Archives Databases

Chuck Watson

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the big picture

Beagle dose-effect SUMMARY	Tissue Archive inventory	Information Archive Inventory	Information details database
ORACLE	PARADOX	PARADOX	ORACLE

the beagle tissue registry is summary information
it can point to the tissue and information inventories
but they should not necessarially point to it

the beagle tissue registry is related to only
a subset of the material in the two inventories.

However, the upper levels of the tissue registry, which define the labs and studies should be available to the user of the inventories.

functions of beagle dose-effect summary

PURPOSE:

combine radiation dose and effects at tissue level across labs

INPUT:

input by scientists in participating labs
bulk loading from existing computer systems

OUTPUT:

dose and effects summaries at tissue level
fixed field subsets for statistical analysis
display or extract narrative summary material

functions of tissue archive inventory

PURPOSE:

support PNL archive project
assignment of unique sample identifiers
print sample labels
inventory control

INPUT:

PNL archive staff

OUTPUT:

usable by visiting scientists
pick lists for specimine collections
inventory by lab or study or animal or tissue

functions of information archive inventory

PURPOSE:

support PNL archive project
assignment of unique sample identifiers
print sample labels
inventory control

INPUT:

PNL archive staff

OUTPUT:

usable by visiting scientists
pick lists for record collections
inventory by lab or study or animal or tissue

Text storage Convention

The data base will be implemented in a standard microcomputer product such as ORACLE or RBASE. Long strings of text are difficult to handle in such data base management languages. We have a need to store and retreive paragraphs of descriptive information such as is presented in Roy Thompson's book.

It must be very easy for the user to view this information, but probably not imperative that it be shown in the browse mode.

I propose that we keep the information in a series of INDIVIDUAL ANCILLARY TEXT FILES. The names of the files will be placed in the data base as a specific field. A convention of enclosing the file name in a special character, such as "@", will be imposed.

When output reports from the data base system are printed or viewed on the screen, the user will have the option of either printing just the file names, the names plus the internal file header, or printing the file name and contents.

The ancillary text files will be prepared in word perfect, so it will be possible to search within the files for specific strings. How will such a search be useful? Suppose a user searches with word perfect and finds that the files PNL.TXT and PNLDOG.TXT are interestng. Then he would use ORACLE to search for remarks fields containing "PNL.TXT" or "PNLDOG.TXT". he would then view those fields plus related fields.

9/26/88 CRW

9/27/88

We should force the ancillary text files to have the first n lines be a descriptive header - understandable to the user.

Header contents:

- file name
- author
- date
- length (in lines, bytes, or words)
- summary line

9/30 CRW

The quantity of such ancillary text files will be great. We will rely on the directory structure of DOS or VMS to organize them. This means that the file names delimited by the @ symbols in the main data base must contain the full path name. We must use care in defining the directory structure to make the names meaningful to the users.

INTER LAB BEAGLE TISSUE REGISTRY
NUMBER OF RECORDS

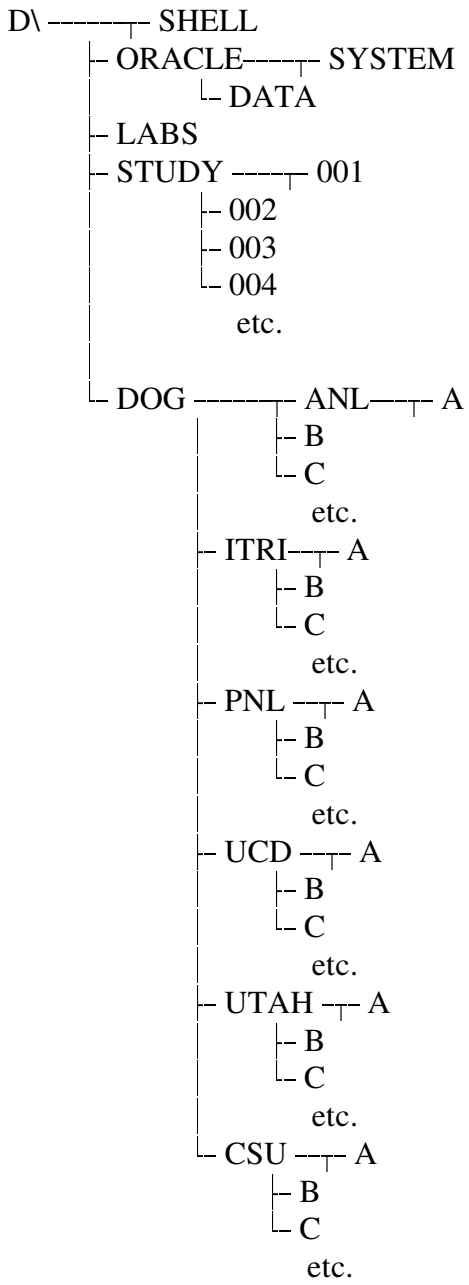
		Number of records	
LEVEL 1	1 record per laboratory	5	
LEVEL 2	1 record per study	48	+ 1 per lab for non study dogs
LEVEL 3	1 record per group	357	+ 1 per lab for non study dogs
LEVEL 4	1 record per dog	5438	20000 if all colony dogs are included
LEVEL 5	1 record per tissue	54380	
	total	60228	75000 if level 4 included for all colony dogs

