



# Air Force Interaction with IOM



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Principal Investigator  
Brooks City-Base TX



# Air Force Interactions with IOM



- **February 2005, briefing by Dr Michalek**
- **May 2005, visit to Brooks City-Base**
- **Responded to questions**
- **Scanned and provided data upon request**
- **Documented all laboratory test across all 6 cycles**



<b>TEST DESCRIPTION CYCLE:</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>HEMATOLOGY</b>						
CELL COUNT/INDICIES	X	X	X	X	X	X
WBC	X	X	X	X	X	X
RBC	X	X	X	X	X	X
RDW	X	X	X	X		
Hgb	X	X	X	X	X	X
Hct (%)	X	X	X	X	X	X
MCV (Cu microns)	X	X	X	X	X	X
MCH (ug)	X	X	X	X	X	X
MCHC (gm/dl)	X	X	X	X	X	X
Plt (Thou/cumm)	X	X	X	X	X	X
<b>DIFFERENTIAL</b>	X	X	X	X	X	X
NEUTROPHILS	X	X	X	X	X	X
LYMPH	X	X	X	X	X	X
MONO	X	X	X	X	X	X
EOS	X	X	X	X	X	X
BANDS	X	X	X	X	X	X
BASO	X	X	X	X	X	X
BLAST	X	X	X	X	X	X



CHEMISTRY MISCELLANEOUS	1	2	3	4	5	6
FSH	X	X	X	X	X	X
LH	X	X	X	X	X	X
TESTOSTERONE, FREE				X	X	X
TESTOSTERONE, TOTAL	X	X	X	X	X	X
SEX HORMONE BINDING GLOBULIN				X		
ESTRADIOL				X	X	X
T4, FREE						X
T4, RIA	X	X	X	X	X	
T3, FREE						X
T3,UPTAKE	X	X	X			
TSH	X	X	X	X	X	X
FTI	X					
PSA				X	X	X
INSULIN,FASTING						X



# AFHS Viability Study



**Dr. Marian Pavuk**

**SpecPro Inc.  
San Antonio, TX, USA**



# AFHS Viability Study



- **Purpose:** To examine the viability of AFHS archived biological specimen
  - Over 70,000 samples stored
  - Some stored for over 20 years



# Viability Study Objectives



## We want to assess whether:

- The MAP technologies can be applied to assay biochemical parameters in AFHS frozen specimens
- AFHS frozen samples are viable for use in future studies by other investigators



# Viability Study Methods



- We randomly selected five AFHS veterans who participated at the 1982, 1985, 1987, 1992, and 1997 physical examinations and had multiple serum samples stored
- One sample per examination per participant was selected
- Total of 25 serum samples to be analyzed



# Viability Study Technology



- Multi-Analyte Profile (MAP) testing by the Rules Based Medicine laboratory (Austin, TX) to analysis samples
- MAPs are high-density, quantitative immunoassays panels that allow identification of biomarker patterns
- MAPs provide a comprehensive evaluation of protein expression patterns indicative of response to disease, drugs, or environment



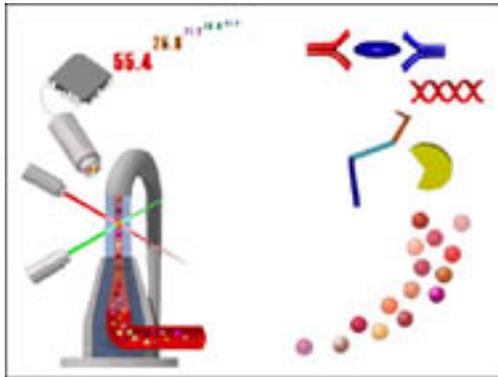
# AFHS Viability Study



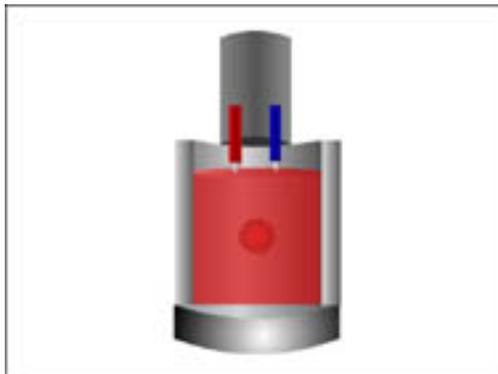
- Each serum specimen to be analyzed for 78 specific serum antigens, 43 autoimmune serologies and 56 infection disease serologies for a total of 177 analytes
- One complex analytical procedure
- Serum requirements: 100  $\mu$ l



# Rules-Based Medicine Technology



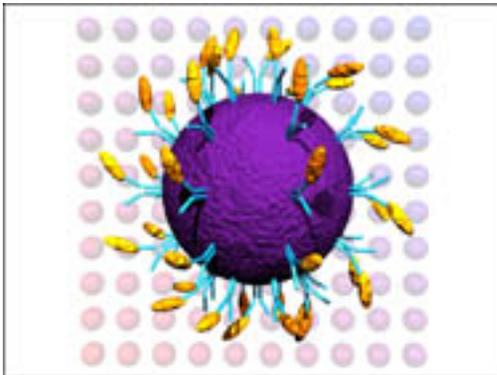
- Rules-Based Medicine's MAP technology employs bioassays, dyed microspheres, high speed fluidics, and digital signal processing



