Alliance *for* Lupus Research

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SPECIAL REPORT

Highlights from the

American College *of* Rheumatology

Meeting Atlanta, GA

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ACR SPECIAL REPORT

Highlights from the American College of Rheumatology 2010 Meeting, Atlanta, GA

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The Alliance for Lupus Research (ALR) is pleased to share our third annual *American College of Rheumatology (ACR) Meeting Special Report*. Each year, thousands of lupus researchers and clinicians from around the world gather at the ACR's annual meeting to network and share their latest discoveries.

The 2010 ACR meeting was held in Atlanta in November. More than 15,000 scientists and physicians from over 100 countries attended the 5-day meeting. They heard presentations from more than 400 speakers and viewed thousands of posters, highlighting the latest work in rheumatologic diseases, including lupus.

We've focused on some of the most relevant presentations in this report, as well as several presentations by our grantees. As always, the most exciting news comes in the work on new therapies, like the drug Benylsta® (belimumab). We hope you find the information helpful and hopeful; we certainly think it is.

We look forward to sharing more information with you about lupus research and treatment advances in the months ahead. We thank our corporate sponsors, **Biogen Idec**, **Genentech** and **Johnson & Johnson**, for their generous support of this special report.

Best Regards,

Kenneth Farber
Executive Director, Alliance for Lupus Research

Highlights of the American College of Rheumatology 2010 Scientific Meeting

It might sound a bit odd, but what ALR Scientific Advisory Board Chair Mary (Peggy) K. Crow, MD found most interesting from this year's meeting had to do with rheumatoid arthritis (RA). Specifically, the possibility that bacterial infections in the mouth and stomach could trigger the disease. So why highlight it here when our focus is lupus? "Because it may also apply to lupus in the end," she said, given that systemic lupus erythematous (SLE) and rheumatoid arthritis share several genetic markers.

Two studies at the ACR meeting focused on bacteria called *Porphyromonas gingivalis (P. gingivalis)*, which causes gum disease. Previous studies have found that people with RA are far more likely to have evidence of *P. gingivalis* infection than those without the disease. Now researchers have found that the bacteria trigger a process called citrulination, which changes the structure of certain proteins, resulting in the anti-citrullinated protein (ACP) antibodies that are a hallmark of RA.[i] Another study used DNA sequencing to prove that RA patients have higher levels of Prevoltellaceae bacteria in their gut than healthy patients, bacteria thought to induce the differentiation of inflammatory Th17 cells in the intestine.[ii]

"The overall theme is that there is value in considering how environmental microbes such as bacteria and viruses can promote autoimmune disease," Dr. Crow said, "turning on and off the immune system in ways they shouldn't."

Of more interest to the lupus community, she said, is the growing science regarding the role of nucleic acids like DNA and RNA in driving immune responses through proteins called toll-like receptors (TLR). These molecules recognize autoantigens that contain DNA and RNA and can trigger inflammatory responses from interferon alpha, resulting in more damage. In addition, she noted, TLR activation is an important mechanism in promoting B cell activation. The ALR has funded several investigators who are focusing on ways to inhibit TLRs from triggering interferon alpha production.

"None of this was even thought of 10 or 12 years ago," she said. "I feel like we've honed in on a lot of the key mechanisms associated with lupus, particularly the role of TLRs and nucleic acids. For years, everyone knew that anti-DNA antibodies target the proteins associated with lupus, but a big advance in the last 10 years has been our ability to understand that they don't just target autoantibodies; they play a role in the autoimmune response. The whole concept suggests all sorts of potential drug targets that can come from controlling the ability of nucleic acids to associate with TLRs."

The Latest Treatment Advances for Lupus

Belimumab Dominates

The painstaking basic and animal research of the past 15 years to unravel the molecular pathways involved in lupus are finally showing tangible rewards. In late 2010, an FDA committee recommended approval of the first new drug for lupus in 50 years—belimumab (Benylsta). The full FDA is expected to deliver its decision this spring. The drug, developed by Human Genome Sciences, is a fully human monoclonal antibody that specifically recognizes and inhibits the biological activity of B-Lymphocyte stimulator (BLyS), also known as B cell activation factor of the TNF family (BAFF). Not surprisingly, there were several presentations of data from late-stage trials on belimumab. Among them:

