through an in-line filter with a microporous membrane not greater than 0.22 microns. Use of filter devices such as IVEX-2[®] filters which incorporate short inlet and outlet PVC-coated tubing has not resulted in significant leaching of DEHP.

Drug Interactions: In a Phase 1 trial using escalating doses of TAXOL (110–200 mg/m²) and cisplatin (50 or 75 mg/m²) given as sequential infusions, myelosuppression was more profound when TAXOL was given after cisplatin than with the alternate sequence (ie, TAXOL before cisplatin). Pharmacokinetic data from these patients demonstrated a decrease in paclitaxel clearance of approximately 33% when TAXOL was administered following cisplatin.

The metabolism of TAXOL is catalyzed by cytochrome P450 isoenzymes CYP2C8 and CYP3A4. Caution should be exercised when TAXOL is concomitantly administered with known substrates (eg, midazolam, buspirone, felodipine, lovastatin, eletriptan, sildenafil, simvastatin, and triazolam), inhibitors (eg, atazanavir, clarithromycin, indinavir, itraconazole, ketoconazole, nefazodone, nelfinavir, ritonavir, saquinavir, and telithromycin), and inducers (eg, rifampin and carbamazepine) of CYP3A4. (See **CLINICAL PHARMACOLOGY**.)

Caution should also be exercised when TAXOL is concomitantly administered with known substrates (eg, repaglinide and rosiglitazone), inhibitors (eg, gemfibrozil), and inducers (eg, rifampin) of CYP2C8. (See **CLINICAL PHARMACOLOGY**.)

Potential interactions between TAXOL, a substrate of CYP3A4, and protease inhibitors (ritonavir, saquinavir, indinavir, and nelfinavir), which are substrates and/or inhibitors of CYP3A4, have not been evaluated in clinical trials.

Reports in the literature suggest that plasma levels of doxorubicin (and its active metabolite doxorubicinol) may be increased when paclitaxel and doxorubicin are used in combination.

Hematology: TAXOL therapy should not be administered to patients with baseline neutrophil counts of less than 1500 cells/mm³. In order to monitor the occurrence of myelotoxicity, it is recommended that frequent peripheral blood cell counts be performed on all patients receiving TAXOL. Patients should not be re-treated with subsequent cycles of TAXOL until neutrophils recover to a level >1500 cells/mm³ and platelets recover to a level >100,000 cells/mm³. In the

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case of severe neutropenia (<500 cells/mm³ for 7 days or more) during a course of TAXOL therapy, a 20% reduction in dose for subsequent courses of therapy is recommended.

For patients with advanced HIV disease and poor-risk AIDS-related Kaposi's sarcoma, TAXOL, at the recommended dose for this disease, can be initiated and repeated if the neutrophil count is at least 1000 cells/mm³.

Hypersensitivity Reactions: Patients with a history of severe hypersensitivity reactions to products containing Cremophor[®] EL (eg, cyclosporin for injection concentrate and teniposide for injection concentrate) should not be treated with TAXOL. In order to avoid the occurrence of severe hypersensitivity reactions, all patients treated with TAXOL should be premedicated with corticosteroids (such as dexamethasone), diphenhydramine and H₂ antagonists (such as cimetidine or ranitidine). Minor symptoms such as flushing, skin reactions, dyspnea, hypotension, or tachycardia do not require interruption of therapy. However, severe reactions, such as hypotension requiring treatment, dyspnea requiring bronchodilators, angioedema, or generalized urticaria require immediate discontinuation of TAXOL and aggressive symptomatic therapy. Patients who have developed severe hypersensitivity reactions should not be rechallenged with TAXOL.

Cardiovascular: Hypotension, bradycardia, and hypertension have been observed during administration of TAXOL, but generally do not require treatment. Occasionally TAXOL infusions must be interrupted or discontinued because of initial or recurrent hypertension. Frequent vital sign monitoring, particularly during the first hour of TAXOL infusion, is recommended. Continuous cardiac monitoring is not required except for patients with serious conduction abnormalities. (See **WARNINGS**.) When TAXOL is used in combination with doxorubicin for treatment of metastatic breast cancer, monitoring of cardiac function is recommended. (See **ADVERSE REACTIONS**.)

Nervous System: Although the occurrence of peripheral neuropathy is frequent, the development of severe symptomatology is unusual and requires a dose reduction of 20% for all subsequent courses of TAXOL.

TAXOL contains dehydrated alcohol USP, 396 mg/mL; consideration should be given to possible CNS and other effects of alcohol. (See **PRECAUTIONS: Pediatric Use**.)

Hepatic: There is limited evidence that the myelotoxicity of TAXOL may be exacerbated in patients with serum total bilirubin >2 times ULN (see **CLINICAL PHARMACOLOGY**).

Extreme caution should be exercised when administering TAXOL to such patients, with dose reduction as recommended in **DOSAGE AND ADMINISTRATION, TABLE 17**.

Injection Site Reaction: Injection site reactions, including reactions secondary to extravasation, were usually mild and consisted of erythema, tenderness, skin discoloration, or swelling at the injection site. These reactions have been observed more frequently with the 24-hour infusion than with the 3-hour infusion. Recurrence of skin reactions at a site of previous extravasation following administration of TAXOL at a different site, ie, “recall,” has been reported.

More severe events such as phlebitis, cellulitis, induration, skin exfoliation, necrosis, and fibrosis have been reported. In some cases the onset of the injection site reaction either occurred during a prolonged infusion or was delayed by a week to 10 days.

A specific treatment for extravasation reactions is unknown at this time. Given the possibility of extravasation, it is advisable to closely monitor the infusion site for possible infiltration during drug administration.

Carcinogenesis, Mutagenesis, Impairment of Fertility: The carcinogenic potential of TAXOL (paclitaxel) has not been studied.

Paclitaxel has been shown to be clastogenic *in vitro* (chromosome aberrations in human lymphocytes) and *in vivo* (micronucleus test in mice). Paclitaxel was not mutagenic in the Ames test or the CHO/HGPRT gene mutation assay.

Administration of paclitaxel prior to and during mating produced impairment of fertility in male and female rats at doses equal to or greater than 1 mg/kg/day (about 0.04 the daily maximum recommended human dose on a mg/m² basis). At this dose, paclitaxel caused reduced fertility and reproductive indices, and increased embryo- and fetotoxicity. (See **WARNINGS**.)

Pregnancy: Pregnancy Category D. (See **WARNINGS**.)

Nursing Mothers: It is not known whether the drug is excreted in human milk. Following intravenous administration of carbon 14-labeled TAXOL to rats on days 9 to 10 postpartum, concentrations of radioactivity in milk were higher than in plasma and declined in parallel with the plasma concentrations. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants, it is recommended that nursing be discontinued when receiving TAXOL therapy.

Pediatric Use: The safety and effectiveness of TAXOL (paclitaxel) in pediatric patients have not been established.

There have been reports of central nervous system (CNS) toxicity (rarely associated with death) in a clinical trial in pediatric patients in which TAXOL was infused intravenously over 3 hours at doses ranging from 350 mg/m² to 420 mg/m². The toxicity is most likely attributable to the high dose of the ethanol component of the TAXOL vehicle given over a short infusion time. The use of concomitant antihistamines may intensify this effect. Although a direct effect of the paclitaxel itself cannot be discounted, the high doses used in this study (over twice the recommended adult dosage) must be considered in assessing the safety of TAXOL for use in this population.

Geriatric Use: Of 2228 patients who received TAXOL in 8 clinical studies evaluating its safety and effectiveness in the treatment of advanced ovarian cancer, breast carcinoma, or NSCLC, and 1570 patients who were randomized to receive TAXOL in the adjuvant breast cancer study, 649 patients (17%) were 65 years or older and 49 patients (1%) were 75 years or older. In most studies, severe myelosuppression was more frequent in elderly patients; in some studies, severe neuropathy was more common in elderly patients. In 2 clinical studies in NSCLC, the elderly patients treated with TAXOL had a higher incidence of cardiovascular events. Estimates of efficacy appeared similar in elderly patients and in younger patients; however, comparative efficacy cannot be determined with confidence due to the small number of elderly patients studied. In a study of first-line treatment of ovarian cancer, elderly patients had a lower median survival than younger patients, but no other efficacy parameters favored the younger group. **TABLE 9** presents the incidences of Grade IV neutropenia and severe neuropathy in clinical studies according to age.

TABLE 9
SELECTED ADVERSE EVENTS IN GERIATRIC PATIENTS RECEIVING TAXOL IN
CLINICAL STUDIES

INDICATION (Study/Regimen)	Patients (n/total [%])				
	Neutropenia (Grade IV)		Peripheral Neuropathy (Grades III/IV)		
	Age (y)		Age (y)		
	≥65	<65	≥65	<65	
• OVARIAN Cancer					
(Intergroup First-Line/T175/3 c75 ^a)	34/83 (41)	78/252 (31)	24/84 (29) ^{*b}	46/255 (18) ^b	
(GOG-111 First-Line/T135/24 c75 ^a)	48/61 (79)	106/129 (82)	3/62 (5)	2/134 (1)	
(Phase 3 Second-Line/T175/3 ^c)	5/19 (26)	21/76 (28)	1/19 (5)	0/76 (0)	
(Phase 3 Second-Line/T175/24 ^c)	21/25 (84)	57/79 (72)	0/25 (0)	2/80 (3)	
(Phase 3 Second-Line/T135/3 ^c)	4/16 (25)	10/81 (12)	0/17 (0)	0/81 (0)	
(Phase 3 Second-Line/T135/24 ^c)	17/22 (77)	53/83 (64)	0/22 (0)	0/83 (0)	
(Phase 3 Second-Line Pooled)	47/82 (57)*	141/319 (44)	1/83 (1)	2/320 (1)	
• Adjuvant BREAST Cancer					
(Intergroup/AC followed by T ^d)	56/102 (55)	734/1468 (50)	5/102 (5) ^e	46/1468 (3) ^e	
• BREAST Cancer After Failure of Initial Therapy					
(Phase 3/T175/3 ^c)	7/24 (29)	56/200 (28)	3/25 (12)	12/204 (6)	
(Phase 3/T135/3 ^c)	7/20 (35)	37/207 (18)	0/20 (0)	6/209 (3)	
• Non-Small Cell LUNG Cancer					
(ECOG/T135/24 c75 ^a)	58/71 (82)	86/124 (69)	9/71 (13) ^f	16/124 (13) ^f	
(Phase 3/T175/3 c80 ^a)	37/89 (42)*	56/267 (21)	11/91 (12)*	11/271 (4)	

* p<0.05

^a TAXOL dose in mg/m²/infusion duration in hours; cisplatin doses in mg/m².

^b Peripheral neuropathy was included within the neurotoxicity category in the Intergroup First-Line Ovarian Cancer study (see **TABLE 11**).

^c TAXOL dose in mg/m²/infusion duration in hours.

^d TAXOL (T) following 4 courses of doxorubicin and cyclophosphamide (AC) at a dose of 175 mg/m²/3 hours every 3 weeks for 4 courses.

^e Peripheral neuropathy reported as neurosensory toxicity in the Intergroup Adjuvant Breast Cancer study (see **TABLE 13**).

^f Peripheral neuropathy reported as neurosensory toxicity in the ECOG NSCLC study (see **TABLE 15**).

Information for Patients: (See Patient Information Leaflet.)

ADVERSE REACTIONS

Pooled Analysis of Adverse Event Experiences from Single-Agent Studies

Data in the following table are based on the experience of 812 patients (493 with ovarian carcinoma and 319 with breast carcinoma) enrolled in 10 studies who received single-agent TAXOL. Two hundred and seventy-five patients were treated in 8, Phase 2 studies with TAXOL doses ranging from 135 to 300 mg/m² administered over 24 hours (in 4 of these studies, G-CSF was administered as hematopoietic support). Three hundred and one patients were treated in the randomized Phase 3 ovarian carcinoma study which compared 2 doses (135 or 175 mg/m²) and 2 schedules (3 or 24 hours) of TAXOL. Two hundred and thirty-six patients with breast carcinoma received TAXOL (135 or 175 mg/m²) administered over 3 hours in a controlled study.

