

## RECOMMENDATIONS

- Studying genes encoding SOD<sub>1</sub> enzyme that is involved in the respiratory burst as a candidate for genetic loci causally related to *B. alexandrina* susceptibility/ resistance to *S. mansoni* at different snail ages is recommended.
- Detected shared protein bands in the used electrophoretic study need further analysis using two dimensional isoelectric focusing to determine whether they are the same proteins or not and to clarify the role of these shared proteins in the host-parasite interaction and their link to snail age and compatibility status.

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## المخلص العربي

يعتبر مرض البلهارسيا من أهم الأمراض الاستوائية المهملة، و يعرف أيضا بالـ "الوباء الصامت". ويصيب هذا المرض ما يقرب من ٢٤٩ مليون شخص في العديد من البلدان النامية في أنحاء العالم المختلفة، وكذلك له العديد من المخاطر على الصحة العامة التي تؤثر سلبا على المستويين الاجتماعي والاقتصادي.

ويتواجد مرض البلهارسيا المعوية في أنحاء كثيرة من العالم بسبب الانتشار الجغرافي الواسع لعائلها الوسيط قوقع البيومفلاريا ، حيث يصاب البشر بالبلهارسيا المعوية عن طريق العدوى بالسركاريا الناتجة من هذا القوقع. و من بين أكثر من أربعة و ثلاثين نوع مختلف من البيومفلاريا على مستوى العالم، تمثل البيومفلاريا الكسندينا العائل الوسيط للبلهارسيا المعوية في مصر.

ومن المعروف أن لقواقع البيومفلاريا نطاق واسع من القابلية للعدوى بالبلهارسيا المعوية تبعا لعوامل مختلفة حيث يعتبر كلاً من السن والخلفية الوراثية ونظام الدفاع الداخلي للقواقع من بين العوامل التي من المعروف أن تؤثر على أنماط القابلية للقواقع. ومع أن العديد من استراتيجيات التحكم في القضاء على مرض البلهارسيا يتم تطبيقها بما في ذلك الطرق الكيميائية و الفيزيائية والبيولوجية المختلفة، ولكن مع ذلك لم تتحقق نتائج فعالة دائمة مطلقة حتى الان في القضاء على انتشار المرض. و يعتبر كسر سلسلة دورة حياة هذا الطفيل من خلال استهداف القوقع العائل لها من أهم الطرق التي تقلل انتقاله . و يعتبر جعل هذه القواقع إما مقاومة أو حتى أقل عرضة للإصابة بالبلهارسيا المعوية من أفضل الحلول على المدى الطويل و أيضا من أكثر الطرق الأمانة بيننا لكسر دورة حياة الطفيل. لذلك فإن دراسة الظواهر الفسيولوجية للقواقع التي تعدل قابليته للعدوى هي دراسة محورية لتقديم رؤى جديدة في السيطرة على القواقع المستهدفة.

وفي هذا السياق، تهدف الدراسة الحالية إلى توضيح تأثير سن قواقع البيومفلاريا الكسندينا على أنماط قابليتها للعدوى بالبلهارسيا المعوية بما في ذلك التباين الوراثي والدفاع الداخلي للقواقع ممثلا في الانزيم الخلوي سوبر اوكسيد ديسميوتاز (SOD<sub>1</sub>). ولدراسة هذا الأثر، أجرينا ثلاثة مناهج بحثية مختلفة وهي ؛ دراسة العوامل الطفيلية، الفحص الإنزيمي للسوبر اوكسيد ديسميوتاز، وكذلك الفصل الكهربائي لهلام بولي أكريلاميد كبريتات الصوديوم دوديسيل (SDS-PAGE).