- **Long-term safety and efficacy.** Most clinical trials last a few weeks, a year or two at the most. But many adverse effects from immune-suppressing drugs like the new biologics under investigation might take years to appear. That's what makes the presentation of safety data from patients receiving belimumab for 5 years so important. The data came from patients who participated in the original Phase 3 trials, but who continued on the drug (or started on it if they'd been in the placebo arm) when the trial ended.
- Overall, 296 patients enrolled in the trial, with about 3% to 9% dropping out each year. Adverse events either remained the same or declined over the 5 years. The frequency of one new BILAG A or 2 BILAG B flares decreased from 30% over the first 6 months of treatment to 11% in the final 6 months of the 5-year follow up. Meanwhile, the frequency of SS Flare Index (SFI) flares declined from 72% (13% severe) in the first 6 months to 22% at the final 6 months (1% severe). Autoantibody levels also declined.[iii]
- Lead investigator **Joan Merrill, MD**, who directs the Clinical Pharmacology Research Program at Oklahoma Medical Research Institute in Oklahoma City, noted that the positive effects could be related to the patients who dropped out if they had more flares. But what's really important, she said, is that after 5 years, 45% of patients were still returning for treatment, meaning they felt the benefits of the drug outweighed any negatives.
- **Less steroid medication required with belimumab.** Significantly more participants in the Phase 3 belimumab trials BLISS-52 and BLISS-76 who received the medication were able to taper off their corticosteroid medication as their condition improved more than those receiving placebo.[iv]

  Key point: *Long-term use of corticosteroids increases the risk of severe side effects, including osteoporosis, diabetes, and cataracts. Reducing steroid dosages could provide significant benefits.*
- **Pooled analysis shows benefits.** A pooled analysis of data from both Phase 3 clinical trials found that participants receiving the drug demonstrated statistically significant improvements in several disease markers. The pooled group included 1,684 people (94% women) with SLE. Those receiving the higher dose of belimumab (10 mg/kg) had lower rates of disease activity, longer time to new flares, longer response, and reduced prednisone use compared to patients receiving placebo.[v]
- **Benefits of immunization continue.** A pooled analysis from both Phase 3 trials showed that vaccine protection against pneumonia, tetanus, and influenza in patients with lupus remained after belimumab treatment.[vi]

  Key point:*Vaccines stimulate B cells to create antibodies against certain pathogens so if you get infected with those viruses, your immune system can spring to action quickly, eliminating the threat before you get sick. Although belimumab works by reducing certain B -cell activity, it did not cause a significant reduction in pre-existing antibodies to the pneumococcal and tetanus vaccines, and had no effect on antibodies to the influenza vaccine. In other words, major parts of the immune system remain functional during belimumab treatment.*
- **Belimumab and disease biomarkers.** In addition to the clinical benefits of belimumab in patients with lupus, the drug also showed significant effects on biomarkers of the disease, including B and T cells. Significantly more patients receiving belimumab during the drug's Phase 3 trials converted from positive levels of key autoantibodies (anti-dsDNA, anti-Sm, anti-ribosomal P, and aCL-IgG), than those receiving placebo.vii They also had far higher levels of complement 3 and 4, a sign of immune health.

  Key point: *Belimumab appears to attack the underlying immune pathology of the disease, providing actual disease-specific benefit, not just symptom relief.*

Positive Results in Phase 2 Epratuzumab Trial

Epratuzumab is a humanized monoclonal antibody under investigation by Immunomedics and UCB. The compound targets CD22 proteins expressed on mature B cells.

Researchers presented two studies during the meeting, both from the Phase 2 EMBLEM™ study. In an oral presentation, principal investigator Daniel J. Wallace, MD, a rheumatologist in private practice in Los Angeles, California, described the results seen in 227 people with moderate/severe lupus. Patients received 1 of 6 intravenous regimens for 12 weeks: 5 with different doses of epratuzumab; one with placebo. All continued on their regular medication.

After 8 weeks, scores in indexes used to measure disease activity were better in all patients who received the drug. They were significantly better in those that received the 600 mg dose every week for 4 weeks, and the group that received the 1200-mg dose every other week (37.8% s 35.1% vs 21.1%). Improvements continued over the final 4 weeks, with 45.9% of patients in the 600-mg group and 40.5% of those in the 1200-mg group demonstrating significant improvement compared to 21.1% in the placebo group. In addition, by week 12, 37.9% in the 600-mg group and 35.3% of patients in the 1200-mg demonstrated improvement of all body systems compared to 22.2% in the placebo group.[viii]

None of the patients in the treatment groups required additional medication and the rate of serious side effects and reactions to the infusion were similar in the treatment and placebo groups.