Ancillary files

		Number of Ancillary Files	
LEVEL 1	2 files per laboratory	10	
LEVEL 2	6 files per study	300	
LEVEL 3	2 files per group	100	
LEVEL 4	1 file per dog	5500	20000 if all colony dogs are included
LEVEL 5	none		
	total number of ancillary files	5910	20410 if level 4 included for all colony dogs

Problem - design things to minimize number of useless directories, but
limit number of files per directory to about 100

Possible DOS directory tree



Ancillary File Naming convention

xxx indicates code for lab name i.e. ANL, PNL, ITRI, UCD, UTAH, CSU

aaa indicates study number
bb indicates group number
nnnnn indicates dog tattoo number

file name	expected number of files
1 directory for level 1:	
\LABS\xxx.RPT	5
\LABS\xxx.SUM	5
50 directories for level 2 and 3:	
\STUDY\aaa\SUMMARY	1
\STUDY\aaa\INSULT	1
\STUDY\aaa\DOSE	1
\STUDY\aaa\TREAT	1
\STUDY\aaa\CLINICAL	1
\STUDY\aaa\TISSUE	1
\STUDY\aaa\bb.TAB	6
\STUDY\aaa\bb.SUM	6

300 directories for level 4:

\DOG\xxx\A\nnnnn (where 0 < nnnnn < 100)
\DOG\xxx\B\nnnnn (where 99 < nnnnn < 200)
\DOG\xxx\C\nnnnn (where 199 < nnnnn < 300)
\DOG\xxx\D\nnnnn (where 299 < nnnnn < 400)
etc.
\DOG\xxx\Y\nnnnn (where 2499 < nnnnn < 2600)
\DOG\xxx\Z\nnnnn (where 2599 < nnnnn < 2700)
\DOG\xxx\AA\nnnnn (where 2699 < nnnnn < 2800)
\DOG\xxx\BB\nnnnn (where 2799 < nnnnn < 2900)

if each lab had 5000 dogs, I need 50 directories per lab or 250 to 300 directories in all.

Record definitions
Written in COBOL PICTURE style

9	indicates a 1 digit number
999 or 9(3)	indicates a 3 digit number, which may include a decimal point
X	indicates a character
XX or X(2)	indicates two characters
X(80)	indicates a string of 80 characters

X(LONG) indicates a long string of undetermined length. Implementation software limitations will probably dictate how this is handled. Present thinking is that long strings will be used for output only, searching within long strings is probably not worth software support. The supporting software must allow for efficient storage of long strings, including the ability to deal with null strings.

Conventions for this application:

All values stored as characters, if the record definition indicates "9" that simply means that only numbers are allowed - there will be no binary representation of numbers

;	is used as a delimiter within strings NOT SURE WE NEED THIS
?	indicates "Value not supplied by Laboratory"
#	indicates "Value set to missing by Laboratory"
!	indicates "Value not applicable for this record"
~	indicates "Value set to missing by the Database", which will be used to indicate that the user labs have not entered anything yet.

