

Supporting Statement B for:

**A multi-center international hospital-based case-control study of  
lymphoma in Asia (AsiaLymph) (NCI)**

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## **B. STATISTICAL METHODS**

### **B.1 Respondent Universe and Sampling Methods**

We are conducting a hospital-based case-control study. Our goal is to conduct the study in several regions of Asia to:

- increase variability in exposure to key risk factors;
- have enough study centers and hospitals to be able to enroll 3,300 lymphoma cases and 3,300 controls in three years;
- have a number of centers with a high prevalence of exposure to occupational compounds of interest; and,
- the extent possible, to carry out the study in centers and regions where NCI personnel have successfully carried out research previously and to be able to take advantage of existing infrastructure and experience.

The AsiaLymph study organization consists of two Study Coordinating Centers (University of Hong Kong and Queen Elizabeth Hospital), four Study Centers with responsibility for all study subject contact and 20 Hospitals (**Attachment 12**). Centers were considered for inclusion in AsiaLymph based initially on NCI study personnel's familiarity with a particular site, additional information provided through lymphoma and hematological pathologists and clinicians identified through literature searches and through contacts we have had through the course of other research conducted in Asia; and a literature search to identify investigators who had carried out any type of study of lymphoma previously in this region.

Additional issues taken into account were as follows:

- 1) Availability of local industrial hygienists and occupational health personnel to work with us on the exposure assessment effort;

- 2) Availability of local epidemiologists in each center;
- 3) Availability of high quality lymphoma pathologists in a given hospital;
- 4) Willingness to collaborate with other hospitals in a given center;
- 5) Willingness to collaborate with NCI on a large, multi-centered effort that required shipment of blood samples to NCI, and shipment of tumor samples to Hong Kong for central pathology review and to NCI for molecular analyses.

We identified four centers (**Attachment 1**) that fulfilled all criteria and in the aggregate allow us to accomplish the scientific objectives of AsiaLymph. Within each center, there are hospitals participating in the study that see approximately 75-95% of all lymphoma cases in their geographical region and include all major hospitals. Hospitals that were excluded from the study were small hospitals in these regions and often did not fulfill one or more criteria listed above.

Eligible cases are Chinese patients at a participating hospital who are between 18 and 79 years of age at time of initial diagnosis and admitted or treated with incident diagnoses of any lymphoid neoplasm. An incident case is defined as a case enrolled into the study within 12 weeks after the date of diagnosis of a lymphoid neoplasm. Cases are permanent residents of the general geographic region that is served by the hospital at the time of diagnosis. Specifically, they must have lived in this general geographic region for at least 15 years at some time in the past. Cases with a previous diagnosis of lymphoma are ineligible. A rapid case ascertainment system is established for case identification in participating hospitals in order to identify and approach all eligible cases. If a case is missed from enrollment during the initial visit to the hospital, the case will be approached at the next scheduled follow-up visit to the hospital. A case referred from a non-study hospital/clinic to a study hospital is eligible for inclusion into the study, if they come from the general geographic region served by the study hospital, if they are

enrolled at the study hospital within 12 weeks of diagnosis, and are otherwise eligible for the study based on the same criteria used for patients initially seen at a study hospital.

Controls are enrolled from Chinese patients seen at the participating hospitals. Controls are individually matched to cases by hospital, age at date of diagnosis/admission (+/-5 years), sex, and date of admission (within 3 months). Further, all cases and controls must live in the same general geographic region served by the hospital and have lived in this region at least 15 years at some time in the past. Controls are drawn from patients seen at the same hospital for diseases/conditions that are unlikely to be associated with risk factors under study, such as injuries and selected diseases of the circulatory, digestive, genitourinary, and central nervous system (**Attachment 1**). Each potential control disease has the same general referral pattern as lymphoma cases to avoid bias. Patients with a history of any lymphoma, including acute lymphoblastic lymphoma, multiple myeloma, chronic lymphocytic leukemia, Hodgkin lymphoma, and non-Hodgkin lymphoma, will not be eligible to serve as controls.

The interviewer in each hospital randomly selects one of the five disease categories from which to draw a given potential control patient for a specific case. The interviewer then identifies potential controls from admissions records with a disease from one of the five disease categories who could be a match to a given case on age and sex, randomly selects one control patient from the list of potential matched controls, and approaches the potential control patient, explains the study, and obtains information to determine if the patient is eligible (i.e., residence in the current geographic region for at least 15 years in the past and no prior history of a lymphoid neoplasm). If the patient is not eligible, or the patient is eligible but does not consent to participate in the study, then the interviewer randomly selects another potential control from the list of potential

matched controls (**Attachment 1**). No more than ~15% of controls enrolled in any hospital have one type of control disease.

