AB65 Agua Bronze TEXTILE

TEXTILE

YARN

AB65 copper alloy

AB65 ：0.03 mm

Textile「Revolution」

High-tech textile

WHY? AB65

The worldwide first

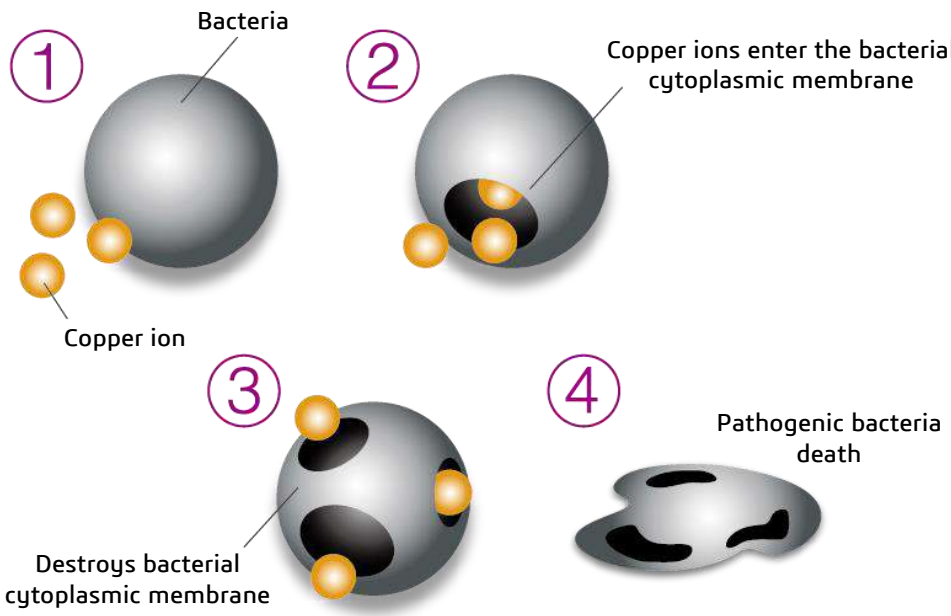
1. Decipher the limits of the combination of copper alloy and textiles
2. ~~No yarn coating shedding~~
3. ~~No nanotized metallic salts~~
4. ~~No skin irritability~~
5. The most primitive and healthy copper ion bacteriostatic agent

Copper & human health

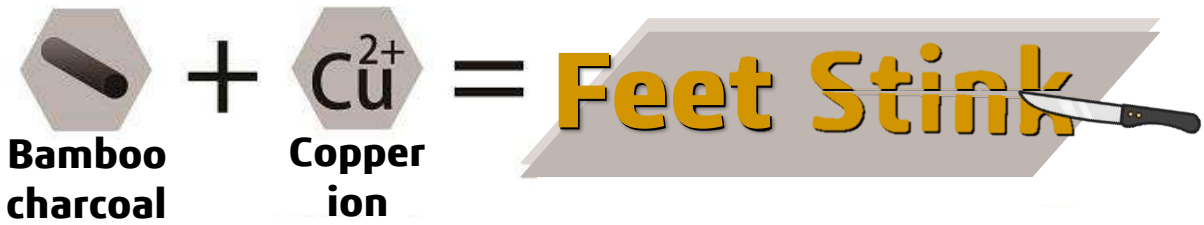
Copper is an essential trace element in most living organisms. It is mainly distributed in human muscle, liver, bones, and etc. Its compounds can be used as antimicrobial agents, fungicides, and wood preservatives

Copper & Antimicrobial

Reactions like "$Cu^{+}+H_2O_2 \rightarrow Cu^{2+}+OH^{-}+ \bullet OH$" can produce reactive hydroxyl radicals, which can destroy proteins and lipid in cells. At the same time, copper ions also lead to depletion of sulfhydryl group, such as in cysteine or glutathione, in a cycle between the "$2Cu^{2+}+2RSH \rightarrow 2Cu^{+}+RSSR+ 2H^{+}$" and "$2Cu^{2+}+2H^{+}+O_2 \rightarrow 2\ Cu^{2+}+H_2O_2$" reactions. These reactions produce hydrogen peroxide, which leads to the further production of toxic hydroxyl radicals that damage cells. In addition, copper ion may also compete with zinc or other metal ions for important binding sites on proteins, thereby affecting enzyme action.



