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Pulmonary Sarcoidosis A-Z

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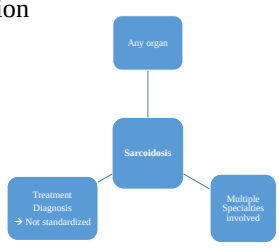
Disclosure

- This presentation has no:
  - Conflicts of interest
  - Off-label promotion of medications

Slide 3

Introduction



Judson MA Am J Med. 2007 May;120(5):403-7.

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Epidemiology

- "Epithelioid cells with large pale nuclei and also a few giant cells" → Sarcoidosis (Boeck, 1899)
- Individuals at all ages (Mainly third and fourth decade)
- Black vs Caucasian:
  - More common (the adjusted annual incidence rate among blacks is roughly 3 times than that among whites)
  - > chronic and fatal
- Prevalence:
  - 59.0-60.1 per 100,000 population overall
  - 141.4 per 100,000 in African- American

Iannuzzi MC, Fontana JR. Sarcoidosis: clinical presentation, immunopathogenesis, and therapeutics. JAMA. 2011;305(4):391-9.

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Epidemiology

- ? Cause is airborne (Involvement of skin, eyes, and the lungs)
- No single predominant environmental or occupational factor has been identified (large, well-matched, multicenter, etiologic study)

- *Iannuzzi MC, Fontana JR. Sarcoidosis: clinical presentation, immunopathogenesis, and therapeutics. JAMA. 2011;305(4):391-9*
- *Hunninghake GW, Costabel U, Ando M, et al. ATS/ERS/WASOG statement on sarcoidosis. American Thoracic Society/European Respiratory Society/World Association of Sarcoidosis and other Granulomatous Disorders. Sarcoidosis Vasc Diffuse Lung Dis. 1999;16(2):149-73.*

Slide 6

Mortality and Sarcoidosis

- During the past 20 years sarcoidosis mortality has increased
- Mainly non-hispanic African American
- Age 55 or more
- Cause of death → sarcoidosis itself

- *Tukey MH, Berman JS, Boggs DA, White LF, Rosenberg L, Cozier YC. Mortality among African American women with sarcoidosis: data from the Black Women's Health Study. Sarcoidosis Vasc Diffuse Lung Dis. 2013;30(2):128-33.*
- *Swigris JJ, Olson AL, Huie TJ, et al. Sarcoidosis-related mortality in the United States from 1988 to 2007. Am J Respir Crit Care Med. 2011;183(11):1524-30.*

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Racial Difference in Sarcoidosis Mortality in the United States

[redacted]

CHEST

METHODS:

- Mortality related to sarcoidosis from 1999 → 2010
- Examining data on multiple causes of death from the National Center for Health Statistics.
- Both African Americans and Caucasians.
- Compared sarcoidosis-related deaths vs deaths:
  - Car accidents (previously healthy control subjects)
  - Rheumatoid arthritis (chronic disease control subjects)

RESULTS:

- Sarcoidosis was reported as an immediate cause of death in 10,348 people in the United States
- 6,285 were African American and 3,984 Caucasian
- Age-adjusted mortality rate for African Americans was 12 times higher than for Caucasians
- African Americans died at an earlier age than Caucasians.
- Compared with the control groups, pulmonary hypertension was significantly more common in individuals with sarcoidosis.

CONCLUSIONS:

- **This nationwide population-based study exposes a significant difference in ethnicity and sex among people dying of sarcoidosis in the United States.**
- Pulmonary hypertension investigation should be considered in all patients with sarcoidosis, especially African Americans.

Mirsaeidi M, Machado RF, Schraufnagel D, Sweiss NJ, Baughman RP. Racial difference in sarcoidosis mortality in the United States. Chest. 2015;147(2):438-49.

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Moller DR. Treatment of sarcoidosis -- from a basic science point of view. J Intern Med. 2003;253(1):31-40.

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Diagnosis

- Clinico-Radiologic
- Path: Granuloma
- Other causes excluded

Culver DA. Sarcoidosis. Immunol Allergy Clin North Am. 2012;32(4):487-511.

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Judson MA Curr Opin Pulm Med. 2019 Jun 11.