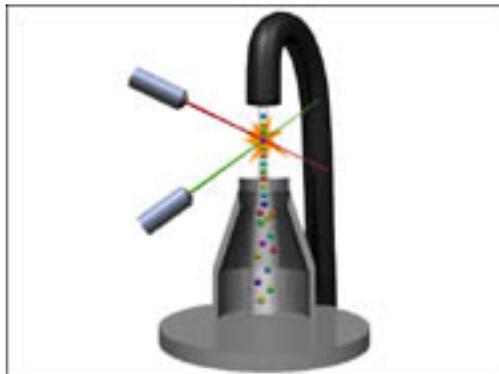
- Specific dyes permeate the polystyrene microspheres



# Rules-Based Medicine Technology



- Each microsphere set is covered with capture antibodies that react with the target protein



- After the assay is complete, the microspheres pass single file past two lasers



# Viability Study

## Current Status



- Samples selected and ready to ship to laboratory
- Awaiting completion of contract activities





# Air Force Health Study Closure Activities



- RIF of civil servants
- Hard copy and electronic materials
- Specimens







# Air Force Health Study



- **AFHS history**
  - White House letter
  - Participant selection, location
  - Dioxin testing



# Air Force Health Study



- **Comprehensive study**
  - Formerly called the longitudinal or summary study
  - Purpose: To document significant AFHS findings
    - Physical examination reports
    - Air Force technical reports
    - Publications
  - Open to RHAC comments





# Program Management Update

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Mr. Richard Ogershok  
HSG/PSP  
Brooks City-Base TX



# Air Force Health Study



- **6 Oct 05, House & Senate Veterans Affairs Committee**
  - 2002 Follow-up Examination Results
  - Publications
  - Presentations at scientific meetings
  - Ranch Hand Advisory Committee meetings
  - Interactions with the Institute of Medicine
  - Planned research activities
- **8 Oct 05, Ranch Hand Reunion**



# Air Force Health Study

## 2002 Follow-up Physical Examination Report



- Released 8 Jul 2005
- Responded to numerous email inquiries
- Available on AFHS website:
  - <http://www.brooks.af.mil/AFRL/HED/hedb/default.html>



# Air Force Health Study FY06 Activities Overview



- Air Force history
- Comprehensive study
- Collaborations
- Compliance study
- Relational database
- Publication support
- In-house Research
- Dioxin congeners with CDC



# Air Force Health Study FY06 Activities



- **External Collaborations**

- New guidelines for collaborations: past and present
- CDC and dioxin congeners
- UC Davis
- Texas Tech University Health Science Center
  - Metabolic syndrome and dioxin
  - Insomnia and dioxin
  - Metabolic syndrome/chronic sleep loss: nested case-control study



# Air Force Health Study FY06 Activities



- **Compliance study**
  - Factors that impacted study subjects participation in the six follow-up physical examinations



# Air Force Health Study FY06 Activities



- **Relational database**
- **Publication Support**
  - Nerve velocity conduction
  - Dioxin and memory
  - Dioxin and hepatic function



# Air Force Health Study FY06 Activities



- **In-house research**
  - Mortality
  - Collaborations
  - Viability study



# **Dioxins, Dibenzofurans, and Polychlorinated Biphenyls in 106 Participants of 2002 AFHS Physical Examination**

**Dr. Marian Pavuk  
SpecPro Inc.  
San Antonio, TX, USA**



# Organochlorines Study Goal



- To measure levels of dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), mono-ortho and non-ortho substituted polychlorinated biphenyls (PCBs) in participants of the 2002 physical examination who did not have a previous valid TCDD measurement



# Methods



- 94 Comparison veterans who participated at 2002 examination did not have a TCDD measurement
  - 61 did not attend any previous physical examination
  - 33 did not have a valid previous measurement
- 12 Ranch Hand veterans without TCDD measurement also included in the study



# Methods



- High-resolution gas chromatography high-resolution mass spectrometry used to analyze dioxin-like compounds
- CDC dioxin laboratory performed the analyses
- Lipid adjusted measurements presented in pg/g of lipid or parts per trillion (ppt) for all congeners except mono-ortho PCBs in ng/g of lipid or parts per billion (ppb)
- WHO TEF used to calculate PCDDs, PCDFs, and PCBs TEQs, and total (sum) TEQ in pg/g of lipid or ppt