All dates stored as 8 characters in the format YYYYMMDD

LEVEL 1:

field name	PICTURE	validation remarks
LAB_CODE	X	This is a code for the laboratory A Argonne P Pacific Northwest I ITRI D University of California, Davis U University of Utah C Colorado State University
LAB_NAME	X(80)	This is space for the full name of the institution.
LAB_DIVISION	X(80)	This is space for the division or department within the institution.
LAB_ADDRESS_1	X(40)	This is space for the mailing address of the institution.
LAB_ADDRESS_2	X(40)	
LAB_ADDRESS_3	X(40)	
LAB_ADDRESS_4	X(40)	
LAB_PHONE	9(10)	This is the general information phone number of a contact within the laboratory who is familiar with these studies.
LAB_CONTACT	X(30)	This is the name of a contact person within each laboratory. This is not necessarily the lab director - it is someone who understands the beagle studies well enough to direct an inquiry to the appropriate person.
LAB_REPORT_file	X(80)	A Reference to the @file@ listing annual reports for each year will be included here. The number of reports and number of lines in the file will be included., See example.
LAB_TEXT_file	X(80)	This is a reference to the @file@ containing written material such as: Philosophy of animal care - a general statement which covers all the studies. For example, this is where the Davis amputation story is presented. Environmental characterization of the colony facility. Philosophy of information management.

LEVEL 2:

field name	PICTURE	validation remarks
LAB_CODE	X	See level 1.
STUDY_CODE	99	A number, unique within each lab, will be assigned to each study. The number will be based on Roy Thompson's tables.
STUDY_STATUS	X	This is a code enplaning the status of the analysis of this study I = In progress, there are dogs still alive in this study, therefore analysis is strictly provisionally and only to be used within the original laboratory. P = Provisional, the analysis of this study is considered provisional, and may change in the future. F = Final, the analysis of this study is complete.
STUDY-NAME	X(80)	This is the name used within the laboratory for this particular experiment.
STUDY_PI	X(120)	This string will contain the names of the principal investigator(s) associated with this study. If more than one PI, separate with a ";" delimiter.
STUDY_INSULT	X(20)	The study insult is a phrase describing the radionuclide.
STUDY_MODE	X(80)	The mode is a phrase describing the mode of aministration. Inhalation, ingestion, injection, external, etc.

insult start age (days)	xxxx
insult start delta (days)	xx

insult duration	xxxx	
insult duration delta	xx	
insult duration units	x	D = days H = hours
administration period	xxxx	
administration period delta	xxxx	
administration period units	x	D = days L = life span
insult count	xxxx	total number of insults per dog, where 0 indicates continuous for life

STUDY_UNITS	???	WE ARE NOT SURE WE NEED THIS
STUDY_FREQUENCY	X	O = once D = daily W = weekly C = continuous B = biweekly S = semiannual 2 = 22 hours per day

STUDY-AGE

AGE AT ONSET OF INSULT

young adult
old adult
prenatal
485 days old
90 days old

NUMBER OF INSULTS

DURATION OF INSULT PHASE OF STUDY

number of days ???

life ??

STUDY_SUMMARY	X(80)	Reference to the @ancillary file@ containing the appropriate paragraphs from Roy Thompson's book.

INSULT-DETAILS	X(80	Reference to the @ancillary file@ containing the supporting narrative information about the insult. For inhalation, this would be the aerosol characterization.
DOSE_DETAILS	X(80)	Reference to the @ancillary file@ containing a detailed explanation of the assumptions and methodology of computing dose for this study.
TREATMENT_DETAILS	X(80)	Reference to the @ancillary file@ containing the protocol for the medical management of the animals on this study.
CLINICAL_DETAILS	X(80)	Reference to the @ancillary file@ containing an explanation of the protocol for determining the existence of a tumor in a live animal.
TISSUE_DETAILS	X(80)	Reference to the @ancillary file@ containing an explanation of the protocol for examination of tissues from animals in this study.

LEVEL 3:

field name	PICTURE	validation remarks
LAB_CODE	X	See level 1.
STUDY_CODE	99	See level 2
GROUP_CODE	99	A unique number within each study in each lab. The number would be applied based on Roy Thompson's tables.
GROUP_STATUS	X	This is a code enplaning the status of the analysis of this particular group: A = Alive, at least one dog in this group is still alive, therefore analysis is strictly provisionally and only to be used within the original laboratory. P = Provisional, the analysis of these animals is considered provisional, and may change in

the future.