وكانت خطة البحث المتبعة كالآتي؛ تمت تربية قواقع البيومفلاريا الكسندينا القابلة للعدوى (I) و المقاومة للعدوى (II) منفردة كلا على حدة للتكاثر الذاتي. ومن ذرية هاتين المجموعتين تم اختيار أربع مجموعات فرعية كل منها مكونة من مائتي قوقع وكانت المجموعات كالآتي؛ القواقع صغيرة السن القابلة للعدوى (Ia)، و القواقع كبيرة السن القابلة للعدوى (Ib)، و القواقع صغيرة السن المقاومة للعدوى (IIa) و القواقع كبيرة السن المقاومة للعدوى (IIb). وتعرضت القواقع من جميع المجموعات الفرعية بشكل فردي لعدوى البلهارسيا المعوية حيث تعرضت القواقع صغيرة السن للعدوى (قبل بداية وضع البيض) في عمر شهرين وحجم ٣-٤ ملليمتر و تعرضت القواقع كبيرة السن (بعد بدء القدرة على الإنجاب) في عمر أربعة أشهر وحجم ٨-١٠ ملليمتر . وبعد مرور أربعة أسابيع، تم فحص مائة من القواقع في كل مجموعة فرعية بشكل فردي لتحديد القواقع القابلة للعدوى والقواقع المقاومة للعدوى. وتكرر هذا الفحص مرتين أسبوعيا لمدة ثلاثة أسابيع لتحديد فترة الحضانة، معدل العدوى ، إجمالي معدل إنتاج السركاريا و إجمالي الوفيات للأربعة مجموعات الفرعية.

في حين خضعت المائة قوقع الأخرى في كل مجموعة فرعية بعد تحديد أنماط قابليتها مع مجموعتين أخريين من القواقع صغيرة السن وكبيرة السن غير المصابة للفحص الإنزيمي للسوبر اوكسيد ديسميوتاز (SOD<sub>1</sub>) و الفصل الكهربائي لهلام بولي أكريلاميد كبريتات الصوديوم دوديسيل (SDS-PAGE).

وكشفت نتائج الدراسة الطفيلية أن المجموعة الفرعية الأكثر قابلية للعدوى كانت القواقع صغيرة السن القابلة للعدوى (Ia) حيث حققت هذه المجموعة أعلى معدل عدوى ٩٢٪، وأقصر فترة حضانة، و أعلى إجمالي إنتاج للسركاريا ١٥١٠٠٢ و أعلى معدل وفيات ٤٧٪. وأعقب ذلك القواقع كبيرة السن القابلة للعدوى (Ib) مع معدل عدوى ٧٤٪، وإجمالي إنتاج للسركاريا ٤١٧٣٢ ومعدل وفيات بنسبة ٣٥٪. وكانت المجموعة الفرعية الثالثة هي القواقع صغيرة السن المقاومة للعدوى (IIa) مع معدل عدوى بنحو ٣٧٪، وإجمالي إنتاج للسركاريا ٩٨٧٧ ومعدل وفيات ٢٧٪. وفيما يتعلق بالقواقع كبيرة السن المقاومة للعدوى (IIb) فإنها احتوت على قواقع مقاومة فقط، وكان معدل الوفيات فيها ٢٧٪.

و قد سجل الفحص الإنزيمي النتائج الآتية ؛ حيث كان نشاط الإنزيم في المجموعات غير المصابة (الصغار والكبار)  $0.26 \pm 0.04$  و  $0.30 \pm 0.03$  وحدة / جرام على التوالي. وفيما يتعلق بنشاط انزيم SOD<sub>1</sub> في المجموعات الفرعية المصابة. تم الحصول على أعلى مستوى من الانزيم في القواقع كبيرة السن المقاومة للعدوى (IIb) بمتوسط  $0.90 \pm 0.07$  وحدة / جرام، بينما سجل أقل نشاط للانزيم من قبل أعضاء القواقع صغيرة السن القابلة للعدوى (Ia) كونها  $0.32 \pm 0.03$ . وكان نشاط الانزيم أعلى في المجموعات المقاومة للعدوى بغض النظر عن سنهم، بالمقارنة مع القواقع القابلة للعدوى و القواقع غير المصابة. إضافة الى ذلك، كان نشاط الانزيم أعلى في المجموعات الفرعية كبيرة السن عن صغيرة السن.