Feet stink killer
水虫や足が臭い人の救世主



AB65 copper alloy fibers + Bamboo charcoal yarn

AB65 copper alloy fibers

The product containing copper alloy fibers is classified as functional fabrics, which has the efficacy of diminishing disease transmission, eliminating odor and improving skin health, etc. It is the latest type of antibacterial textile that is currently in fashion in the United States.

Silver-containing fibers have been widely used in the past decade, but in 2014 the NRDC publicly restricted the use of nanosilver in textiles, citing the growing discovery that silver fibers were not as safe as expected. Except for silver nitrate, silver compounds are basically insoluble. Silver ions or nanosilver will penetrate the skin and enter the human body to form a biotoxic accumulation, which may affect health in the long run. On the contrary, it is found that copper compounds can be dissolved and excreted from the body by etabolism after entering the body, and copper is the third life element among the three essential trace elements in human body, only second to iron and zinc.

In addition, copper and iron are vital elements in the hematopoietic function. Copper plays an important role in the metabolism of human skin, cartilage and other connective tissue. It can catalyze the formation of hemoglobin, and participate in the hematopoietic process.

Currently, odor elimination in textiles is mainly focused on two scenarios: one is to eliminate the rancid odor produced by the metabolism of bacteria or fungi, and the other is to improve human body odor (including the odor produced by gases or liquids such as ammonia, acetic acid, and etc.).

Bamboo charcoal yarn

The exclusive patent bamboo charcoal yarn is a polypropylene environment-friendly yarn made from high cost bamboo charcoal spinning materials. It is different from the common bamboo charcoal products made by chemical dyeing or soaking. It can provide 100% deodorization effect.

Bamboo charcoal yarn has natural negative ions, anti- mold and anti-bacteria, far infrared energy, and improves body meridian circulation. In the high temperature environment, it can prevent hot air from entering, in the low temperature environment, it can also continue the heat effect, its water content is very low, fixed drying speed is short, can quickly sweat out, breathable effect is good.

Certifications

Test items	Test results
Trichophyton mentagrophytes	Grade 2
Candida Albicans	> 99.9
Staphylococcus Aureus	> 99.9
Klebsiellar Pneumonia	> 99.9
Skin Irritation Test	Negligible
Closed-Path Test for Skin Sensitization	Negative reaction

TTRI report

Certification items

Trichophyton mentagrophytes

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TEST REPORT TUCHENG

ORIGINAL

Date: Apr.16,2018 Date of Receipt: Feb.05,2018

Report No.: TFF7B047-A Quantity: 1PC Page Order/Pages: (P1/1) Ref. No.: NIL

Report Title: YUANG HSIAN METAL INDUSTRIAL CORP.(U1712) Item: Knitted Fabric

Address: 35, LN. 183, CHANG SHOEI RD., CHANG HUA, TAIWAN(R.O.C.)

Test Items	Test Results	Test Methods
Trichophyton mentagrophytes ATCC 9533	Grade 2	CNS 2690 L3063-2008 Wet Method

Note: Grade 1 : The area on the specimen surface of fungus growth<1/10.

Grade 2 : The area on the specimen surface of fungus growth from 1/10 to 1/3.

Grade 3 : The area on the specimen surface of fungus growth>1/3.

Note: Sample description is given by the client: ANTIBACTERIAL FABRIC WITH COMPOSITE FIBER COPPER ALLOY WIRE

Note: As the remaining sample was asked to return along with the test report, re-testing would not be possible.

Department of Testing and Certification 檢測及驗證處

Gwo-Tsuen Jou

Director.
Department of Testing and Certification

Authorized by president of Taiwan Textile Research Institute

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TTRI report

Certification items

Candida albicans

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TEST REPORT TUCHENG

ORIGINAL

Date: Apr.10,2018 Date of Receipt: Mar.20,2018

Report No.: TFF7B047-B Quantity: 1PC Page Order/Pages: (P1/1) Ref. No.: NIL

Report Title: YUANG HSIAN METAL INDUSTRIAL CORP.(U1712) Item: Knitted Fabric

Address: 35, LN. 183, CHANG SHOEI RD., CHANG HUA, TAIWAN(R.O.C.)

