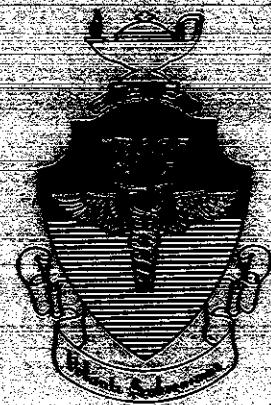


AIR FORCE HEALTH STUDY  
PROJECT NUMBER 1000

AN EPIDEMIOLOGIC ASSESSMENT OF HEALTH  
EFFECTS IN AIR FORCE PERSONNEL FOLLOWING  
EXPOSURE TO HELICOBES

BASELINE MORBIDITY STUDY RESULTS

6 FEBRUARY 1984



EPIDEMIOLOGY DIVISION  
DATA SCIENCES DIVISION  
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## **FINAL RANCH HAND REPORT**

### **ONGOING REFINEMENTS**

- HOUSEKEEPING: TYPOS, GLOSSARIES, ETC.
- SELECTED STATISTICAL POWER CALCULATIONS
- SELECTED RELATIVE RISKS, ODDS RATIOS, CONFIDENCE INTERVALS
- FERTILITY/REPRODUCTIVE ANALYSES USING TOTAL COMPARISON GROUP
- EXPANDED APPENDICES: DATA TABLES
- INCLUSION OF SCIENCE PANEL RECOMMENDATIONS

## **CARDIOVASCULAR EVALUATION SUMMARY**

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- PHYSICAL EXAMINATION SHOWED SIMILAR GROUP FINDINGS FOR
  - SYSTOLIC, DIASTOLIC BLOOD PRESSURES
  - ABNORMAL ECG'S
  - COMPARISON OF PAST ECG'S TO THE EXAM ECG
  - HEART SOUNDS
  - FUNDUSCOPIC ABNORMALITIES
  - CAROTID BRUITS
- AGE WAS A SIGNIFICANT COVARIATE IN ALL OF THE ABOVE PARAMETERS
- VERIFIED PAST HEART DISEASE CORRELATED WITH DETECTED ABNORMALITIES FOR SBP, DBP, AND ECG
- NO PREMATURE HEART DISEASE IN THE RANCH HANDERS
- OLDER, HEAVY SMOKING RANCH HANDER HAD MORE VERIFIED HEART DISEASE THAN EQUIVALENT COMPARISONS
- OLDER, LESS SMOKING RANCH HANDER HAD LESS VERIFIED HEART DISEASE THAN EQUIVALENT COMPARISONS

## **CARDIOVASCULAR EVALUATION SUMMARY**

- ABNORMAL PERIPHERAL PULSES:  $RH > C$ ,  $P = 0.05$
- SUBSET ANALYSES SHOWED CORRELATION TO
  - INCREASED AGE
  - HEAVY PAST SMOKING
  - CURRENT SMOKING
  - HISTORY OF VERIFIED HEART DISEASE
- CAROTID AND FEMORAL ARTERY ABNORMALITIES,  $RH > C$ ,  
BUT MAY BE BIOLOGICALLY SIGNIFICANT IN VIEW OF SMALL VESSEL FINDINGS
- HERBICIDE EXPOSURE ANALYSES WERE ESSENTIALLY NEGATIVE FOR CENTRAL  
AND PERIPHERAL CARDIOVASCULAR VARIABLES

## **DERMATOLOGIC EVALUATION SUMMARY**

- DERMATOLOGIC ASSESSMENT BY QUESTIONNAIRE SHOWED NO GROUP DIFFERENCES FOR
  - OCCURRENCE OF PAST ACNE
  - OCCURRENCE OF PAST ACNE RELATIVE TO INDIVIDUAL'S SEA TOUR
  - SEVERITY OR DURATION OF PAST ACNE
  - ANATOMIC LOCATION OF PAST ACNE SUGGESTING CHLORACNE

