在臺灣 Tuberculin 皮內反應陽性牛病變之統計的考察

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一、緒 言

現在臺灣之乳牛飼養頭數尚未滿4,500頭，將來更有發展餘地，但有若干問題亟須改善，就中牛結核病乃應提出之一個問題，政府於1956年對比較有規模的大牧場應用Tuberculin皮內反應實施結核病檢查結果陽性率竟達5.0%之多。第二次世界大戰後政府因限於人力、經費等無法澈底辦理結核病防治工作，惟鑑於事態之嚴重自1957年對全省之乳牛施行結核病檢查，並積極辦理防治工作而且對陽性牛一律予以撲殺。歷年檢驗成績如下：

檢查年度	檢查頭數（頭）	陰性反應（頭）	陽性反應（頭）	陽性率%
1956	260	247	13	5.00
1957	1,846	1,767	79	4.30
1958	2,577	2,356	221	8.60
1959	2,912	2,804	108	3.70
1960（第一次）	3,026	2,937	89	2.80
1960（第二次）	3,101	3,041	60	2.00
1961（第一次）	3,180	3,157	23	0.70
1961（第二次）	3,387	3,369	18	0.50
1962（第一次）	3,944	3,901	43	1.10
1962（第二次）	3,983	3,965	18	0.50
1963（第一次）	4,417	4,395	22	0.50

備註：(1)本省每年陽性反應牛均分南、中、北區交給就近獸疫血清製造所撲殺。

(2)自1960年以後每年檢查2次。

筆者自1958年11月至1963年10月對北部（北區陽性反應牛均交省家畜衛生試驗所撲殺）Tuberculin皮內反應陽性牛313頭剖檢結果，將該病牛之病理解剖學的病變予以分類統計，可看出本省乳牛結核病病巢變移之一端，爲確有興趣之問題，茲啓露如下：

二、材料及方法

自1958年11月至1963年10月計5年間於臺灣省家畜衛生試驗所剖檢Tuberculin皮內反應陽性牛313頭。以上乳牛之品種係 Holstein 或其雜種牛，均在臺北近郊私營牧場所飼養之乳牛，其年齡及飼養情形均區區不一。

於各例之剖檢變狀均限於肉眼可看出有結核結節者，如僅有淋巴腺之腫脹者不包括於變狀。各例之變狀因例數多，不予詳細記載，擬分爲數種項目加以檢討。剖檢牛每例均兼行細菌檢查，如認有必要者施行細菌培養及動物接種至細菌檢查成績不屬于本題之目的擬略述，但雖然在肉眼認不出病巢（無病巢牛）

經細菌培養及動物接種結果均有分離出細菌。

本試驗供用之 Tuberculin 診斷液係臺灣省家畜衛生試驗所出品者，該診斷液均經過嚴格檢查之合格品，其用量、用法均採取國際標準。

三、成　　績

1. Tuberculin皮內反應與病變之關係

對臺灣之乳牛施行 Tuberculin 皮內接種是示有多少之腫脹差？腫脹差與病變是否有關係？經加檢討結果如下表。

第 I 表　TB皮內反應與病變之關係

腫脹差 ＼ 病變別 ／ 年度別		浸潤性結核 頭（%）	肺及附屬淋巴腺結核 頭　%	淋巴結核 頭　%	無病巢 頭　%	合計 頭　%
3.0～5.0 mm	1959 ｜ 1960	4（30.8%）	1（7.7%）	6（46.2%）	2（15.4%）	13（6.9%）
	1961 ｜ 1963	3（10.3%）	5（17.2%）	14（48.3%）	7（24.1%）	29（23.2%）
	小計	7（16.7%）	6（14.3%）	20（47.6%）	9（21.4%）	42（13.4%）
5.01～ 10.0mm	1959 ｜ 1960	25（22.7%）	23（20.9%）	50（45.5%）	12（10.9%）	110（58.5%）
	1961 ｜ 1963	8（11.8%）	27（39.7%）	19（27.9%）	14（20.6%）	68（54.4%）
	小計	33（18.5%）	50（28 1%）	69（38.8%）	26（14.6%）	178（56.9%）
10.01～ 15.0mm	1959 ｜ 1960	8（23.5%）	7（20.6%）	13（38.2%）	6（17.6%）	34（18.1%）
	1961 ｜ 1963	3（13.6%）	9（40.9%）	7（31.8%）	3（13.6%）	22（17.6%）
	小計	11（19.6%）	16（28.6%）	20（35.7%）	9（16.1%）	56（17.9%）
15.01～ 20.0mm	1959 ｜ 1960	3（13.0%）	10（43.5%）	10（43.5%）	0	23（12.2%）
	1961 ｜ 1963	0	1（16.7%）	5（83.3%）	0	6（4.8%）
	小計	3（10.3%）	11（37.9%）	15（51.7%）	0	29（9.3%）
20.0mm 以　上	1959 ｜ 1960	1（12.5%）	3（37.5%）	3（37.5%）	1（12.5%）	8（4.3%）
	1961 ｜ 1963	0	0	0	0	0
	小計	1（12.5%）	3（37.5%）	3（37.5%）	1（12.5%）	8（2.6%）

合計	1959～1960	41（21.8%）	44（23.4%）	82（43.6%）	21（11.2%）	188
	1961～1963	14（11.2%）	42（33.6%）	45（36.0%）	24（19.2%）	125
	小計	55（17.6%）	86（27.5%）	127（40.6%）	45（14.4%）	313

由第1表可明瞭於Tuberculin皮內反應，其皮膚之腫脹差5.01～10.0mm最多，即313例中佔178例，竟達56.9%。其次10.01～15.0mm佔56例，約佔17.9%，3.0～5.0mm佔42例，約佔13.4%，15.01～20.0mm佔29例，約佔9.3%之順序。至反應腫脹差20.0mm以上有8例，僅約佔2.6%而已。