TABLE 10
SUMMARY^a OF ADVERSE EVENTS IN PATIENTS WITH SOLID TUMORS RECEIVING SINGLE-AGENT TAXOL

		Percent of Patients (n=812)
• Bone Marrow		
—Neutropenia	<2000/mm ³	90
	<500/mm ³	52
—Leukopenia	<4000/mm ³	90
	<1000/mm ³	17
—Thrombocytopenia	<100,000/mm ³	20
	<50,000/mm ³	7
—Anemia	<11 g/dL	78
	<8 g/dL	16
—Infections		30
—Bleeding		14
—Red Cell Transfusions		25
—Platelet Transfusions		2
• Hypersensitivity Reaction^b		
—All		41
—Severe [†]		2
• Cardiovascular		
—Vital Sign Changes ^c		
—Bradycardia (n=537)		3
—Hypotension (n=532)		12
—Significant Cardiovascular Events		1
• Abnormal ECG		
—All Pts		23
—Pts with normal baseline (n=559)		14
• Peripheral Neuropathy		
—Any symptoms		60
—Severe symptoms [†]		3
• Myalgia/Arthralgia		
—Any symptoms		60
—Severe symptoms [†]		8
• Gastrointestinal		
—Nausea and vomiting		52
—Diarrhea		38
—Mucositis		31
• Alopecia		
• Hepatic (Pts with normal baseline and on study data)		
—Bilirubin elevations (n=765)		7
—Alkaline phosphatase elevations (n=575)		22
—AST (SGOT) elevations (n=591)		19
• Injection Site Reaction		
		13

^a Based on worst course analysis.

^b All patients received premedication.

^c During the first 3 hours of infusion.

[†] Severe events are defined as at least Grade III toxicity.

None of the observed toxicities were clearly influenced by age.

Disease-Specific Adverse Event Experiences

First-Line Ovary in Combination: For the 1084 patients who were evaluable for safety in the Phase 3 first-line ovary combination therapy studies, **TABLE 11** shows the incidence of important adverse events. For both studies, the analysis of safety was based on all courses of therapy (6 courses for the GOG-111 study and up to 9 courses for the Intergroup study).

TABLE 11
FREQUENCY^a OF IMPORTANT ADVERSE EVENTS IN THE PHASE 3 FIRST-LINE
OVARIAN CARCINOMA STUDIES

		Percent of Patients			
		Intergroup		GOG-111	
		T175/3 ^b	C750 ^c	T135/24 ^b	C750 ^c
		c75 ^c	c75 ^c	c75 ^c	c75 ^c
		(n=339)	(n=336)	(n=196)	(n=213)
•	Bone Marrow				
—	Neutropenia <2000/mm ³	91 ^d	95 ^d	96	92
	<500/mm ³	33 ^d	43 ^d	81 ^d	58 ^d
—	Thrombocytopenia <100,000/mm ^{3e}	21 ^d	33 ^d	26	30
	<50,000/mm ³	3 ^d	7 ^d	10	9
—	Anemia <11 g/dL ^f	96	97	88	86
	<8 g/dL	3 ^d	8 ^d	13	9
—	Infections	25	27	21	15
—	Febrile Neutropenia	4	7	15 ^d	4 ^d
•	Hypersensitivity Reaction				
—	All	11 ^d	6 ^d	8 ^{d,g}	1 ^{d,g}
—	Severe [†]	1	1	3 ^{d,g}	— ^{d,g}
•	Neurotoxicity^h				
—	Any symptoms	87 ^d	52 ^d	25	20
—	Severe symptoms [†]	21 ^d	2 ^d	3 ^d	— ^d
•	Nausea and Vomiting				
—	Any symptoms	88	93	65	69
—	Severe symptoms [†]	18	24	10	11
•	Myalgia/Arthralgia				
—	Any symptoms	60 ^d	27 ^d	9 ^d	2 ^d
—	Severe symptoms [†]	6 ^d	1 ^d	1	—
•	Diarrhea				
—	Any symptoms	37 ^d	29 ^d	16 ^d	8 ^d
—	Severe symptoms [†]	2	3	4	1
•	Asthenia				
—	Any symptoms	NC	NC	17 ^d	10 ^d
—	Severe symptoms [†]	NC	NC	1	1
•	Alopecia				
—	Any symptoms	96 ^d	89 ^d	55 ^d	37 ^d
—	Severe symptoms [†]	51 ^d	21 ^d	6	8

^a Based on worst course analysis.

^b TAXOL (T) dose in mg/m²/infusion duration in hours.

^c Cyclophosphamide (C) or cisplatin (c) dose in mg/m².

^d p<0.05 by Fisher exact test.

^e <130,000/mm³ in the Intergroup study.

^f <12 g/dL in the Intergroup study.

^g All patients received premedication.

^h In the GOG-111 study, neurotoxicity was collected as peripheral neuropathy and in the Intergroup study, neurotoxicity was collected as either neuromotor or neurosensory symptoms.

[†] Severe events are defined as at least Grade III toxicity.

NC Not Collected

Second-Line Ovary: For the 403 patients who received single-agent TAXOL in the Phase 3 second-line ovarian carcinoma study, the following table shows the incidence of important adverse events.

TABLE 12
FREQUENCY^a OF IMPORTANT ADVERSE EVENTS IN THE PHASE 3 SECOND-LINE OVARIAN CARCINOMA STUDY

		Percent of Patients			
		175/3 ^b	175/24 ^b	135/3 ^b	135/24 ^b
		(n=95)	(n=105)	(n=98)	(n=105)
• Bone Marrow					
—Neutropenia	<2000/mm ³	78	98	78	98
	<500/mm ³	27	75	14	67
—Thrombocytopenia	<100,000/mm ³	4	18	8	6
	<50,000/mm ³	1	7	2	1
—Anemia	<11 g/dL	84	90	68	88
	<8 g/dL	11	12	6	10
—Infections		26	29	20	18
• Hypersensitivity Reaction^c					
—All		41	45	38	45
—Severe [†]		2	0	2	1
• Peripheral Neuropathy					
—Any symptoms		63	60	55	42
—Severe symptoms [†]		1	2	0	0
• Mucositis					
—Any symptoms		17	35	21	25
—Severe symptoms [†]		0	3	0	2

^a Based on worst course analysis.

^b TAXOL dose in mg/m²/infusion duration in hours.

^c All patients received premedication.

[†] Severe events are defined as at least Grade III toxicity.

Myelosuppression was dose and schedule related, with the schedule effect being more prominent. The development of severe hypersensitivity reactions (HSRs) was rare; 1% of the patients and 0.2% of the courses overall. There was no apparent dose or schedule effect seen for the HSRs. Peripheral neuropathy was clearly dose related, but schedule did not appear to affect the incidence.

Adjuvant Breast: For the Phase 3 adjuvant breast carcinoma study, the following table shows the incidence of important severe adverse events for the 3121 patients (total population) who were evaluable for safety as well as for a group of 325 patients (early population) who, per the study protocol, were monitored more intensively than other patients.

TABLE 13
FREQUENCY^a OF IMPORTANT SEVERE^b ADVERSE EVENTS IN THE PHASE 3
ADJUVANT BREAST CARCINOMA STUDY

	Percent of Patients			
	Early Population		Total Population	
	AC ^c (n=166)	AC ^c followed by T ^d (n=159)	AC ^c (n=1551)	AC ^c followed by T ^d (n=1570)
• Bone Marrow^e				
—Neutropenia <500/mm ³	79	76	48	50
—Thrombocytopenia <50,000/mm ³	27	25	11	11
—Anemia <8 g/dL	17	21	8	8
—Infections	6	14	5	6
—Fever Without Infection	—	3	<1	1
• Hypersensitivity Reaction^f	1	4	1	2
• Cardiovascular Events	1	2	1	2
• Neuromotor Toxicity	1	1	<1	1
• Neurosensory Toxicity	—	3	<1	3
• Myalgia/Arthralgia	—	2	<1	2
• Nausea/Vomiting	13	18	8	9
• Mucositis	13	4	6	5

^a Based on worst course analysis.

^b Severe events are defined as at least Grade III toxicity.

^c Patients received 600 mg/m² cyclophosphamide and doxorubicin (AC) at doses of either 60 mg/m², 75 mg/m², or 90 mg/m² (with prophylactic G-CSF support and ciprofloxacin), every 3 weeks for 4 courses.

^d TAXOL (T) following 4 courses of AC at a dose of 175 mg/m²/3 hours every 3 weeks for 4 courses.

^e The incidence of febrile neutropenia was not reported in this study.

^f All patients were to receive premedication.

The incidence of an adverse event for the total population likely represents an underestimation of the actual incidence given that safety data were collected differently based on enrollment cohort. However, since safety data were collected consistently across regimens, the safety of the sequential addition of TAXOL (paclitaxel) following AC therapy may be compared with AC therapy alone. Compared to patients who received AC alone, patients who received AC followed by TAXOL experienced more Grade III/IV neurosensory toxicity, more Grade III/IV myalgia/arthralgia, more Grade III/IV neurologic pain (5% vs 1%), more Grade III/IV flu-like symptoms (5% vs 3%), and more Grade III/IV hyperglycemia (3% vs 1%). During the additional 4 courses of treatment with TAXOL, 2 deaths (0.1%) were attributed to treatment. During

TAXOL treatment, Grade IV neutropenia was reported for 15% of patients, Grade II/III neurosensory toxicity for 15%, Grade II/III myalgias for 23%, and alopecia for 46%.

The incidences of severe hematologic toxicities, infections, mucositis, and cardiovascular events increased with higher doses of doxorubicin.

Breast Cancer After Failure of Initial Chemotherapy: For the 458 patients who received single-agent TAXOL in the Phase 3 breast carcinoma study, the following table shows the incidence of important adverse events by treatment arm (each arm was administered by a 3-hour infusion).

TABLE 14
FREQUENCY^a OF IMPORTANT ADVERSE EVENTS IN THE PHASE 3 STUDY OF BREAST CANCER AFTER FAILURE OF INITIAL CHEMOTHERAPY OR WITHIN 6 MONTHS OF ADJUVANT CHEMOTHERAPY

		Percent of Patients	
		175/3 ^b (n=229)	135/3 ^b (n=229)
• Bone Marrow			
—Neutropenia	<2000/mm ³	90	81
	<500/mm ³	28	19
—Thrombocytopenia	<100,000/mm ³	11	7
	<50,000/mm ³	3	2
—Anemia	<11 g/dL	55	47
	<8 g/dL	4	2
—Infections		23	15
—Febrile Neutropenia		2	2
• Hypersensitivity Reaction^c			
—All		36	31
—Severe [†]		0	<1
• Peripheral Neuropathy			
—Any symptoms		70	46
—Severe symptoms [†]		7	3
• Mucositis			
—Any symptoms		23	17
—Severe symptoms [†]		3	<1

^a Based on worst course analysis.

^b TAXOL dose in mg/m²/infusion duration in hours.

^c All patients received premedication.

[†] Severe events are defined as at least Grade III toxicity.

Myelosuppression and peripheral neuropathy were dose related. There was one severe hypersensitivity reaction (HSR) observed at the dose of 135 mg/m².

First-Line NSCLC in Combination: In the study conducted by the Eastern Cooperative Oncology Group (ECOG), patients were randomized to either TAXOL (T) 135 mg/m² as a 24-hour infusion in combination with cisplatin (c) 75 mg/m², TAXOL (T) 250 mg/m² as a 24-hour infusion in combination with cisplatin (c) 75 mg/m² with G-CSF support, or cisplatin (c) 75 mg/m² on day 1, followed by etoposide (VP) 100 mg/m² on days 1, 2, and 3 (control).

The following table shows the incidence of important adverse events.

TABLE 15
FREQUENCY^a OF IMPORTANT ADVERSE EVENTS IN THE PHASE 3 STUDY FOR
FIRST-LINE NSCLC

		Percent of Patients		
		T135/24 ^b c75 (n=195)	T250/24 ^c c75 (n=197)	VP100 ^d c75 (n=196)
• Bone Marrow				
—Neutropenia	<2000/mm ³	89	86	84
	<500/mm ³	74 ^e	65	55
—Thrombocytopenia	< normal	48	68	62
	<50,000/mm ³	6	12	16
—Anemia	< normal	94	96	95
	<8 g/dL	22	19	28
—Infections		38	31	35
• Hypersensitivity Reaction^f				
—All		16	27	13
—Severe [†]		1	4 ^e	1
• Arthralgia/Myalgia				
—Any symptoms		21 ^e	42 ^e	9
—Severe symptoms [†]		3	11	1
• Nausea/Vomiting				
—Any symptoms		85	87	81
—Severe symptoms [†]		27	29	22
• Mucositis				
—Any symptoms		18	28	16
—Severe symptoms [†]		1	4	2
• Neuromotor Toxicity				
—Any symptoms		37	47	44
—Severe symptoms [†]		6	12	7
• Neurosensory Toxicity				
—Any symptoms		48	61	25
—Severe symptoms [†]		13	28 ^e	8
• Cardiovascular Events				
—Any symptoms		33	39	24
—Severe symptoms [†]		13	12	8

^a Based on worst course analysis.

- ^b TAXOL (T) dose in mg/m²/infusion duration in hours; cisplatin (c) dose in mg/m².
- ^c TAXOL dose in mg/m²/infusion duration in hours with G-CSF support; cisplatin dose in mg/m².
- ^d Etoposide (VP) dose in mg/m² was administered IV on days 1, 2, and 3; cisplatin dose in mg/m².
- ^e p<0.05.
- ^f All patients received premedication.
- [†] Severe events are defined as at least Grade III toxicity.