## DERMATOLOGIC EVALUATION SUMMARY

- PHYSICAL EXAMINATION SHOWED
  - NO CLINICAL DIAGNOSES OF CHLORACNE
  - NO POSITIVE BIOPSIES FOR CHLORACNE
  - NO GROUP DIFFERENCES IN THE PREVALENCE OF THE 5 MOST COMMON DIAGNOSES
- THE COUNT OF DIAGNOSED SKIN ABNORMALITIES DID NOT DIFFER SIGNIFICANTLY BY HISTORICAL SUBSET (NO ACNE, ACNE <1961, ACNE >1961) BETWEEN GROUPS
- EXPOSURE INDEX ANALYSES WERE NEGATIVE

## **RENAL FUNCTION SUMMARY**

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- BOTH GROUPS SIMILAR FOR
  - PRESENCE OF URINARY OCCULT BLOOD
  - PROTEINURIA
  - CREATININE CLEARANCE
  - BLOOD UREA NITROGEN (BUN)
  - URINE SPECIFIC GRAVITY
  - WBC'S/HPF
- AGE VERY SIGNIFICANT COVARIATE FOR BUN AND SPECIFIC GRAVITY;  
BLOOD GLUCOSE SIGNIFICANT COVARIATE FOR SPECIFIC GRAVITY
- NONCOMPLIANCE TO 24-HOUR URINE COLLECTIONS SIGNIFICANTLY  
HIGHER IN OLDER AGED PARTICIPANTS

## **RENAL FUNCTION SUMMARY**

- RANCH HAND > COMPARISON ( $P=0.039$ ) FOR HISTORY OF KIDNEY DISEASE
- CUMULATIVE ABNORMALITIES FOR BUN, CREATININE CLEARANCE, OCCULT BLOOD, WBC'S, AND PROTEIN WERE NOT CORRELATED TO A HISTORY OF PAST KIDNEY DISEASE
- HERBICIDE EXPOSURE ANALYSES WERE ESSENTIALLY NEGATIVE

## MALIGNANCY

- SIGNIFICANTLY MORE POST-RVN SKIN CANCER IN THE RANCH HAND GROUP THAN IN THE ORIGINAL COMPARISONS ( $p < 0.01$ ) WHO COMPLETED PHYSICAL EXAMINATION
  - OBSERVED DIFFERENCE ONLY BORDERLINE ( $p = 0.07$ ) WITH ALL ORIGINAL COMPARISONS OR THE TOTAL COMPARISON GROUP
  - ANALYSES NOT FULLY ADJUSTED FOR SUN EXPOSURE (GEOGRAPHIC AREA OF RESIDENCE) AND ETHNICITY (RACE)
  - NON-MELANOMA CELL TYPE PREDOMINATES (91% RH, 93% C)
  - FACE, HEAD AND NECK PREDOMINANT DISTRIBUTION (84% RH, 80% C)
- NO SIGNIFICANT DIFFERENCE IN THE OCCURRENCE OF "SYSTEMIC" CANCER ( $p = 0.68$ )

## MALIGNANCY (CONT'D)

- ANALYSES DEMONSTRATED ASSOCIATION BETWEEN SMOKING AND "SYSTEMIC" CANCER ( $p=0.07$ ) AND INDUSTRIAL CHEMICAL EXPOSURE AND SKIN CANCER ( $p=0.03$ )
- A CLUSTER OF SEVEN GENITOURINARY CANCERS IN THE RANCH HAND GROUP. ALL OCCURRED AT YOUNGER AGE THAN THE THREE COMPARISON GROUP GENITOURINARY CANCERS
- EXPOSURE INDEX ANALYSES REVEALED NO STATISTICALLY SIGNIFICANT OR SUGGESTIVE ASSOCIATIONS BETWEEN HERBICIDE EXPOSURE AND OTHER SKIN OR "SYSTEMIC" MALIGNANCY

# FERTILITY

## SUMMARY OF GROUP DIFFERENCES

### PHYSICAL EXAMINATION PARAMETERS

SPERM COUNT (p = 0.77)  
SPERM ABNORMALITY (p = 0.71)

### HISTORICAL DATA PARAMETERS

#### FERTILITY/INFERTILITY

NUMBER OF CONCEPTIONS	(p = 0.93)
NUMBER OF CHILDLESS MARRIAGES	(p = 0.33)
COUPLES WITH DESIRED NUMBER OF CHILDREN	(p = 0.24)
INFERTILITY INDEX	(p = 0.20)
FERTILITY INDEX	(p = 0.25)