F = Final, the analysis of this group of animals is complete.

G_NAME	X(80)	The name or code used by the lab to indicate the group within the study.
G_QUANTITY	9(10)	The quantity of insult administered to this group. The units are those defined in level 2.
G_TABLE_REF	X(80)	This is a reference to an ancillary text @file@ containing the appropriate table in Roy Thompson's book.
G_SUMMARY	X(80)	This is a reference to an ancillary @file@ containing the summary from Roy Thompson's book. ITRI has semi annual sham exposures which should be discussed here.

LEVEL 4:

field name	PICTURE	validation remarks
LAB_CODE	X	See level 1.
STUDY_CODE	99	See level 2
GROUP_CODE	99	See level 3
TATTOO	X(6)	A unique alphanumeric code assigned by the laboratory to the dog. This corresponds to the TATTOO. Some labs use strictly numbers with leading zeros, others mix in letters and prefer left justification. Leading blanks were also suggested. FINAL DETERMINATION OF THIS FIELD WILL DEPEND ON ACTUAL WORK WITH THE 5 COLONY MASTER FILES. Note that the tattoo number need only be unique within a study.
Species	XX	A unique code assigned by data master (do not build in today, add this field when a second

species is inserted.)

STATUS	X	This is a code enplaning the status of this particular dog: A = Alive, this dog is still alive, therefore analysis is strictly provisionally and only to be used within the original laboratory. P = Provisional, the analysis of this group is considered provisional, and may change in the future. Use of this data by investigators authorized by the NRAAC is allowed. F = Final, the analysis of this group is complete.
ASSIGNED_ID	X(10)	This is the assignment code or experiment designation as reported in the annual report of each lab. ANL brief codes are the longest at 10 bytes.
SEX	X	

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The next two fields imply that genetic records for all the dogs will be available in this data base. Thus, one record for each dog in the colony must be generated.

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SIRE_tattoo	X(6)	The unique alphanumeric code assigned by the laboratory to the sire of this dog. Exact format will correspond to dog_tattoo.
DAM_tattoo	X(6)	The unique alphanumeric code assigned by the laboratory to the dam of this dog. Exact format will correspond to dog_tattoo.

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LITTER NUMBER	X(4)	A unique number or code assigned to each litter within a colony. This could be a sequence number starting with litter 1. This code will allow rapid location of litter mates.
DATE OF BIRTH	9(8)	yyyymmdd (all dates in this 8 character format)
DATE_FIRST_INSULT	9(8)	YYYYMMDD
DATE_FINAL_INSULT	9(8)	YYYYMMDD
WEIGHT_AT_INSULT	9(8)	The weight in Kilograms with explicit decimal point, of the dog at the time of first insult.
DATE_OF_DEATH	9(8)	YYYYMMDD This date also includes date of REMOVAL from the study if such were the case. Removal from the study implies that this animal is "Lost to Follow up"

========== ask some pathologists about this one ==========

TISSUE_QUALITY	X	This is a code describing the quality of tissues available for analysis E = excellent tissues, dog killed on the necropsy table F = fair tissues, dog died in the run, necropsy performed as soon as possible N = no tissues, animal terminated from study and lost to follow up or no tissues taken by choice. Is there a SNOMED code for quality of tissues taken? NO

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TYPE_OF_DEATH	X	A code for the type of death or removal from study: S Scheduled = preplanned, killed on a particular date D Died = Natural causes, see E for sick animals which were euthanized. A Accidental = trauma E Euthanasia = killed because death was judged immanent R Rem = Removed from study, lost to follow up (NO TISSUE RECORDS AVAILABLE)
MAJOR_FINDINGS	X(320)	This is the brief summarization of the significant findings for this animal. clinical phrases will be separated by the standard delimiter ";". The first phrase will be the one published in the annual reports. At ANL this is Gross cause of death. ANL example: "FINAL [primary, gross] COD: Necrosis of Liver; GROSS: Liver Necrosis; inflamation of the kidney; etc."
DELIVERED_INSULT	9(8)	This is a number of nCi per gram of lung or something. The inhalation studies are the only ones which will need to use this at the animal level.
ANIMAL_SUMMARY	X(80)	This is a reference to an ancillary @file@ containing a narrative summary of this animal. The University of Utah pathologist's summary is a good example of material which ought to be included. ANL does not use this approach, therefore this field will be blank.

