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Skin Sensitization Test

Guinea Pig Maximization

Final Report



Verification

Report Number: CSTBB2023100311

Article Name: Crown & Bridge Resin (C & B Resin)

Method Standard: ISO 10993-10:2021

Sponsor

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Notices

1. Please apply for rechecking within 15 days of receiving the report if there is any objection.
2. Any erasure or without special testing seal renders the report null and void.
3. The report is only valid when signed by the persons who edited, checked and approved it.
4. The report is only responsible for the test results of the tested samples.
5. The report shall not be reproduced except in full without the written approval of the company.

Abstract

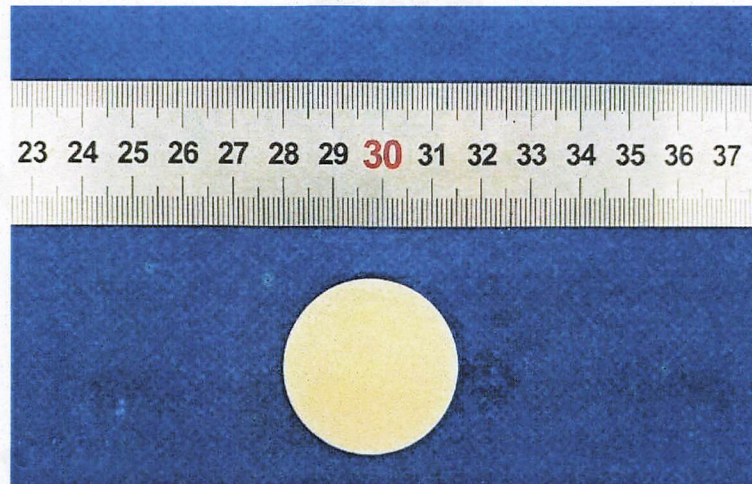
In this study, guinea pigs were used to test for skin sensitization from the test article according to ISO 10993-10:2021.

The test article were extracted by 0.9% Sodium Chloride Injection and Sesame Oil. The extract was mixed with Freund's complete adjuvant into a stable emulsifier. Intradermal induction and topical induction were operated in the dehaired intrascapular region of each animal. At 14 days after completion of the topical induction phase, challenge all test and control animals with the test sample at sites that were not treated during topical induction phase. The erythema and edema of the challenge site were observed to test the sensitization response of the test article. The erythema and edema reactions at each application site was described and scored according to the Magnusson and Kligman scales at 24 hours and 48 hours after the challenge phase.

The results showed that the guinea pigs in the negative control group (0.9% Sodium Chloride Injection, Sesame Oil) retained a normal appearance throughout the test and showed no skin irritation. Severe skin reactions for erythema and oedema were shown in the positive control group (DNCB). The skin reaction of the test article group did not exceed that of the control group. The skin reactions for erythema and oedema were not observed in test article group.

Based on the above results, it can be concluded that under the experimental conditions, the test article has no potential skin sensitization on guinea pigs in the extraction method.

Study Verification and Signature



Protocol Number	SST2309003602BB
Protocol Effective Date	2023-09-06
Technical Initiation Date	2023-09-08
Technical Completion Date	2023-10-06
Final Report Completion Date	2023-10-20

Personnel

Bonnie Lin2023-10-20
Date Completed

Approved

Vicky Yin
Study Director2023-10-20
Date Completed

Supervisory

[Signature]
Test Facility Manager2023-10-20
Date Completed**CCIC Huatongwei International Inspection (Suzhou) Co., Ltd.**

Quality Assurance Statement and GLP Statement

Quality Assurance Statement

The Quality Assurance Unit conducted inspections on the following dates. The findings were reported to the Study Director and to the HTW's Management.

The final report was reviewed to assure that the report accurately describes the methods and standard operating procedures. The reported results accurately reflect the raw data of the nonclinical study conducted per the protocol.

Phase Inspected	Date	Study Director	Management
Experiment	2023-09-08	2023-09-08	2023-09-08
Raw Data	2023-10-06	2023-10-06	2023-10-06
Final Report	2023-10-20	2023-10-20	2023-10-20

The findings of these inspections have been reported to Management and the Study Director.

Hong Xia Li

Quality Assurance

2023-10-20

Date

GLP Statement

This study was conducted in compliance with current U.S. Food and Drug Administration regulations set forth in 21 CFR, Part 58.

The sections of the regulations not performed by or under the direction of HTW, exempt from this Good Laboratory Practice Statement, included characterization and stability of the test article and its mixture with carriers, 21 CFR, Part 58.105 and 58.113.

Vicky Yin

Study Director

2023-10-20

Date

1.0 Purpose

The test was designed to evaluate the potential of a test article to cause skin sensitization.