A poster presentation reported on an evaluation of disease status in 112 patients receiving the 600- or 1,200-mg doses. The analysis focused on the BILAG index, which assesses disease activity in various organs in the body. It found rates of response in those receiving the drug were twice those of the placebo group, with particular improvement in the cardiorespiratory and neuropsychiatric systems.[ix]

Next step: The positive results from the Phase 2 trial means that epratuzumab is moving into Phase 3 clinical trials, with the first patient enrolled in the trial in December. The FDA has put the drug on a fast track approval process designed to facilitate its development and expedite its review once the application is submitted.

Looking Down the Road: A Look at New Therapies Under Investigation for Lupus

What's next in lupus therapies? Here's a look at two compounds that are still in the very early stages of investigation as lupus treatments. These reports are based on the Phase 1 trials, the first phase of clinical testing, in which the safety, tolerability, dosing, and actions in the body, or pharmacodynamics, of a drug are evaluated.

AMG 557. This compound is being developed by Amgen, in Thousand Oaks, Calif. This fully humanized monoclonal antibody binds to a B7-related protein that stimulates T cell responses.x In a study presented at the ACR meeting, researchers described a new blood test the company developed that should help them determine the most appropriate dosing in future clinical trials.

What's next: A Phase 1 trial continues in humans.

SBI-087. This compound is a humanized SMIP™ (Small Modular ImmunoPharmaceutical) biologic being developed by Pfizer. The compound is directed against the CD20 antigen located on B cells.xi Although its target is similar to that of rituximab (Rituxan®), which has shown disappointing results in clinical trials in lupus, SBI-087 is structurally different from rituximab. It is also being developed for subcutaneous administration (i.e., a shot under the skin), which would avoid the need for intravenous (IV) infusions and premedication with IV corticosteroids that is required with rituximab.

Researchers presented the results of a phase 1 study in 24 healthy individuals, 23 of them women. The results showed B cell depletion in patients who received the drug both intravenously and subcutaneously with few adverse events. One person experienced flu-like side effects; two had chills; and two had some flushing on the day of the injection.

What's next: The company is recruiting participants for a phase 2 trial, with results expected in 2011. You can learn more about the trial at www.clinicaltrials.gov, or ask your doctor if you might be eligible for inclusion.

Treatment May Help Prevent Neonatal Lupus

Exciting news for women at risk of delivering a child with neonatal lupus. A study presented at the ACR meeting found that women who took hydroxychloroquine (Plaquenil®) during their pregnancy reduced their risk of having a child with the cardiac form of the disease by 75% and the risk of any form of the disease (cardiac or cutaneous) by 44%.[xvi]

The study assessed the outcomes of 24 pregnancies in 22 women, 9 of whom had lupus and most of whom had who had anti-SSA/Ro antibodies, a major risk factor for neonatal lupus. These women had all had a child with either cardiac or cutaneous neonatal lupus, which increased their risk of having another child with the disease tenfold. The women took hydroxychloroquine 6 weeks before getting pregnant and throughout their pregnancy. While the expected rate of having another baby with cardiac neonatal lupus was about 17.2% in women who had given birth to a child with the disease, and 13% in women who had given birth to a child with cutaneous neonatal lupus, just one baby was born with cardiac neonatal disease (to a woman who had previously delivered a baby with cutaneous neonatal lupus), for a recurrence/occurrence rate of just 4.2%.

Key point: *Using hydroxychloroquine before and during your pregnancy may reduce the risk of delivering a baby with cardiac neonatal lupus (which can be fatal for the baby).*

The Brain and Lupus: 2010 Update

Neuropsychiatric manifestations of lupus include headache, cognitive dysfunction, mood disorders, cerebrovascular events (i.e., stroke), seizures, polyneuropathy, anxiety, and psychosis. It's difficult, however, for clinicians to know what is caused by lupus and what may have existed before lupus or despite lupus.