以上綜合而觀依T.B皮內反應腫脹與病變部位似無關係，結核陽性反應牛之過半數，其T.B皮內接種之腫脹差均呈在5.01～10.0mm，但由檢查年度別似無認出有差異。

爲求確實，應用生物統計學加以分析，即1959～1960爲第一期，1961～1963第二期分開檢討如次表。

特一表 (1959～1960年) 第一期

病變別 / 腫脹差	汎發性結核	肺及附屬淋巴腺結核	淋巴腺結核	無病巢	計	$R_i=\frac{1}{x_j}$
3.0～5.0mm	4	1	6	2	13	0.076923
5.01～10.0mm	25	23	50	12	110	0.009091
10.01～15.0mm	8	7	13	6	34	0.029412
15.01～20.0mm	3	10	10	0	27	0.043478
20.0以上	1	3	3	1	8	0.125000
X_j	41	44	82	21	188	
$C_j=\frac{I}{x_j}$	0.024390	0.022727	0.012195	0.049619		
X_{ij}^2	16	1	36	4		
	625	529	2,500	144		
	64	49	169	36		
	9	100	100	0		
	1	9	9	1		
$X_{ij}^2 \cdot R_i$	1.230768	0.009091	2.769228	0.307692		
	5.681875	4.807173	22.727500	1.309134		
	1.882368	1.441188	4.970628	1.058832		
	0.391302	4.347800	4.347800	0		
	0.125000	1.125000	1.125000	0.125000		
$\sum_i^p R_i \cdot X_{ij}^2$	9.311313	11.732218	35.840156	2.800658		
$C_j \sum_i^p R_i \cdot X_{ij}^2$	0.215453	0.266638	0.437071	0.133364	$\sum_i^p C_j \sum_j^q R_i \cdot X_{ij}^2 = 1.052526$	

$$X^2 = N\left\{\sum_i^p C_j \sum_j^q R_i \cdot X_{ij}^2 - 1\right\}$$

$$= 188(1.052526 - 1)$$

$=188\times0.052526$

$=9.498888$

df自由度$n_1=5$　$n_2=4$

$df=(n_1-1)(n_2-1)=(5-1)(4-1)=12$

查X^2表

$df=12$　$P\begin{cases}0.01=26,725\\0.05=21,026\end{cases}$

$X^2=9.498888<P\begin{cases}0.01=26,725\\0.05=21,026\end{cases}$……（差異不顯著）

即證明腫脹差與結核菌病巢各自獨立並無關連

特二表　(1961～1963年) 第二期

腫脹差 ＼ 病變別	汎發性結核	肺及附屬淋巴腺結核	淋巴腺結核	無病巢	x_j 計	$R_i=\frac{1}{x_i}$
3.0～5.0mm	3	5	14	7	29	0.034482
5.01～10.0mm	8	27	19	14	68	0.014705
10.01～15.0mm	3	9	7	3	22	0.045455
15.01～20.0mm	0	1	5	0	6	0.166666
20.0mm以上	0	0	0	0	0	0
X_j	14	42	45	24	125	
$C_j=\frac{1}{x_j}$	0.071428	0.023809	0.022222	0.041667		
X_{ij}^2	9	25	196	49		
	64	729	361	196		
	9	81	49	9		
	0	1	25	0		
	0	0	1	0		
$X_{ij}^2\cdot R_i$	0.310338	0.862050	6.758472	1.689618		
	0.941120	10.661125	5.308505	2.882180		
	0.409095	3.681855	2.227295	0.409095		
	0	0.166666	4.166650	0		
	0	0	0	0		
$\sum_i^p R_i\cdot X_{ij}^2$	1.660553	15.371696	18.460922	4.980893		
$C_j\sum_i^p R_i\cdot X_{ij}^2$	0.118610	0.365985	0.410238	0.207539	$=\sum_i^p C_j\sum_j^q R_i\cdot X_{ij}^2=1.102372$	

$X^2=N\left\{\sum_i^p C_j\sum_j^q R_i\cdot X_{ij}^2-1\right\}=125\times(1.102372-1)=12.796500$

df自由度$n_1=5$　$n_2=4$　$df=(n_1-1)(n_2-1)=12$

查X^2表$df=12$　$P\begin{cases}0.01=26,725\\0.05=21,026\end{cases}$

實測$X^2=12.796500<P\begin{cases}0.01=26,725\\0.05=21,026\end{cases}$……（差異不顯著）

即證明腫脹差與病巢間各自獨立並無關聯。因此自1958年～1963年撲殺313頭病牛，其經 T.B.Test之腫脹差與內部結核病巢間各自獨立確無關聯。

2.調查結核菌好犯組織

從結核菌好犯之組織，可分爲汎發性結核，肺及附屬淋巴腺結核，淋巴腺結核等三種，由各檢查年度別予以比較如下。

第Ⅱ表　結核菌之好犯組織

年別 ＼ 病變別	汎發性結核 頭 %	肺及附屬淋巴腺結核 頭 %	淋巴腺結核 頭 %	無病巢 頭 %	合計 頭
第一年（1959）	32（27.1%）	35（29.6%）	43（36.4%）	8（6.8%）	118
第二年（1960）	9（12.9%）	9（12.9%）	39（55.7%）	13（18.6%）	70
小　計	41（21.8%）	44（23.4%）	82（43.6%）	21（11.2%）	188
第三年（1961）	12（14.8%）	28（34.6%）	28（34.6%）	13（16.0%）	81
第四年（1962）	1（7.7%）	3（23.1%）	5（38.5%）	4（30.8%）	12
第五年（1963）	1（3.2%）	11（35.5%）	12（38.7%）	7（22.6%）	31
小　計	14（11.2%）	42（33.6%）	45（36.0%）	24（19.2%）	125