Toxicity was generally more severe in the high-dose TAXOL treatment arm (T250/c75) than in the low-dose TAXOL arm (T135/c75). Compared to the cisplatin/etoposide arm, patients in the low-dose TAXOL arm experienced more arthralgia/myalgia of any grade and more severe neutropenia. The incidence of febrile neutropenia was not reported in this study.

Kaposi's Sarcoma: The following table shows the frequency of important adverse events in the 85 patients with KS treated with 2 different single-agent TAXOL (paclitaxel) regimens.

TABLE 16
FREQUENCY^a OF IMPORTANT ADVERSE EVENTS IN THE AIDS-RELATED KAPOSI'S
SARCOMA STUDIES

		Percent of Patients	
		Study CA139-174 TAXOL 135/3 ^b q 3 wk (n=29)	Study CA139-281 TAXOL 100/3 ^b q 2 wk (n=56)
•	Bone Marrow		
—	Neutropenia		
	<2000/mm ³	100	95
	<500/mm ³	76	35
—	Thrombocytopenia		
	<100,000/mm ³	52	27
	<50,000/mm ³	17	5
—	Anemia		
	<11 g/dL	86	73
	<8 g/dL	34	25
—	Febrile Neutropenia	55	9
•	Opportunistic Infection		
—	Any	76	54
—	Cytomegalovirus	45	27
—	Herpes Simplex	38	11
—	<i>Pneumocystis carinii</i>	14	21
—	<i>M. avium intracellulare</i>	24	4
—	Candidiasis, esophageal	7	9
—	Cryptosporidiosis	7	7
—	Cryptococcal meningitis	3	2
—	Leukoencephalopathy	—	2
•	Hypersensitivity Reaction^c		
—	All	14	9
•	Cardiovascular		
—	Hypotension	17	9
—	Bradycardia	3	—
•	Peripheral Neuropathy		
—	Any	79	46
—	Severe [†]	10	2
•	Myalgia/Arthralgia		
—	Any	93	48
—	Severe [†]	14	16
•	Gastrointestinal		
—	Nausea and Vomiting	69	70
—	Diarrhea	90	73
—	Mucositis	45	20
•	Renal (creatinine elevation)		
—	Any	34	18
—	Severe [†]	7	5
•	Discontinuation for drug toxicity	7	16

^a Based on worst course analysis.

^b TAXOL dose in mg/m²/infusion duration in hours.

^c All patients received premedication.

[†] Severe events are defined as at least Grade III toxicity.

As demonstrated in this table, toxicity was more pronounced in the study utilizing TAXOL (paclitaxel) at a dose of 135 mg/m² every 3 weeks than in the study utilizing TAXOL at a dose of 100 mg/m² every 2 weeks. Notably, severe neutropenia (76% vs 35%), febrile neutropenia (55% vs 9%), and opportunistic infections (76% vs 54%) were more common with the former dose and schedule. The differences between the 2 studies with respect to dose escalation and use of hematopoietic growth factors, as described above, should be taken into account. (See **CLINICAL STUDIES: AIDS-Related Kaposi's Sarcoma.**) Note also that only 26% of the 85 patients in these studies received concomitant treatment with protease inhibitors, whose effect on paclitaxel metabolism has not yet been studied.

Adverse Event Experiences by Body System

Unless otherwise noted, the following discussion refers to the overall safety database of 812 patients with solid tumors treated with single-agent TAXOL in clinical studies. Toxicities that occurred with greater severity or frequency in previously untreated patients with ovarian carcinoma or NSCLC who received TAXOL in combination with cisplatin or in patients with breast cancer who received TAXOL after doxorubicin/cyclophosphamide in the adjuvant setting and that occurred with a difference that was clinically significant in these populations are also described. The frequency and severity of important adverse events for the Phase 3 ovarian carcinoma, breast carcinoma, NSCLC, and the Phase 2 Kaposi's sarcoma studies are presented above in tabular form by treatment arm. In addition, rare events have been reported from postmarketing experience or from other clinical studies. The frequency and severity of adverse events have been generally similar for patients receiving TAXOL for the treatment of ovarian, breast, or lung carcinoma or Kaposi's sarcoma, but patients with AIDS-related Kaposi's sarcoma may have more frequent and severe hematologic toxicity, infections (including opportunistic infections, see **TABLE 16**), and febrile neutropenia. These patients require a lower dose intensity and supportive care. (See **CLINICAL STUDIES: AIDS-Related Kaposi's Sarcoma.**) Toxicities that were observed only in or were noted to have occurred with greater severity in the population with Kaposi's sarcoma and that occurred with a difference that was clinically significant in this population are described. Elevated liver function tests and renal toxicity have a higher incidence in KS patients as compared to patients with solid tumors.

Hematologic: Bone marrow suppression was the major dose-limiting toxicity of TAXOL. Neutropenia, the most important hematologic toxicity, was dose and schedule dependent and was generally rapidly reversible. Among patients treated in the Phase 3 second-line ovarian study with a 3-hour infusion, neutrophil counts declined below 500 cells/mm³ in 14% of the patients treated with a dose of 135 mg/m² compared to 27% at a dose of 175 mg/m² (p=0.05). In the same

study, severe neutropenia (<500 cells/mm³) was more frequent with the 24-hour than with the 3-hour infusion; infusion duration had a greater impact on myelosuppression than dose. Neutropenia did not appear to increase with cumulative exposure and did not appear to be more frequent nor more severe for patients previously treated with radiation therapy.

In the study where TAXOL was administered to patients with ovarian carcinoma at a dose of 135 mg/m²/24 hours in combination with cisplatin versus the control arm of cyclophosphamide plus cisplatin, the incidences of grade IV neutropenia and of febrile neutropenia were significantly greater in the TAXOL plus cisplatin arm than in the control arm. Grade IV neutropenia occurred in 81% on the TAXOL plus cisplatin arm versus 58% on the cyclophosphamide plus cisplatin arm, and febrile neutropenia occurred in 15% and 4% respectively. On the TAXOL/cisplatin arm, there were 35/1074 (3%) courses with fever in which Grade IV neutropenia was reported at some time during the course. When TAXOL followed by cisplatin was administered to patients with advanced NSCLC in the ECOG study, the incidences of Grade IV neutropenia were 74% (TAXOL 135 mg/m²/24 hours followed by cisplatin) and 65% (TAXOL 250 mg/m²/24 hours followed by cisplatin and G-CSF) compared with 55% in patients who received cisplatin/etoposide.

Fever was frequent (12% of all treatment courses). Infectious episodes occurred in 30% of all patients and 9% of all courses; these episodes were fatal in 1% of all patients, and included sepsis, pneumonia and peritonitis. In the Phase 3 second-line ovarian study, infectious episodes were reported in 20% and 26% of the patients treated with a dose of 135 mg/m² or 175 mg/m² given as 3-hour infusions, respectively. Urinary tract infections and upper respiratory tract infections were the most frequently reported infectious complications. In the immunosuppressed patient population with advanced HIV disease and poor-risk AIDS-related Kaposi's sarcoma, 61% of the patients reported at least one opportunistic infection. (See **CLINICAL STUDIES: AIDS-Related Kaposi's Sarcoma**.) The use of supportive therapy, including G-CSF, is recommended for patients who have experienced severe neutropenia. (See **DOSAGE AND ADMINISTRATION**.)

Thrombocytopenia was reported. Twenty percent of the patients experienced a drop in their platelet count below 100,000 cells/mm³ at least once while on treatment; 7% had a platelet count $<50,000$ cells/mm³ at the time of their worst nadir. Bleeding episodes were reported in 4% of all courses and by 14% of all patients, but most of the hemorrhagic episodes were localized and the frequency of these events was unrelated to the TAXOL dose and schedule. In the Phase 3 second-line ovarian study, bleeding episodes were reported in 10% of the patients; no patients treated with the 3-hour infusion received platelet transfusions. In the adjuvant breast carcinoma

trial, the incidence of severe thrombocytopenia and platelet transfusions increased with higher doses of doxorubicin.

Anemia (Hb <11 g/dL) was observed in 78% of all patients and was severe (Hb <8 g/dL) in 16% of the cases. No consistent relationship between dose or schedule and the frequency of anemia was observed. Among all patients with normal baseline hemoglobin, 69% became anemic on study but only 7% had severe anemia. Red cell transfusions were required in 25% of all patients and in 12% of those with normal baseline hemoglobin levels.

Hypersensitivity Reactions (HSRs): All patients received premedication prior to TAXOL (see **WARNINGS** and **PRECAUTIONS: Hypersensitivity Reactions**). The frequency and severity of HSRs were not affected by the dose or schedule of TAXOL administration. In the Phase 3 second-line ovarian study, the 3-hour infusion was not associated with a greater increase in HSRs when compared to the 24-hour infusion. Hypersensitivity reactions were observed in 20% of all courses and in 41% of all patients. These reactions were severe in less than 2% of the patients and 1% of the courses. No severe reactions were observed after course 3 and severe symptoms occurred generally within the first hour of TAXOL infusion. The most frequent symptoms observed during these severe reactions were dyspnea, flushing, chest pain, and tachycardia. Abdominal pain, pain in the extremities, diaphoresis, and hypertension were also noted.

The minor hypersensitivity reactions consisted mostly of flushing (28%), rash (12%), hypotension (4%), dyspnea (2%), tachycardia (2%), and hypertension (1%). The frequency of hypersensitivity reactions remained relatively stable during the entire treatment period.

Chills, shock, and back pain in association with hypersensitivity reactions have been reported.

Cardiovascular: Hypotension, during the first 3 hours of infusion, occurred in 12% of all patients and 3% of all courses administered. Bradycardia, during the first 3 hours of infusion, occurred in 3% of all patients and 1% of all courses. In the Phase 3 second-line ovarian study, neither dose nor schedule had an effect on the frequency of hypotension and bradycardia. These vital sign changes most often caused no symptoms and required neither specific therapy nor treatment discontinuation. The frequency of hypotension and bradycardia were not influenced by prior anthracycline therapy.

Significant cardiovascular events possibly related to single-agent TAXOL (paclitaxel) occurred in approximately 1% of all patients. These events included syncope, rhythm abnormalities, hypertension, and venous thrombosis. One of the patients with syncope treated with TAXOL at

175 mg/m² over 24 hours had progressive hypotension and died. The arrhythmias included asymptomatic ventricular tachycardia, bigeminy, and complete AV block requiring pacemaker placement. Among patients with NSCLC treated with TAXOL in combination with cisplatin in the Phase 3 study, significant cardiovascular events occurred in 12 to 13%. This apparent increase in cardiovascular events is possibly due to an increase in cardiovascular risk factors in patients with lung cancer.

Electrocardiogram (ECG) abnormalities were common among patients at baseline. ECG abnormalities on study did not usually result in symptoms, were not dose-limiting, and required no intervention. ECG abnormalities were noted in 23% of all patients. Among patients with a normal ECG prior to study entry, 14% of all patients developed an abnormal tracing while on study. The most frequently reported ECG modifications were non-specific repolarization abnormalities, sinus bradycardia, sinus tachycardia, and premature beats. Among patients with normal ECGs at baseline, prior therapy with anthracyclines did not influence the frequency of ECG abnormalities.

Cases of myocardial infarction have been reported. Congestive heart failure, including cardiac dysfunction and reduction of left ventricular ejection fraction or ventricular failure, has been reported typically in patients who have received other chemotherapy, notably anthracyclines. (See **PRECAUTIONS: Drug Interactions.**)

Atrial fibrillation and supraventricular tachycardia have been reported.

Respiratory: Interstitial pneumonia, lung fibrosis, and pulmonary embolism have been reported. Radiation pneumonitis has been reported in patients receiving concurrent radiotherapy.

Pleural effusion and respiratory failure have been reported.

Neurologic: The assessment of neurologic toxicity was conducted differently among the studies as evident from the data reported in each individual study (see **TABLES 10–16**). Moreover, the frequency and severity of neurologic manifestations were influenced by prior and/or concomitant therapy with neurotoxic agents.

In general, the frequency and severity of neurologic manifestations were dose-dependent in patients receiving single-agent TAXOL. Peripheral neuropathy was observed in 60% of all patients (3% severe) and in 52% (2% severe) of the patients without pre-existing neuropathy. The frequency of peripheral neuropathy increased with cumulative dose. Paresthesia commonly occurs in the form of hyperesthesia. Neurologic symptoms were observed in 27% of the patients after the first course of treatment and in 34 to 51% from course 2 to 10. Peripheral neuropathy

was the cause of TAXOL discontinuation in 1% of all patients. Sensory symptoms have usually improved or resolved within several months of TAXOL discontinuation. Pre-existing neuropathies resulting from prior therapies are not a contraindication for TAXOL therapy.