# Demographic Characteristics of US Air Force Veterans



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	<b>Comparison (N=96)</b>	<b>Ranch Hand (N=12)</b>
<b>Age at qual. tour (yr), Mean (SD)</b>	<b>31 (7.4)</b>	<b>30.2 (8.7)</b>
<b>Year at birth, Mean (SD)</b>	<b>1939 (7.6)</b>	<b>1938 (7.6)</b>
<b>2002 BMI, Mean (SD)</b>	<b>28.9 (4.3)</b>	<b>28.7 (4.7)</b>
<b>2002 Alcohol (drink-yrs)</b>	<b>46 (107)</b>	<b>68 (83)</b>
<b>2002 Pack years of smoking</b>	<b>16.4 (21.5)</b>	<b>13.8 (23.2)</b>
<b>Officer (%)</b>	<b>33 (35.1)</b>	<b>6 (50)</b>
<b>Enlisted Flyer (%)</b>	<b>20 (21.3)</b>	<b>2 (16.7)</b>
<b>Enlisted Ground (%)</b>	<b>41 (43.6)</b>	<b>4 (33.3)</b>

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# PCDDs in Comparisons and Ranch Hands (ppt)



	Comp			RH		
	% Dt.	Mean	Min- Max	% Dt.	Mean	Min- Max
2,3,7,8-TCDD	36	1.74	0.42-11.7	42	5.46	0.42-34
1,2,3,7,8-PnCDD	60	4.97	0.49-21.7	75	5.27	0.42-11.3
1,2,3,4,7,8-HxCDD	43	3.61	0.64-14.3	50	3.87	0.78-8.4
1,2,3,6,7,8-HxCDD	99	48.2	1.62-107	83	37.9	1.41-67.2
1,2,3,7,8,9-HxCDD	19	2.64	0.64-13	75	4.73	0.85-11.1
1,2,3,4,6,7,8-HpCDD	100	47	5.7-129	100	39.8	6.8-74.9
OCDD	99	369	43-900	92	261	52.8-529

% Dt. - % above the limit of detection



# PCDFs in Comparisons and Ranch Hands (ppt)



	<b>Comp</b>			<b>RH</b>		
	<b>% Dt.</b>	<b>Mean</b>	<b>Min- Max</b>	<b>% Dt.</b>	<b>Mean</b>	<b>Min- Max</b>
2,3,7,8-TCDF	2.1	0.73	0.42-1.91	0	0.88	0.28-4.74
1,2,3,7,8-PnCDF	1.0	0.77	0.42-2.26	0	0.91	0.35-4.53
2,3,4,7,8-PnCDF	88	7.54	0.57-23.2	83	6.49	0.71-18.4
1,2,3,4,7,8-HxCDF	97	5.56	0.49-14.5	100	5.33	1.9-10.8
1,2,3,6,7,8-HxCDF	95	5.46	0.84-15.7	75	4.04	0.49-8
2,3,4,6,7,8-HxCDF	0	0.79	0.42-2.19	0	1	0.42-5.02
1,2,3,7,8,9-HxCDF	50	1.54	0.57-4.7	8.3	1.42	0.49-4.88
1,2,3,4,6,7,8-HpCDF	100	12.6	3.7-36.5	92	8.91	4.74-16.7
1,2,3,4,7,8,9-HpCDF	0	0.9	0.42-2.33	0	1.08	0.49-4.74
OCDF	--	--	--	--	--	--



# Non-ortho PCBs in Comparisons and Ranch Hands (ppt)



	Comp			RH		
	% Dt.	Mean	Min- Max	% Dt.	Mean	Min- Max
TeCB 77	--	--	--	--	--	--
TeCB 81	32	4.3	0.1-23.5	0	1.4	0.3-2.5
PnCB 126	96	48.3	1.2-1570	92	19	8.1-35.9
HxCB 169	100	33.3	9.7-346	100	33.1	16.6-63.4

% Dt. - % above the limit of detection



# Mono-ortho PCBs in Comparisons and Ranch Hands (ppb)



	Comp			RH		
	% Dt.	Mean	Min- Max	% Dt.	Mean	Min- Max
TeCB 118	91.5	22	2.3-395	91.7	14.4	3.6-67.7
PnCB 105	21.3	3.9	0.2-82.5	8.3	2.9	0.7-16.1
PnCB 167	6.4	3.2	0.6-34.4	0	2.7	1.4-5.4
HxCB 156	90.4	10.6	2-50	0	12	5-24.3
HxCB 157	4.3	2.6	0.5-13.8	8.3	2.6	1-5.4