如第Ⅱ表所示汎發性結核逐年銳減，無病巢牛反而增加，即表示臺灣辦理牛結核病防治工作確漸上軌道之一佐證。

TAZIMA等報告；結核淘汰牛41例之剖檢成績與筆者之成績作比較如第Ⅲ表。

第Ⅲ表　TAZIMA氏等成績作爲比較

		汎發性結核 頭 %	肺及附屬淋巴腺結核 頭 %	淋巴腺結核 頭 %	合計 頭
TAZIMA SHIBATA 等		14（34.1%）	13（31.7%）	14（34.1%）	41
筆者	1959～1960	41（24.6%）	44（26.3%）	82（49.1%）	167
	1961～1963	14（13.9%）	41（40.6%）	46（45.5%）	101
	小　計	55（20.5%）	85（31.7%）	128（47.8%）	268

備註：筆者撲殺乳牛中無病巢牛不包括在內。TAZIMA 氏等結核病淘汰牛係屬何種性質之乳牛無法獲悉，但於病變別之出現頻度似無太差。在筆者之調查例淋巴腺結核所佔之例較多，汎發性結核反而較少。淋巴腺結核例數之增加，可能每年定期施行結核檢查結果其陽性反應牛隻均受撲殺之後果，今後因擬繼續推動撲殺工作可能更會增加。

TAZIMA田嶋、SHIBATA柴田氏等之淘汰牛材料來源與筆者所調查之材料如完全相同時，彼等與筆者所調查結果是否相同？擬加以分析檢討如表。

特三表　TAZIMA氏等成績作爲比較

病變別 ＼ 調查者	TAZIMA氏等 X_{1j}	筆者 X_{2j}	計 $X_{\cdot j}$	$(X_{\cdot j})^2$	$\frac{(X_{1j})^2}{X_{\cdot j}}$
汎發性結核	14	55	69	196	2.840579
肺及附屬淋巴腺結核	13	85	98	169	1.724489
淋巴腺結核	14	123	142	196	1.382282
合　計	41	268	309		5.945350

$$X^2=\frac{N^2}{X_1j\cdot X_2j}\left(\sum_j^k\frac{(X_1j)^2}{X\cdot j}-\frac{(X_1j)^2}{N}\right)=\frac{(309)^2}{41\times 268}(5.945350)-\frac{(41)^2}{309}=4.390153$$

$df=3-1=2$　　查X^2表P$\begin{cases}0.05=11,070\\0.01=15,286\end{cases}$

實測$X^2=4.390153<$P$\begin{cases}0.05=11.070\\0.01=15.286\end{cases}$……（不顯著）

由上表可證明TAZIMA氏等與筆者所調查之成績是屬于相同的結果。

3.由病巢所佔部位之成績

根據KAMOCHI氏之調查報告218頭結核陽性牛與筆者所調查之臺灣省Tuberculin 皮內反應陽性牛計313頭之病巢所佔之各臟器作爲比較成績如下表。

第Ⅳ表　KAMOCHI 氏等成績作爲比較

	肺及附屬淋巴腺	頭胸部淋巴腺	肺	全身各臟器	腹腔臟器	無病巢	合計
KAMOCHI氏	85（39.0%）	57（26.1%）	43（19.7%）	23（10.6%）	3（1.4%）	7（3.2%）	218
筆者 1959～1960	36（19.1%）	61（32.4%）	8（4.3%）	47（25.0%）	15（8.0%）	21（11.2%）	188
1961～1963	34（27.2%）	35（28.0%）	8（6.4%）	14（11.2%）	10（8.0%）	24（19.2%）	125
筆者小計	70（22.4%）	96（30.7%）	16（5.1%）	61（19.5%）	25（8.0%）	45（14.4%）	313

據KAMOCHI氏之報告例僅肺部有病變之例，在筆者之調查例中所佔之成數較少。由此事實可推測KAMOCHI氏所調查之病例較TAZIMA氏等所觀之病例，概爲感染結核經過較淺之牛較多。

由第Ⅳ表可觀出全身各臟器均有結核病巢之汎發性結核較KAMOCHI氏之報告多約倍數。此乃表示臺灣對牛結核病之防治工作應加强辦理之時機已到且不應拖延之一證明。惟全部檢例中子宮結核僅有一例而已。

應用生物統計學將KAMOCHI氏之調查成績與筆者在本省之調查成績作爲比較檢討是否有同樣之結果如特四表。

特四表　與KAMOCHI氏之調查成績比較

病變別＼調查者	KAMOCHI氏 X_1j	筆者 X_2j	合計 $X\cdot j$	$(X_1j)^2$	$\frac{(X_1j)^2}{X\cdot j}$
肺及附屬淋巴	85	70	155	7225	46.612903
頭、胸部淋巴	57	96	153	3249	21.235294
肺	43	16	59	1849	31.338983
全身各臟器	23	61	84	529	6.297619
腹腔臟器	3	25	28	9	0.321485
無病巢	7	45	52	49	0.942307
合計	218	313	531		106.748591

$$X^2=\frac{N^2}{X_1j\cdot X_2j}\left(\sum_j^k\frac{(X_1j)^2}{X\cdot j}-\frac{(X_1j)^2}{N}\right)=\frac{(531)^2}{218\times 313}\left(106.748591-\frac{(218)^2}{531}\right)$$