In the Intergroup first-line ovarian carcinoma study (see **TABLE 11**), neurotoxicity included reports of neuromotor and neurosensory events. The regimen with TAXOL 175 mg/m² given by 3-hour infusion plus cisplatin 75 mg/m² resulted in greater incidence and severity of neurotoxicity than the regimen containing cyclophosphamide and cisplatin, 87% (21% severe) versus 52% (2% severe), respectively. The duration of grade III or IV neurotoxicity cannot be determined with precision for the Intergroup study since the resolution dates of adverse events were not collected in the case report forms for this trial and complete follow-up documentation was available only in a minority of these patients. In the GOG first-line ovarian carcinoma study, neurotoxicity was reported as peripheral neuropathy. The regimen with TAXOL 135 mg/m² given by 24-hour infusion plus cisplatin 75 mg/m² resulted in an incidence of neurotoxicity that was similar to the regimen containing cyclophosphamide plus cisplatin, 25% (3% severe) versus 20% (0% severe), respectively. Cross-study comparison of neurotoxicity in the Intergroup and GOG trials suggests that when TAXOL is given in combination with cisplatin 75 mg/m², the incidence of severe neurotoxicity is more common at a TAXOL dose of 175 mg/m² given by 3-hour infusion (21%) than at a dose of 135 mg/m² given by 24-hour infusion (3%).

In patients with NSCLC, administration of TAXOL followed by cisplatin resulted in a greater incidence of severe neurotoxicity compared to the incidence in patients with ovarian or breast cancer treated with single-agent TAXOL. Severe neurosensory symptoms were noted in 13% of NSCLC patients receiving TAXOL 135 mg/m² by 24-hour infusion followed by cisplatin 75 mg/m² and 8% of NSCLC patients receiving cisplatin/etoposide (see **TABLE 15**).

Other than peripheral neuropathy, serious neurologic events following TAXOL administration have been rare (<1%) and have included grand mal seizures, syncope, ataxia, and neuroencephalopathy.

Autonomic neuropathy resulting in paralytic ileus has been reported. Optic nerve and/or visual disturbances (scintillating scotomata) have also been reported, particularly in patients who have received higher doses than those recommended. These effects generally have been reversible. However, reports in the literature of abnormal visual evoked potentials in patients have suggested persistent optic nerve damage. Postmarketing reports of ototoxicity (hearing loss and tinnitus) have also been received.

Convulsions, dizziness, and headache have been reported.

Arthralgia/Myalgia: There was no consistent relationship between dose or schedule of TAXOL and the frequency or severity of arthralgia/myalgia. Sixty percent of all patients treated experienced arthralgia/myalgia; 8% experienced severe symptoms. The symptoms were usually transient, occurred 2 or 3 days after TAXOL administration, and resolved within a few days. The frequency and severity of musculoskeletal symptoms remained unchanged throughout the treatment period.

Hepatic: No relationship was observed between liver function abnormalities and either dose or schedule of TAXOL administration. Among patients with normal baseline liver function 7%, 22%, and 19% had elevations in bilirubin, alkaline phosphatase, and AST (SGOT), respectively. Prolonged exposure to TAXOL was not associated with cumulative hepatic toxicity.

Hepatic necrosis and hepatic encephalopathy leading to death have been reported.

Renal: Among the patients treated for Kaposi's sarcoma with TAXOL, 5 patients had renal toxicity of grade III or IV severity. One patient with suspected HIV nephropathy of grade IV severity had to discontinue therapy. The other 4 patients had renal insufficiency with reversible elevations of serum creatinine.

Patients with gynecological cancers treated with TAXOL and cisplatin may have an increased risk of renal failure with the combination therapy of paclitaxel and cisplatin in gynecological cancers as compared to cisplatin alone.

Gastrointestinal (GI): Nausea/vomiting, diarrhea, and mucositis were reported by 52%, 38%, and 31% of all patients, respectively. These manifestations were usually mild to moderate. Mucositis was schedule dependent and occurred more frequently with the 24-hour than with the 3-hour infusion.

In patients with poor-risk AIDS-related Kaposi's sarcoma, nausea/vomiting, diarrhea, and mucositis were reported by 69%, 79%, and 28% of patients, respectively. One-third of patients with Kaposi's sarcoma complained of diarrhea prior to study start. (See **CLINICAL STUDIES: AIDS-Related Kaposi's Sarcoma.**)

In the first-line Phase 3 ovarian carcinoma studies, the incidence of nausea and vomiting when TAXOL was administered in combination with cisplatin appeared to be greater compared with the database for single-agent TAXOL in ovarian and breast carcinoma. In addition, diarrhea of

any grade was reported more frequently compared to the control arm, but there was no difference for severe diarrhea in these studies.

Intestinal obstruction, intestinal perforation, pancreatitis, ischemic colitis, dehydration, esophagitis, constipation, and ascites have been reported. Neutropenic enterocolitis (typhlitis), despite the coadministration of G-CSF, was observed in patients treated with TAXOL alone and in combination with other chemotherapeutic agents.

Injection Site Reaction: Injection site reactions, including reactions secondary to extravasation, were usually mild and consisted of erythema, tenderness, skin discoloration, or swelling at the injection site. These reactions have been observed more frequently with the 24-hour infusion than with the 3-hour infusion. Recurrence of skin reactions at a site of previous extravasation following administration of TAXOL at a different site, ie, “recall,” has been reported.

More severe events such as phlebitis, cellulitis, induration, skin exfoliation, necrosis, and fibrosis have been reported. In some cases the onset of the injection site reaction either occurred during a prolonged infusion or was delayed by a week to 10 days.

A specific treatment for extravasation reactions is unknown at this time. Given the possibility of extravasation, it is advisable to closely monitor the infusion site for possible infiltration during drug administration.

Other Clinical Events: Alopecia was observed in almost all (87%) of the patients. Transient skin changes due to TAXOL-related hypersensitivity reactions have been observed, but no other skin toxicities were significantly associated with TAXOL administration. Nail changes (changes in pigmentation or discoloration of nail bed) were uncommon (2%). Edema was reported in 21% of all patients (17% of those without baseline edema); only 1% had severe edema and none of these patients required treatment discontinuation. Edema was most commonly focal and disease-related. Edema was observed in 5% of all courses for patients with normal baseline and did not increase with time on study.

Skin abnormalities related to radiation recall as well as maculopapular rash, pruritus, Stevens-Johnson syndrome, and toxic epidermal necrolysis have been reported.

Reports of asthenia and malaise have been received as part of the continuing surveillance of TAXOL safety. In the Phase 3 trial of TAXOL 135 mg/m² over 24 hours in combination with cisplatin as first-line therapy of ovarian cancer, asthenia was reported in 17% of the patients, significantly greater than the 10% incidence observed in the control arm of cyclophosphamide/cisplatin.

Conjunctivitis, increased lacrimation, anorexia, confusional state, photopsia, visual floaters, vertigo, and increase in blood creatinine have been reported.

Accidental Exposure: Upon inhalation, dyspnea, chest pain, burning eyes, sore throat, and nausea have been reported. Following topical exposure, events have included tingling, burning, and redness.

OVERDOSAGE

There is no known antidote for TAXOL (paclitaxel) overdose. The primary anticipated complications of overdose would consist of bone marrow suppression, peripheral neurotoxicity, and mucositis. Overdoses in pediatric patients may be associated with acute ethanol toxicity (see **PRECAUTIONS: Pediatric Use**).

DOSAGE AND ADMINISTRATION

Note: Contact of the undiluted concentrate with plasticized PVC equipment or devices used to prepare solutions for infusion is not recommended. In order to minimize patient exposure to the plasticizer DEHP [di-(2-ethylhexyl)phthalate], which may be leached from PVC infusion bags or sets, diluted TAXOL solutions should be stored in bottles (glass, polypropylene) or plastic bags (polypropylene, polyolefin) and administered through polyethylene-lined administration sets.

All patients should be premedicated prior to TAXOL administration in order to prevent severe hypersensitivity reactions. Such premedication may consist of dexamethasone 20 mg PO administered approximately 12 and 6 hours before TAXOL, diphenhydramine (or its equivalent) 50 mg IV 30 to 60 minutes prior to TAXOL, and cimetidine (300 mg) or ranitidine (50 mg) IV 30 to 60 minutes before TAXOL.

For patients with **carcinoma of the ovary**, the following regimens are recommended (see **CLINICAL STUDIES: Ovarian Carcinoma**):

- 1) For previously untreated patients with carcinoma of the ovary, one of the following recommended regimens may be given every 3 weeks. In selecting the appropriate regimen, differences in toxicities should be considered (see **TABLE 11** in **ADVERSE REACTIONS: Disease-Specific Adverse Event Experiences**).
 - a. TAXOL administered intravenously over 3 hours at a dose of 175 mg/m^2 followed by cisplatin at a dose of 75 mg/m^2 ; or
 - b. TAXOL administered intravenously over 24 hours at a dose of 135 mg/m^2 followed by cisplatin at a dose of 75 mg/m^2 .

- 2) In patients previously treated with chemotherapy for carcinoma of the ovary, TAXOL has been used at several doses and schedules; however, the optimal regimen is not yet clear. The recommended regimen is TAXOL 135 mg/m² or 175 mg/m² administered intravenously over 3 hours every 3 weeks.

For patients with **carcinoma of the breast**, the following regimens are recommended (see **CLINICAL STUDIES: Breast Carcinoma**):

- 1) For the adjuvant treatment of node-positive breast cancer, the recommended regimen is TAXOL, at a dose of 175 mg/m² intravenously over 3 hours every 3 weeks for 4 courses administered sequentially to doxorubicin-containing combination chemotherapy. The clinical trial used 4 courses of doxorubicin and cyclophosphamide (see **CLINICAL STUDIES: Breast Carcinoma**).
- 2) After failure of initial chemotherapy for metastatic disease or relapse within 6 months of adjuvant chemotherapy, TAXOL at a dose of 175 mg/m² administered intravenously over 3 hours every 3 weeks has been shown to be effective.

For patients with **non-small cell lung carcinoma**, the recommended regimen, given every 3 weeks, is TAXOL administered intravenously over 24 hours at a dose of 135 mg/m² followed by cisplatin, 75 mg/m².

For patients with **AIDS-related Kaposi's sarcoma**, TAXOL administered at a dose of 135 mg/m² given intravenously over 3 hours every 3 weeks or at a dose of 100 mg/m² given intravenously over 3 hours every 2 weeks is recommended (dose intensity 45–50 mg/m²/week). In the 2 clinical trials evaluating these schedules (see **CLINICAL STUDIES: AIDS-Related Kaposi's Sarcoma**), the former schedule (135 mg/m² every 3 weeks) was more toxic than the latter. In addition, all patients with low performance status were treated with the latter schedule (100 mg/m² every 2 weeks).

Based upon the immunosuppression in patients with advanced HIV disease, the following modifications are recommended in these patients:

- 1) Reduce the dose of dexamethasone as 1 of the 3 premedication drugs to 10 mg PO (instead of 20 mg PO);
- 2) Initiate or repeat treatment with TAXOL only if the neutrophil count is at least 1000 cells/mm³;
- 3) Reduce the dose of subsequent courses of TAXOL by 20% for patients who experience severe neutropenia (neutrophil <500 cells/mm³ for a week or longer); and

4) Initiate concomitant hematopoietic growth factor (G-CSF) as clinically indicated.

For the therapy of patients with solid tumors (ovary, breast, and NSCLC), courses of TAXOL should not be repeated until the neutrophil count is at least 1500 cells/mm³ and the platelet count is at least 100,000 cells/mm³. TAXOL should not be given to patients with AIDS-related Kaposi's sarcoma if the baseline or subsequent neutrophil count is less than 1000 cells/mm³. Patients who experience severe neutropenia (neutrophil <500 cells/mm³ for a week or longer) or severe peripheral neuropathy during TAXOL therapy should have dosage reduced by 20% for subsequent courses of TAXOL. The incidence of neurotoxicity and the severity of neutropenia increase with dose.

Hepatic Impairment: Patients with hepatic impairment may be at increased risk of toxicity, particularly grade III–IV myelosuppression (see **CLINICAL PHARMACOLOGY** and **PRECAUTIONS: Hepatic**). Recommendations for dosage adjustment for the first course of therapy are shown in **TABLE 17** for both 3- and 24-hour infusions. Further dose reduction in subsequent courses should be based on individual tolerance. Patients should be monitored closely for the development of profound myelosuppression.