What is important, said **John Hanly, MD**, of Dalhousie University in Halifax, Nova Scotia, Canada, is teasing out those symptoms that began before the lupus diagnosis (i.e., migraines) and those that are likely related to the lupus or its treatment, i.e., stroke. He and his colleagues published a seminal paper on the topic in 2007 in which they assessed 572 patients recently diagnosed with lupus. They found that about a third had at least one neuropsychiatric event, with 10% exhibiting more than one. Events attributed to lupus occurred in 6% to 12% of patients (depending on how the association was determined). No matter what caused the patients' neuropsychiatric event, however, all demonstrated reduced quality of life and increased organ damage compared to a similar cohort with no neuropsychiatric events.[xv]

There are likely numerous underlying causes of these events, Dr. Hanly said, including the effect of lupus on blood vessels (which can affect blood flow to the brain); autoantibodies and inflammatory mediators. For instance, some studies show that injecting autoantibodies into the brain leads to memory deficits, seizures, and neuropathological changes. It is possible that the blood/brain barrier that typically protects the brain against such invasion is weaker in patients with lupus, enabling certain autoantibodies to penetrate into the brain.

Other than aspirin or other antithrombotic therapies to prevent stroke, only symptomatic therapies are available for most neuropsychiatric indications, including anticonvulsants, anti-psychotics, anxiolytics, and immunosuppression to reduce inflammation, all with mixed evidence as to their benefits. Rituximab is being tried in some centers to treat neuropsychiatric lupus, he said, and while the evidence is "not robust... it is the best we have at this stage."

Key point: *Whether depression, anxiety, cognitive problems, or other neuropsychiatric conditions are caused by lupus or result from other issues, they should be treated aggressively given their effect on quality of life and overall disease status.*

Risk of Some Cancers Double in Lupus

Previous research has shown a link between lupus and certain cancers, particularly lymphoma. To determine whether there is actually an increased risk of cancer in patients with lupus, **Sasha R. Bernatsky, MD, PhD**, of McGill University in Montreal, and her colleagues analyzed data from more than 13,000 people from 24 lupus centers around the world followed for an average of 9 years. They found an overall 15% increased risk of cancer, but a more than doubled risk of blood-related cancers such as lymphoma, non-Hodgkin's lymphoma, and leukemia.[xiv]

There was also an increased risk for lung, cervical, vulval and vaginal cancer, the latter three possibly related to an inability of patients to clear the human papillomavirus (HPV) responsible for most such cancers. The good news was that the risk of breast, endometrial, and ovarian cancers were lower in women with lupus, she said, possibly related to some alteration in the metabolism of estrogen or even genetic differences.

Although the risk of blood-related cancers is higher in patients with lupus, their overall incidence is still incredibly rare. "So if you followed 2,000 lupus patients for a year, you might see one additional cancer," she said. "It's important to know about (the increased risk) and to study it to understand more about the pathogenesis, but we don't want to scare any lupus patients," she said. The higher incidence may also be related to the treatments women with lupus undergo, which Dr. Bernatsky's group is also investigating.

Key point: *The higher incidence in lung cancer and cancers related to HPV makes it all the more important that women with lupus quit smoking and get regular Pap smears and vaginal examinations, which can find early evidence of HPV-related cancers.*

Assessing the Cost of Lupus

If you have lupus, you don't need a study to tell you that the disease is expensive. Even with the best health insurance, you're likely spending thousands of dollars out of pocket each year for doctor visits, medications, and other health-related costs. And that doesn't even count the cost to your work and income. A study at the ACR meeting describing data from 4 published analyses of costs in newly diagnosed or newly active patients with lupus found that the average cost per patient ranged from $13,735 to $27,531 a year compared to $7,794 to $9,788 in people without lupus. In patients with lupus nephritis, the costs were significantly higher, ranging from $29,034 to $62,651.[xii]

Most important, however, was that the researchers found little data on variations in costs based on disease severity, disease manifestations, and treatments. This is information that will become more important as the new biologic drugs enter the treatment arsenal. Although these drugs are more expensive than older therapies, if they can improve disease severity and reduce hospitalization and other direct medical costs, their overall costs may actually be *lower* than treatment with traditional therapies.

From the Lab to the Clinic: Lessons Learned About Lupus

In a major session related to progress in lupus research, three researchers focused on recent findings from the laboratory and how they can move the entire field of lupus research and treatment forward.

Thomas Tedder, PhD, of Duke University Medical Center in Durham, NC, discussed recent work that identified a rare IL-10-competent B- cell subset in humans similar to those discovered earlier in animals. "Harnessing the capacity of these cells to regulate inflammation will be important for the future," he said. The other important message of his talk: B cells differ based on their point of differentiation, something that needs to be taken into account in drug development and clinical trials, as well as in the timing of treatment.