$=4.132265(106.748591-89.499058)=71.279641$

$df=6-1=5$　　查X^2表$df=5$　　P$\begin{cases}0.05=11.070\\0.01=15.086\end{cases}$

今實測$X^2=71.279641>$ P$\begin{cases}0.05=11,070\\0.01=15,086\end{cases}$……（差異顯著）

即證明KAMOCHI氏之調查成績與筆者之調查成績可能在抽樣機差之不同致有甚差異顯著之結果。

4.肺臟之變狀

經剖檢陽性反應牛313例中除無病巢牛45例，剩餘268例乳牛之肺臟病變細查結果呈內眼的變狀（即肺結核計129例），約佔48.1%。所謂肺結核病左右兩肺所犯之情形由統計表示如下：

第V表　肺之病變

年次	合計 頭	兩肺 頭	%	左肺 頭	%	右肺 頭	%
1959	58	35	(60.3%)	12	(20.7%)	11	(19.0%)
1960	18	10	(55.6%)	6	(33.3%)	2	(11.1%)
小計	76	45	(59.2%)	18	(23.7%)	13	(17.1%)
1961	38	9	(23.7%)	19	(50.0%)	10	(26.4%)
1962	3	3	(100%)	0		0	
1963	12	4	(33.4%)	5	(41.7%)	3	(25.0%)
小計	53	16	(30.2%)	24	(45.3%)	13	(24.5%)
合計	129	61	(47.3%)	42	(32.6%)	26	(20.2%)

由上表可觀出兩肺具犯之例最多，129例中佔61例，約佔47.3%，左肺佔42例，約佔32.6%，右肺26例，約佔20.2%，左肺所犯較右肺稍多，此乃富有興趣之事實。

5.淋巴腺之病變

T.B陽性反應牛315例，扣除無病巢牛45例剩餘之268例，調查淋巴腺之病變出現情形如下：

第IV表　淋巴腺之病變（病變出現例）

淋巴腺之種類 \ 年次別	1959～1960	1961～1963	合計	備註
縱隔膜淋巴腺	101 (60.5%)	58 (47.9%)	159 (55.2%)	
肺門淋巴腺	89 (53.3%)	45 (37.2%)	134 (46.5%)	
腸間膜淋巴腺	49 (29.3%)	27 (22.3%)	76 (26.4%)	
咽背淋巴腺	32 (19.2%)	28 (23.1%)	60 (20.8%)	
顎凹淋巴腺	7 (4.2%)	10 (8.3%)	17 (5.9%)	
肝門淋巴腺	14 (8.3%)	3 (2.5%)	17 (5.9%)	
乳房淋巴腺	3 (1.8%)	3 (2.5%)	6 (2.1%)	
膕蹊淋巴腺	4 (2.4%)	0	4 (1.4%)	
腎門淋巴腺	3 (1.8%)	1 (0.8%)	4 (1.4%)	
胸前淋巴腺	4 (2.4%)	0	4 (1.4%)	
胃門淋巴腺	1 (0.6%)	0	1 (0.3%)	
膝襞淋巴腺	3 (1.8%)	0	3 (1.0%)	

備註：1959～1960年剖檢牛188例，無病巢牛21例，
1961～1963年剖檢牛125例，無病巢牛24例，
1959～1963年剖檢牛313例，病變牛268例。

由第VI表可觀出而且甚明顯示出臺灣T.B陽性反應牛之淋巴腺變狀在縱隔膜淋巴腺發現病巢最多，竟達159例，約佔55.2%。肺門淋巴腺134例，約佔46.5%次之。腸間膜淋巴腺76例，約佔26.4%第三位。咽背淋巴腺60例，約佔20.8%第四位。顎凹淋巴腺，肝門淋巴腺均17例，約佔5.9%第五位。乳房淋巴腺6例，約佔2.1%第六位。膕蹊、腎門、胸前等淋巴腺均4例，約佔1.4%，膝襞淋巴腺3例，約佔1.0%，胃門淋巴腺僅1例，約佔0.3%而已。

在縱隔膜淋巴腺，肺門淋巴腺發現病巢最多，至爲明顯。由此事實可利用爲今後在臺灣實施T.B陽性反應牛剖檢時之借鏡。

四、結論

1.自1958年11月至1963年10月計5年間剖檢臺灣北區之Tuberculin皮內反應陽性牛313例，其中無病巢例45例，約佔14.4%，比較美國，日本等所發表之百分比爲低。檢查初期（1959年）臺灣之無病巢牛約佔6.8%，經不斷的檢查及澈底的撲殺實施至第五年（1963年）增加至22.6%。在臺灣如此繼續實施檢查及撲殺，不斷淘汰結核病陽性牛，可預料無病巢陽性牛比率更會提高。

2 根據剖檢成績明白顯示出，結核病初期感染多呈淋巴腺結核，但經多次之淘汰與撲殺犯淋巴腺結核之比率逐漸升高，此等事實在第II表即可觀出。

3.在第IV表均顯示出犯肺臟之肺結核不但在臺灣在日本亦無太差，惟淋巴腺結核例在筆者之調查例較多，況發性結核例反而較少。肺之變狀中，兩肺同時均犯之例最多，約佔47.3%，只單肺有病變例，即犯左肺之例較犯右肺之例多。

4.淋巴腺中最易犯者即縱隔膜淋巴腺佔病變牛例之55.2%均認出有變狀，肺門淋巴腺46.5%次之，腸間膜淋巴腺約佔26.4%第三位，咽背淋巴腺20.8%佔在第四位。頸四，肝門淋巴腺等僅約佔5.9%，腸蹊、腎門、胸前等淋巴腺更少僅佔約1.4%，縢髮淋巴腺亦僅1.0%而已。胃門淋巴腺最少，僅0.3%而已。