## **FERTILITY (CONT'D)**

### **SUMMARY OF GROUP DIFFERENCES**

#### **CONCEPTION OUTCOMES**

MISCARRIAGE	(p = 0.77)
STILLBIRTH	(p = 1.00)
INDUCED ABORTION	(p = 0.89)
LIVE BIRTH	(p = 0.95)

#### **LIVEBIRTH OUTCOMES**

LEARNING DISABILITY	(p = 0.17)
PHYSICAL HANDICAPS	(p = 0.73)
INFANT DEATH	(p = 1.0)
NEONATAL DEATH	(p = 0.18)
BIRTH DEFECTS	(p = 0.04)

## FERTILITY (CONT'D)

- SIGNIFICANT GROUP DIFFERENTIALS NOTED FOR REPORTED NON-VERIFIED BIRTH DEFECTS ( $p=0.04$ )
  - SIGNIFICANCE LOST ( $p=0.18$ ) WHEN SKIN ANOMALIES ARE REMOVED
- EXPOSURE ANALYSIS REVEALED SIGNIFICANCE IN OVERALL REPORTED BIRTH DEFECTS IN FLYING OFFICERS ( $p=0.02$ ) AND FLYING ENLISTED PERSONNEL ( $p=0.03$ )
  - SIGNIFICANT ASSOCIATION BETWEEN INCREASING EXPOSURE AND MISCARRIAGE IN OFFICERS ( $p=0.04$ ) PHYSICAL HANDCAPS IN OFFICERS ( $p=0.05$ ) NEONATAL DEATH IN ENLISTED GROUND PERSONNEL ( $p=0.02$ )
  - DOSE RESPONSE PATTERN INCONSISTENT BETWEEN OCCUPATIONAL CATEGORIES

## GENERAL HEALTH

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- SIGNIFICANT GROUP DIFFERENCES FOUND IN SELF-PERCEPTION OF HEALTH ( $p=<.025$ ), WITH MORE RANCH HANDERS PERCEIVING THEMSELVES TO BE IN FAIR OR POOR HEALTH
  - NOT SUPPORTED BY EXPOSURE INDEX ANALYSES
- BORDERLINE SIGNIFICANT GROUP DIFFERENCE ( $p=0.056$ ) IN THE EXAMINER'S ASSESSMENT OF ILLNESS OR DISTRESS (RH>C)
  - UNSUPPORTED BY THE EXPOSURE INDEX ANALYSIS
- NO SIGNIFICANT GROUP DIFFERENCE IN PERCENT BODY FAT OR HEMATOCRIT
- SIGNIFICANTLY MORE INDIVIDUALS WITH SEDIMENTATION RATE ABNORMALITIES IN THE YOUNGER ( $\leq 40$ ) COMPARISONS (4.2%) THAN IN THE RANCH HANDERS (0.5%)
  - NO OVERALL DIFFERENCES OBSERVED ( $p=0.25$ )

## **NEUROLOGICAL**

- NO SIGNIFICANT GROUP DIFFERENCES IN CRANIAL NERVE FUNCTION
- EXCEPT FOR A BORDERLINE DIFFERENCE IN BABINSKI REFLEX ( $p=.10$ ),  
NO SIGNIFICANT GROUP DIFFERENCES IN TESTS OF PERIPHERAL NERVES
  - ASSOCIATIONS BETWEEN GLUCOSE AND ALCOHOL AND PERIPHERAL NERVE FUNCTION ABNORMALITY IDENTIFIED
- NO SIGNIFICANT GROUP DIFFERENCES IN NERVE CONDUCTION VELOCITY
- NO GROUP DIFFERENCES IN CENTRAL FUNCTION (TREMOR, COORDINATION,  
ROMBERG, GAIT)
  - TREMOR AND BALANCE ASSOCIATED WITH GLUCOSE AND ALCOHOL

## NEUROLOGICAL (CONT'D)

- NO CONSISTENT DOSE RESPONSE ASSOCIATIONS IN NERVE CONDUCTION VELOCITY OR CRANIAL NERVE FUNCTION
- NO SIGNIFICANT ASSOCIATION BETWEEN PERIPHERAL OR CENTRAL FUNCTION AND HERBICIDE EXPOSURE LEVELS