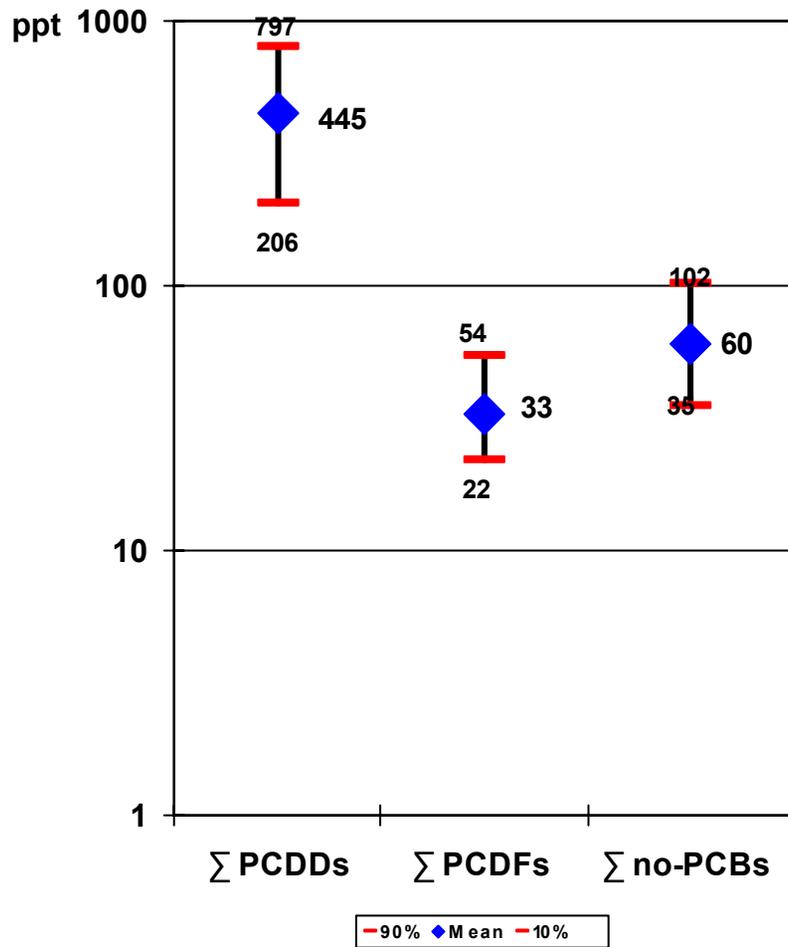
% Dt. - % above the limit of detection



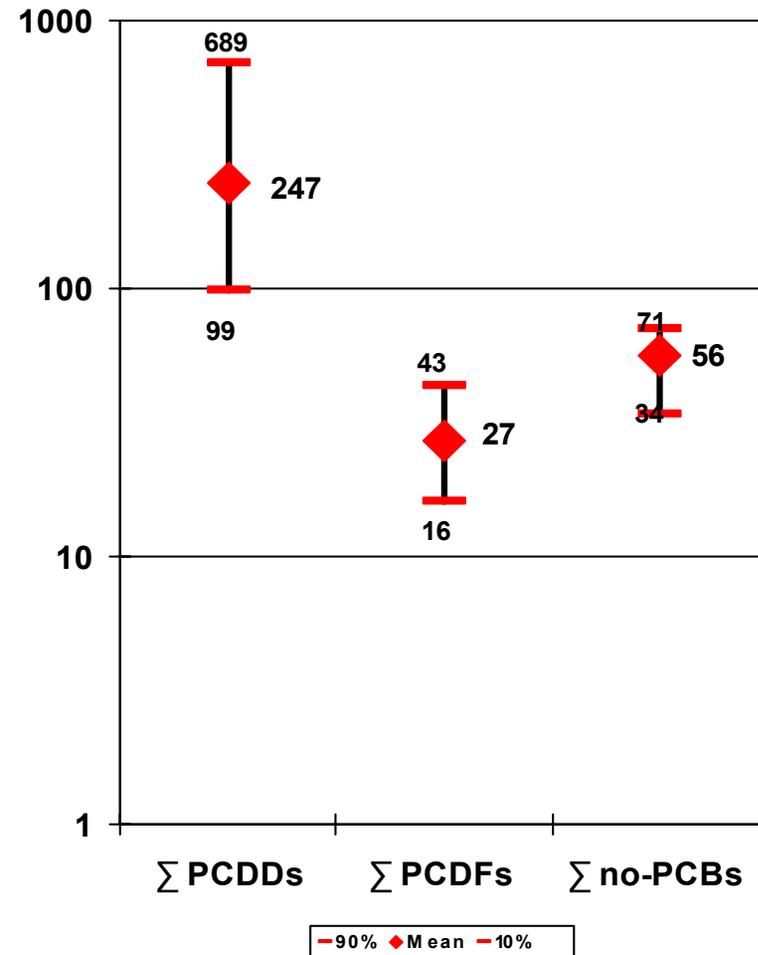
# Sums of PCDDs, PCDFs, and non-ortho PCBs