LEVEL 5:

field name	PICTURE	validation remarks
LAB_CODE	X	See level 1.
STUDY_CODE	99	See level 2
GROUP_CODE	99	See level 3
TATTOO	X(6)	See level 4
TISSUE_CODE	X(6)	This is the SNODOG topography code for this tissue. Include one record per major tissue or organ. There may be different "interesting" organs for particular studies.
TISSUE_STATUS	X	This is a code enplaning the status of the analysis of this particular tissue: A = Alive, this dog is still alive, therefore analysis of this tissue is inappropriate. P = Provisional, the analysis of this tissue is considered provisional, and may change in the future. F = Final, the analysis of this tissue is complete.

THE FOLLOWING FIELDS WILL PROBABLY NOT BE AVAILABLE IN EXISTING LABORATORY DATABASES.

LAST NORMAL OBSERVATION - The next four fields are related to the last time that this tissue was observed and determined to be normal. For incidental findings (only revealed at necropsy), this corresponds to the death date. However, for tissues with clinically diagnosed tumors, this is date is based on a review of the medical records and a subjective determination by the clinician - pathologist team. These dates only relate to tumors.

DATE_LAST_NORMAL	9(8)	When was the last time this tissue was observed clinically and/or radiologically without evidence of what ever abnormality is being reported histopathologically?
TYPE_LAST_NORMAL	X	This is a code for the type of normal observation reported above.

P	Physical exam or observation, i.e. palpation
R	Radiograph
S	Scan
H	Hematology
B	Biopsy or Surgical removal

DOSE_LAST_NORMAL X(10) What is the estimated cumulative dose to this tissue on the date of last normal observation? See Study definition table for details of methodology and units.

DOSE_ERR_LAST_NORMAL X(10) Standard error associated with dose estimate. See Study definition table for details of methodology and units.

CLINICAL DIAGNOSIS - The next four fields relate to the date PRIOR TO DEATH that this tissue was diagnosed. (If no such diagnosis was made, these three fields will be identical to those for the tissue diagnosis.)

DATE_CLINICAL_DIAG 9(8) When was this condition (or tumor) diagnosed prior to death? This will be identical to the date of observation if the diagnosis was made at death.

TYPE_CLINICAL_DIAG X This is a code for the type of clinical diagnosis reported above.

P	Physical
R	Radiograph
S	Scan
H	Hematology

DOSE_CLINICAL_DIAG X(10) What is the estimated cumulative dose to this tissue on the date of diagnosis?

DOSE_ERR_CLINICAL_DIAG X(10) Standard error associated with dose estimate.

See Study definition table for details of methodology and units.

TISSUE DIAGNOSIS - The next four fields relate to the date of histopathological examination of this tissue.

DATE_TISSUE_DIAG	9(8)	This is the date the tissue was obtained for histopathological examination. (if not death date, assume BIOPSY) (This is not the date of the pathologist's report, it is the date of death or biopsy)
TYPE_TISSUE_DIAG	X	This is a code for the type of tissue diagnosis reported above. G Gross M Microscopic
DOSE_TISSUE_DIAG	X(10)	What is the estimated cumulative dose to this tissue on the date of death or biopsy?
DOSE_ERR_TISSUE_DIAG	X(10)	Standard error associated with dose estimate. See Study definition table for details of methodology and units.
DOSE_FUNCTION	X(80)	What expression is used to define the dose to this tissue at any point in time for this particular dog? The space reserved for this item is temporarily left at 80 characters pending analysis of actual functions.

OBSERVATION - The following four fields contain the coded observation about this tissue. The SNODOG coding scheme is used. The vast majority of the observations will be histopathological determinations of a morphological condition.

OBSERVATION_LETTER	X	This is the SNODOG letter code which identifies the type of observation

M = morphology
(E = Etiology, include this ??)
(F = Function, include this ??)
(D = Disease, include this ??)