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Table 3. The differential diagnosis of granulomatous inflammation other than sarcoidosis, by organ

Organ	Differential diagnosis
Lung	Tuberculosis Atypical mycobacteria Fungi Pneumocystis jirovecii Mycoplasma Hypersensitivity pneumonitis Pneumoconiosis: beryllium (chronic beryllium disease, aluminum, titanium Aspiration of foreign substances Granulomatosis with polyangiitis Rheumatoid nodules Necrotizing sarcoid granulomatosis Drug reactions including drug-induced sarcoidosis-like reactions

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Diagnosis

- Medical history (Granulomatous disease)
- Tuberculin skin test (Pos ? Tb)

Table 1 Differential Diagnosis of Granulomatous Disorders

Tuberculosis, other mycobacteria
Fungi
Hypersensitivity pneumonitis
Vasculitis (eg, Wegner's granulomatosis)
Chronic beryllium disease, other metal exposure
Foreign body reactions
Lymphoma

Judson MA Am J Med. 2007 May;120(5):403-7.

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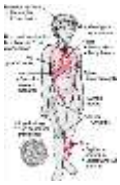
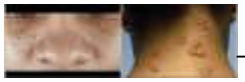
Diagnosis

- Physical examination:
  - Pulmonary manifestations:
    - Cough
    - Dyspnea
    - Wheezing
    - chest pain
  - Extra-pulmonary manifestations:
    - Red eyes
    - Skin lesions
    - Cardiac rhythm disturbances
    - Neurologic deficits
    - Organomegaly





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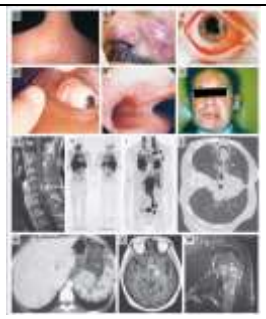

N Engl J Med. 2007 Nov 22;357(21):2153-65

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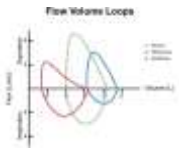
Diagnosis

- Pulmonary assessment:
  - Pulmonary function test + diffusing capacity (restrictive, ? Obstructive)
  - Chest radiograph/CT scan of chest
- Extra-pulmonary Assessment:
  - Complete blood count
  - Serum chemistries
  - Urinalysis
  - Electrocardiogram
  - Ophthalmic examination



Judson MA Am J Med. 2007 May;120(5):403-7.

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Table 2 — Recommended Initial Evaluation of Patients with Sarcoidosis

1. History (occupational and environmental exposure, symptoms)
2. Physical examination
3. Posteroanterior chest radiography
4. Pulmonary function tests: spirometry, DLCO, and KCO
5. Peripheral blood counts: white blood cells, red blood cells, platelets
6. Serum chemistries: calcium, liver enzymes (alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase), creatinine, BUN
7. Urine analysis
8. ECG
9. Routine ophthalmologic examination
10. Tuberculin skin test

DLCO = carbon monoxide diffusion in the lung; KCO = transfer coefficient; BUN = blood urea nitrogen; ECG = electrocardiogram.

Published with permission from: Hunninghake GW, Costabel U, Ando M, et al. ATS/ERS/WASOG statement on sarcoidosis. Sarcoid Vasc Diff Lung Dis. 1999;16:149-173.

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Diagnosis waived

- Lofgren syndrome:
  - Bilateral hilar lymphadenopathy
  - Erythema nodosum
  - Periarticular inflammation (typically of the ankles, not always present)
  - Fever and malaise (usually)
- Heerfordt syndrome
  - Uveitis
  - Parotid swelling
  - Fever and malaise (usually)
- Asymptomatic bilateral hilar lymphadenopathy

Culver DA. Sarcoidosis. Immunol Allergy Clin North Am. 2012;32(4):487-511.

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Radiographic Staging

- **Siltzbach/Scadding's Radiographic Staging: (Chest xray)**
  - Stage 0: Normal Chest xray
  - Stage I: Bilateral Hilar Adenopathy
  - Stage II: Bilateral Hilar Adenopathy plus parenchymal abnormalities
  - Stage III: Parenchymal abnormality alone
  - Stage IV: Pulmonary Fibrosis

Guidry C, Fricke BG, Bom R, Pandey T, Jambhekar K. Imaging of Sarcoidosis: A Contemporary Review. Radiol Clin North Am. 2016;54(3):519-34.