Meanwhile, **Anne Davidson, MB**, of the Feinstein Institute for Medical Research in Manhasset, NY, an ALR grantee, discussed her work in lupus nephritis. She noted that disease stage is very important in treatment and that the disease has a great deal of heterogeneity. Sometimes, she said, the body's natural tendency towards balance, or homeostasis, "counteracts what we're trying to do."

"Lupus nephritis is a challenge," she admitted. "The disease course is unpredictable and response to therapy is unpredictable." Given the failure of several biologic agents in the disease, "we need something different." Her team, she said, "is interested in an integrative approach that will be multidisciplinary and multi-institutional to get a better sense of the disease process in the individual patient and target therapy to the mechanism that is actually destroying the kidney in that patient rather than guessing."

To that end, her work focuses on identifying the genetic "switch" that triggers lupus nephritis. When genes identified in animal studies are overlaid with those from lupus nephritis patients, she said, "We see quite a lot of similarities."

Finally, **Bevra H. Hahn, MD**, of the University of California-Los Angeles School of Medicine, another ALR grantee and Scientific Advisory Board member, discussed the challenges of clinical trials in lupus, suggesting that a focus on highly targeted therapies may not be the most appropriate approach "unless we want short-term results. We probably have to do something not only about the B and T cells but about the 'cross talk' with innate immunity and the effectors of damage and inflammation on the activation of complement."

Clinical trials for lupus drugs are difficult because there are so many different immune system pathways involved in the disease. That's why therapies with multiple targets like glucocorticoids are effective: "They hit the innate immune system and the effects of damage," Dr. Hahn said.

She focused on the results of two major clinical trials: the ALMS (Aspreva Lupus Management Study) study, which compared induction therapy with mycophenolate mofetil to cyclophosphamide; and the BLISS studies for belimumab.

Although some considered the ALMS trial a failure because it didn't demonstrate superiority of mycophenolate over cyclosporine, the fact that both were equally effective and neither was more toxic than the other "were very important findings."

In addition, the trial showed that African Americans and Hispanics had a higher response rate to mycophenolate than IV cyclosporine. "This is a very valuable lesson for this trial," she said, given "signals" prior to the study that African Americans were not as responsive as whites to IV cyclosporine. Also important was that the study involved patients early in the diagnosis, when "we all think we're most likely to get our best responses."

The Phase III trials for belimumab were not only successful, she said, but "clinically important." The primary outcome was novel compared to primary outcomes in other lupus clinical trials, like those in rituximab and abatacept, which, despite expectations, were not successful. It is also important that all patients were seropositive for autoantibodies at the start of the trial. "The other thing I like is that the efficacy of the drug could be detected on a background of steroids and either mycophenolate, methotrexate, or azathioprine. That's a very high bar to ask something to look better than this background therapy," she said.

The conclusion, Dr. Hahn said, is that multiple targets will need to be targeted in lupus while, the lack of homogeneity in patients means that studies should be powered to observe response in subsets of patients. Overall, she said, despite some setbacks "we have certainly made progress in clinical trials in lupus in the past couple of years."

ALR-Supported Research Focus of Plenary Session

Christine McBurney, MD, of the University of Pittsburgh, presented the results of work supported, in part, by the ALR during one of the plenary sessions at the ACR. She focused on the linkages between C4d, a remnant product from complement, a component of the immune system, which is deposited on red blood cells.

Earlier studies found abnormal levels of C4d on the red blood cells of people with lupus. They also found that C4d levels were significantly associated with disease activity and central nervous system involvement, including seizures and psychosis; and, in a non-lupus population, with stroke. In this study, McBurney and her colleagues, including ALR grantee **Joseph Ahearn, MD**, also of the University of Pittsburgh, evaluated C4d levels in 356 patients with lupus over 8 years. They found that higher levels of C4d were associated with higher levels of disease activity and blood clotting abnormalities. Patients with higher levels were twice as likely to have experienced cardiovascular events, particularly stroke and pulmonary embolism. They also had a fivefold increased risk of a stroke. C4d levels were also independently associated with death from any cause, with patients with high C4d levels having a nearly eightfold risk of death compared to those with lower levels.