We propose to increase the sample size of the study by 2,900 cases and 900 controls, which we plan to enroll over the next three years in three study centers (Hong Kong, Chengdu, and Tianjin, China) (**Attachment 1**).

The same methods, questionnaire, biological sample protocol, personnel and hospitals used in the AsiaLymph study in the three participating study centers will be used for enrolling myeloid neoplasm cases. Further, controls already being enrolled in the AsiaLymph study will be frequency-matched to the myeloid neoplasm cases, so that we will not need to enroll additional controls for these cases.

For a dichotomous exposure variable (e.g., ever vs. never exposed to a particular chemical in the workplace; ever vs. never use of specific medications) with a prevalence of 2%, we will have 80% statistical power (two-sided alpha = 0.05) to detect ORs ranging from 1.4 to 1.7 for the target sample size for key subgroups of lymphoid and myeloid neoplasm cases. For an exposure variable with a prevalence of 3%, we will have 80% power to detect ORs of 1.3 to 1.6. For risk factors with a higher prevalence of exposure, we will have adequate power to detect lower ORs. For studies of genetic polymorphisms, we will have 80% power to detect an OR of 1.2 per allele (from an additive genetic model) for minor allele frequencies ranging from 8% to 36% for the target sample size for key subgroups of lymphoid and myeloid neoplasm cases. We will be able to detect an OR of 1.3 per allele for MAFs of 3.5% to 11.5%. The prevalence range and expected ORs used for these statistical power calculations are realistic estimates that fall within the range observed within observational epidemiologic studies of cancer studying questionnaire-based and measured genetic risk factors.

## **B.2 Procedures for the Collection of Information**

Both cases and controls are interviewed within 48 hours after they are identified. A computer assisted personal interview (CAPI) ascertains occupational, family, medical, lifestyle, and residential histories (**Attachment 3**). The English version of the questionnaire was created solely to provide a basis for translation; participants choose one of the four Chinese-version questionnaires to complete. The four Chinese-version questionnaires are being used between four centers where the study is occurring. The differences between the four Chinese questionnaires include slight differences in the phrasing of a few questions, reflecting local and regional language usage. The content, information being collected, and the amount of time required to administer is the same for all the questionnaires. **For updated versions of the screener and core questionnaire in Chinese that will be used in Hong Kong, Tianjin, and Chengdu, see Attachments 3B, 3D, and 3E. English versions of the updated screener and core questionnaires (Attachments 3A, 3B, and 3C) are also included. There is a small change to the screener in which potential study subjects are asked if they have had a prior history of myeloid neoplasms or acute leukemia (in addition to being asked if they have had a prior history of lymphoma) and no change to the questionnaire, so content and information being collected is the same and the amount of time required to administer the questionnaire is the same as in the previous request to OMB.**

The CAPI triggers occupational exposure assessment modules in the OccIdeas system designed specifically to assess occupational exposures using more detailed, exposure-oriented job and industry questions. Specifically, a patient who reports a particular combination of industry and job title triggers questions for certain types of occupational industries, job titles, or

types of chemical exposures (e.g., benzene, trichloroethylene) (examples in **Attachments 4 and 5**). A key feature of the OccIDEAS system is the ability to program exposure decision rules based on the patterns of responses to one or more questions, which provides automated exposure assessments and substantially reduces the time and expense needed to publish occupational data collected a given study. Based on current responses, we estimate that about 50% of study subjects are administered 1-3 of these modules and that the remaining 50% are not administered any modules.

In addition, interviewers scan selected documents from the medical record (e.g., discharge summary, pathology report, major diagnostic tests) for use in confirming case diagnosis, which is conducted through a central pathology review by the study pathology center in Hong Kong. Interviewers upload the CAPI, which are automatically encrypted, and scanned files to the study coordinating center (Hong Kong University School of Public Health). Interviewers use various tracking forms to ensure that all study activities are completed (**Attachment 11**).

A 27 ml blood sample is collected from each study subject. To the extent possible, blood samples are collected prior to initiation of therapy. The samples are collected in EDTA vacutainers (3 tubes with 9 ml each). The samples are transported to the processing laboratory within 4 hours and processed, which will include standard low speed centrifugation, vortexing, and aliquotting into 1ml plasma aliquots and the remaining blood fraction into 3.4 ml aliquots. Aliquots are then stored at either -20°C short-term for up to one week and then stored at -80°C, or stored at -80°C immediately after aliquotting. The processed samples are shipped to the study center and subsequently the NCI biorepository, where they are stored at -80 °C until they are

used up. The NCI SSIRB has explicitly requested that this language be used and that a time limit for storing samples not be used in the study or in the informed consent.