5.爲求本調查成績之確實，應用生物統計學加以分析其結果如下

A、依照特一表與特二表可觀出Tuberculin皮內反應之陽性差與結核病巢各自獨立並無關連性。

B、由特三表所示TAZIMA氏等與筆者所調查之結果在病變別而觀完全相同。

C由特四表能示出筆者之調查與KAMOCHI氏之調查結果似有顯著差異，可能在抽樣機差所導致之結果。

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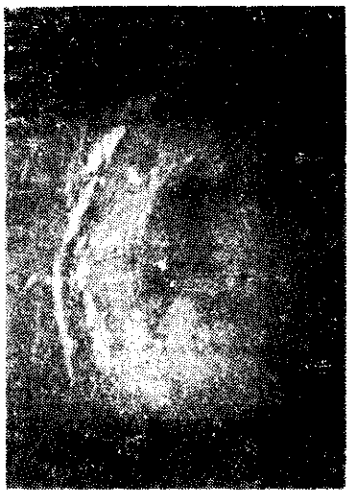
附：病理組織切片照片。

The photograph of pathological slide of tissue

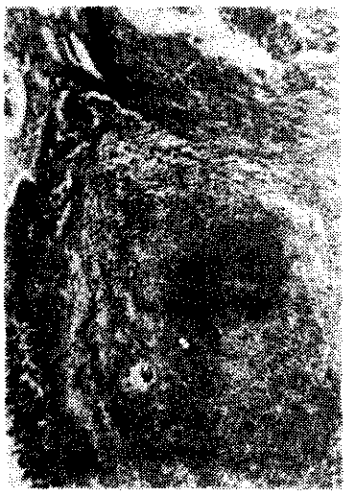
附：病理組織切片照片

甲



乙

丙



Description

說明：

照片甲：淋巴腺結核結節（低倍），中心呈紅色部份係已發乾酪化，周邊可看出類上皮細胞層，並有少數淋巴球之浸潤，於類上皮細胞層本應可見出巨大細胞，但因倍數低之關係，在本片上無法發現Langhan's Giant Cell。

照片乙：結核結節擴大像

照片丙：　〃

Astatistical Observation Pathologico-Anatomical Lesions in Tuberculin Positive Cattle in Taiwan

BY

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I. Introduction

Though the dairy cattle in Taiwan are not over 4500, yet it is quite easy to visualize its rapid development and prosperity of this newly established business. For this fact, we would confronted with many problems to be resolved. Among them, tuberculosis is most challenged. In 1956, cattle in several well-running pastures were examined by means of intradermal tuberculin test, surprisingly enough, positive rate was up to 5.0%. After second world war, because of limited in financial and personal facilities, we could not do well tuberculosis prevention for the cattle. However, by recognizing its seriousness, all the cattle in this island have been under tuberculin test since 1957, and positive ones were Killed. Efforts forward eradication of tuberculosis in cattle are carrying on actively now.

The results of tuberculin tests perfomed in recent years are listed as following:

Year of exam.	Number of cattle examined	Negative reactor	Positive reactor	Positive rate(%)
1956	260	247	13	5.0
1957	1,846	1,767	79	4.3
1958	2,577	2,356	221	8.6
1959	2,912	2,804	108	3.7
1960(first stage)	3,026	2,937	89	2.8
1960(second stage)	3,101	3,041	60	2.0
1961(first stage)	3,180	3,157	23	0.7
1961(second stage)	3,387	3,369	18	0.5
1962(first stage)	3,944	3,901	43	1.1
1962(second stage)	3,983	3,965	18	0.5
1963(first stage)	4,417	4,395	22	0.5

Remark: The positive reactors are grouped into 3 divisions……South, Middle. North divisions and sent to nearly "Veterinary Serum Institute" and Killing.

Author has studied 313 cattle in North Taiwan postmortemly, which had been proved to be tuberculin positive and sent to"Provincial Research Institute for Animal Health" for autopsy during Nov. 1958 to Oct. 1963. All lesions were studied

pathologically and classified statistically. This may offer certain aspect of tuberculosis lesions distributed in the dairy cattle and with academic interest.

II Material and Method:

As mentioned above, during the period of 5 years from Nov. 1958 to Oct. 1963, 313 tuberculin positive cattle were sent to "Provincial Research Institute for Animal Health" for autopsy. All these cattle were undergone postmortem examination and pathological study. These cattle are raising in private pastures near Taipei, belonging to Holstein strain or its Hybrid. Age is various, nutritional and environmental conditions are not uniform.

In this report, all collected and studied material are limited to these with gross tubercle lesion, material without tubercle formation or only with lymphadenopathy are not involved in this report. No attempt was made to list all detailed lesion, however, subdivide them into several categories and tabulated. Bacteriological smear examination was performed in each case. Culture and animal inoculation were done if necessary. Of course, some materials without tubercle lesion were found to be positive in bacterial culture and animal inoculation. The results of bacteriological study will be reported in another paper and try to discuss in detail. The tuberculin used for diagnosis is from "Provincial Research Institute Animal Health" The potency of tuberculin has been unber strict assay and in international standard. Dosage and method of administration are also to international standardization.

III Result:

(1)Correlation between intradermal tuberculin reaction and lesion:

The size of induration after intradermal tuberculin injection and its relation to the extension of lesion are listed as following:

Table I.