Test Items		Test Results		Test Methods
		Control	Sample	
Candida albicans ATCC 18814	COI	1.5 E+5	1.5 E+5	ISO 20743:2013 Quantitative test Absorption method
	Co	3.0 E+4	--	
	Ct	3.6 E+6	--	
	To	--	2.6 E+4	
	Tt	--	8.8 E+3	
	F	2.1	--	
	G	--	-0.5	
	A	--	2.6	

Note: 1. COI:Concentration of inoculum (cells/mL). The test inoculum shall be 1.0~3.0 E+5.

2. Co:The number of bacteria recovered from the control at the beginning of contact time.
   Ct:The number of bacteria after 18~24 h inoculation of the control.
   To:The number of bacteria recovered from the sample at the beginning of contact time.
   Tt:The number of bacteria after 18~24 h inoculation of the sample.
3. F:The growth value on the control=logCt-logCo. The value of F shall be ≧1.0.
4. G:The growth value on the sample=logTt-logTo. (In case of Co>To, substitute Co for To.)
5. A:Antibacterial activity value=F-G.
6. 2.0 E+2 is equal to 200, 1.3 E+4 is equal to 13000, etc.
7. The dilution of the test organism of Cardida albicans is made in 1/20 YPDB.
8. Sample description is given by the client: ANTIBACTERIAL FABRIC WITH COMPOSITE FIBER COPPER ALLOY WIRE

Note: As the remaining sample was asked to return along with the test report, re-testing would not be possible.

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TTRI report

Certification items

Staphylococcus aureus

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TEST REPORT TUCHENG

Date: Jan.18,2019 Date of Receipt: Jan.04,2019 ORIGINAL

Report No.: TFF8A053 Quantity: 1PC Page Order/Pages: (P1/2) Ref. No.: NIL

Report Title: Yuang Hsian Metal Industrial Corp.(U1712) Item: Knitted Fabric

Address: 35, Ln. 183, Chang Shoei Rd., Chang Hua, Taiwan(R.O.C.)

Test Items		Test Results	Test Methods
Staphylococcus aureus ATCC 6538	B	1.49 E+5	AATCC 100-2012
	A	< 100	
	R(%)	> 99.9	

Note: 1. A = the number of bacteria recovered from the inoculated treated test specimen swatches in the jar incubated for 18~24 h.

B = the number of bacteria recovered from the inoculated treated test and untreated control specimen swatches in the jar immediately after inoculation (at "0" contact time).

If the two number are not significantly different, calculate the average.

If they are not similar, the larger number should be used.

R = % reduction : 100(B-A)/B=R

2. 2.0 E+2 is equal to 200, 1.3 E+4 is equal to 13000, etc.
3. 4 treated swatches used per jar.
4. The dilution of the test organism is made in 1/20 NB,
5. One specimen was uesd for this testing.
6. Sample description is given by the client: ANTIBACTERIAL FABRIC WITH COMPOSITE FIBER COPPER ALLOY WIRE

Note: As the remaining sample was asked to return along with the test report, re-testing would not be possible.

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Director. Department of Testing and Certification

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Taiwan Textile Research Institute

TEST REPORT TUCHENG

ORIGINAL

Date: Jan.18,2019 Date of Receipt: Jan.04,2019

Report No.: TFF8A053 Quantity: 1PC Page Order/Pages: (P2/2) Ref. No.: NIL

Report Title: Yuang Hsian Metal Industrial Corp.(U1712) Item: Knitted Fabric

Address: 35, Ln. 183, Chang Shoei Rd., Chang Hua, Taiwan(R.O.C.)

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TTRI report

Certification items

Klebsiellar pneumonia

TEST REPORT TUCHENG

Date: Jan.18,2019 Date of Receipt: Jan.04,2019 ORIGINAL

Report No.: TFF8A054 Quantity: 1PC Page Order/Pages: (P1/2) Ref. No.: NIL

Report Title: Yuang Hsian Metal Industrial Corp.(U1712) Item: Knitted Fabric

Address: 35, Ln. 183, Chang Shoei Rd., Chang Hua, Taiwan(R.O.C.)

Test Items		Test Results	Test Methods
Klebsiella pneumoniae ATCC 4352	B	1.49 E+5	AATCC 100-2012
	A	< 100	
	R(%)	> 99.9	

Note: 1. A = the number of bacteria recovered from the inoculated treated test specimen swatches in the jar incubated for 18~24 h.