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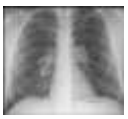
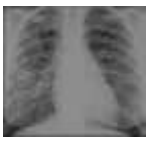
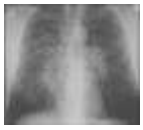


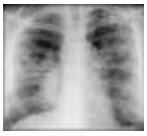
Stage I
- Prevalence: 50%
- Resolution: 50-90%



Stage III
- Prevalence: 10-12%
- Resolution: 10-20%



Stage II
- Prevalence: 25-30%
- Resolution: 30-70%



Stage IV
- Prevalence: 5%
- Resolution: 0%

Guidry C, Fricke BG, Ram R, Pandey T, Jambhekar K. Imaging of Sarcoidosis: A Contemporary Review. Radiol Clin North Am. 2016;54(3):519-34.

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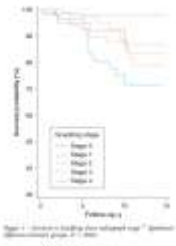
Mortality



Kirkil G, Lower EE, Baughman RP. Chest 2018 Jan;153(1):105-113.

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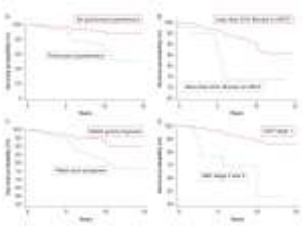
Mortality



Kirkil G, Lower EE, Baughman RP. Chest 2018 Jan;153(1):105-113.

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Diagnosis

- Role of EBUS:
- EBUS TBNA is a safe procedure and with high diagnostic yield
- EBUS (esp. stage I and II) should be added to conventional bronchoscopy diagnostic criteria.

- *Wong M, Yasufuku K, Nakajima T, et al. Endobronchial ultrasound: new insight for the diagnosis of sarcoidosis. Eur Respir J. 2007;29(6):1182-6*
- *Nakajima T, Yasufuku K, Kurosu K, et al. The role of EBUS-TBNA for the diagnosis of sarcoidosis--comparisons with other bronchoscopic diagnostic modalities. Respir Med. 2009;103(12):1796-800.*

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Who has Sarcoidosis?

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More Likely	Less Likely
African American or northern European	Age <18 Age >50 in men
Female	Smoking
Symmetric bilateral hilar adenopathy	Exposure to metal dusts, bioaerosols, organic antigens
Asymptomatic presentation	History of exposure to tuberculosis
Peripheral blood lymphopenia	History of recurrent infections
BAL lymphocytes >15% and/or BAL CD4/CD8 ratio >3.5	Hypogammaglobulinemia
Multisystem involvement	Systemic disease capable of inducing granulomatous reactions Malignancy Inflammatory bowel disease Immunodeficiency
Elevated serum ACE	

Culver DA. Sarcoidosis. Immunol Allergy Clin North Am. 2012;32(4):487-511.

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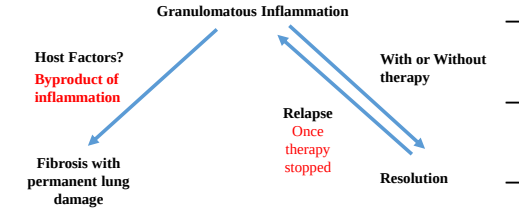
Natural Course of Sarcoidosis



Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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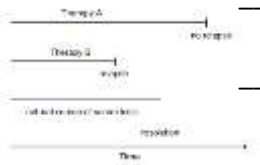
Natural Course of Sarcoidosis

- Duration of therapy could determine the chance of relapse because sarcoidosis treatment may not affect the natural course of disease.
- If the duration of therapy exceeds the duration of disease activity (Therapy A), then the patient will not relapse when therapy is withdrawn.
- If the duration of therapy is shorter than the duration of disease activity (Therapy B), then the patient will relapse when therapy is withdrawn.



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Management of Pulmonary Sarcoidosis

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Who to treat?