T.B lesions Induration (mm)	Years	Generalizd T.B (%)	Pulm. T. B & adjacent T.B lymphadenopathy (%)	T.B lymphadenopathy (%)	No lesion (%)	Total (%)
	1959-1960	4(30.8)	1(7.7)	6(46.2)	2(15.4)	13(6.9)
3.0-5.0	1961-1963	3(10.3)	5(17.2)	14(48.3)	7(24.1)	29(23.2)
	total	7(16.7)	6(14.3)	20(47.6)	9(21.4)	42(13.4)
	1959-1960	25(22.7)	23(20.9)	50(45.5)	12(10.9)	110(58.5)
5.01-10.0	1961-1963	8(11.8)	27(39.7)	19(27.9)	14(20.6)	68(54.4)
	total	33(18.5)	50(28.1)	69(38.8)	26(14.6)	178(56.9)
	1959-1960	8(23.5)	7(20.6)	13(38.2)	6(17.6)	34(18.1)
10.01-15.0	1961-1963	3(13.6)	9(40.9)	7(31.8)	3(13.6)	22(17.6)
	total	11(19.6)	16(28.6)	20(35.7)	9(16.1)	56(17.9)
	1959-1960	3(13.0)	10(43.5)	10(43.5)	0	23(12.2)
15.01-20.0	1961-1963	0	1(16.7)	5(83.3)	0	6(4.8)
	total	3(10.3)	11(37.9)	15(51.7)	0	29(9.3)
	1959-1960	1(12.5)	3(37.5)	3(37.5)	1(12.5)	8(4.3)
up to 20.01	1961-1963	0	0	0	0	0
	total	1(12.5)	3(37.5)	3(37.5)	1(12.5)	8(2.6)

	1959-1960	41(21.8)	44(23.4)	82(43.6)	21(11.2)	188
all total	1961-1963	14(11.2)	42(33.6)	45(36.0)	24(19.2)	125
	total	55(17.6)	86(27.5)	127(40.6)	45(14.4)	313

From this results we find the size of induration after intradermal tuberculin injection falls into the range of 5.01-10.0mm. In most case, about 56.9% (178 cases in 313 cases) 56 cases or 17.9% are in the range of 10.01-15.0mm. Only 42 cases or 13.4% are less than 5.0 mm. 29 cases or 9.3% in 15.01-20.0 mm, only 8 cases (2.6%) its induration are over 20.01mm.

The fellowing methods of biometry are applied to test the accuracy of results (The first stage was 1959-1960, the second stage was 1961-1963):

Special table I. (1959-1960, lst stage)

T.B lesion Induration (mm)	Generalized T.B	Pulm. T.B with adjacent lymphadenopathy	T.B lymphadenopathy	No lesion	total	$R_i=\frac{1}{X_i}$
3.0-5.0	4	1	6	2	13	0.076923
5.01-10.0	25	23	50	12	110	0.009091
10.01-15.0	8	7	13	6	34	0.029412
15.01-20.0	3	10	10	0	27	0.043478
up to 20.01	1	3	3	1	8	0.125000
X_j	41	44	82	21	188	
$C_j=\frac{1}{X_j}$	0.024390	0.022727	0.012195	0.047619		
X_{ij}^2	16	1	36	4		
	625	529	2500	144		
	64	49	169	36		
	9	100	100	0		
	1	9	9	1		
$X^2_{ij}R_i$	1.230768	0.009091	2.769228	0.307692		
	5.681875	4.807173	22.727500	1.309134		
	1.882368	1.441188	4.970628	1.058832		
	0.391302	4.347800	4.347800	0		
	0.125000	1.125000	1.125000	0.125000		
$\sum_i^p R_i \cdot X_{ij}^2$	9.311313	11.732218	35.840156	2.800658		
$C_j\sum_i^p R_i \cdot X_{ij}$	0.215453	0.266638	0.437071	0.133364	$=\sum_i^p C_j \sum_i^q R_i \cdot X_{ij}^2$ $=1.052526$	

$$X^2=N\left(\sum_i^p C_j \sum_j^q R_i \cdot X_{ij}^2-1\right)=188(1.052526-1)=188\times 0.052526=9.498888$$

df(degrees of freedom) $n_1=5$ $n_2=4$

$df=(n_1-1)(n_2-1)=(5-1)(4-1)=12$

See X^2table $df=12$ $P=\begin{cases}0.01=26.725\\0.05=21.026\end{cases}$

$X^2=9.498888<P=\begin{cases}0.01=26,725\\0.05=21,026\end{cases}$.....(insignificant difference).

The above analysis proves that the size of induration and the tubercle lesion are not correlated.

Special table II. (1961-1963) second stage:

T.B lesion induration (m.m)	Generalized T.B	Pulm. T.B with adjacent lymphadenopathy	T.B lymphadenopathy	No lesion	Total	$R_i=\frac{1}{X_i}$
3.0-5.0	3	5	14	7	29	0.034482
5.01-10.0	8	27	19	14	68	0.014705
10.01-15.0	3	9	7	3	22	0.045455
15.01-20.0	0	1	5	0	6	0.166666
up to 20.01	0	0	0	0	0	0
X_j	14	42	45	24	125	
$Cj=\frac{1}{Xj}$	0.071428	0.023809	0.022222	0.041667		
X_{ij}^2	9	25	196	49		
	64	729	361	196		
	9	81	49	9		
	0	1	25	0		
	0	0	0	0		
$X^2_{ij}R_i$	0.310338	0.862050	6.758472	1.689618		
	0.941120	10.661125	5.308505	2.882180		
	0.409095	3.681855	2.227295	0.409095		
	0	0.166650	4.166650	0		
	0	0	0	0		
$\sum_i^p R_i \cdot X_{ij}^2$	1.660553	15.371696	18.460922	4.980893		
$Cj\sum_i^p R_i \cdot X_{ij}^2$	0.118610	0.365985	0.410238	0.207539	$=\sum_i^p Cj\sum_j^q R_i \cdot X_{ij}^2$	
					$=1.102372$	

$$X^2=N\left\{\sum_j^p Cj\cdot\sum_i^q R_i X_{ij}^2-1\right\}=125\times(1.102372-1)=12.796500$$

df (degrees of freedom) $n_1=5$ $n_2=4$ $df=(n_1-1)(n_2-1)=12$

See X^2 table $X^2=12.796500<$ $P=\begin{cases}0.01=26,725\\0.05=21,026\end{cases}$ .....(insignificant difference).