TABLE 17
RECOMMENDATIONS FOR DOSING IN PATIENTS WITH HEPATIC IMPAIRMENT
BASED ON CLINICAL TRIAL DATA^a

Degree of Hepatic Impairment			
Transaminase Levels		Bilirubin Levels ^b	Recommended TAXOL Dose ^c
24-hour infusion			
<2 × ULN	and	≤1.5 mg/dL	135 mg/m ²
2 to <10 × ULN	and	≤1.5 mg/dL	100 mg/m ²
<10 × ULN	and	1.6–7.5 mg/dL	50 mg/m ²
≥10 × ULN	or	>7.5 mg/dL	Not recommended
3-hour infusion			
<10 × ULN	and	≤1.25 × ULN	175 mg/m ²
<10 × ULN	and	1.26–2.0 × ULN	135 mg/m ²
<10 × ULN	and	2.01–5.0 × ULN	90 mg/m ²
≥10 × ULN	or	>5.0 × ULN	Not recommended

^a These recommendations are based on dosages for patients without hepatic impairment of 135 mg/m² over 24 hours or 175 mg/m² over 3 hours; data are not available to make dose adjustment recommendations for other regimens (eg, for AIDS-related Kaposi's sarcoma).

^b Differences in criteria for bilirubin levels between the 3- and 24-hour infusion are due to differences in clinical trial design.

^c Dosage recommendations are for the first course of therapy; further dose reduction in subsequent courses should be based on individual tolerance.

Preparation and Administration Precautions

Procedures for proper handling and disposal of anticancer drugs should be considered. Several guidelines on this subject have been published.¹⁻⁴ To minimize the risk of dermal exposure, always wear impervious gloves when handling vials containing TAXOL Injection. If TAXOL solution contacts the skin, wash the skin immediately and thoroughly with soap and water. Following topical exposure, events have included tingling, burning, and redness. If TAXOL contacts mucous membranes, the membranes should be flushed thoroughly with water. Upon inhalation, dyspnea, chest pain, burning eyes, sore throat, and nausea have been reported.

Given the possibility of extravasation, it is advisable to closely monitor the infusion site for possible infiltration during drug administration (see **PRECAUTIONS: Injection Site Reaction**).

Preparation for Intravenous Administration

TAXOL (paclitaxel) Injection must be diluted prior to infusion. TAXOL should be diluted in 0.9% Sodium Chloride Injection, USP; 5% Dextrose Injection, USP; 5% Dextrose and 0.9% Sodium Chloride Injection, USP; or 5% Dextrose in Ringer's Injection to a final concentration of 0.3 to 1.2 mg/mL. The solutions are physically and chemically stable for up to 27 hours at ambient temperature (approximately 25° C) and room lighting conditions. Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration whenever solution and container permit.

Upon preparation, solutions may show haziness, which is attributed to the formulation vehicle. No significant losses in potency have been noted following simulated delivery of the solution through IV tubing containing an in-line (0.22 micron) filter.

Data collected for the presence of the extractable plasticizer DEHP [di-(2-ethylhexyl)phthalate] show that levels increase with time and concentration when dilutions are prepared in PVC containers. Consequently, the use of plasticized PVC containers and administration sets is not recommended. TAXOL solutions should be prepared and stored in glass, polypropylene, or polyolefin containers. Non-PVC containing administration sets, such as those which are polyethylene-lined, should be used.

TAXOL should be administered through an in-line filter with a microporous membrane not greater than 0.22 microns. Use of filter devices such as IVEX-2[®] filters which incorporate short inlet and outlet PVC-coated tubing has not resulted in significant leaching of DEHP.

The Chemo Dispensing Pin™ device or similar devices with spikes should not be used with vials of TAXOL since they can cause the stopper to collapse resulting in loss of sterile integrity of the TAXOL solution.

Stability

Unopened vials of TAXOL (paclitaxel) Injection are stable until the date indicated on the package when stored between 20°–25° C (68°–77° F), in the original package. Neither freezing nor refrigeration adversely affects the stability of the product. Upon refrigeration, components in the TAXOL vial may precipitate, but will redissolve upon reaching room temperature with little or no agitation. There is no impact on product quality under these circumstances. If the solution remains cloudy or if an insoluble precipitate is noted, the vial should be discarded. Solutions for infusion prepared as recommended are stable at ambient temperature (approximately 25° C) and lighting conditions for up to 27 hours.

HOW SUPPLIED

NDC 0015-3475-30 30 mg/5 mL multidose vial individually packaged in a carton.
NDC 0015-3476-30 100 mg/16.7 mL multidose vial individually packaged in a carton.
NDC 0015-3479-11 300 mg/50 mL multidose vial individually packaged in a carton.

Storage

Store the vials in original cartons between 20°–25° C (68°–77° F). Retain in the original package to protect from light.

Handling and Disposal

See **DOSAGE AND ADMINISTRATION: Preparation and Administration Precautions.**

REFERENCES

1. NIOSH Alert: Preventing occupational exposures to antineoplastic and other hazardous drugs in healthcare settings. 2004. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2004-165.

2. OSHA Technical Manual, TED 1-0.15A, Section VI: Chapter 2. Controlling occupational exposure to hazardous drugs. OSHA, 1999.
http://www.osha.gov/dts/osta/otm/otm_vi/otm_vi_2.html.
3. American Society of Health-System Pharmacists. ASHP guidelines on handling hazardous drugs. *Am J Health-Syst Pharm*. 2006;63:1172-1193.
4. Polovich M, White JM, Kelleher LO, eds. 2005. Chemotherapy and biotherapy guidelines and recommendations for practice. 2nd ed. Pittsburgh, PA: Oncology Nursing Society.

Bristol-Myers Squibb Company
Princeton, NJ 08543 USA

Rev August 2010

Patient Information

TAXOL[®] (TAX all) (paclitaxel) Injection

Read this patient information leaflet before you start taking TAXOL. There may be new information. This information does not take the place of talking to your healthcare provider about your medical condition or your treatment.

What is the most important information I should know about TAXOL?

TAXOL can cause serious side effects including death.

Serious allergic reactions (anaphylaxis) can happen in people who receive TAXOL. Anaphylaxis is a serious medical emergency that can lead to death and must be treated right away.

Tell your healthcare provider right away if you have any of these signs of an allergic reaction:

- trouble breathing
- sudden swelling of your face, lips, tongue, throat, or trouble swallowing
- hives (raised bumps) or rash

Your healthcare provider will give you medicines to lessen your chance of having an allergic reaction.

What is TAXOL?

TAXOL is a prescription medicine used to treat some forms of:

- ovarian cancer
- breast cancer
- lung cancer
- Kaposi's sarcoma

It is not known if TAXOL is safe or effective in children.

Who should not receive TAXOL?

Do not receive TAXOL if:

- you are allergic to any of the ingredients in TAXOL. See the end of this leaflet for a complete list of ingredients in TAXOL.
- are allergic to medicines containing Cremophor[®] EL* (polyoxyethylated castor oil).
- you have low white blood cell counts.

What should I tell my healthcare provider before receiving TAXOL?

Before receiving TAXOL, tell your healthcare provider about all your medical conditions, including if you:

- have liver problems
- have heart problems
- are pregnant or plan to become pregnant. TAXOL can harm your unborn baby. Talk to your healthcare provider if you are pregnant or plan to become pregnant.
- are breast-feeding or plan to breast-feed. It is not known if TAXOL passes into your breast milk. You and your healthcare provider should decide if you will receive TAXOL or breast-feed.

Tell your healthcare provider about all the medicines you take, including prescription and non-prescription medicines, vitamins, and herbal supplements.

Know the medicines you take. Keep a list of them and show it to your healthcare provider and pharmacist when you get a new medicine.

How will I receive TAXOL?

- TAXOL is injected into a vein (intravenous [IV] infusion) by your healthcare provider.

Your healthcare provider will do certain tests while you receive TAXOL.

What are the possible side effects of TAXOL?

Tell your healthcare provider right away if you have:

- severe stomach pain
- severe diarrhea

The most common side effects of TAXOL include:

- low red blood cell count (anemia) feeling weak or tired
- hair loss
- numbness, tingling, or burning in your hands or feet (neuropathy)
- joint and muscle pain
- nausea and vomiting
- hypersensitivity reaction - trouble breathing; sudden swelling of your face, lips, tongue, throat, or trouble swallowing; hives (raised bumps) or rash
- diarrhea
- mouth or lip sores (mucositis)
- infections - if you have a fever (temperature above 100.4°F) or other sign of infection, tell your healthcare provider right away
- swelling of your hands, face, or feet
- bleeding events
- irritation at the injection site
- low blood pressure (hypotension)

Tell your healthcare provider if you have any side effect that bothers you or that does not go away.

These are not all the possible side effects of TAXOL. For more information, ask your healthcare provider or pharmacist.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

General information about the safe and effective use of TAXOL.

Medicines are sometimes prescribed for purposes other than those listed in a patient information leaflet. Do not use TAXOL for a condition for which it was not prescribed. Do not give TAXOL to other people, even if they have the same symptoms that you have. It may harm them.

This patient information leaflet summarizes the most important information about TAXOL. If you would like more information, talk with your healthcare provider. You can ask your pharmacist or healthcare provider for information about TAXOL that is written for health professionals. For more information call 1-800-321-1335 or go to www.bms.com.

What are the ingredients in TAXOL?

Active ingredient: paclitaxel.

Inactive ingredients include: purified Cremophor[®] EL (polyoxyethylated castor oil) and dehydrated alcohol, USP.

What is cancer?

Under normal conditions, the cells in your body divide and grow in an orderly, controlled way. Cell division and growth are necessary for the human body to perform its functions and to repair itself, when necessary. Cancer cells are different from normal cells because they are not able to control their own growth. The reasons for this abnormal growth are not yet fully understood.

A tumor is a mass of unhealthy cells that are dividing and growing fast and in an uncontrolled way. When a tumor invades surrounding healthy body tissue, it is known as a malignant tumor. A malignant tumor can spread (metastasize) from its original site to other parts of the body if not found and treated early.

Bristol-Myers Squibb Company
Princeton, NJ 08543 USA

*Cremophor[®] EL is the registered trademark of BASF Aktiengesellschaft.

Cremophor[®] EL is further purified by a Bristol-Myers Squibb Company proprietary process before use.

Rev August 2010

**CENTER FOR DRUG EVALUATION AND
RESEARCH**

APPLICATION NUMBER:

020262Orig1s048

MEDICAL REVIEW(S)

FILE MEMORANDUM

MEMO DATE: 9/29/2008, 03/06/2009, and 4/26/2010

TO: NDA: 20-262 SLR-048 CBE-30 PM: L. Skarupa
Supporting Doc number: EDR Sequence # 048
SUBMISSION DATE: 11/21/2007
RECEIVED DATE: 11/21/2007
Network path in edr: \\CDSESUB1\N20262\S_048\2007-11-21

FROM: Robert Kane, MD, Medical Reviewer; Division of Drug Oncology Products, OODP

SUBJECT: Taxol SLR-048: to add ARs, safe handling precautions, PK and revised patient information Bristol-Myers Squibb BMS

Via: Ann Farrell, MD, team leader, DDOP, OODP

Reviewer Recommendation:

The proposed label changes, as revised, are acceptable.

BMS has proposed clinical label changes to add ARs to the label are data-based and are acceptable. Some additional minor label text edits are being made for clarity as indicated below. Also at this time, we are revising the label to delete reference to adjectives expressing quantity such as "rare" or "rarely" as recommended by current good label procedures. In addition, the patient information form (PPI), as revised and re-submitted by BMS this year, is acceptable to OSE and to the review division. The other label revision sections have been reviewed by clinical pharmacology and toxicology reviewers and found acceptable, as revised.

Background:

See sponsor's cover letter dated 11/21/2007:

"We are providing a revised electronic submission containing labeling that incorporates the following changes: revised statement regarding TAXOL use with inducers, substrates, or inhibitors for cytochrome P450 isoenzymes in PRECAUTIONS: Drug Interactions section;

- Added statement regarding monitoring of cardiac function when TAXOL is use with Doxorubicin in PRECAUTIONS: Cardiovascular section;

When TAXOL is used in combination with doxorubicin for treatment of metastatic breast cancer, monitoring of cardiac function is recommended. (See **ADVERSE REACTIONS.**) (track changes label page 23)

including cardiac dysfunction and reduction of left ventricular ejection fraction or ventricular failure, ... (track changes label page 40)

- Updating of the ADVERSE REACTIONS: Respiratory, Neurologic, Renal Gastrointestinal, and Other Events subsections with new information;



(b) (4)

- added statements regarding opportunistic infections, and elevated liver function tests and renal toxicity in Kaposi's sarcoma patients to ADVERSE Event Experiences by Body System section;



(b) (4)

- added additional adverse events when TAXOL is combined with other chemotherapy, notably anthracyclines, in ADVERSE REACTIONS: Adverse Event Experiences by Body System – Cardiovascular and Other Clinical events section;
- Added safe handling of primary package to the HOW SUPPLIED: Handling and Disposal section;
- updating of the REFERENCES;
- Added text and modify the PATIENT INFORMATION section;

- Minor editorial changes were made to the package insert."