B = the number of bacteria recovered from the inoculated treated test and untreated control specimen swatches in the jar immediately after inoculation (at "0" contact time).

If the two number are not significantly different, calculate the average.

If they are not similar, the larger number should be used.

R = % reduction : 100(B-A)/B=R

2. 2.0 E+2 is equal to 200, 1.3 E+4 is equal to 13000, etc.
3. 4 treated swatches used per jar.
4. The dilution of the test organism is made in 1/20 NB,
5. One specimen was uesd for this testing.
6. Sample description is given by the client: ANTIBACTERIAL FABRIC WITH COMPOSITE FIBER COPPER ALLOY WIRE

Note: As the remaining sample was asked to return along with the test report, re-testing would not be possible.

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TEST REPORT TUCHENG

ORIGINAL

Date: Jan.18,2019 Date of Receipt: Jan.04,2019

Report No.: TFF8A054 Quantity: 1PC Page Order/Pages: (P2/2) Ref. No.: NIL

Report Title: Yuang Hsian Metal Industrial Corp.(U1712) Item: Knitted Fabric

Address: 35, Ln. 183, Chang Shoei Rd., Chang Hua, Taiwan(R.O.C.)

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Bio-safety

Certification items

Skin Irritation

Biomaterials Laboratory Test Report

STUDY TITLE

Skin Irritation Test

SPONSOR

Yuang Hsian Metal Industrial Corp.

TEST ARTICLE

Antibacterial Fabric with Composite Fiber Copper Alloy Wire

Testing Laboratory
1828

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Biomaterials Laboratory Test Report

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TEST ARTICLE

The following information of the test article was supplied by the sponsor.

Name: Antibacterial Fabric with Composite Fiber Copper Alloy Wire

Lot No.: N/A

Model No.: N/A

Physical State: Metal, Composite and Synthetic Polymer

Color: Not Supplied by Sponsor

Expiration Date: Not Supplied by Sponsor

Storage Conditions: Room Temperature

Article No.: T-1070613-01

Appearance of the Test Article:

SPONSOR

Name: Yuang Hsian Metal Industrial Corp.

Address: 35, Ln. 183, Chang Shoei Rd., Chang Hua, Taiwan

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Biomaterials Laboratory Test Report

TEST FACILITY

Name: Biomaterials Laboratory, Europe America Biotechnology Co., Ltd.
Address: Room 305, 3F ., Innovation Incubator National Chung Hsing University, No. 145, Xingda Rd., South District, Taichung City 402, TAIWAN (R. O. C.)
Testing Location: Laboratory Rm.305, Animal Laboratory Rm.203

RECORDS

Original data generated during the conduct of the study are stored in the Document Room of Biomaterials Laboratory, Europe America Biotechnology Co., Ltd for 5 years after issue of the final report.

TEST SCHEDULE

Date Received: 2018/06/13
Date Initiated: 2018/07/10
Date Completed: 2018/07/13

PURPOSE

The purpose of this study was to estimate the potential of the test article to produce dermal irritation in the rabbits.

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Biomaterials Laboratory Test Report

MATERIALS

Test Article: Antibacterial Fabric with Composite Fiber Copper Alloy Wire

Other Materials:

Surgical Tape

Bandage

Gauze

TEST SYSTEM

Species: Rabbits

Breed: New Zealand White

Source: Hui Chun Farm

Sex: Female

Body Weight: 2.1 ~ 2.3 kg

Age: Young Adult

Number of Animals: Three

Animal No.: NR18-063, NR18-064, NR18-065

IACUC Animal Requisition Form No.: IAC2018-01

Animal Husbandry

Temperature: 18 ~ 24 ℃

Humidity: 30 ~ 70 %

Light Period: 12hr light period (5:30~ 17:30); 12hr dark period (17:30~ 5:30).

Food Brand: Altromin

Food Source: Altromin Spezialfutter GmbH & Co. KG

Food Access: Each animal is freely available to at least approximately 200 g diet per day.

Water: Pure water produced by reverse osmosis (R.O.).

Water Access: Freely available by municipal residue control.