- Sarcoidosis patients receiving corticosteroid therapy have a higher rate of relapse
- Higher doses of steroids → higher risk of relapse
- Never been clearly demonstrated that the treatment of sarcoidosis affects the natural course of the disease
- Adequate therapy for sarcoidosis may be more a matter of the duration of therapy than the use of specific medications or specific doses

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Steroids and Relapse?

Study objective:
- Determine the demographic, clinical, and radiographic characteristics of corticosteroid- treated patients with sarcoidosis who developed relapse following a period of clinical stability lasting longer than 1 month, and to compare these characteristics with those of a group of patients with sarcoidosis who were not treated.

Design:
- Historic, concurrent and prospective, nonrandomized, observational study.

Conclusions:
- Relapse occurred frequently treated with steroids
- Rarely occurred in patients who had not been treated with corticosteroids
- Striking difference in relapse rate between treated and untreated:
  - One explanation is that severe presenting symptoms portend a protracted and recurrent course;
  - Alternative explanation is that corticosteroids contributed to the prolongation of the disease by delaying resolution.

We observed a 74% relapse rate in the induced remission group, but only an 8% relapse rate in the spontaneous remission group (p<O.OI).

Gottlieb JE, Israel HL, Steiner RM, Triolo J, Patrick H. Outcome in sarcoidosis. The relationship of relapse to corticosteroid therapy. Chest. 1997;111(3):623-31.

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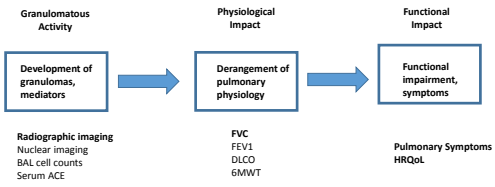
Factors involved in the treatment decision



Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Who to treat?

Established versus newly Diagnosed

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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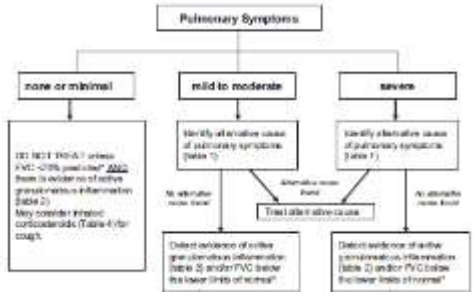

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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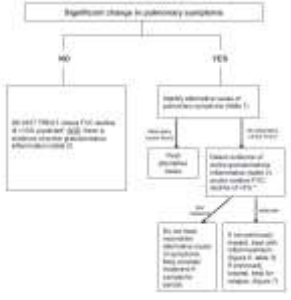

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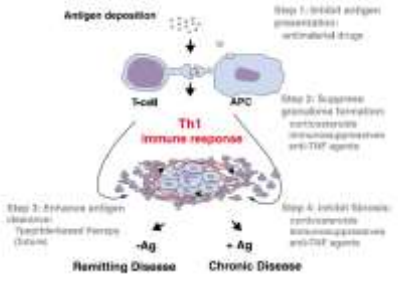

Moller DR. Treatment of sarcoidosis -- from a basic science point of view. J Intern Med. 2003;253(1):31-40.

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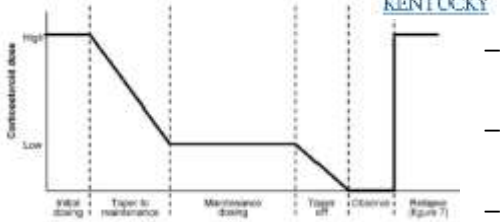
Steroids



The six phases of treatment for pulmonary sarcoidosis

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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6 Phase Treatment for Pulmonary Sarcoidosis

Phase	Daily Dose	Period
Initial dosing	20 – 40 mg	2-6 weeks
Taper to maintenance	N/A	6 weeks- 6 month
Maintenance dosing	5-15 mg	5-9 months
Taper off corticosteroid therapy	N/A	1-6 months
Monitor while not receiving therapy	N/A	N/A
Treatment of relapse		

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Relapse

- 20 -70 % of patients in whom steroids are discontinued
- Steroid for relapses may be used identically as for the initial treatment of pulmonary sarcoidosis
- Sensitive to corticosteroids compared to other forms of sarcoidosis (20 mg of daily prednisone equivalent)
- Toxicities:
  - side effects from corticosteroids are cumulative (e.g., weight gain, osteoporosis, cataracts)