Pharm-tox and clin-pharm have been consulted for the Safe Handling review and CYP-related changes proposed.

OSE has been consulted for the Patient Information section review and agrees with the final text as submitted by BMS in April 2010.

Application Type/Number	Submission Type/Number	Submitter Name	Product Name
NDA-20262	SUPPL-48	BRISTOL MYERS SQUIBB CO PHARMACEUTICA L RESEARCH INSTITUTE	TAXOL (PACLITAXEL) INJ

This is a representation of an electronic record that was signed electronically and this page is the manifestation of the electronic signature.

/s/

ROBERT C KANE
04/26/2010

ANN T FARRELL
04/26/2010

**CENTER FOR DRUG EVALUATION AND
RESEARCH**

APPLICATION NUMBER:

020262Orig1s048

**CLINICAL PHARMACOLOGY AND
BIOPHARMACEUTICS REVIEW(S)**

CLINICAL PHARMACOLOGY/BIPHARMACEUTICS REVIEW

NDA: 20-262/SLR-048
BRAND NAME: TAXOL
GENERIC NAME: Paclitaxel
DOSAGE FORM/ STRENGTHS: 6 mg/mL of Paclitaxel as 30 mg (5 mL), 100 mg (16.7 mL), and 300 mg (50 mL) Multi-dose Vials.
INDICATIONS: First-Line treatment of Advanced Carcinoma of the Ovary, Adjuvant Treatment of Node-Positive Breast Cancer, Breast Cancer after Failure of Combination Chemotherapy for Metastatic Disease or Relapse within 6 Months of Adjuvant Chemotherapy, First-Line Treatment of Non-Small Cell Lung Cancer, and Second-Line Treatment of AIDS-Related Kaposi's Sarcoma

SUBMISSION DATE: 21-Nov-2007
SUBMISSION TYPE: NDA-Labeling Supplement
APPLICANT: Bristol-Myers Squibb Company
DDOP: Division of Drug Oncology Products
OCP DIVISION: Division of Clinical Pharmacology 5
OCP REVIEWER: Sophia Abraham, Ph.D.
OCP TEAM LEADER: Brian Booth, Ph.D.

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Appendices

1. Proposed Package Insert (Major Changes from the Clinical Pharmacology Perspective)

1. EXECUTIVE SUMMARY

In the current NDA 20-262 submission, the Applicant provides some changes being effected in the approved labeling for TAXOL (Paclitaxel) for Injection. From the clinical pharmacology perspective, the Applicant provided a revised statement under the Precautions/ Drug Interactions section regarding the use of CYP450 substrates, inhibitors, and inducers

with TAXOL (see Appendix 1). In addition, minor changes were made under the Clinical Pharmacology section.

1.1 RECOMMENDATION

20-262/SLR-048 submitted in support of labeling changes for TAXOL (Paclitaxel) for Injection is acceptable to the Office of Clinical Pharmacology. The minor changes made under the Clinical Pharmacology section are acceptable. The Applicant should incorporate the clinical pharmacology Labeling Recommendations as outlined under Section 3 of this review (pp. 5).

Please forward the clinical pharmacology Labeling Recommendations (pp. 5 of this review) to the Applicant.

1.2 PHASE 4 COMMITMENTS

[None]

1.3 SUMMARY OF CLINICAL PHARMACOLOGY FINDINGS

2 QUESTION BASED REVIEW

Refer to the original NDA 20-262 (Submission Date: 29-Dec-1992) for the following issues

2.1 *General Attributes of the Drug*

- 2.1.1 What are the highlights of the chemistry and physical-chemical properties of the drug substance and the formulation of the drug product as they relate to clinical pharmacology and biopharmaceutics review?
- 2.1.2 What are the proposed mechanism(s) of action and therapeutic indication(s)?
- 2.1.3 What are the proposed dosage(s) and route(s) of administration?

2.2 *General clinical pharmacology*

- 2.2.1 What are the design features of the clinical studies used to support dosing or claims?
- 2.2.2 What is the basis for selecting the response endpoints (i.e., clinical or surrogate endpoints) or biomarkers (collectively called pharmacodynamics (PD) and how are they measured in clinical pharmacology and clinical studies?
- 2.2.3 Are the active moieties in the plasma (or other biological fluid) appropriately identified and measured to assess pharmacokinetic parameters and exposure response relationships?

2.2.4 Exposure-response

- 2.2.4.1 What are the characteristics of the exposure-response relationships (dose-response, concentration-response) for efficacy?

- 2.2.4.2 What are the characteristics of the exposure-response relationships (dose-response, concentration-response) for safety?
- 2.2.4.3 Does this drug prolong the QT or QTc interval?
- 2.2.4.4 Is the dose and dosing regimen selected by the sponsor consistent with the known relationship between dose-concentration-response, and are there any unresolved dosing or administration issues?
- 2.2.5 What are the PK characteristics of the drug and its major metabolite?
- 2.2.5.1 What are the single dose and multiple dose PK parameters?
- 2.2.5.2 How does the PK of the drug and its major active metabolites in healthy volunteers compare to that in patients?
- 2.2.5.3 What are the characteristics of drug absorption?
- 2.2.5.4 What are the characteristics of drug distribution?
- 2.2.5.5 Does the mass balance study suggest renal or hepatic as the major route of elimination?
- 2.2.5.6 What are the characteristics of drug metabolism?
- 2.2.5.7 What are the characteristics of drug excretion?
- 2.2.5.8 Based on PK parameters, what is the degree of linearity or nonlinearity in the dose-concentration relationship?
- 2.2.5.9 How do the PK parameters change with time following chronic dosing?
- 2.2.5.10 What is the inter- and intra-subject variability of PK parameters in volunteers and patients, and what are the major causes of variability?

2.3 Intrinsic Factors

- 2.3.1 What intrinsic factors (age, gender, race, weight, height, disease, genetic polymorphism, pregnancy, and organ dysfunction) influence exposure (PK usually) and/or response, and what is the impact of any differences in exposure on efficacy or safety responses?
- 2.3.2 Based upon what is known about exposure-response relationships and their variability and the groups studied, healthy volunteers vs. patients vs. specific populations (examples shown below), what dosage regimen adjustments, if any, are recommended for each of these groups?
- 2.3.2.7 What pharmacogenetics information is there in the application and is it important or not?
- 2.3.2.7 What pregnancy and lactation use information is there in the application?

2.4 Extrinsic Factors

- 2.4.1 What extrinsic factors (drugs, herbal products, diet, smoking, and alcohol use) influence dose-exposure and/or -response and what is the impact of any differences in exposure on response?

2.4.2 Drug-drug interactions

- 2.4.2.1 Is there an in vitro basis to suspect in vivo drug-drug interactions?
- 2.4.2.2 Is the drug a substrate of CYP enzymes? Is metabolism influenced by genetics?
- 2.4.2.3 Is the drug an inhibitor and/or an inducer of CYP enzymes?

- 2.4.2.4 Is the drug a substrate and/or an inhibitor of P-glycoprotein transport processes?
- 2.4.2.5 Are there other metabolic/transporter pathways that may be important?
- 2.4.2.6 Does the label specify co-administration of another drug (e.g., combination therapy in oncology) and, if so, has the interaction potential between these drugs been evaluated?
- 2.4.2.7 What other co-medications are likely to be administered to the target patient population?
- 2.4.2.8 Are there any in vivo drug-drug interaction studies that indicate the exposure alone and/or exposure-response relationships are different when drugs are co-administered?
- 2.4.2.10 Are there any unresolved questions related to metabolism, active metabolites, metabolic drug interactions, or protein binding?
- 2.4.3 What issues related to dose, dosing regimens, or administration are unresolved and represent significant omissions?

2.5 General Biopharmaceutics

[NOT APPLICABLE]

- 2.5.1 Based on the biopharmaceutics classification system (BCS) principles, in what class is this drug and formulation? What solubility, permeability, and dissolution data support this classification?
- 2.5.2 What is the relative bioavailability of the proposed to-be-marketed formulation to the pivotal clinical trial?
 - 2.5.2.1.1 What data support or do not support a waiver of in vivo BE data?
 - 2.5.2.2 What are the safety or efficacy issues, if any, for BE studies that fail to meet the 90% CI using equivalence limits of 80-125%?
 - 2.5.2.3 If the formulations do not meet the standard criteria for bioequivalence, what clinical pharmacology and/or clinical safety and efficacy data support the approval of the to-be-marketed product?
- 2.5.3 What is the effect of food on the bioavailability (BA) of the drug from the dosage form? What dosing recommendation should be made, if any, regarding administration of the product in relation to meals or meal types?
- 2.5.4 When would a fed BE study be appropriate and was one conducted?
- 2.5.5 How do the dissolution conditions and specifications ensure in vivo performance and quality of the product?
- 2.5.6 If different strength formulations are not bioequivalent based on standard criteria, what clinical safety and efficacy data support the approval of the various strengths of the to-be-marketed product?
- 2.5.7 If the NDA is for a modified release formulation of an approved immediate product without supportive safety and efficacy studies, what dosing regimen changes are necessary, if any, in the presence or absence of PK-PD relationship?
- 2.5.8 If unapproved products or altered approved products were used as active controls, how is BE to the approved product demonstrated? What is the basis for using either in vitro or in vivo data to evaluate BE?
- 2.5.9 What other significant, unresolved issues related to in vitro dissolution or in vivo BA and BE need to be addressed?

2.6 Analytical Section

2.6.1 How are the active moieties identified and measured in the plasma in the clinical pharmacology and biopharmaceutics studies?

2.6.2 Which metabolites have been selected for analysis and why?

2.6.3 For all moieties measured, is free, bound, or total measured? What is the basis for that decision, if any, and is it appropriate?

2.6.4 What bioanalytical methods are used to assess concentrations?

2.6.4.1 What is the range of the standard curve? How does it relate to the requirements for clinical studies? What curve fitting techniques are used?

2.6.4.2 What are the lower and upper limits of quantification (LLOQ)?

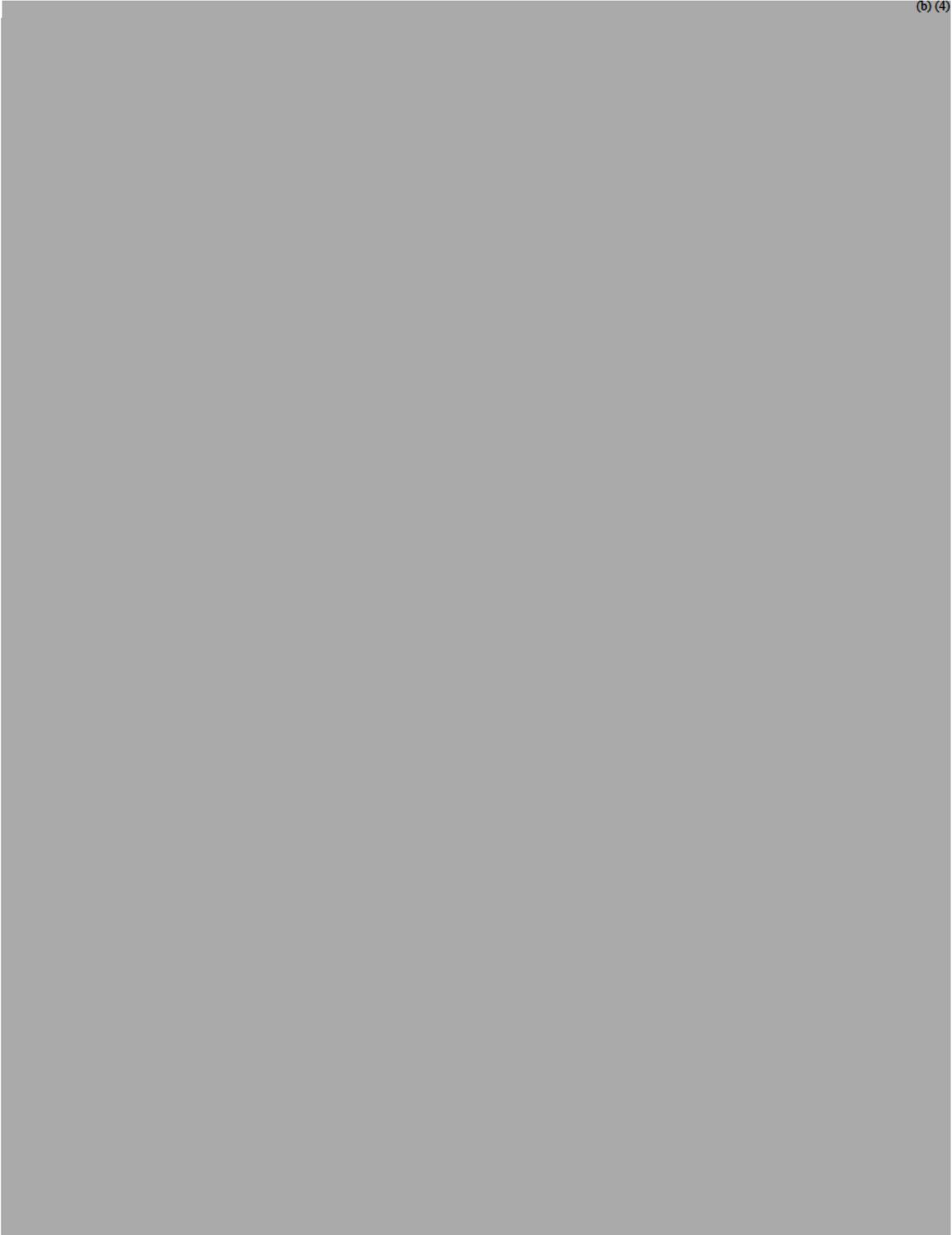
2.6.4.3 What are the accuracy, precision, and selectivity at these limits?