## Comparisons

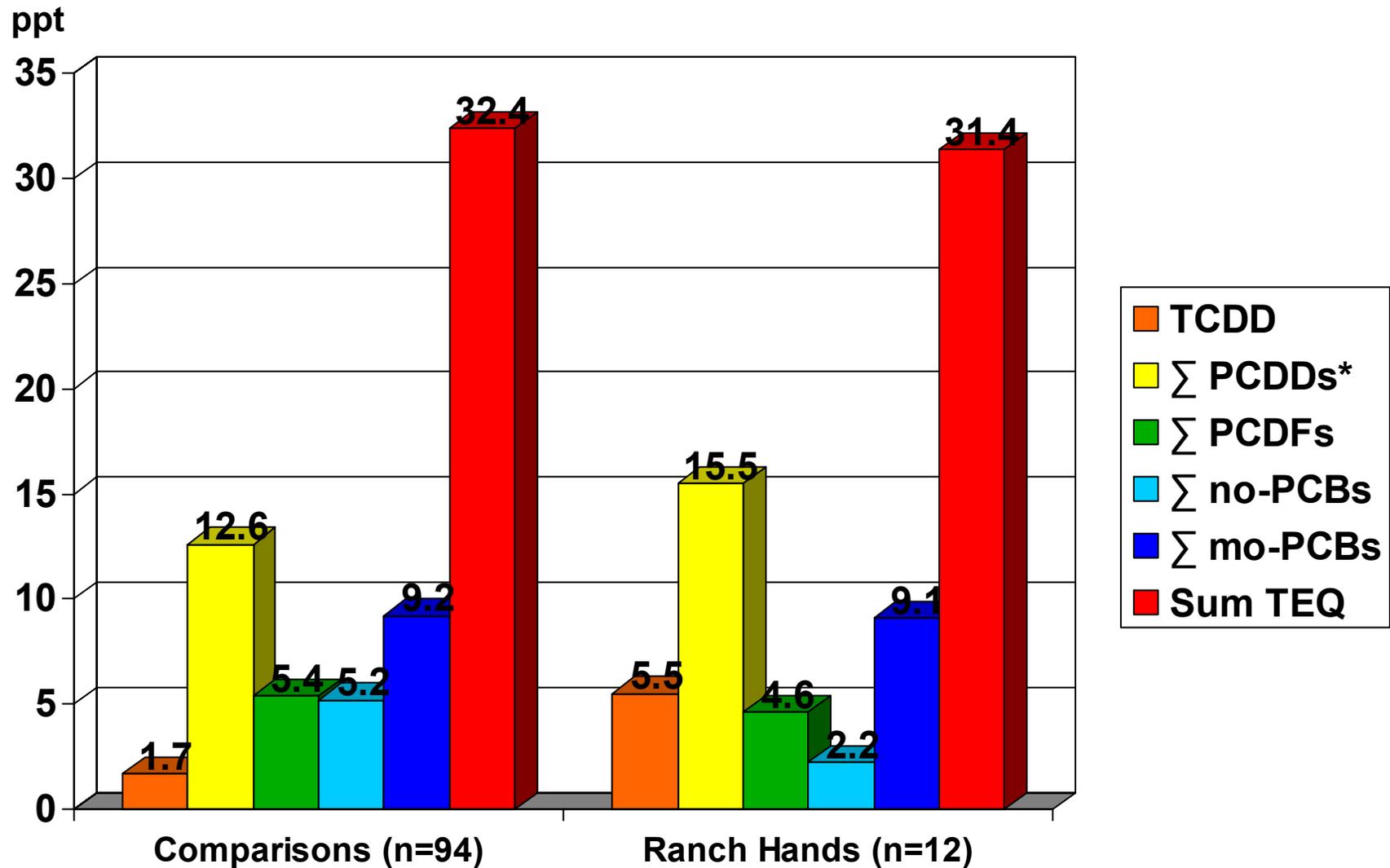


## Ranch Hand