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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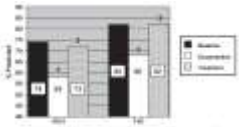
Efficacy of Short-Course, Low-Dose Corticosteroid Therapy for Acute Pulmonary Sarcoidosis Exacerbations

Methods:
- Reviewed the short-term treatment outcome (median duration 21 days)
- 36 patients with acute exacerbations of pulmonary sarcoidosis
- Low-dose corticosteroid therapy (20 mg or less of daily prednisone equivalent)

Conclusions:
- **Treatment of acute exacerbations of pulmonary sarcoidosis with 20 mg prednisone for a median of 21 days improved spirometry back to baseline and improved clinical symptoms.**
- These data suggest that this corticosteroid dose can be safely used initially, and an attempt at tapering can be considered within the first month.



Mckinzie BP, Bullington WM, Mazur JE, Judson MA. Efficacy of short-course, low-dose corticosteroid therapy for acute pulmonary sarcoidosis exacerbations. Am J Med Sci. 2010;339(1):1-4.

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Steroid sparing agents

- Rarely effective alone for the treatment of sarcoidosis
- Allow for a reduction in the maintenance corticosteroid dose (steroid sparing)
- Require 3 to 9 months to reach peak efficacy for the treatment
- Steroids slowly tapered after an alternative agent added

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Steroid sparing agents

- Add of an alternative agent be for the initial treatment of pulmonary sarcoidosis ?
- Large percentage of treated patients will not relapse and, therefore, will avoid the potential toxicity of a second agent if they are treated with corticosteroid alone

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Steroid sparing agents

- Second line agent: **Methotrexate**
- Most well studied
- Only non-corticosteroid therapy demonstrated equivalence to corticosteroids as a single agent for acute disease
- A consensus of sarcoidosis experts (25/30, 83%) selected methotrexate as the preferred second line agent for pulmonary sarcoidiosis

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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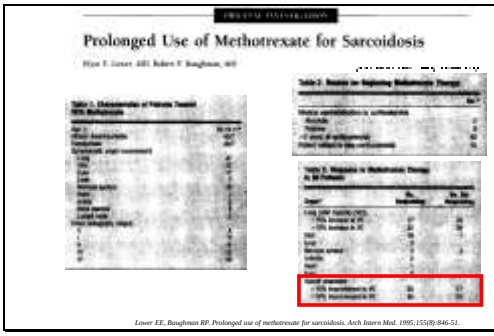
Prolonged Use of Methotrexate for Sarcoidosis

Lower EE, Baughman RP. Prolonged use of methotrexate for sarcoidosis. Arch Intern Med. 1995;155(8):846-51.

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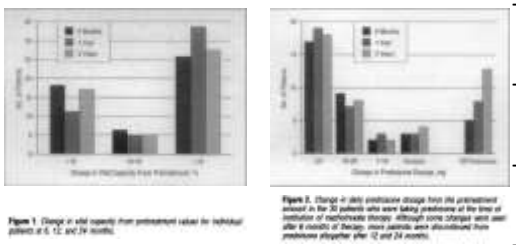

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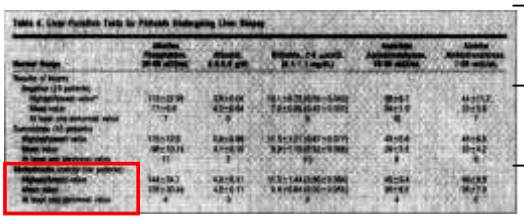

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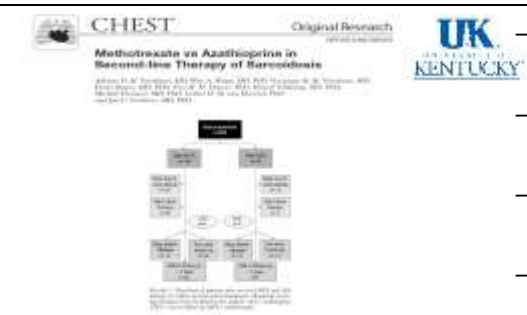

Vorselaars AD, Wuyts WA, Vorselaars VM, et al. Methotrexate vs azathioprine in second-line therapy of sarcoidosis. Chest. 2013;144(3):805-12.