2.0 Reference

Biological evaluation of medical devices-Part 10: Tests for skin sensitization (ISO 10993-10:2021)

Biological evaluation of medical devices-Part 2: Animal welfare requirements (ISO 10993-2:2022)

Biological evaluation of medical devices-Part 12: Sample preparation and reference materials (ISO 10993-12:2021)

3.0 Test and control articles

Groups	Test article	Negative Control Article(Polar)	Negative Control Article(Non-Polar)	Positive Control
Name	Crown & Bridge Resin (C&B Resin)	0.9% Sodium Chloride Injection(SC)	Sesame Oil (SO)	2, 4-Dinitrochlorobenzene (DNCB)
Manufacturer	Shenzhen Yongchanghe Technology Co.,Ltd.	Cisen Pharmaceutical Co., Ltd.	Ji'an Lv yuan natural flavor oil refinery	TOKYO CHEMICAL INDUSTRY CO., LTD
Size	PCS	500 ml	25 kg	25 g
Model	DF series	/	/	/
Lot Batch#	JH20230830	E22121523	2023.4.18	H2UKD-DM
Test Article Material	3D PRINTER RESIN	/	/	/
Physical State	Solid	Liquid	Liquid	Solid
Color	beige	Colorless	Light yellow	Light yellow
Package material	PE BAG	/	/	/
Sterilized or Not	Not Sterilized	/	/	/
Concentration	/	0.9 %	/	Induction Concentration: 0.1 % Challenge Concentration: 0.05 % Dissolved in ethanol
Surface (cm ²)	Not Provided	/	/	/
Weight (g)	2	/	/	/
Storage Condition	Room Temp.	Room Temp.	Room Temp.	Room Temp.

Note: The information about the test article was supplied by the sponsor wherever applicable.

4.0 Identification of test system

4.1 Test animal

Species: Albino Guinea Pig

Number: 30 (20 Test +10 Control)

Sex: either sex

Initial body weight: 300.0~500.0 g

Health status: Healthy, not previously used in other experimental procedures. Female animals are nulliparous and not pregnant

Animal identification: Ear tag

Cages: Plastic cage

Acclimation Period: 7 days under the same conditions as for the actual test

4.2 Justification of test system

The albino guinea pig has been used historically for sensitization studies (Magnusson and Kligman, 1970). The guinea pig is believed to be the most sensitive animal model for this type of study. DNCB is the positive control article recommended in the test instructions. To ensure the sensitivity of the experimental system, the positive control article should be verified every three months.

5.0 Animal management

Animal purchase: Wuxi hengtai experimental animal breeding co. LTD SCXK (SU) 2020-0003

Bedding: Ordinary bedding, Pizhou Xiaohe Technology Development Co., Ltd

Feed: Full-price pellets, Wuxi hengtai experimental animal breeding co. LTD

Water: Drinking water met the Standards for Drinking Water Quality GB 5749-2022

Animal room temperature: 18-26 °C

Animal room relative humidity: 30 %-70 %

Lights: 12 hours light/dark cycle, full-spectrum lighting

Personnel: Associates involved were appropriately qualified and trained

Selection: Only healthy, previously unused animals were selected

There were no known contaminants present in the feed, water, or bedding expected to interfere with the test data.

6.0 Equipment and reagents

6.1 Instruments

Constant Temperature Vibrator (SHB007), Electronic scale (SHB017)

6.2 Reagents

Freund's adjuvant Complete liquid (SIGMA, Lot No: SLCD4457), Sodium dodecyl sulfate (Solarbio, Lot No: 1019Y032)

7.0 Experiment design

7.1 Sample preparation

The extracts of test article will be prepared according to the following steps:

Aseptic Sampling			Extraction in sterile vessels				
	Sampling Manner	Actually sampling	Ratio	Reagent		Condition	pH
Intradermal induction phase I	Whole	4.5 g	0.2g:1mL	SC	22.5 mL	50°C / 72 h/ 60rpm	5.5
		4.5 g		SO	22.5 mL		/
Topical induction phaseII	Whole	4.5 g	0.2g:1mL	SC	22.5 mL	50°C / 72 h/ 60rpm	5.5
		4.5 g		SO	22.5 mL		/
Challenge phase	Whole	4.5 g	0.2g:1mL	SC	22.5 mL	50°C / 72 h/ 60rpm	5.5
		4.5 g		SO	22.5 mL		/

Both induction and challenge phase extracts were prepared by the number of times. The state of the leaching solution did not change visually after the leaching was advanced. The extraction solution and the pH value should not been adjusted, filtered, centrifuged, diluted and other processes before used. The control solution was prepared under the same conditions. The extraction of the test article could be stored at room temperature for no more than 24 h. No particulates or color changes were observed in pre- and post-extraction, the color and pH of the extraction solution did not change before and after use, and the pH value was 5.5, the status of the extract was shown in the table below.