The above analysis proves that there is no correlation between the size of induration and the tuberculosis lesion in 313 positive tuberculin cattle (1959-1963).

(2)Distribution of the T.B lesion:

The distribution of the tuberculosis lesion are classified arbitrarily into 3 categories ..... Generalize T.B. pulm. T.B with adjacent lymphadenopathy and T.B lymphadenopathy. Results of exemination are as following:

TableII.

T.B lesion year	Generalized T.B (%)	Pulm. T.B with adjacent lymphadenopathy (%)	T.B lymphadenopathy (%)	No of lesion (%)	Total
1959	32(27.1)	35(29.8)	43(36.4)	8(6.8)	118
1960	9(12.9)	9(12.9)	39(55.7)	13(18.6)	70
total	41(21.8)	44(23.4)	82(43.6)	21(11.2)	188
1961	12(14.8)	28(34.6)	28(34.6)	13(16.0)	81
1962	1(7.7)	3(23.1)	5(38.5)	4(30.8)	13
1963	1(3.3)	11(35.5)	12(38.7)	7(22.6)	31
total	14(11.2)	42(33.6)	45(36.0)	24(19.2)	125

Accordingly, we are quite easy to know the cases of generalized T.B are declining gradually year by year, on the contrary, the positive rate in non-lesion cattle are increasing This fact explains the brilliant award of tuberculosis prevention for cattle in Taiwan.

Having comparied with the results reported by Tazima etal after 41 tuberculosis cattle postmortumly in Japan (as Table IV), we know no difference is present about the distribution of the lesion, though the Strain of cattle studied by Tazima is not know. The only difference seems to be that the higher rate of tuberculosis lymphadenopathy in author's series. sIt might by predicted that the percentage of tuberculosis lymphadenopathy will be increasing by performing strict tuberculin test and killing all positive reacters each year.

Table III.

T.B lesion Author	Generalized T.B (%)	Pulm. T.B with adjacent lymphadenopathy (%)	T.B lymphadenopathy (%)	Tatal
Tazimaetal	14(34.1)	13(31.7)	14(34.1)	41
Auther 1959-1960	41(24.6)	44(26.3)	82(49.1)	167
1961-1963	14(13.9)	41(40.6)	46(45.5)	101
total	55(20.5)	85(31.7)	128(47.8)	268

If the material sourlces of tuberculin positive cattle for Tazima and Shibata are as well as the author's and whether identifed completely with the results of author's investigation or not will be analysed as the following table:

Special table III.

Investigator T.B lesion	Tazima & Shibata X_{1j}	Author X_{2j}	Tatal $X_{\bullet j}$	$(X_{\bullet j})^2$	$\frac{(X_{1j})^2}{X_{\bullet j}}$
Generalized T.B	14	55	69	196	2.840579
Pulm. T.B with adjacent lymphadenopathy	13	85	98	169	1.724489
T.B lymphadenopathy	14	128	142	196	1.382282
Tatal	41	268	309		5.945350

$$X^2=\frac{N^2}{X_{1j}\cdot X_{2j}}\left(\sum_j^k\frac{(X_{1j})^2}{X_{\bullet j}}-\frac{(X_{1j})^2}{N}\right)=\frac{(309)^2}{41\times 268}\left(5.945350-\frac{(41)^2}{309}\right)=4.390153$$

df=3-1=2

See X^2 table get:

$p=0.05=11.070$ $p=0.01=15.286$ result $X^2=$ $4.390153 < P\begin{cases}0.05=11,070\\0.01=15,286\end{cases}$……(insignificant difference)

According to the above table shows that the result of author's investigation are identical with Tazima.& Shibata.

(3) Distribution of the tuberculosis lesion:

Kamochi had studied the distribution of tuberculosis lesion in various viscera in 218 tuberculin positive cattle in Japan. For the purpose of comparison the distribution of lesions in this series is also to be listed.

Table IV.

Distribution of lesion / Author	Pulm. T. B with adjacent lymphadenopathy (%)	Head & chest T.B lymphadenopathy (%)	Pulm. T.B (%)	Abdominalviscera T.B (%)	Generalized T.B (%)	No lesion (%)	Tota (%)
Kamochi	25(39.0)	57(26.1)	43(19.7)	3(1.4)	23(10.6)	7(3.2)	218
Author1959-1960	36(19.1)	61(32.4)	8(4.3)	15(8.0)	47(25.0)	21(11.2)	188
1961-1963	34(27.2)	35(28.0)	8(6.4)	10(8.0)	14(11.2)	24(19.2)	125
total	70(22.4)	96(30.7)	16(5.1)	25(8.0)	61(19.5)	45(14.4)	313

The percentage of generalized tuberculosis in Author's Series is much higher than that of Kamochis' This is quite clear, we are engaged in emergency for tuberculosis preventive work for cattie in Taiwan. In 268 cases of uteri tuberculosis was found.

The comparison between Kamochis' Investigation and Author's with Application Biometry are made as following:

Special table IV.