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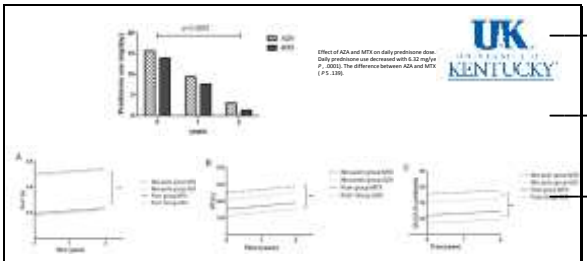

Effect of AZA and MTX on daily prednisone dose. Daily prednisone use decreased with 6.32 mg/ye P _ .0001). The difference between AZA and MTX (P 5 .139).

Pulmonary function increased significantly over time for FEV 1 (P 5 .006) (A), VC (P 5 .001) (B), and DLCO (P 5 .018) (C). There was a signifi cant difference between the pulm and non-pulm treatment groups. No difference was found between the AZA and MTX treatment effect. * P 0 .049..

Vorselaars AD, Wuyts WA, Vorselaars VM, et al. Methotrexate vs azathioprine in second-line therapy of sarcoidosis. Chest. 2013;144(3):805-12.

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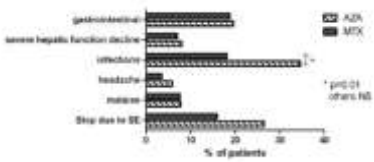

- Reported side effects during AZA and MTX treatment by percentage of patients. Patients could have more than one side effect.
- Hepatic function decline was defined severe when it was a reason to discontinue therapy.
- There was a significant difference between the number of patients with infections in both treatment groups (*P 0.01*).

Vorselaars AD, Wuyts WA, Vorselaars VM, et al. Methotrexate vs azathioprine in second-line therapy of sarcoidosis. Chest. 2013;144(3):805-12.

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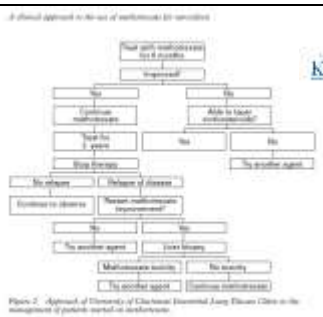

Baughman RP, Lower EE. A clinical approach to the use of methotrexate for sarcoidosis. Thorax. 1999;54(8):742-6.

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Third line agent

- Infliximab:
  - Cost
  - Difficulties of intravenous administration

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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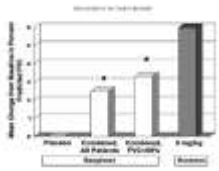
Infliximab

- The mean change from baseline in the percent predicted forced vital capacity (FVC) 6 months after starting therapy, derived from two randomized trials of infliximab.
- Baughman and colleagues :
  - 138 patients
  - Three treatment groups (placebo, 3 mg/kg, and 5 mg/kg)
  - Significant improvement in percent predicted FVC for patients treated with 3 or 5 mg/kg compared with placebo (P<0.05).
  - Difference was larger for those who had a pretreatment FVC less than 69% (the median of all patients in the study) (P<0.05)



- Rossman and colleagues:
  - 19 patients with chronic pulmonary sarcoidosis who received 5 mg/kg infliximab either initially (13 patients) or delayed (6 patients).
  - Mean FVC percent predicted before therapy (59.6%).
  - Improvement in FVC percent predicted 22 weeks after two treatments with infliximab

- *Rossman MD, Newman LS, Baughman RP, et al. A double-blinded, randomized, placebo-controlled trial of infliximab in subjects with active pulmonary sarcoidosis. Sarcoidosis Vasc Diffuse Lung Dis. 2006;23(3):201-8*
- *Baughman RP, Drent M, Kavuru M, et al. Infliximab therapy in patients with chronic sarcoidosis and pulmonary involvement. Am J Respir Crit Care Med. 2006;174(7):795-802..*

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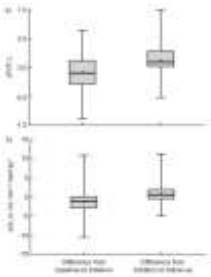
How about Leflunomide?