وأما عن نتائج الفصل الكهربائي للبروتينات الكلية بين المجموعات الفرعية المختلفة ، فقد لوحظ وجود اختلافات في انماط البروتين من حيث عدد الشرائط البروتينية و الوزن الجزيئي لها. و عند حساب معامل دايس للتشابه بين المجموعات تم العثور على معامل أعلى للتشابه بين أفراد القواقع كبيرة السن المقاومة للعدوى (Iib) و الأفراد المقاومة من القواقع كبيرة السن القابلة للعدوى (Ib) ، كونها 0.89، والتي يمكن أن تعزى إلى مزيج من أوجه التشابه بين كل من عمر وحالة التوافق. علاوة على ذلك، تم حساب معاملات 0.84 و 0.85 بين الأفراد المقاومة و القابلة للعدوى من مجموعة القواقع صغيرة السن القابلة للعدوى (Ia) و بين الأفراد المقاومة و القابلة للعدوى من مجموعة القواقع صغيرة السن المقاومة للعدوى (IIa) على التوالي. ويمكن أن يعزى ذلك إلى التشابه بين كل من الأصل الجيني والعمر، وإن كانت هناك اختلافات في التوافق للقواقع في كلتا الحالتين. من ناحية أخرى، لوحظ أقل مؤشر للتشابه بين أكثر المجموعات الفرعية مقاومة وهي القواقع كبيرة السن المقاومة للعدوى (Iib) والمجموعة الفرعية الأكثر قابلية (القواقع صغيرة السن القابلة للعدوى (Ia)) بحيث كان معامل التشابه 0.4، حيث كانت الاختلافات بين المجموعتين الفرعية اختلافات وراثية عمرية مع اختلاف التوافق.

و تظهر نتائجنا، بما في ذلك؛ نتائج الدراسة الطفيلية، والدراسة الأنزيمية والفصل الكهربائي للهلام أن التفاعل بين العمر والخلفية الوراثية والدفاع الداخلي أدى إلى اختلافات كبيرة بين المجموعات الفرعية التي شملتها الدراسة. بالإضافة إلى ذلك، ظهر أعلى فرق بين أكثر المجموعات الفرعية مقاومة وهي القواقع كبيرة السن المقاومة للعدوى (Iib) والمجموعة الفرعية الأكثر قابلية؛ القواقع صغيرة السن القابلة للعدوى (Ia). إلى جانب ذلك، فإنه من الواضح أن الدفاع الداخلي لديه اليد العليا في تحديد وضع التوافق في القواقع كبيرة السن، في حين أن الأصل الجيني هو أكثر أهمية في تحديد التوافق في القواقع صغيرة السن.

ويمكن للنتائج المقدمة في هذه الدراسة أن يكون لها أهمية محتملة في السيطرة على قواقع البيومفلاريا. حيث أن تحديد سن القواقع الأكثر عرضة للعدوى بالبلهارسيا المعوية يساعد في تحديد أفضل توقيت لتطبيق المبيدات الكيميائية للقواقع وهذا بدوره يزيد من فعالية طريقة تطبيقها، وبالتالي يقوي مكافحة البلهارسيا. وكذلك، يمكن الاستفادة من القواقع كبيرة السن المقاومة للعدوى في مكافحة البيولوجية للقواقع، وذلك بعد دراسة مدى توافق الأجيال المتعاقبة.

# تفاعل قواقع البيومفلاريا اليكسندرينا حديثة السن وكبيرة السن مع الشستوسوما مانسوني

رسالة علمية

مقدمة لكلية الطب – جامعة الإسكندرية  
إيفاءً جزئياً لشروط الحصول على درجة

الدكتوراه فى الطفيليات الطبية

مقدمة من

الطبيبة/ صفاء ابراهيم عبد الحليم خضر

بكالوريوس الطب والجراحة – جامعة الإسكندرية  
ماجستير الطفيليات الطبية  
مدرس مساعد بقسم الطفيليات الطبية  
كلية الطب – جامعة الإسكندرية

كلية الطب  
جامعة الإسكندرية  
٢٠١٥

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رسالة مقدمة من

الطبيبة/ صفاء ابراهيم عبد الحليم خضر

بكالوريوس الطب والجراحة- الإسكندرية ٢٠٠٣

ماجستير الطفيليات الطبية- الإسكندرية ٢٠٠٩

مدرس مساعد بقسم الطفيليات الطبية

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٢٠١٥/٣/٢٦

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