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REFERENCES

The test was conducted based upon the following references:

1. ISO 10993-1:2009/Cor. 1:2010(E) Biological evaluation of medical devices --- Part 1: Evaluation and testing within a risk management process
2. ISO 10993-10:2010(E) Biological evaluation of medical devices --- Part 10: Tests for Tests for irritation and skin sensitization
3. ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories

METHODS

Test Method: (SOP: EA-WI-006)

Test Procedure:

The fur was carefully clipped on the backs of the animals for a sufficient distance on both sides of the spine before the testing. Two test articles (25 mm × 25 mm) were applied directly to the skin on each side of the animal as shown in Figure 1. Two control patches of gauze (25 mm × 25 mm) were applied directly to the skin on each side of the animal as shown in Figure 1. The application sites were covered with a surgical tape. The trunk of each animal was wrapped with a bandage to maintain the test patched in position. After 4 hr exposure, the dressings were removed.

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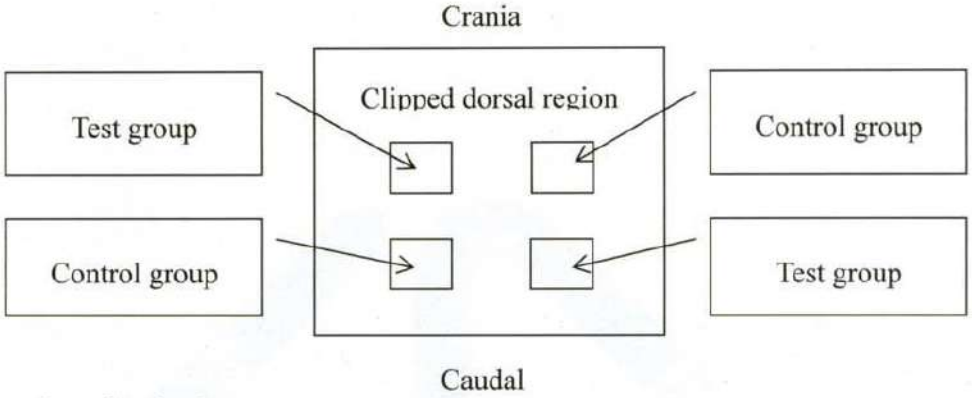
Figure 1 — Location of skin application sites



Observation of Animals:

Dermal observation for erythema and oedema was at 1±0.1, 24±2, 48±2 and 72±2 hr after patch removal in accordance with the criteria in Table 1.

Table 1 — Scoring system for skin reaction.

Reaction	Primary Irritation Score
Erythema and Eschar Formation	
No erythema	0
Very slight erythema (barely perceptible)	1
Well-defined erythema	2
Moderate erythema	3
Severe erythema (beet-redness) to eschar formation preventing grading of erythema	4
Oedema Formation	
No oedema	0
Very slight oedema (barely perceptible)	1
Well-defined oedema（edges of area well-defined by definite raising）	2
Moderate oedema (raised approximately 1 mm)	3
Severe oedema (raised more than 1 mm and extending beyond exposure area)	4
Maximal possible score for irritation	8

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Evaluation of Results:

After the 72 hr grading, all erythema scores plus oedema scores were totaled separately for each test and control group for each animal. The sum of each group was divided by 6 (two test sites, three time points) to obtain the primary irritation score (PI). The difference of PI could be obtained by subtracting the PI of control group from the PI of test group. The difference of PI was divided by 3 (the number of animals) to obtain the primary irritation index (PII). Evaluated the results according to the responses defined in Table 2.

Table 2 — Primary irritation index categories in a rabbit.

Response Category	Primary Irritation Index
Negligible	0 – 0.4
Slight	0.5 – 1.9
Moderate	2.0 – 4.9
Severe	5.0 – 8.0

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Biomaterials Laboratory Test Report

RESULTS

Animal No.	Time	Observation Sites Skin Reaction Scores (Erythema / Oedema)			
		Test Group		**Control Group**	
		Left Side	**Right Side**	**Left Side**	**Right Side**
NR18-063	1hr*	0/0	0/0	0/0	0/0
	24 hr	0/0	0/0	0/0	0/0
	48 hr	0/0	0/0	0/0	0/0
	72 hr	0/0	0/0	0/0	0/0
NR18-064	1hr*	0/0	0/0	0/0	0/0
	24 hr	0/0	0/0	0/0	0/0
	48 hr	0/0	0/0	0/0	0/0
	72 hr	0/0	0/0	0/0	0/0
NR18-065	1hr*	0/0	0/0	0/0	0/0
	24 hr	0/0	0/0	0/0	0/0
	48 hr	0/0	0/0	0/0	0/0
	72 hr	0/0	0/0	0/0	0/0
Sum		0		0	
PI (Sum/6)		0		0	
Difference of PI (Test-Control)		0			
PII (Difference of PI /3)		0			

Note: * = The scores of 1 hr were not used for the evaluation criteria.