Investigator	Kamochi X_{1j}	Author X_{2j}	Total $X_{\cdot j}$	$(X_{1j})^2$	$\frac{(X_{1j})^2}{X_{\cdot j}}$
T.B lesion Pulm. with adjacent lymphadenopathy	85	70	155	7225	46.612903
Head & chest T.B lymphadenopathy	57	96	153	3249	21.235294
Pulm. T.B	43	16	59	1849	31.338983
Generalized T.B	23	61	34	529	6.297619
Abdominal visceral T.B	3	25	28	9	0.321485
No lesion	7	45	52	49	0.942307
Total	218	313	531		106.748591

$$X^2=\frac{N^2}{X_{1j}\cdot_{2j}}\left(\sum_j^k\frac{(X_{1j})^2}{X_{\cdot j}}-\frac{(X_{1j})^2}{N}\right)=\frac{(531)^2}{313\times218}(106.748591-\frac{(218)^2}{531})=4.132265(106.748591-89.499058)$$

$=71.279641$ df $=6-1=5$ X^2(df=5) $P\begin{cases}0.05=11,070\\0.01=15,086\end{cases}$

results $X^2=71.279641 > P\begin{cases}0.05=11,070\\0.01=15,086\end{cases}$……(h'ghly sigificant difference).

This result proved that there are an apparent differences between the Author and Kamochi.

⑷Pulmonary lesion.

45 cattle in 313 cases showed no gross tubercle, in addition to these other 268 cases all revealed gross tuberculosis changes and 129 cases(48.1%)are with pulmonary lesion, The status of involvement is as following:

Table V.

Division	Total	Both lungs	Right lung	Left lung
Year 1959	58	35(60.3)	11(19.0)	12(20.7)
1960	18	10(55.6)	2(11.1)	6(33.3)
total	76	45(59.2)	13(17.1)	18(23.7)
1961	38	9(23.7)	10(26.3)	19(50.0)
1962	3	3(100.0)	0	0
1963	12	4(33.4)	3(25.0)	5(41.7)
total	53	16(30.2)	13(24.5)	24(45.3)
All total	129	61(47.3)	26(20.2)	42(32.6)

In most cases both lungs are involved, simultaneously, left lung seems to be invaded more frequently.

⑸Lymphadenopathy:

The following table denotes the distribution of the lymphadenopathy in 268 cases.

Table VI.

Division Distribution of lymph note	Number of cases (Percentage of cases) 1959-1960 (%)	1961-1963 (%)	Total (%)
Mediastinal lymph nodes	101(60.5)	58(47.9)	159(55.2)
Hilar lymph nodes	89(53.3)	45(37.2)	134(46.5)
Mesenteric lymph nodes	49(29.3)	27(22.3)	76(26.4)
Retropharyngeal lymph nodes	32(19.2)	28(23.1)	60(20.8)
Submandibular lymph nodes	7(4.2)	10(8.3)	17(5.9)
Portal lymph nodes	14(8.3)	3(2.5)	17(5.9)
Mammal lymph nodes	3(1.8)	3(2.5)	6(2.1)
Inguinals lymph nodes	4(2.4)	0	4(1.4)
Renal lymph nodes	3(1.8)	1(0.8)	4(1.4)
Anterior chest lymph nodes	4(2.4)	0	4(1.4)
Patellar lymph nodes	3(1.8)	0	3(1.0)
Gastric lymph nodes	1(0.6)	0	1(0.3)

Remark: 313 autopised, 268 with gross lesion, 45 without gross lesion.

From above, it is obvious that mediastinal lymphnode are involved most frequently, up to 159 cases or 55.2%, hilar lymphnode for the next 134 cases or 46.5%, mesenteric lymphnode take the 3rd. place, 76 ecass or 26.4% The other, arrange in order as following retropharyngeal 60 cases or 20.8%,Portal and submandibular all 17 cases or 5.9%, mammal 6 cases or 2.1%, inguinale, renal and anterior all 4 cases

or 1.4%, and gastric patellar 3 cases or 1.0%, Gastric only 1 cases or 0.3%.

IV. Conclusion:

Author has Pathologico-anatomically studied 313 tuberculin intradermal test positive reactors in North Taiwan during November, 1958 to Oct. 1963 period. The results were as following:

(1)All 313 tuberculin intradermal positive reactor were autopsied and 45 cases or 14.3% were found to be non-lesion reactors. This figure is lower than that of in the U.S.A. and in Japan. High rate may be deoreased if the test is continued and culling of positive reactors intensified.

(2) As shown in the autopsy results, early stage of infection is manifested as nodular tuberculosis in lymph gland. If the culling of positive reactors intensified, the rate of nodular tuberculosis will be increased (see table III.)

(3) Pulmonary tuberculosis was observed in 40% of all positive (see table IV and V). of which 47.3% was infected in both lungs. In single lung infection cases, more lesion were found in left than in the right.

(4) Tuberculous lesion were mostly observed in mediastinal lymph nodes with the rate of 55.2% These lesions were also found 46.5%, in hilar, 26.4 % in mesenteric, 20.8% in retropharyngeal, 5.9% in portal and submandibular, 2.1% in mammal lymph glands. Other lymph nodes affected in orderwerer inguinal ,anterior chest renal, patellar and gastric lymph nodes.

(5) In order to making investigation more accurater, it had been analysing by means of the biometry, the results are as following:

A. According to the special lst table and the special 2nd table datum show that there are no correlation between the size of induration and distribution of T.B lesion.

B. The special 3rd table shows no differences between the investigation and the Tazi mas.

C. The Special 4th table shows that the difference between the investigation and Kamochi's may be caused by the sampling errors of different data and circumstance.

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Fig, Encapaulated caseous tubercle in lymph nebe. Middle and Right figures show a single tubercle with casesus center and peripheral zone of lymphocytes and fibroblasts. A few Langhan's giant cells are irregularly distributed in the peripheral zone.