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Organs as a Source of Factors Capable of Eliciting the Shwartzman Phenomenon.*

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In a previous investigation[1] it was shown that fractions prepared from tumor tissue were capable of producing the Shwartzman phenomenon. The present study was extended to include normal tissues, and it was found that in a number of cases the factors capable of eliciting the Shwartzman phenomenon were present in these tissues as well. Though a variety of organs were tested in this connection for provocative potency a more complete investigation was made of bovine pancreas and testis, and rabbit liver as sources of both preparatory and provocative factors.

The tissues employed were obtained from the operating room or from freshly killed animals. Bacteriological studies of the fresh animal organs were not always made because of the lack of facilities at the abbatoir. Whenever possible, cultures were made on blood agar plates, semi-solid agar, and anerobic sheep brain media. The organs which were cultured are indicated in the tables. A portion of the tissue was removed for histological examination and the remainder was treated immediately in the manner previously described.[1] It is obvious that no special precautions to maintain sterility were needed since every step in the preparation of the fractions was of such a nature that sterility was automatically maintained. The dried fractions thus obtained were dissolved in physiological saline at 100°, just prior to use and these solutions were tested against the extracts obtained from bacteria as previously described.[2]

It may be seen from the tables that fractions from bovine pancreas and testis, and rabbit liver contain both preparatory and provocative factors. Sheep pancreas and testis fractions were found to act similarly. An occasional preparation was found to be inactive regardless of the dose administered. The effects of preparations from a variety of other organs are apparent from Tables I and II. Heart preparations proved fatally toxic to the rabbits though at the time of death there was indication of the onset of positive reactions.

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1 Antopol, W., *J. Infect. Dis.*, 1937, **61**, 333.

2 Antopol, W., *J. Infect. Dis.*, 1937, **61**, 331.

TABLE I.

Various Preparations as Provocative Factors.

Source	Organ	Preparation used	Provocative dose (mg.)	Reactions in rabbits‡
	Skin preparatory dose 1 mg. *B. proteus* preparation.			
Cow	Liver†	A	50	3/0
Rabbit	" *	N	"	2/1
Cow	Muscle	A	"	1/2
"	Kidney*	A	"	2/1
"	Spleen†	A	"	0/2
Sheep	Brain†	B	"	2/0
Human	Placenta*	M	"	2/1
"	Uterus*	N	20	0/1
"	"	N	55	1/0
"	Breast*	O	12	1/0
Cow	" (lactating)*	L	20	0/1
"	" "	L	50	1/0
"	Pancreas	C	"	0/1
"	"	C	75	1/0
"	"	D	100	1/0
	Skin preparatory dose 20 mg. *B. typhosus* preparation.			
Cow	Pancreas	A	50	2/1
"	"	A	100	8/0
Bull	Testis	F	50	2/0
"	"	G	75	1/0

*Tissues bacteriologically sterile.

†Diphtheroids cultured aerobically, sterile anaerobically. (All other tissues not cultured.)

‡The results are indicated according to the convention of Shwartzman and Morell.[6] The numerator denoting the number of positive and the denominator denoting the number of negative animals.

TABLE II.

Source	Organ	Preparation used	Skin preparatory dose (mg.)	Provocative dose extract of *B. proteus* (mg.)	Reactions in rabbits
Cow	Pancreas	E	50	.125	1/1
"	"	F	50	.125	1/0
"	"	G	50	.125	0/1
"	"	G	25	1.0	1/0
"	" *	H	50	.25	1/0
"	" *	H	95	.25	1/0
"	" *	I	50	.25	0/1
Bull	Testis	A	50	.125	0/1
"	"	B	50	.125	0/2
"	"	B	50	.500	0/1
"	"	C	50	.125	0/1
"	" *	D	50	.25	1/0
"	" †	E	75	1.0	1/0
Rabbit	Liver*	N	50	.25	1/2
"	" *	S	50	.25	1/0

*, † refer to Table I.

[6] Shwartzman, G., and Morell, S., *J. Exp. Med.*, 1938, **67**, 1.

The presence of Shwartzman factors in normal tissues is not entirely unexpected since vascular lesions have been described in various organs without preliminary preparation, after the intravenous introduction of potent bacterial filtrates prepared in the manner described by Shwartzman[3, 4, 5] or with fractions prepared from the bacteria themselves.[2]

The possible rôle of Forrsman antigen-antibody combination in the mechanism of these reactions has been excluded in this instance, since the cow, which was the source for most of the tissues, is devoid of this heterophile antigen. In addition, fractions obtained from sterile rabbit liver, of the same species as the test animal, also contained preparatory as well as provocative factors.

Since the diphtheroids were cultivated from the organs used as sources of the fractions which gave negative Shwartzman reactions in certain instances, and in other cases, fractions gave positive reactions even though the tissues from which they were prepared were culturally sterile, it is reasonable to assume that this organism played no significant part in the elicitation of the reaction.

An attempt is being made at the present time to determine the nature of the potent factors involved.

Summary. Fractions prepared from pancreas, testis, liver, kidney, brain, placenta, muscle, breast, and uterus were shown to possess provocative Shwartzman phenomenon factors, although the results were irregular in some cases. Similar fractions from spleen gave negative results. Only the fractions from the first 3 of these tissues were also tested for preparatory potency, and were found to elicit positive reactions in some of the rabbits.

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3 Shwartzman, G., PROC. SOC. EXP. BIOL. AND MED., 1928, **25**, 560; *J. Exp. Med.*, 1928, **48**, 247.

4 Apitz, K., *Virchow's Arch. f. path. Anat.*, 1934, **293**, 1.

5 Gerber, I., *Arch. Path.*, 1936, **22**, 776.