## **PSYCHOLOGY**

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- ANALYSES STRATIFIED BY EDUCATION
  - EFFECT OF EDUCATION ON PSYCHOLOGICAL TESTING IS SUBSTANTIAL
  - MAY REFLECT HIGHER LEVEL OF PSYCHOLOGICAL DEFENSES AMONG COLLEGE EDUCATED INDIVIDUALS OR DIFFERENTIAL IMPACT OF MEDIA INTEREST
- SUBJECTIVE MEASURES (SELF-REPORTED PROBLEMS AND CORNELL INDEX) SHOWED SIGNIFICANT GROUP DIFFERENCES FOR HIGH SCHOOL EDUCATED PERSONNEL (FATIGUE, ANGER, EROSION, ANXIETY, CORNELL INDEX)
  - NOT OBSERVED IN THE COLLEGE EDUCATED INDIVIDUALS
  - DEPRESSION NOT SIGNIFICANTLY DIFFERENT BETWEEN GROUPS
  - SIGNIFICANT GROUP DIFFERENCES IN ISOLATION NOTED ( $P < 0.01$ ) AFTER ADJUSTMENT FOR EDUCATION

## **PSYCHOLOGY (CONT'D)**

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- MMPI REVEALED SIGNIFICANT DIFFERENCES IN DENIAL (K SCALE) HYPOCHONDRIA, MASCULINITY/FEMININITY, MANIA/HYPOMANIA, AND SOCIAL INTROVERSION FOR HIGH SCHOOL EDUCATED PERSONNEL
  - COLLEGE LEVEL INDIVIDUALS ONLY DIFFERED IN THE INTROVERSION SCALE
  - LOG LINEAR ANALYSIS ADJUSTED FOR EDUCATION REVEALED SIGNIFICANT DIFFERENCES IN THE HYPOCHONDRIA, DEPRESSION, HYSTERIA, AND SCHIZOPHRENIA SCALES
- NO SIGNIFICANT GROUP DIFFERENCES IN HALSTEAD-REITAN OR IQ
- EXPOSURE INDEX ANALYSES: CORNELL INDEX NS  
MMPI – NO CONSISTENT FINDINGS
  - THE QUESTIONNAIRE, MMPI AND CORNELL INDEX RESULTS AMONG THE HIGH SCHOOL GROUPS COULD BE HERBICIDE RELATED, BUT COULD ALSO BE THE RESULT OF "MEDIA BIAS", POST-VIETNAM STRESS, OR DIFFERENTIAL REPORTING

## **PULMONARY FUNCTION AND DISEASE**

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- NO GROUP DIFFERENCES IN REPORTED DISEASE, FORCED VITAL CAPACITY, FORCES EXPIRATORY VOLUME (1 SECOND) OR  $FEV_1/FVC$  RATIO
- NO CONSISTENT ASSOCIATIONS BETWEEN PULMONARY FUNCTION AND EXPOSURE LEVELS. SEVERAL AGE/SMOKING/EXPOSURE LEVEL INTERACTIONS OBSERVED BUT INCONSISTENT IN NATURE
- NO INDICATION THAT CURRENT PULMONARY FUNCTION WAS AFFECTED BY EXPOSURE TO HERBICIDES DURING THE VIETNAM WAR

## EVALUATION OF HEPATIC STATUS

- OVERALL GROUP DIFFERENCES:

GGPT (RH > C), LDH (RH > C), CHOLESTEROL (RH < C)

- NO OVERALL GROUP DIFFERENCES:

SGOT, SGPT, ALK. PHOS. T. BILI, D. BILI, TRIGLYCERIDES, UROPORPHYRIN,  
COPROPORPHYRIN, D-ALA

- SIGNIFICANT INTERACTIONS:

SGOT  $\diamond$  ALCOHOL  $\diamond$  GROUP  $\diamond$

LDH  $\diamond$  ALCOHOL  $\diamond$  GROUP  $\diamond$   $\exists$

SGPT  $\diamond$  INDUSTRIAL CHEM.  $\diamond$  GROUP

LDH  $\diamond$  DEGREASING CHEM.  $\diamond$  GROUP

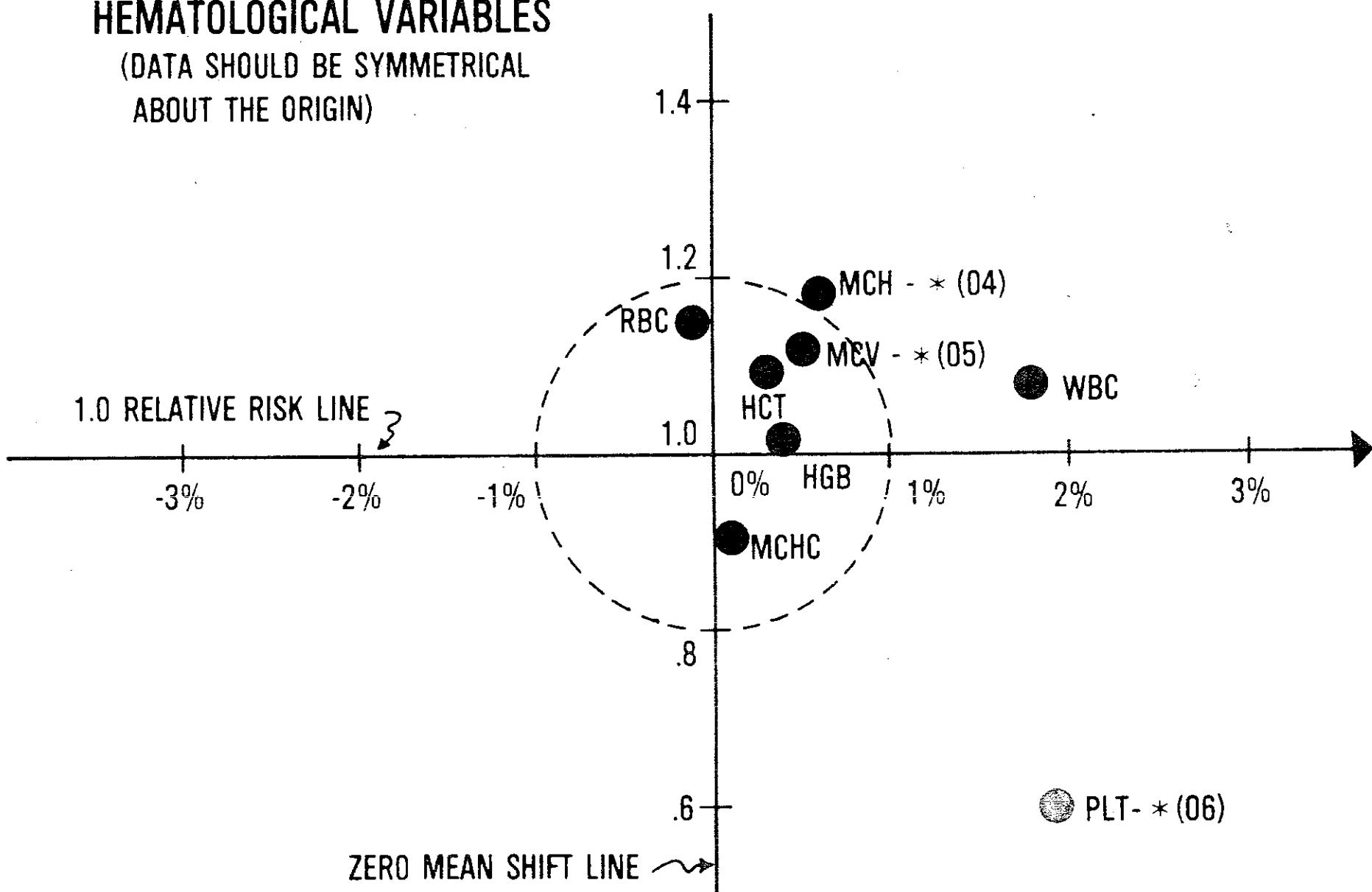
- NO EXPOSURE INDEX REGRESSIONS

## EVALUATION OF HEPATIC STATUS

- HEPATOMEGALY: 1.56% vs 0.78% (p = 0.138)
- NONSPECIFIC LIVER DISORDERS: 1.53% vs 0.39% (p=0.004)
- SKIN PATCHES, BRUISES, SENSITIVITY: 44.2% vs 36.0% (p < 0.001)
- NO EXPOSURE INDEX REGRESSIONS