3. Clinical Pharmacology Labeling Recommendations

(b) (4)

Appendices

Appendix 1. Proposed Package Insert (Major Changes from the Clinical Pharmacology Perspective)



3 Page(s) of Draft Labeling has been Withheld in Full as b4 (CCI/TS) immediately following this page

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/s/

Sophia Abraham
10/17/2008 11:55:54 AM
BIOPHARMACEUTICS

Brian Booth
10/23/2008 08:54:59 AM
BIOPHARMACEUTICS

**CENTER FOR DRUG EVALUATION AND
RESEARCH**

APPLICATION NUMBER:
020262Orig1s048

OTHER REVIEW(S)

REGULATORY PROJECT MANAGER LABELING REVIEW (PHYSICIAN LABELING RULE)

Division of Drug Oncology Products

Application Number: NDA 020262/S-048

Name of Drug: Taxol (paclitaxel) Injection

Applicant: Bristol-Myers Squibb
Princeton, NJ

Material Reviewed:

Submission Date(s): November 21, 2007

Receipt Date(s): November 21, 2007

Background and Summary

NDA 020262 is approved for ovarian carcinoma, breast carcinoma, non-small cell lung carcinoma, and AIDS-Related Kaposi's Sarcoma. S-048 provides for revisions to the following areas:

- revised statement regarding TAXOL use with inducers, substrates, or inhibitors for cytochrome P450 isoenzymes in PRECAUTIONS: Drug Interactions section
- added statement regarding monitoring of cardiac function when TAXOL is used with Doxorubicin in PRECAUTIONS: Cardiovascular section
- updating of the ADVERSE REACTIONS: Respiratory, Neurologic, Renal, Gastrointestinal, and Other Events subsections with new information
- added statements regarding opportunistic infections, and elevated liver function tests and renal toxicity in Kaposi's sarcoma patients to ADVERSE Event Experiences by Body System section;
- added additional adverse events when TAXOL is combine with other chemotherapy, notably anthracyclines, in ADVERSE REACTIONS: Adverse Event Experiences by Body System – Cardiovascular and Other Clinical Events section;
- added safe handling of primary package to the HOW SUPPLIED: Handling and Disposal section
- updating of the REFERENCES
- added test to PATIENT INFORMATION section
- minor editorial changes were made to the package insert

as well as to remove Bristol-Myers Squibb Oncology logo. This supplement has been reviewed by and changes concurred by Robert Kane, M.D. (Clinical Team); Leigh Verbois Ph.D.

(Pharmacology Toxicology Review Team); Qi Liu, Ph.D., and Sophia Abraham (Clinical Pharmacology Team); LaShawn Griffiths (OSE Reviewer) and Cynthia Collins (DDMAC Reviewer). The pharmacology/toxicology and regulatory revisions in this RPM labeling review were reviewed and concurred by Leigh Verbois Ph.D. The other reviews for this supplement were the clinical review dated September 29, 2008, revised March 06, 2009 and April 26, 2010, the clinical pharmacology review dated October 23, 2008, the OSE review dated March 4, 2009, and the DDMAC Review April 30, 2010.

This CBE-0 supplemental application was submitted to CDER's electronic document room.

The labeling submitted CBE S048 Revised March 2003 was compared to the Label Revised March 2003 in the annual report (submitted April 15, 2003).

Deletions are shown as ~~strikeouts~~ and additions are shown as double underlines. The following revisions were noted.

Package Insert

Conclusions

Recommendations made from the Clinical Pharmacology, Clinical, Pharmacology/Toxicology and OSE were forwarded to Bristol Myers Squibb. Further revisions were made by Bristol Myers Squibb; the final versions (identified as "Revised May 2010") were agreed with by FDA. Supplement 048 is recommended for approval and an approval letter should be sent out.

Lisa Skarupa, RN, MSN
Regulatory Project Manager

Supervisory Comment/Concurrence:

Frank Cross,
Chief, Project Management Staff

Drafted: L. Skarupa/ 9/15/2008

Revised/Initialed: LS 10/19/2008; March 26, 2010; April 22, 2010, June 3, 2010; FC June 14, 2010

Finalized: June 14, 2010

Filename: N20262TaxolRPM reviewJune7

Application Type/Number	Submission Type/Number	Submitter Name	Product Name
NDA-20262	SUPPL-48	BRISTOL MYERS SQUIBB CO PHARMACEUTICA L RESEARCH INSTITUTE	TAXOL (PACLITAXEL) INJ

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/s/

LISA M SKARUPA
06/29/2010

SANDI L VERBOIS
06/29/2010

FRANK H Cross
06/29/2010

MEMORANDUM

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration
Center for Drug Evaluation and Research
Division of Drug Marketing, Advertising, and Communications

*****PRE-DECISIONAL AGENCY INFORMATION*****

Date: April 29, 2010

To: Lisa Skarupa
Regulatory Health Project Manager
Division of Drug Oncology Products (DDOP)

From: Cynthia Collins
Regulatory Review Officer
Division of Drug Marketing, Advertising, and Communications (DDMAC)

Cc: Sangeeta Vaswani, Group Leader, DDMAC
Carole Broadnax, Regulatory Review Officer, DDMAC
Nisha Patel, Regulatory Review Officer, DDMAC

Re: **NDA 020262: TAXOL (paclitaxel) injection**
DDMAC label consult response: Patient Instructions for Use

Background:

DDMAC has reviewed the following draft patient labeling for TAXOL (paclitaxel) injection (Taxol):

- Draft Patient Package Insert
 - document entitled "Taxol USPI Markup 041510"
 - document received from DDOP on April 27, 2010

We offer the following comments on the draft patient labeling:

Patient Package Insert (PPI)

1. Under "**What is the most important information I should know about Taxol?**" the draft PPI describes the risk of anaphylaxis, symptoms of anaphylaxis, and the need for premedication. However, the "black box" warning in the draft PI for Taxol also includes information regarding neutropenia.

DDMAC Comment: *Would it be appropriate to also include the risk of neutropenia and serious infections in this "most important information" section of the PPI?*

2. Under "**How will I receive TAXOL?**" the draft PPI states:

- "Your healthcare provider will do certain tests while you receive Taxol."

However, the Warnings section of the draft PI states "Frequent monitoring of blood counts should be instituted during TAXOL treatment." Additionally, the "black box" warning regarding neutropenia in the draft PI states ". . .it is recommended that frequent peripheral blood cell counts be performed on all patients receiving TAXOL."

DDMAC Comment: *DDMAC recommends revising the statement above to include in consumer-friendly language that patients should undergo frequent peripheral blood cell count monitoring while taking Taxol, in addition to other tests that may be done while receiving the Taxol injection (e.g. vital sign monitoring, as described in the Precautions/Cardiovascular section of the draft PI).*

3. Under "**What are the possible side effects of TAXOL?**" the draft PPI states:

- "Tell your healthcare provider right away if you have:
 - severe stomach pain
 - severe diarrhea"

However, the same section of the draft PPI also states (emphasis added):

- "The most common side effects of Taxol include:
 - . . .
 - infections - If you have a fever (temperature above 100.4°F) or other sign of infection, tell your healthcare provider right away."

DDMAC Comment: *While it is appropriate to include the risk of infection in the "common side effects" subsection, DDMAC recommends moving the instruction regarding fever to the "tell your healthcare provider right away" subsection of the draft PPI.*

4. Under "**What are the possible side effects of TAXOL?**" the draft PPI states:

- "The most common side effects of Taxol include:
 - low red blood cell count (anemia) feeling weak or tired
 - . . .
 - infections - If you have a fever (temperature above 100.4°F) or other sign of infection, tell your healthcare provider right away."
 - . . .
 - bleeding events

However, according to Table 10 (Summary of Adverse Events) in the draft PI, bone marrow adverse events experienced by >10% of patients receiving Taxol include neutropenia, leukopenia, thrombocytopenia, anemia, infections, bleeding, and red cell transfusions.

DDMAC Comment: *The disconnected side effect list of "anemia," "infections," and "bleeding events" in the draft PPI do not adequately describe the risk of bone marrow toxicities in patients in receiving Taxol. DDMAC recommends revising this section to more accurately communicate all the various risks associated with bone marrow toxicity, in consumer-friendly language.*

5. Under "**What are the possible side effects of TAXOL?**" the draft PPI states:

- "The most common side effects of Taxol include:
 - . . .
 - hypersensitivity reaction - trouble breathing; sudden swelling of your face, lips, tongue, throat, or trouble swallowing; hives (raised bumps) or rash

DDMAC Comment: *While this is an appropriate description of a severe hypersensitivity reaction, according to the Precautions/Hypersensitivity Reactions section of the draft PI, minor symptoms of hypersensitivity reactions also include flushing, hypotension, or tachycardia. Would it be appropriate to also include these symptoms here?*

6. Under "**What are the possible side effects of TAXOL?**" the draft PPI omits several risks that are included in the draft PI for Taxol. Specifically, in addition to the bone marrow toxicity risks discussed in point #4 above, the following risks are omitted from the draft PPI:

- the warning regarding severe conduction abnormalities
- the "Abnormal ECG" adverse events
- the "Hepatic" adverse events
- adverse events specific to patients treated for AIDS-related Kaposi's sarcoma, as detailed in Table 16 of the draft PI (e.g. an increase in opportunistic infections and creatinine elevation)

DDMAC Comment: *Would it be appropriate to include these risks in consumer-friendly language in the draft PPI for Taxol?*

7. Under "**What are the possible side effects of TAXOL?**" the draft PPI includes a bulleted list of 13 potential side effects. These side effects appear to be listed in approximate order of adverse event frequency (based on Table 10 in the draft PI); however, this results in a disconnected list, with related side effects separated by unrelated concepts. For example, the bullet for hypersensitivity is #6 on the list, between the bullets for nausea/vomiting (#5) and diarrhea (#7).

DDMAC Comment: *DDMAC recommends revising this list so that (1) the order of side effects follows the order of the Warnings and Precautions sections of the draft PI, and (2) related concepts are listed consecutively.*

DDMAC appreciates the opportunity to provide comments on these materials. If you have any questions, please contact:

- Cynthia Collins
(301) 796-4284, or cynthia.collins@fda.hhs.gov

Application Type/Number	Submission Type/Number	Submitter Name	Product Name
NDA-20262	SUPPL-48	BRISTOL MYERS SQUIBB CO PHARMACEUTICA L RESEARCH INSTITUTE	TAXOL (PACLITAXEL) INJ

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/s/

CYNTHIA S COLLINS
04/30/2010



**Department of Health and Human Services
Public Health Service
Food and Drug Administration
Center for Drug Evaluation and Research
Office of Surveillance and Epidemiology**

Date: March 3, 2009

To: Robert Justice, M.D. Director
Division of Drug Oncology Products

Through: Jodi Duckhorn, MA, Team Leader
**Patient Labeling and Education Team
Division of Risk Management**

From: LaShawn Griffiths, MSHS-PH, BSN, RN
Patient Product Information Reviewer
**Patient Labeling and Education Team
Division of Risk Management**

Subject: DRISK Review of Patient Labeling (Patient Package Insert)

Drug Name(s): Taxol (paclitaxel)

Application Type/Number: NDA 20-262

Submission Number: S-048

Applicant/sponsor: Bristol-Myers Squibb Company

OSE RCM #: 2009-78

1 INTRODUCTION

This drug was first approved in December 29, 1992 for cancer treatment. Bristol-Myers Squibb Company submitted a Supplemental New Drug Application, sNDA 20-262/S-048 on November 21, 2007 in which they submitted proposed safety label revisions to the Package Insert (PI), and adding text to the Patient Package Insert (PPI).

The review division requested that DRISK's Patient Labeling and Education Team review the sponsor's proposed patient labeling. This review is written in response to that request.