Phase	Vehicle	Time Observed	Extracts	Condition of Final Extracts		
				Color	Clear or Not	Particulates
Intradermal induction phase I	0.9% Sodium Chloride Injection(SC)	Before Extraction	Test article	Colorless	Clear	None
			Negative Control	Colorless	Clear	None
		After Extraction	Test article	Colorless	Clear	None
			Negative Control	Colorless	Clear	None
	Sesame Oil (SO)	Before Extraction	Test article	Light yellow	Clear	None
			Negative Control	Light yellow	Clear	None
		After Extraction	Test article	Light yellow	Clear	None
			Negative Control	Light yellow	Clear	None
Topical induction phaseII	0.9% Sodium Chloride Injection(SC)	Before Extraction	Test article	Colorless	Clear	None
			Negative Control	Colorless	Clear	None
		After Extraction	Test article	Colorless	Clear	None
			Negative Control	Colorless	Clear	None
	Sesame Oil (SO)	Before Extraction	Test article	Light yellow	Clear	None
			Negative Control	Light yellow	Clear	None
		After	Test article	Light yellow	Clear	None
			Test article	Light yellow	Clear	None

		Extraction	Negative Control	Light yellow	Clear	None
Challenge phase	0.9% Sodium Chloride Injection(SC)	Before Extraction	Test article	Colorless	Clear	None
			Negative Control	Colorless	Clear	None
		After Extraction	Test article	Colorless	Clear	None
			Negative Control	Colorless	Clear	None
	Sesame Oil (SO)	Before Extraction	Test article	Light yellow	Clear	None
			Negative Control	Light yellow	Clear	None
		After Extraction	Test article	Light yellow	Clear	None
			Negative Control	Light yellow	Clear	None

7.2 Test method

7.2.1 Intradermal induction phaseI

Make a pair of 0.1 ml intradermal injections of each of the following, into each animal, at the injection sites (A, B and C) , as shown in Figure 1 in the clipped intrascapular region.

Site A: A 50:50 volume ratio stable emulsion of Freund's complete adjuvant mixed with the chosen solvent.

Site B: The test sample (undiluted extract); inject the control animals with the extraction solvent alone.

Site C: The test sample at the concentration used at site B, emulsified in a 50:50 volume ratio stable emulsion of Freund's complete adjuvant and the solvent; inject the control animals with an emulsion of the blank liquid with adjuvant.

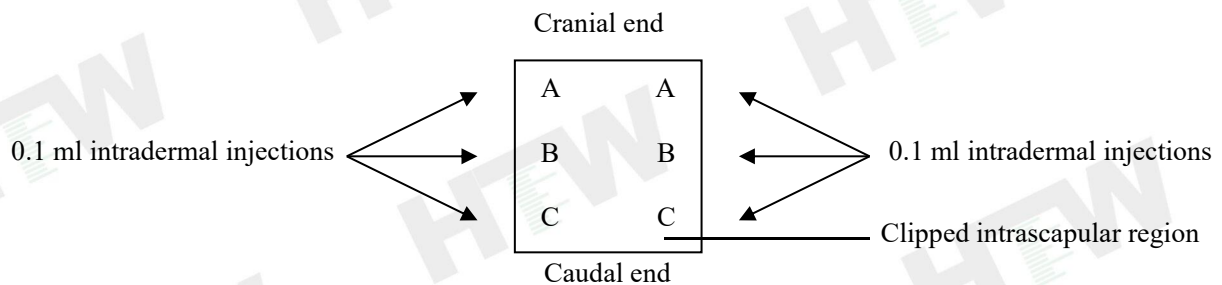


Figure 1 Location of intradermal injection sites

7.2.2 Topical induction phaseII

At (7±1) d after the intradermal induction phase, administer the test article extract by topical application to the intrascapular region of each animal, using a patch of area approximately 8cm² (absorbent gauze), so as to cover the intradermal injection sites. If the maximum concentration that can be achieved in Intradermal induction phase I does not produce irritation, pretreat the area with 10% sodium dodecyl sulfate(SDS) massaged into the skin (24±2) h before the patch is applied. Secure the patches with an occlusive dressing. Remove the dressings and patches after (48±2) h.

Treat the control animals similarly, using the blank liquid alone.

7.2.3 Challenge phase

All test and control animals shall be challenged at (14±1) d after completion of the topical induction phase. Absorbent gauzes (2.5 cm x 2.5 cm) were soaked respectively with test article and control article. Apply the test

article extract and control article topically to two sites that were not treated during the induction stage. The patches shall be secured with an occlusive dressing. Dressings and patches shall be removed after (24 ± 2) h.