A buccal cell sample is collected and used as an additional source of DNA and for viral studies. Buccal cells are collected from cases and controls by swishing water in mouth for about a minute. Isopropanol is added to the sample, which is then centrifuged, the supernatant removed, and cells frozen. The pellet is stored at -20 °C, and samples are subsequently shipped to the study center followed by the NCI Repository and stored at -80°C.

Tumor tissues, including pathology blocks for review, diagnosis, and molecular typing, and snap frozen tissues are collected where possible. For each case, 25 unstained 5 micron sections on HistoBond slides are made and shipped to the study pathology center. The 25 unstained sections are cut and mounted on the HistoBond slides. Two 20 µm-thick sections will also be cut and placed in two separate eppendorfs for molecular studies.

Evidence increasingly supports both commonality and heterogeneity in the etiology of lymphoid and myeloid neoplasms. It is therefore essential that an epidemiologic study of lymphoid and myeloid neoplasms achieve high quality diagnostic specificity in identifying disease subtypes. Classification of lymphoid and myeloid neoplasms has evolved rapidly in recent decades. In 2001, the World Health Organization (WHO) introduced a new classification that was adopted worldwide and represents the current gold standard for classifying all hematopoietic neoplasms (Jaffe et al. 2004; Swerdlow 2009). Because of variability in the laboratory testing undertaken, additional immunophenotyping is often required in order to achieve high confidence in the diagnosis (Turner et al. 2004). Based on the importance of accurately identifying lymphoid neoplasms and classifying disease subtypes, AsiaLymph conducts centralized pathology review for all cases using the gold-standard WHO classification.

The pathology review will take place in Hong Kong, led by Dr. John Chan, an internationally-recognized expert hematopathologist.

The study team has had extensive experience conducting multi-center studies and have used the experience acquired from these previous investigations to design the quality control component of the study. Site-visits are conducted to every study center and hospital by coordinating center staff to review all aspects of the study. NCI staff visit each center and hospital every 6 months. In addition to the oversight of the study in Asia, NCI staff reviews the study status on a weekly basis, including review of enrollment reports generated from the study management system in Hong Kong, review of questionnaires for completeness and quality, and review of biological sample collection, processing and storage. NCI staff also have a weekly phone call with the coordinating center to review all aspects of the study. A study management system (SMS) with online access tracks subject enrollment, interview and hospital record status, biospecimen and tumor tissue collection status, and other key data as described in the protocol. The SMS must be available to study staff at the Study Centers for data input and reporting, and to NCI investigators to monitor study progress.

### **B.3 Methods to Maximize Response Rates and Deal with Nonresponse**

Based on the relatively high participation rates we have had in previous types of studies in Asia, and data from participants that have already been enrolled in the AsiaLymph study to date, we expect to have a final participation rate of about 70%. We spent a substantial amount of time during training on approaches to enhance patient participation and refusal conversion. Further, we closely followed case capture rates, case and control participation rates, and pre-treatment phlebotomy rates and identify hospitals and interviewers that are low outliers and re-train as needed.

#### **B.4 Test of Procedures or Methods to be Undertaken**

The questionnaire used in AsiaLymph represents the cumulated experience obtained in multiple case-control studies of cancer conducted by DCEG epidemiologists who are working on AsiaLymph, including studies in Asia, Europe, and the United States. Many questions are in a standard format that has been used in other studies. Some represent revisions made to such questions based on the experience obtained in previous studies. In addition, the procedures for the collection and processing of biologic samples are standard and have been used successfully in previous studies. Further, we have conducted a pilot test of the AsiaLymph questionnaire and study procedures on 9 subjects and that experience has been used to revise the questionnaire.

Finally, the first month of the full study which started in March, 2012, is considered an additional pilot test of the questionnaire. Non-substantive changes were made to the questionnaires as a result of the pilot, these changes included rephrasing questions and adding one question, and were approved later in 2012. At this time there are no other preliminary findings to report.

#### **B.5 Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing Data**

The Biostatistics Branch of the NCI Division of Cancer Epidemiology and Genetics (DCEG) has a staff of biostatisticians who are experts in this type of study. Dr. Nilanjan Chatterjee, Chief of the DCEG Biostatistics Branch, is lead study investigator for statistical analysis. The statistical analysis plan and power calculations were developed with these and other biostatistics investigators and are provided in the protocol (**Attachment 1**).

The study centers in Hong Kong, Chengdu, Tianjin, and Taiwan are responsible for data collection activities under this protocol (**Attachment 1**). The study organization and list of key non-Federal personnel for the study is shown in **Attachment 12**.

The National Cancer Institute is responsible for overall study management and coordination and statistical analysis. Federal scientific investigators conducting data analysis are listed in **Attachment 2**.