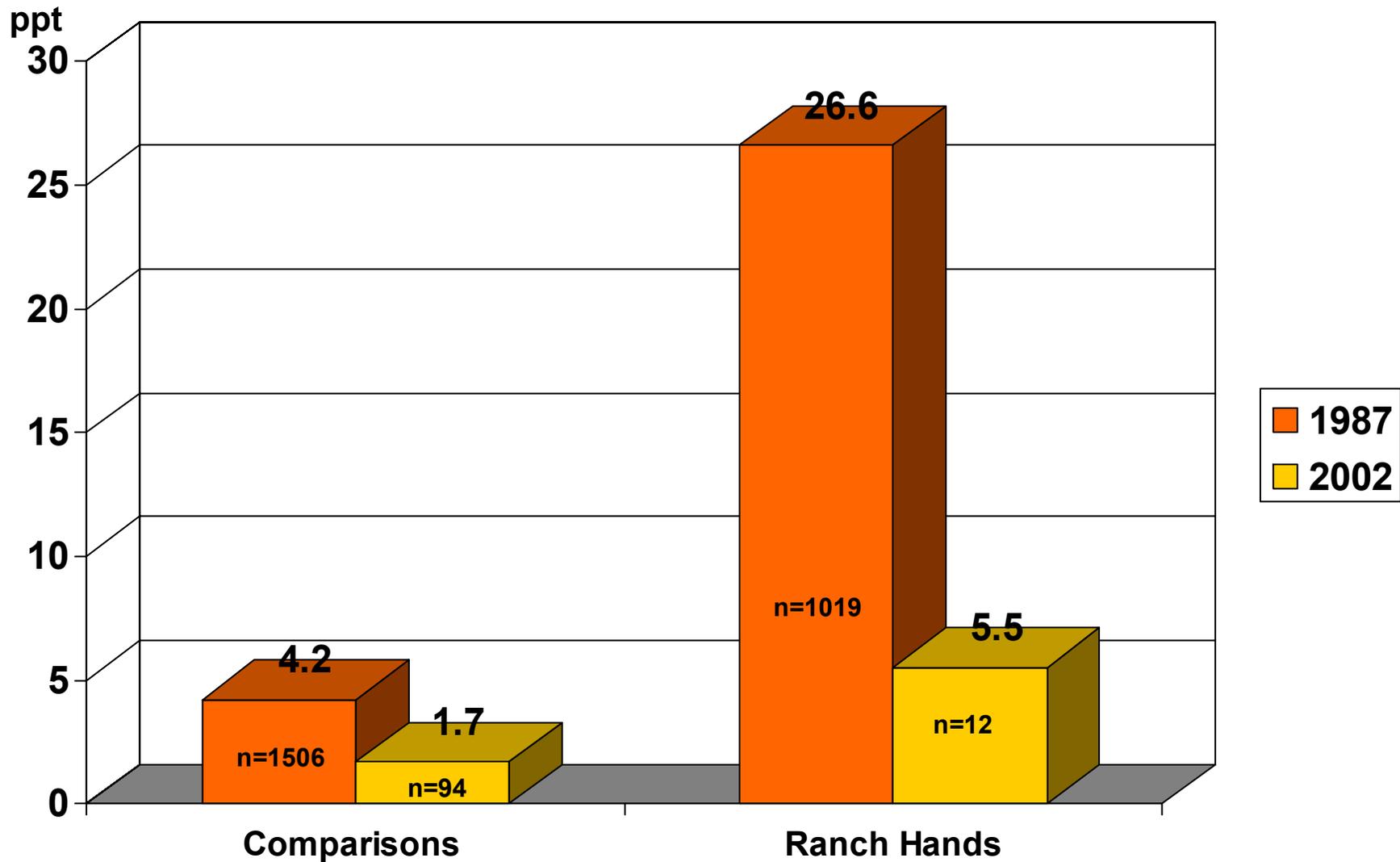
# PCDDs, PCDFs, non-ortho and mono-ortho PCBs TEQs