8.0 The results observed

Observe the appearance of the challenge skin sites of the test and control animals (24 ± 2) h and (48 ± 2) h after removal of the dressings. Use of natural lighting is highly recommended in order to visualize the skin reactions. Describe and grade the skin reactions for erythema and oedema according to the Magnusson and Kligman grading scale given in Table 1 for each challenge site and at each time interval.

Table 1 Magnusson and Kligman scale

Patch test reaction	Grading scale
No visible change	0
Discrete or patchy erythema	1
Moderate and confluent erythema	2
Intense erythema and/or swelling	3

9.0 Evaluation criteria

Magnusson and Kligman grades of 1 or greater in the test group generally indicate sensitization, provided grades of less than 1 are seen in control animals. If grades of 1 or greater are noted in control animals, then the reactions of test animals which exceed the most severe reaction in control animals are presumed to be due to sensitization. If the response is equivocal, rechallenge is recommended to confirm the results from the first challenge. The outcome of the test is presented as the frequency of positive challenge results in test and control animals.

10.0 Results of the test

All animals survived and no abnormal signs were observed during the study. Individual results of dermal scoring for the challenge appear in Table 2.

11.0 Conclusion

The test article showed no evidence of causing delayed dermal contact sensitization in the guinea pig.

12.0 Compliance

US FDA Good Laboratory Practice Regulations 21 CFR 58, effective June 20, 1979, as amended 52 FR 33780, Sept. 4, 1987, and subsequent amendments

Standard operating procedure of CCIC Huatongwei International Inspection (Suzhou) Co., Ltd.

13.0 Record

All raw data pertaining to this study and a copy of the final report are retained in designated Huatongwei archive.

14.0 Confidentiality agreement

Statements of confidentiality are as agreed upon prior to study initiation.

15.0 Protocol amendment/deviations

There were no amendments or deviations that occurred during the course of this study.

Table 2 Guinea pig Sensitization Dermal Reactions

Group		No.	Pretest weight(g)	Finished weight(g)	The Challenge patch was removed 24h later		The Challenge patch was removed 48h later		Positive rate
					Erythema	Swelling	Erythema	Swelling	
SC	Test article	1	303.8	363.9	0	0	0	0	0%
		2	302.8	373.8	0	0	0	0	
		3	302.4	379.7	0	0	0	0	
		4	310.4	368.0	0	0	0	0	
		5	314.2	365.0	0	0	0	0	
		6	316.7	369.2	0	0	0	0	
		7	307.8	371.5	0	0	0	0	
		8	317.8	375.9	0	0	0	0	
		9	315.6	373.9	0	0	0	0	
		10	305.0	361.2	0	0	0	0	
	Negative Control	11	312.0	382.3	0	0	0	0	0%
		12	302.4	370.1	0	0	0	0	
		13	302.7	381.2	0	0	0	0	
		14	303.0	372.4	0	0	0	0	
		15	311.5	373.2	0	0	0	0	
SO	Test article	16	305.4	363.2	0	0	0	0	0%
		17	311.0	383.4	0	0	0	0	
		18	315.0	377.1	0	0	0	0	
		19	316.9	378.9	0	0	0	0	
		20	306.0	379.0	0	0	0	0	
		21	309.5	381.8	0	0	0	0	
		22	305.0	381.6	0	0	0	0	
		23	305.1	361.6	0	0	0	0	
		24	317.9	374.1	0	0	0	0	
		25	314.0	369.6	0	0	0	0	
	Negative Control	26	305.0	371.5	0	0	0	0	0%
		27	307.5	377.2	0	0	0	0	
		28	313.4	365.9	0	0	0	0	
		29	317.5	380.0	0	0	0	0	
		30	303.7	360.9	0	0	0	0	

Table 3 Positive control

Group	No.	Pretest weigh(g)	Finished weigh(g)	The Challenge patch was removed 24 h later		The Challenge patch was removed 48 h later		Positive rate
				Erythema	Swelling	Erythema	Swelling	
Positive Article Group	1	314.2	371.2	1	2	2	3	100%
	2	314.4	372.4	1	2	3	2	
	3	311.2	372.2	1	1	3	2	
	4	311.4	380.3	2	2	2	2	
	5	316.5	373.4	2	2	2	3	
	6	313.1	376.2	2	2	3	2	
	7	314.4	372.5	2	1	2	2	
	8	312.0	369.2	2	2	3	2	
	9	305.1	381.6	2	2	3	2	
	10	311.7	379.9	2	1	2	2	
Solution Control Group	11	305.0	377.5	0	0	0	0	0%
	12	315.2	375.2	0	0	0	0	
	13	313.2	371.2	0	0	0	0	
	14	313.3	374.2	0	0	0	0	
	15	316.2	374.9	0	0	0	0	

Note: The positive control was CSTBB23090002P1 (Finish date: 2023-09-29)