OBSERVATION_CODE X(6) This is the SNODOG 6 character code for the observation. Some terms for normal and not examined are:

M000100 = Normal tissue morphology,
M001200 = Normal cellular morphology,
M090000 = Insufficient tissue for diagnosis,
M090200 = Tissue not examined,
M091000 = No Tissue received,
M091500 = Tissue lost in processing.

OBSERVATION_QUALIFIER X This is a code to qualify the SNODOG observation.

C = clinical
G = gross
H = histopathology, we expect 99.9% of the observations to be Histo.

TUMOR_CONTEXT_CODE X This code, originally suggested by PETO, applies only to tumors.

Peto et. al. WHO tumor classification
for neoplasms in rodent studies

0 Scheduled Sacrifice

1 Definitely Incidental

2 Probably Incidental

3 Probably Fatal

4 Definitely Fatal

5 Mortality Independent (only for skin tumors in a skin tumor study)

ANL uses Primary, Contributory, and Unrelated

EXAMPLES:

Example, Level 1

LAB_CODE	P
LAB_NAME	Pacific Northwest Laboratoryt
LAB_DIVISION	Biology Department, Life Sciences Center
LAB_ADDRESS_1	Biology Department
LAB_ADDRESS_2	Pacific Northwest Laboratory
LAB_ADDRESS_3	Box 999
LAB_ADDRESS_4	Richland, Washington, 99352
LAB_PHONE	5093762797
LAB_CONTACT	Dr. James F. Park
LAB_REPORT_file	@\LABS\PNL.RPT@ contains 227 lines and lists 29 reports
LAB_TEXT_file	@\LABS\PNL.SUM@ contains 523 lines

Example - Level 2
where study number is 14

LAB_CODE	P
STUDY_CODE	14
STUDY_STATUS	P
STUDY-NAME	Low level exposure to inhaled Plutonium dioxide
STUDY_PI	James Park
STUDY_INSULT	Pu238 oxide aerosol
STUDY_MODE	inhallation, awake, with full muzzle mask
insult start age (days)	270
insult start delta (days)	60
insult duration	2
insult duration delta	1
insult duration units	H
administration period	1
administration period delta	0
administration period units	D
insult count	1
STUDY_SUMMARY	@STUDY\14\SUMMARY@ contains 5 paragraphs
INSULT-DETAILS	@STUDY\14\INSULT@ has supporting narrative
DOSE_DETAILS	see also @STUDY\14\DOSE@
TREATMENT_DETAILS	see also ancillary file @STUDY\14\TREAT@
CLINICAL_DETAILS	see also ancillary file @STUDY\14\CLINICAL@

TISSUE_DETAILS	see aldo file @STUDY\14\TISSUE@

Example, Level 3
where this is group 2 of study 14

LAB_CODE	P
STUDY_CODE	14
GROUP_CODE	02
GROUP_STATUS	P
G_NAME	LOW
G_QUANTITY	20
G_TABLE_REF	@\STUDY\14\02.TAB@ contains a 23 line table showing the relationship of this group to the whole study.
G_SUMMARY	@\STUDY\14\02.SUM@ contains 523 lines summarizing the results for this group.

Example of level 4

LAB_CODE	P
STUDY_CODE	14
GROUP_CODE	02
TATTOO	000404
Species	BD
STATUS	P
ASSIGNED_ID	404
SEX	F
SIRE_tattoo	000123
DAM_tattoo	000098
LITTER NUMBER	1
DATE OF BIRTH	19710214
DATE_FIRST_INSULT	19720615
DATE_FINAL_INSULT	19720614
WEIGHT_AT_INSULT	000010.25
DATE_OF_DEATH	198311232
TISSUE_QUALITY	E
TYPE_OF_DEATH	D
MAJOR_FINDINGS	LUNG TUMOR; LIVER HYPERPLASIA; ADDISON'S DISEASE
DELIVERED_INSULT	2590.