2 MATERIAL REVIEWED

- Taxol Patient Package Insert (PPI) submitted November 21, 2007
- Taxol Prescribing Information (PI) submitted November 21, 2007, and revised by the Review Division throughout the current review cycle

3 DISCUSSION

The purpose of patient directed labeling is to facilitate and enhance appropriate use and provide important risk information about medications. Our recommended changes are consistent with current research to improve risk communication to a broad audience, including those with lower literacy.

The draft PPI submitted by the sponsor has a Flesch Kinkaid grade level of 9.1, and a Flesch Reading Ease score of 54.2%. To enhance patient comprehension, materials should be written at a 6th to 8th grade reading level, and have a reading ease score of at least 60% (60% corresponds to an 8th grade reading level). Our revised PPI has a Flesch Kinkaid grade level of 8.5 and a Flesch Reading Ease score of 55.6%.

In our review of the PPI, we have:

- simplified wording and clarified concepts where possible,
- ensured that the PPI is consistent with the PI,
- removed unnecessary or redundant information
- ensured that the PPI meets the criteria as specified in FDA's Guidance for Useful Written Consumer Medication Information (published July 2006).

In 2008, The American Society of Consultant Pharmacists Foundation in collaboration with The American Foundation for the Blind published *Guidelines for Prescription Labeling and Consumer Medication Information for People with Vision Loss*. They recommend using fonts such as Arial, Verdana, or APHont to make medical information more accessible for patients with low vision. We have reformatted the PPI document using the font APHont, which was developed by the American Printing House for the Blind specifically for low vision readers.

See the attached document for our recommended revisions to the PPI. Comments to the review division are ***bolded, underlined and italicized***.

We are providing the review division a marked-up and clean copy of the revised PPI. We recommend using the clean copy as the working document.

All future relevant changes to the PI should also be reflected in the PPI.

4 CONCLUSIONS AND RECOMMENDATIONS

1. In the section “What is Taxol?” disease specific information was removed. This can be placed at the end of the PPI or preferably be addressed with patients separately from the product specific information.
2.  (b) (4)
3.  (b) (4)
4. We added the sections “What should I tell my healthcare provider before taking Taxol?” and “What are the ingredients in Taxol?”. These are standard sections in the patient labeling.
5. In the section “What are the possible side effects of TAXOL?” The sponsor should clarify how they chose the side effects to list. What percentage cut-off was used? The RD should review and revise the list as appropriate.
6. We have added the following statement to the end of the section, “What are the possible side effects of TRADENAME?”:

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

This verbatim statement is required for all Medication Guides (see 21 CFR 208.20 (b)(7)(iii)). Although not required for voluntary PPIs like Taxol, we recommend adding this language to all FDA-approved patient labeling for consistency.

Please let us know if you have any questions.

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/s/

LaShawn Griffiths
3/4/2009 09:37:09 AM
DRUG SAFETY OFFICE REVIEWER

Jodi Duckhorn
3/4/2009 09:44:48 PM
DRUG SAFETY OFFICE REVIEWER

**CENTER FOR DRUG EVALUATION AND
RESEARCH**

APPLICATION NUMBER:
020262Orig1s048

ADMINISTRATIVE and CORRESPONDENCE
DOCUMENTS

REQUEST FOR CONSULTATION

TO (Division/Office) OSE-DRISK Sandra Griffith;
Cheryl Campbell

FROM: HFD-150/Lisa Skarupa

DATE
1-07-2009

IND NO.

NDA NO.
20-262 S_048

TYPE OF DOCUMENT
Supplement SLR

DATE OF DOCUMENT
11-21-07

NAME OF DRUG: Taxol (paclitaxel)

PRIORITY
CONSIDERATION

CLASSIFICATION OF DRUG

DESIRED COMPLETION DATE
30 days

NAME OF SPONSOR: Bristol Myers Squibb Company

REASON FOR REQUEST

I. GENERAL

NEW PROTOCOL

PROGRESS REPORT
NEW CORRESPONDENCE
DRUG ADVERTISING
ADVERSE REACTION REPORT
MANUFACTURING CHANGE/ADDITION
MEETING PLANNED BY

PRE-sNDA MEETING
END OF PHASE II MEETING
RESUBMISSION
SAFETY/EFFICACY
PAPER NDA
CONTROL SUPPLEMENT

RESPONSE TO DEFICIENCY LETTER (fax)
FINAL PRINTED LABELING
■ LABELING REVISION
ORIGINAL NEW CORRESPONDENCE
FORMULATIVE REVIEW
OTHER (SPECIFY BELOW)

II. BIOMETRICS

STATISTICAL EVALUATION BRANCH

STATISTICAL APPLICATION BRANCH

TYPE A OR B NDA REVIEW
END OF PHASE II MEETING
CONTROLLED STUDIES
PROTOCOL REVIEW
OTHER

CHEMISTRY REVIEW
PHARMACOLOGY
BIOPHARMACEUTICS
OTHER

III. BIOPHARMACEUTICS

DISSOLUTION
BIOAVAILABILITY/PK STUDIES
PHASE IV STUDIES

DEFICIENCY LETTER RESPONSE
PROTOCOL-BIOPHARMACEUTICS
IN-VIVO WAIVER REQUEST

IV. DRUG EXPERIENCE

PHASE IV SURVEILLANCE/EPIDEMIOLOGY PROTOCOL
DRUG USE e.g. POPULATION EXPOSURE,
ASSOCIATED DIAGNOSES
CASE REPORTS OF SPECIFIC REACTIONS (List below)
COMPARATIVE RISK ASSESSMENT ON GENERIC DRUG GROUP

REVIEW OF MARKETING EXPERIENCE, DRUG USE AND
SAFETY
SUMMARY OF ADVERSE EXPERIENCE
POISON RISK ANALYSIS

V. SCIENTIFIC INVESTIGATIONS

9 CLINICAL

9 PRECLINICAL

COMMENTS/SPECIAL INSTRUCTIONS: This SLR is overdue. It proposes safety label revisions and changes to the 'patient information' I've never reviewed this drug before, and I won't get to look at this submission for a month or so. Please proceed with your OSE review actions as warranted by your review of the submission.

The MO is Dr. Robert Kane. The submission is in CDER eDR location : \CDSESUB1\N20262\S_048\2007-11-21.

Thank you

SIGNATURE OF REQUESTER
Lisa Skarupa, RPM

METHOD OF DELIVERY (Check one)
 FAX

ELECTRONICALLY

SIGNATURE OF RECEIVER

SIGNATURE OF DELIVERER



RE: SPECIAL SUPPLEMENT - CHANGES BEING EFFECTED

NDA 20-262
TAXOL (paclitaxel) Injection
(BMS-181339)

November 21, 2007

Robert Justice, M.D.
Director, Division of Oncology Drug Products
Food and Drug Administration
Center for Drug Evaluation and Research
Office of Oncology Drug Products
5901-B Ammendale Road
Beltsville, Maryland 20705-1266

Dear Dr. Justice:

Reference is made to our approved New Drug Application for TAXOL (paclitaxel) Injection, NDA 20-262.

We are providing a revised electronic submission containing labeling that incorporates the following changes:

- revised statement regarding TAXOL use with inducers, substrates, or inhibitors for cytochrome P450 isoenzymes in PRECAUTIONS:Drug Interactions section;
- added statement regarding monitoring of cardiac function when TAXOL is used with Doxorubicin in PRECAUTIONS:Cardiovascular section;
- updating of the ADVERSE REACTIONS: Respiratory, Neurologic, Renal, Gastrointestinal, and Other Events subsections with new information;
- added statements regarding opportunistic infections, and elevated liver function tests and renal toxicity in Kaposi's sarcoma patients to ADVERSE Event Experiences by Body System section;
- added additional adverse events when TAXOL is combined with other chemotherapy, notably anthracyclines, in ADVERSE REACTIONS:Adverse Event Experiences by Body System – Cardiovascular and Other Clinical Events section;
- added safe handling of primary package to the HOW SUPPLIED:Handling and Disposal section;
- updating of the REFERENCES;
- Added text to PATIENT INFORMATION section;
- minor editorial changes were made to the package insert.

A summary of the changes made to the labeling is included electronically in the labeling history file (history.pdf). The electronic file named markup.pdf shows all of the revisions to the labeling.

A description of this electronic submission, which includes all information required per the Guidance for Industry: Providing Regulatory Submissions in Electronic Format - NDAs, dated January 29, 1999, is provided as an attachment to this cover letter.

The effective date for the TAXOL insert is December 21, 2007.

If you require additional information regarding this submission, please contact me by telephone at (609) 252-5741, or via fax at (609) 252-6000. I can also be reached via secure electronic mail at: fred.fruzzo@bms.com.

Sincerely,



Fred J. Frullo
Director Oncology
Global Regulatory Sciences

FJF/TSM/tmc
Attachments

Electronic Media Information

November 21, 2007

NDA 20-262

TAXOL ® (paclitaxel) Injection

Re: Special Supplement: Changes Being Effected

The archival copy of this submission is a fully compliant electronic submission and is being provided electronically in lieu of paper as per the Guidance for Industry: Providing Regulatory Submissions in Electronic Format - General Considerations, dated January 27, 1999, and the Guidance for Industry: Providing Regulatory Submissions in Electronic Format - NDAs, dated January 27, 1999.

The media for this electronic submission has been prepared as follows:

The total size of the electronic submission is approximately 26.1 MB and is being provided via E Gateway. There are 20 files and 3 folders. The files have been checked for viruses using McAfee Virus Scan Software (Version 8.0i) and no viruses were detected.

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/s/

Lisa M Skarupa
1/9/2009 03:18:35 PM

REQUEST FOR CONSULTATION

TO (Division/Office) HFD-860, Brian Booth Ph.D

FROM: HFD-150/ Lisa Skarupa, RPM

DATE 10-21-08	IND NO.	NDA NO. 20-262 /S048	TYPE OF DOCUMENT SLR	DATE OF DOCUMENT 11/21/07
NAME OF DRUG: Taxol (paclitaxel) Injection		PRIORITY CONSIDERATION	CLASSIFICATION OF DRUG	DESIRED COMPLETION DATE 30 days

NAME OF SPONSOR:

REASON FOR REQUEST

I. GENERAL

NEW PROTOCOL PROGRESS REPORT NEW CORRESPONDENCE DRUG ADVERTISING ADVERSE REACTION REPORT MANUFACTURING CHANGE/ADDITION MEETING PLANNED BY	PRE-NDA MEETING END OF PHASE II MEETING RESUBMISSION SAFETY/EFFICACY PAPER NDA CONTROL SUPPLEMENT	RESPONSE TO DEFICIENCY LETTER (fax) FINAL PRINTED LABELING LABELING REVISION ORIGINAL NEW CORRESPONDENCE FORMULATIVE REVIEW <input checked="" type="checkbox"/> OTHER (SPECIFY BELOW) Labeling Supplement
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II. BIOMETRICS

STATISTICAL EVALUATION BRANCH TYPE A OR B NDA REVIEW END OF PHASE II MEETING CONTROLLED STUDIES PROTOCOL REVIEW OTHER	STATISTICAL APPLICATION BRANCH CHEMISTRY REVIEW PHARMACOLOGY BIOPHARMACEUTICS OTHER
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III. BIOPHARMACEUTICS

DISSOLUTION BIOAVAILABILITY/PK STUDIES PHASE IV STUDIES	DEFICIENCY LETTER RESPONSE PROTOCOL-BIOPHARMACEUTICS IN-VIVO WAIVER REQUEST
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IV. DRUG EXPERIENCE

PHASE IV SURVEILLANCE/EPIDEMIOLOGY PROTOCOL DRUG USE e.g. POPULATION EXPOSURE, ASSOCIATED DIAGNOSES CASE REPORTS OF SPECIFIC REACTIONS (List below) COMPARATIVE RISK ASSESSMENT ON GENERIC DRUG GROUP	REVIEW OF MARKETING EXPERIENCE, DRUG USE AND SAFETY SUMMARY OF ADVERSE EXPERIENCE POISON RISK ANALYSIS
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V. SCIENTIFIC INVESTIGATIONS

CLINICAL	PRECLINICAL
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COMMENTS/SPECIAL INSTRUCTIONS: Bristol Myers Squibb submitted revisions to their labeling that also included added text in the Patient Information section. Please review regarding the changes as well as assuring it meets current standards. There are several generics and "almost" generic taxols that should follow this updated PPI for their products as well. The submission is in CDER eDR location :\\CDSESUB1\N20262\S_048\2007-11-21. Thank you.

SIGNATURE OF REQUESTER Lisa Skarupa, RPM	METHOD OF DELIVERY (Check one) <input type="checkbox"/> FAX <input checked="" type="checkbox"/> Electronically
SIGNATURE OF RECEIVER	SIGNATURE OF DELIVERER

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/s/

Lisa M Skarupa
10/22/2008 11:50:05 AM