## HEMATOLOGICAL VARIABLES

(DATA SHOULD BE SYMMETRICAL  
ABOUT THE ORIGIN)



## ENDOCRINE STATUS

- T3 }  
T4 }      RH>C  
FTI }
- GLUCOSE 2 HR }      RH NOT STATISTICALLY DIFFERENT FROM C  
OVERALL, BUT GROUP BY AGE INTERACTION.
- TESTOSTERONE }      RH = 637 ng/dl      (P=0.06)  
C = 652 ng/dl
- EXPOSURE INDEX REGRESSIONS DO NOT REINFORCE GROUP DIFFERENCES.

**IMMUNOLOGICAL CELL COUNTS (THOUSANDS/mm<sup>3</sup>)**  
**AND PERCENTAGES (%)**

	<u>RH</u>	<u>COMP</u>
T11	1.29 (65.7%)	1.33 (65.0%)
T3	1.29 (65.1%)	1.36 (65.6%)
T4	0.85 (43.1%)	0.88 (42.1%)
T8	0.61 (30.8%)	0.66 (32.0%)
T4/T8	1.65 (NA)	1.54 (NA)
B1	0.10 (5.4%)	0.12 (5.8%)
LYMPHS	1.92 (NA)	2.00 (NA)

T AND B CELL FUNCTIONAL STUDIES  
BY GROUP WITH P VALUES FOR TESTS BETWEEN GROUP MEANS

<u>VARIABLE</u>	<u>RH</u>	<u>COMP</u>	<u>P VALUE</u>
CONTROL 1	535	652	0.031
CON A	54637	57454	0.310 *
PHA	80433	83808	0.370 *
CONTROL 2	480	523	0.310
PW	33710	32092	0.370
TT	7051	6848	0.860

\* STATISTICALLY SIGNIFICANT ALCOHOL BY GROUP DIFFERENCES

## **INDIVIDUAL HEALTH SUMMARY**

- BOTH GROUPS SIMILAR IN
  - RISK TAKING ACTIVITIES (6)
  - RELIGIOUS PREFERENCE
  - EDUCATION
  - PERSONAL AND FAMILY INCOME
  - MILITARY STATUS
  - REPORTED INJURIES AND POISONINGS
  - CURRENT USE OF ALCOHOL
  - PAST HISTORY OF CIGARETTE, PIPE, CIGAR, AND MARIJUANA USAGE
- MORE RANCH HANDERS CURRENTLY SMOKE THAN COMPARISONS

## INDIVIDUAL HEALTH SUMMARY

- NUMBER OF ABNORMALITIES BY ORGAN SYSTEM SHOWED SIGNIFICANCE FOR MALIGNANCY (RH>C, P=0.01) AND PULMONARY FUNCTION (C > RH, P=0.05)
- THE DISTRIBUTION OF IDENTIFIED ABNORMALITIES PER PERSON BY GROUP, AND A WEIGHTED SCORE OF THESE ABNORMALITIES, SHOWED NO DIFFERENCE BETWEEN GROUPS

## CONCLUSIONS

- THE ASSERTION OF AN OVERALL HERBICIDE – HEALTH EFFECT CAUSE AND EFFECT RELATIONSHIP MUST CONSIDER
  - AGGREGATION OF ADVERSE ASSOCIATIONS IN THE RANCH HAND GROUP
  - SUBJECTIVE VERSUS OBJECTIVE FINDINGS
  - LACK OF DIAGNOSED STS, PCT, AND CHLORACNE
  - CLINICALLY IRRELEVANT OR QUESTIONABLE GROUP DIFFERENCES
  - PREDOMINANTLY NEGATIVE DOSE - RESPONSE RELATIONSHIPS
  - POTENTIAL SELECTION AND PARTICIPATION BIASES
  - LATENCY
  - “NEGATIVE” BASELINE MORTALITY STUDY
- THE RANCH HAND BASELINE MORBIDITY STUDY IS NOT NEGATIVE, NOR IS SUPPORTIVE OF AN HERBICIDE EFFECT. THE STUDY HAS DISCLOSED NUMEROUS FINDINGS THAT MERIT FOLLOW-UP IN ACCORDANCE WITH THE STUDY PROTOCOL.