ANIMAL_SUMMARY	ancillary file @\DOG\PNL\D\404@ contains 783 word pathologists summary

example LEVEL 5

LAB_CODE	P
STUDY_CODE	14
GROUP_CODE	02
TATTOO	000404
TISSUE_CODE	280000
TISSUE_STATUS	P
DATE_LAST_NORMAL	19800115
TYPE_LAST_NORMAL	R
DOSE_LAST_NORMAL	112
DOSE_ERR_LAST_NORMAL	50
DATE_CLINICAL_DIAG	19800930
TYPE_CLINICAL_DIAG	R
DOSE_CLINICAL_DIAG	150
DOSE_ERR_CLINICAL_DIAG	60
DATE_TISSUE_DIAG	19810224
TYPE_TISSUE_DIAG	M
DOSE_TISSUE_DIAG	182
DOSE_ERR_TISSUE_DIAG	65
DOSE_FUNCTION	??????????
OBSERVATION_LETTER	M
OBSERVATION_CODE	960200
OBSERVATION_QUALIFIER	H
TUMOR_CONTEXT_CODE	1

There needs to be a section about the bibliography

get Roy's current version

provision for update

THE LIFE-SPAN BEAGLE STUDIES

lab study	year	nuclide		live/dead 10/1/87	status today
U-1	52-74	Pu-239		10/285	at ITRI
U-2	53-70	Ra-226		0/165	
U-3	54-63	Ra-228		0/89	
U-4	54-63	Th-228		0/94	
U-5	55-66	Sr-90	0/99		
U-6	66-75	Am-241		10/117	at ITRI
U-7	71-74	Cf-249		5/36	at ITRI
U-8	71-73	Cf-252		3/35	at ITRI
U-9	72-78	Pu-239 (juvenile)	26/75		at ITRI
U-10	73	Es-253		0/5	
U-11	75-78	Pu-239 (aged)	3/34		at ITRI
U-12	75-78	Ra-226 (juvenile)	23/53		at ITRI
U-13	75-80	Ra-226 (aged)		1/33	at ITRI
U-14	77-79	Ra-224		78/128	at ITRI
D-1	52-58	X-Ray	0/360		completed 1986
D-2	61-67	Sr-90 (ingested)	0/484		PI active
D-3	63-67	Sr-90 (injected)	0/46		PI active
D-4	63-67	Ra-226		0/341	PI active
A-1	56	Sr-90 (transplacental)	0/53		PI retired
A-2	57	Sr-90 (subcutaneous)	0/98		PI retired
A-3	60-64	Ce-144		0/49	PI retired
A-4	61-63	Cs-137		0/65	PI retired
A-5	68-78	Co-60 (ext. τ continuous)	115/311		PI active
A-6	68-77	Co-60 (ext. τ terminated)	70/343		PI active
P-1	59-62	Pu-239		0/35	PI inactive
P-2	67	Pu-238		0/22	PI inactive
P-3	70-72	Pu-239 (oxide)		1/136	PI active, 0 live
P-4	72-75	Pu-238 (oxide)		22/136	PI active, 0 live
P-5	75-77	Pu-239 (nitrate)	77/148		PI active, 10 live
I-1	65-67	Sr-90 (soluble)	0/63		
I-2	66-67	Ce-144 (soluble)	0/70		
I-3	66-67	Y-91 (soluble)		0/54	
I-4	67-71	Ce-144 (insoluble)	1/126		
I-5	68-69	Cs-137 (soluble)	0/66		
I-6	69-71	Y-90 (insoluble)	0/101		
I-7	70-71	Y-91 (insoluble)	0/108		
I-8	70-74	Sr-90 (insoluble)	5/124		
I-9	72-76	Ce-144 (juvenile)	11/54		
I-10	72-75	Ce-144 (aged)		0/54	

I-11	72-75	Ce-144 (multiple exp.)	2/36
I-12	73-76	Pu-238 (3.0 μm particles)	7/84
I-13	74-76	Pu-238 (1.5 μm particles)	12/84
I-14	77-79	Pu-238 (0.75 μm particles)	22/60
I-15	77-79	Pu-239 (1.5 μm particles)	45/108
I-16	77-79	Pu-239 (3.0 μm particles)	23/83
I-17	77-78	Pu-239 (multiple exp.)	34/72
I-18	79-83	Pu-239 (juvenile)	83/108
I-19	79-82	Pu-239 (aged)	3/60