C4d, said McBurney, "May provide a link between complement activation systemic inflammation and thrombosis, including stroke."[xiii]

Key point: *This study suggests that C4d may provide a biomarker to assess patient risk of stroke, cardiovascular disease, and death.*

ALR grantee **Susan A. Boackle, MD** of the University of Colorado-Denver School of Medicine delivered the REF Edmond L. Dubois, MD, Memorial Lectureship. Her topic, "The Path from Gene to Function: Analysis of a Lupus Susceptibility Gene c/r," examined her own journey to pin down the role of the gene, complement receptor 2 (CR2), in the pathogenesis of lupus.

References

i Bingham CO, et al. Citrullination and Peptidylarginine Deiminase (PAD) Expression Is Detected in the Oral Mucosa and Periodontium in the Absence of Rheumatoid Arthritis.

ii Scher JU, et al. Characteristic Oral and Intestinal Microbiota in Rheumatoid Arthritis (RA): A Trigger for Autoimmunity?

iii Merrill JT, et al. Five-Year Experience with Belimumab, a BLyS-Specific Inhibitor, in Patients with Systemic Lupus Erythematosus (SLE).

iv Vollenhoven RF, et al. Belimumab, a BLyS-Specific Inhibitor, Reduced Corticosteroid Use in Patients with Active SLE: Results from the Phase 3 BLISS-52 and -76 Studies.

v Petri MA, et al. Belimumab, a BLyS-Specific Inhibitor, Reduced Disease Activity, Flares, and Prednisone Use in Patients with Seropositive SLE: Combined Efficacy Results from the Phase 3 BLISS-52 and -76 Studies.

vi Chatham WW. Effect of Belimumab, a B-Lymphocyte Stimulator–Specific Inhibitor, on Functional Antibodies to Pneumococcal, Tetanus, and Influenza Vaccines.

vii Stohl W. Belimumab, a BLyS-Specific Inhibitor, Significantly Reduced Autoantibodies, Normalized Low Complement, and Reduced Selected B-Cell Populations in Patients with Seropositive Systemic Lupus Erythematosus (SLE): The Phase 3 BLISS Studies.

viii Wallace DJ, et al. Epratuzumab Demonstrates Clinically Meaningful Improvements in Patients with Moderate to Severe Systemic Lupus Erythematosus (SLE): Results from EMBLEM™, a Phase IIb Study.

ix Kalunian KC, et al. BILAG-Measured Improvement in Moderately and Severely Affected Body Systems in Patients with Systemic Lupus Erythematosus (SLE) by Epratuzumab: Results from EMBLEM™, a Phase IIb Study.

x Sullivan BA, et al. A Flow Cytometric Receptor Occupancy Assay Demonstrates Dose-Dependent Blockade of B7RP-1 by AMG 557 on Circulating B Cells from SLE Subjects.

xi Fleischmann RM. Evidence of Peripheral B Cell Depletion in Subjects with Controlled Systemic Lupus Erythematosus (SLE) Following Subcutaneous Administration of SBI-087.

xii Salwsky KA, et al. A Systematic Literature Review of the Direct Costs of Systemic Lupus Erythematosus (SLE) in the United States (US).

xiii McBurney CA. Platelet C4d Is Associated with All-Cause Mortality in Patients with Systemic Lupus Erythematosus.

xiv Bernatsky SR, et al. Further Defining Cancer Risk in Systemic Lupus: Updated Results in an Expanded International Multi-Centre Cohort

xv Hanly JG, Urowitz MB, Sanchez-Guerrero J, et al. Neuropsychiatric events at the time of diagnosis of systemic lupus erythematosus: an international inception cohort study. Arthritis Rheum. 2007;56(1):265-73.

xvi Izmirly PM, et al. Hydroxychloroquine and Prevention of Anti-SSA/Ro Associated Cardiac Disease in Mothers with a Previous Child with Neonatal Lupus

More information about lupus and treatment advances can be found by visiting www.lupusresearch.org.

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The mission of the Alliance for Lupus Research (ALR) is to find better treatments and ultimately prevent and cure systemic lupus erythematosus (SLE or lupus), a debilitating autoimmune disease, by supporting medical research. The ALR Board of Directors funds all ALR administrative and fundraising costs, so 100% of every donation to the ALR goes directly to support lupus research programs. Lupus affects an estimated 1.4 million Americans and 90% of those diagnosed are women. Symptoms are unpredictable and can range from extreme fatigue and joint pain to severe organ damage. Since its founding in 1999, the ALR has become the largest private funder of lupus research in the world. Leading the way to a cure.