\* Σ PCDDs includes values for TCDD

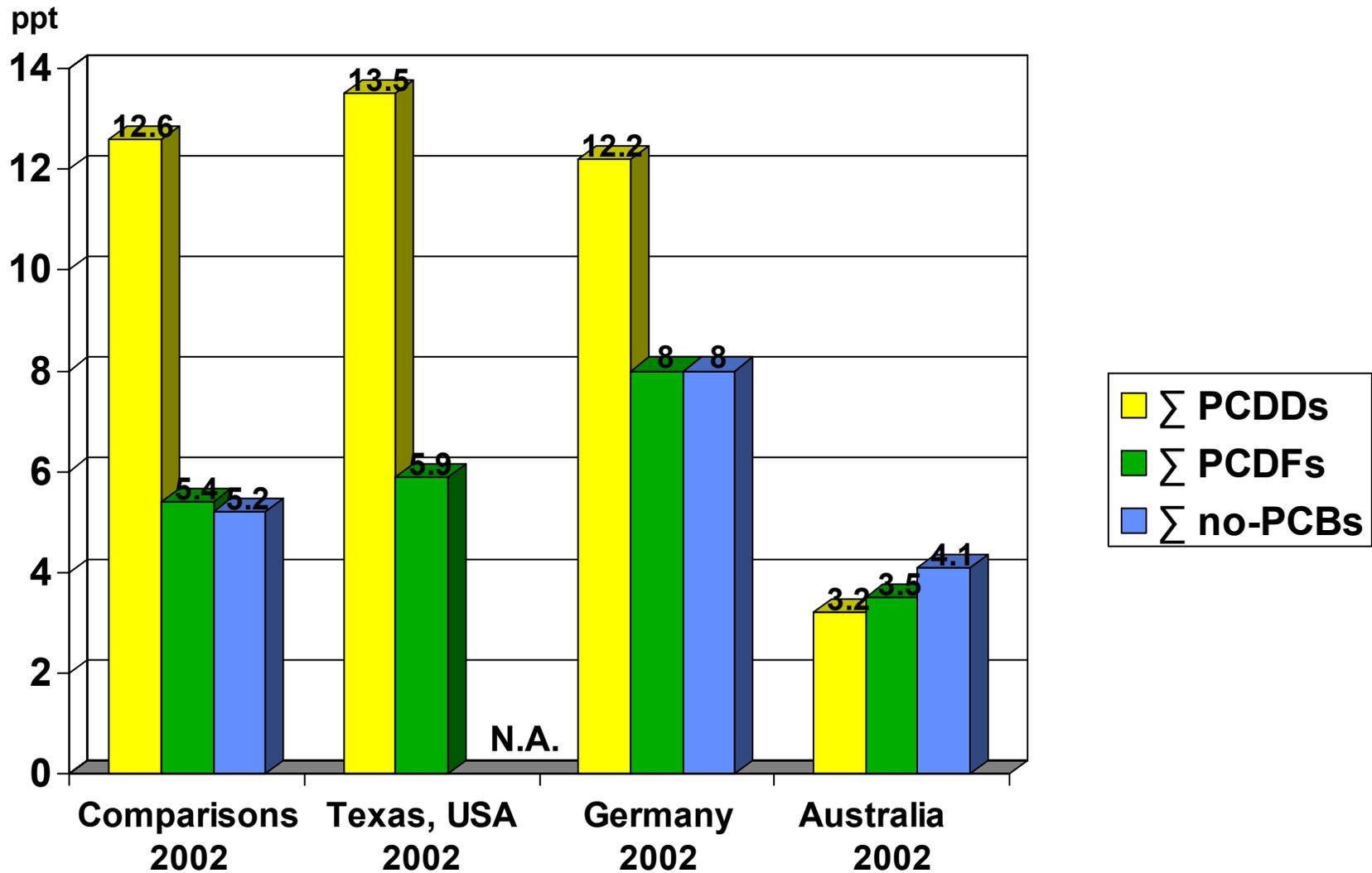


# 1987 and 2002 TCDD Levels



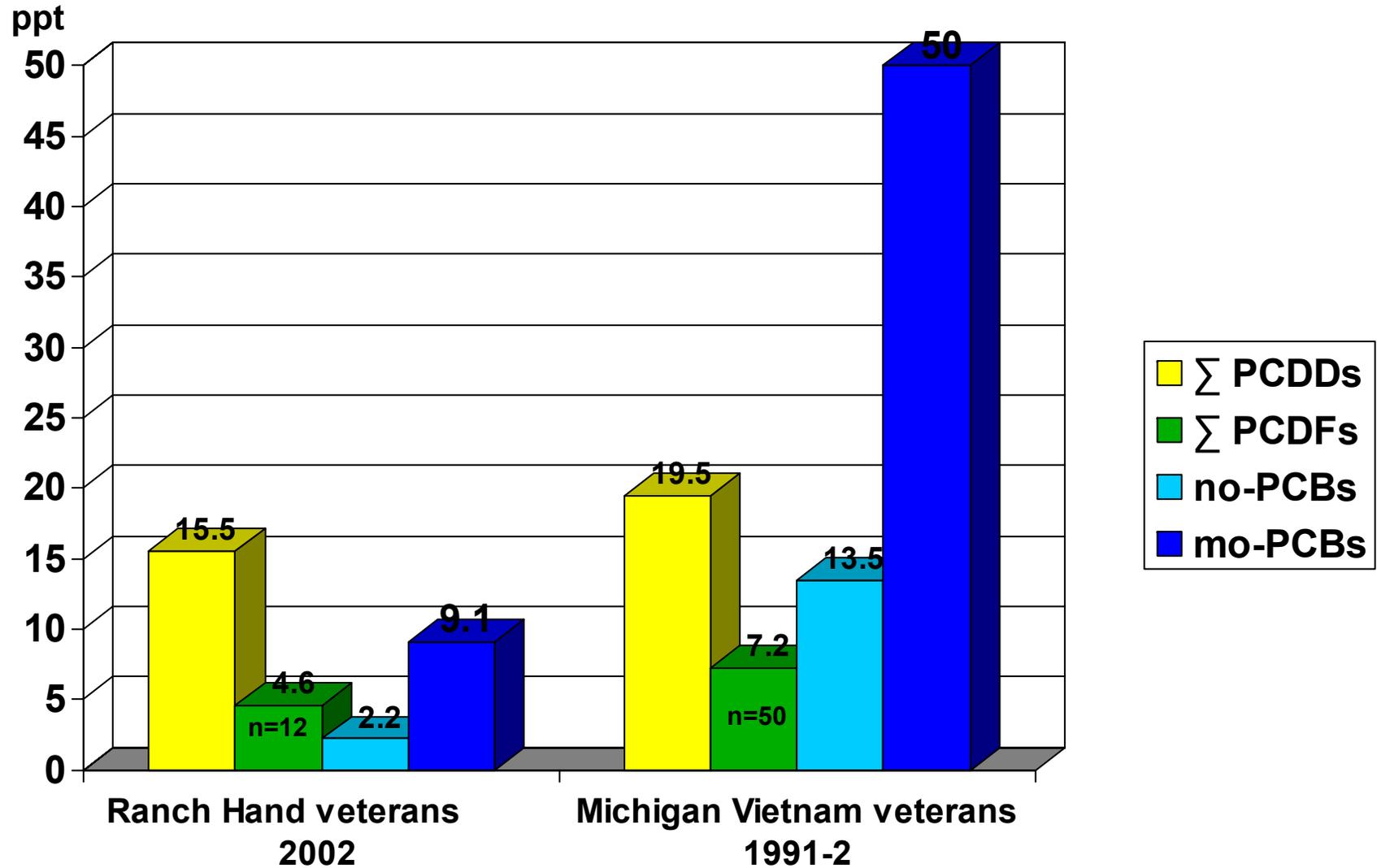


# TEQ Levels in US and International General Population



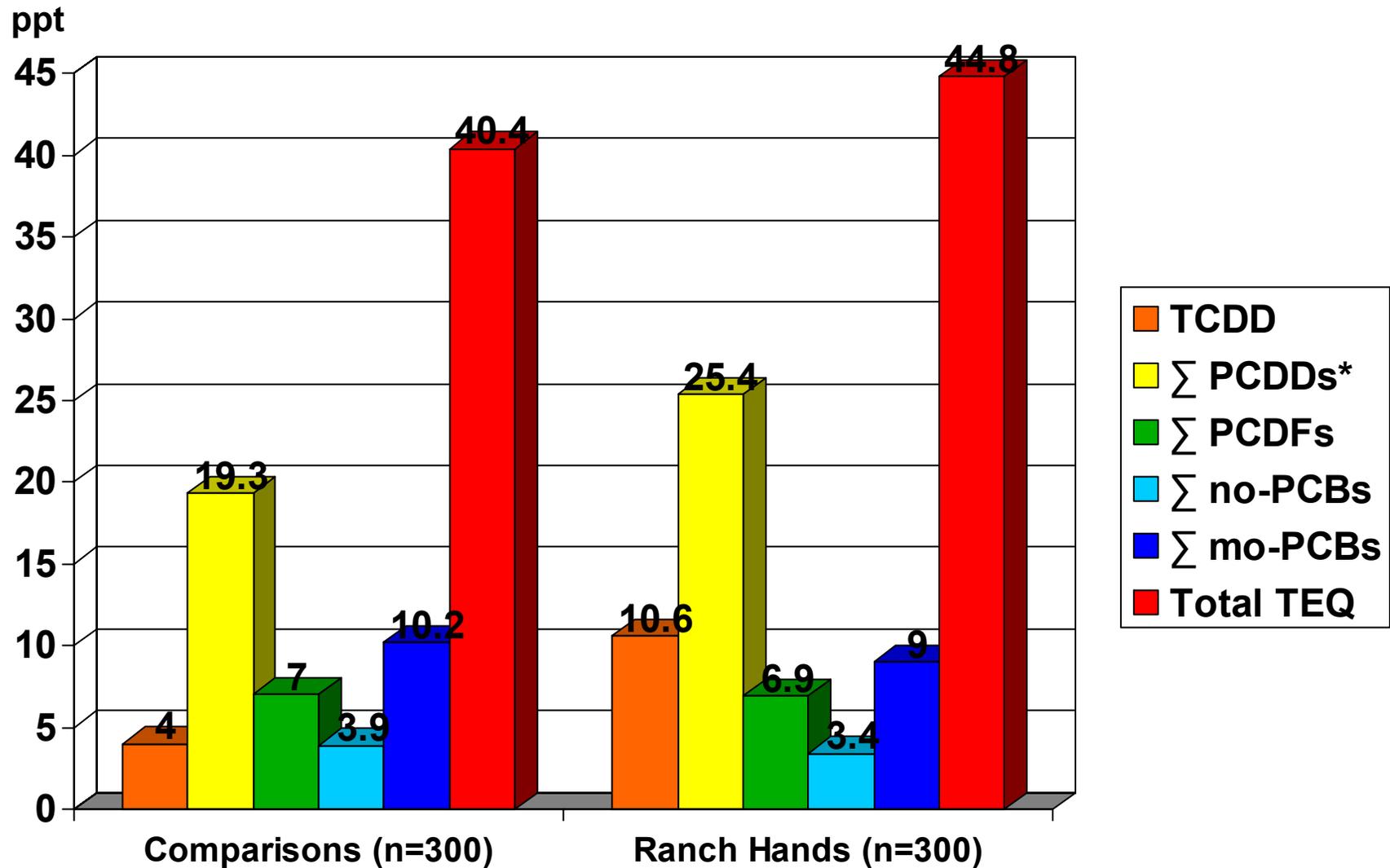


# TEQs in US Vietnam War Veterans





# Preliminary Results: PCDDs, PCDFs, non-ortho and mono-ortho PCBs TEQs



\*  $\Sigma$  PCDDs includes values for TCDD



# Conclusions



- Background organochlorines levels observed in the general population were found in both Ranch Hands and Comparisons in this study
- Mean TCDD levels decreased two to five times relative to the 1987 levels, consistent with decreases observed in the general population



# Conclusions



- The mean 2002 TCDD level in Ranch Hands was about three times higher than in Comparison veterans (5.5 versus 1.7 ppt)
- Total TEQs were similar, 32.4 ppt and 31.4 ppt (10%-90%: Ranch Hands 15.1-48.4 ppt, Comparisons 15.9-45.7 ppt)
- Ranch Hands sample size was too small to make any definitive inferences about the total TEQs



# Conclusions



- Additional 600 samples were analyzed by CDC for PCDDs, PCDFs, PCBs, and organochlorine pesticides
- Statistical analysis of these data by the Air Force and CDC is ongoing