PI: Primary Irritation Scores.

PII: Primary Irritation Index.

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Biomaterials Laboratory Test Report

CONCLUSION

No erythema and no oedema were observed on the skin of the rabbits. The primary irritation index for the test article was calculated to be 0. The response of the test article was categorized as **"negligible"**.

Study Director

Mei-Wen Wang
Laboratory Chief

Completed Date

2018/07/30

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Bio-safety

Certification items

Skin sensitization

Biomaterials Laboratory Test Report

STUDY TITLE

Closed-Patch Test for Skin Sensitization

SPONSOR

Yuang Hsian Metal Industrial Corp.

TEST ARTICLE

Antibacterial Fabric with Composite Fiber Copper Alloy Wire

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TEST ARTICLE

The following information of the test article was supplied by the sponsor.

Name: Antibacterial Fabric with Composite Fiber Copper Alloy Wire

Lot No.: N/A

Model No.: N/A

Physical State: Metal, Composite, Synthetic Polymer

Color: Not Supplied by Sponsor

Expiration Date: Not Supplied by Sponsor

Storage Conditions: Room Temperature

Article No.: T-1070613-01

Appearance of the Test Article:

SPONSOR

Name: Yuang Hsian Metal Industrial Corp.

Address: 35, Ln. 183, Chang Shoei Rd., Chang Hua, Taiwan

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TEST FACILITY

Name: Biomaterials Laboratory, Europe America Biotechnology Co., Ltd.
Address: Room 305, 3F., Innovation Incubator National Chung Hsing University, No. 145, Xingda Rd., South District, Taichung City 402, TAIWAN (R. O. C.)
Testing Location: Laboratory Rm.305, Animal Laboratory Rm.203

RECORDS

Original data generated during the conduct of the study are stored in the Document Room of Biomaterials Laboratory, Europe America Biotechnology Co., Ltd for 5 years after issue of the final report.

TEST SCHEDULE

Date Received: 2018/06/13
Date Initiated: 2018/08/01
Date Completed: 2018/08/30

PURPOSE

An assessment was made of the potential of the test article under test to produce skin sensitization in the guinea pigs.

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MATERIALS

Test Article: Antibacterial Fabric with Composite Fiber Copper Alloy Wire

Other Materials:

Gauze

Occlusive Bandage

Elastic Adhesive Bandage

TEST SYSTEM

Species: Guinea Pigs

Breed: Hartley

Source: Hui Chun Farm

Sex: Male

Body Weight: 301 ~ 427 g

Age: Young Adult

Number of Animals: Fifteen

Animal No.: G18-1N-01~15

IACUC Animal Requisition Form No.: IAC2018-06

Animal Husbandry

Temperature: 18~24 ℃

Humidity: 30~70 %

Light Period: 12 hr light period (5:30~17:30); 12 hr dark period (17:30~5:30).

Food Brand: Altromin

Food Source: Altromin Spezialfutter GmbH & Co. KG

Food Access: Each animal is freely available to at least approximately 60~100 g diet per day.

Water: Pure water produced by reverse osmosis (R.O.)

Water Access: Each animal is freely available to at least approximately 200 ml water per day.

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REFERENCES

The test was conducted based upon the following references:

ISO 10993-1:2009/Cor.1:2010 (E) Biological evaluation of medical devices –Part 1: Evaluation and testing within a risk management process

ISO 10993-10:2010(E)Biological evaluation of medical devices－Part 10:Tests for irritation and skin sensitization

ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories

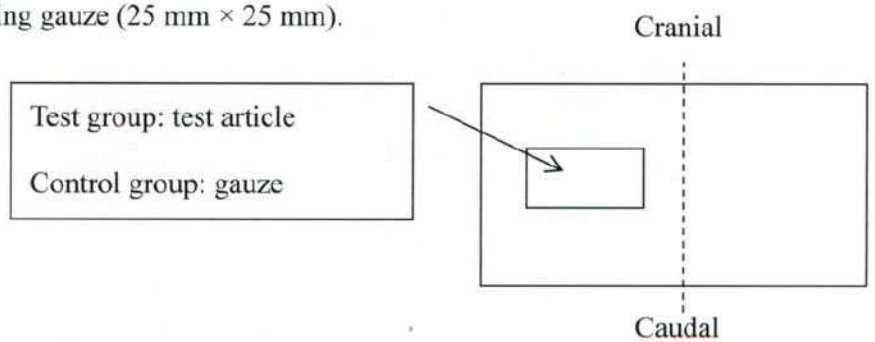
METHODS

Test Method: (SOP: EA-WI-008)

Induction Phase:

The fur was removed with an electric clipper from the left back region of 10 guinea pigs designed as test group and 5 guinea pigs designed as control group.

The test article (25 mm × 25 mm) was administered by topical application to the clipped left upper back region of each animal. The test article was secured with an occlusive bandage, wrapped with elastic adhesive bandage and then rounded with occlusive bandage to ensure occlusion. All wraps and patches were removed after 6±0.5 h. This procedure was repeated on three consecutive days a week for three weeks. The control animals were similarly treated, but using gauze (25 mm × 25 mm).



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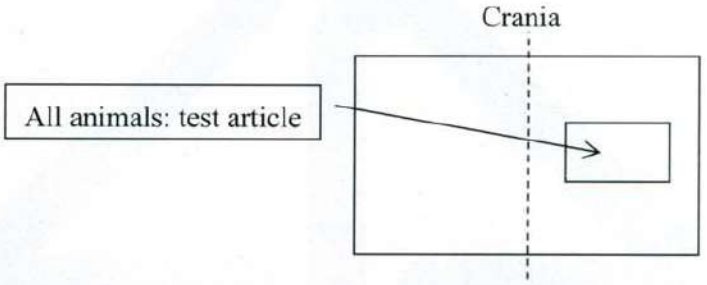
Challenge Phase:

At fourteen days (± 1 day) after the last induction application, all test group and control group were challenged with the test article. The test article was administered by a single topical application to a clipped untested area of each animal. The test article was secured with an occlusive bandage, wrapped with elastic adhesive bandage and then rounded with occlusive bandage to ensure occlusion. All wraps and patches were removed after 6±0.5 h.



Observation of Animals:

The fur of test and control animals on the challenged site and surrounding areas were clipped after wraps removal. The test sites were scored in accordance with Table 1 at 24±2 h and 48±2 h after challenge phase completion.

Table 1- Classification System for Skin Reactions (Magnusson and Kligman Scale/ ISO 10993-10)

Reaction	Grading Scale
No visible change	0
Discrete or patchy erythema	1
Moderate and confluent erythema	2
Intense erythema and/or swelling	3

Evaluation of Results:

1. If the score was ≧1 in test group and the score was < 1 in control group indicating sensitization. The result was positive reaction, and the contrary was negative reaction.
2. If the score was ≧1 in control group, then the reactions of test animals which exceeded the most severe reaction in control animals were presumed to be due to sensitization.

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RESULTS

The assessment of skin reactions were showed as following table.

Table 2 - Average Scores of Skin Reactions

Observation / Animals	Hours After Patch Removal	
Test Group	24 hr	48 hr
G18-1N-01	0	0
G18-1N-02	0	0
G18-1N-03	0	0
G18-1N-04	0	0
G18-1N-05	0	0
G18-1N-06	0	0
G18-1N-07	0	0
G18-1N-08	0	0
G18-1N-09	0	0
G18-1N-10	0	0
Total Score	0	
Average Score	0	
Control Group	24 hr	48 hr
G18-1N-11	0	0
G18-1N-12	0	0
G18-1N-13	0	0
G18-1N-14	0	0
G18-1N-15	0	0
Total Scores	0	
Average Score	0	

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CONCLUSION

Under the conditions of this study, the test article showed no evidence of causing sensitization in the guinea pig, therefore the test article under this study showed "**negative reaction**".

Study Director

Mei-Wen Wang
Laboratory Chief

Completed Date

2018/08/31

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