- Median corticosteroid dose at initiation was 10 mg (interquartile range 5–20) mg at baseline, and 0 (0–10) mg at the 6-month follow-up (p,0.001).
- Leflunomide is a viable alternative agent for pulmonary and extrapulmonary sarcoidosis.
- Leflunomide appears to facilitate reduction of steroid dose and can be considered as monotherapy or as add-on therapy in cases of progressive disease.

Sahoo DH, Bandyopadhyay D, Xu M, et al. Effectiveness and safety of leflunomide for pulmonary and extrapulmonary sarcoidosis. Eur Respir J. 2011;38(5):1145-50.

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Inhalers

- Inhaled corticosteroids:
  - Cough
  - High doses

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Classification of Sarcoidosis

- Acute disease:
  - Resolves within 2 to 5 years of time of diagnosis residual defects are fibrosis, not ongoing inflammation
- Chronic disease:
  - Persists beyond 5 years after diagnosis
- Refractory disease:
  - Chronic disease that worsens despite adequate systemic therapy

Baughman RP, Costabel U, Du bois RM. Treatment of sarcoidosis. Clin Chest Med. 2008;29(3):533-48, ix-x.

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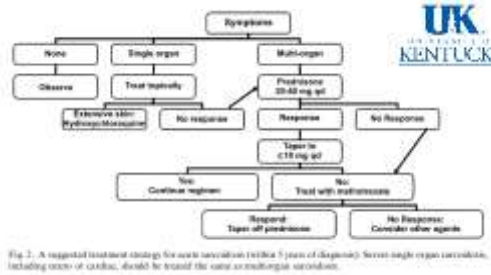

Baughman RP, Costabel U, Du bois RM. Treatment of sarcoidosis. Clin Chest Med. 2008;29(3):533-48, ix-x.

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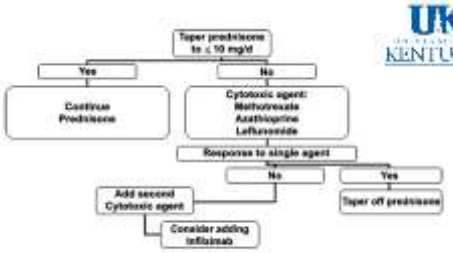

Fig. 3. A suggested treatment strategy for chronic sarcoidosis.

Baughman RP, Costabel U, Du bois RM. Treatment of sarcoidosis. Clin Chest Med. 2008;29(3):533-48, ix-x.

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Therapy for Pulmonary Fibrosis

- Treatment decisions based on the propensity to develop pulmonary fibrosis rather than the duration of disease
  - Respiratory failure
  - Pulmonary hypertension
  - Mycetoma
- Taper off → High rate of relapse
- Taper to 10 mg a day (successful taper)

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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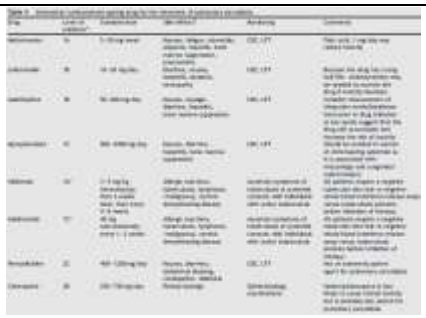

Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Acthar gel

- 1950s corticotrophin (Acthar) reported effective in treating sarcoidosis
- First drug approved for treatment of pulmonary sarcoidosis by the FDA (limited number of case reports)
- FDA approved the drug for pulmonary sarcoidosis without new studies examining the effectiveness of Acthar gel in sarcoidosis.
- Fell out of favor:
  - Cost
  - Convenience of an oral versus injected route of delivery
  - Local reactions at the site of injection
  - Question that Acthar may have been less effective (Dosing)

Baughman RP, Barney JB, O'hare L, Lower EE. A retrospective pilot study examining the use of Acthar gel in sarcoidosis patients. Respir Med. 2016;110:66-72.

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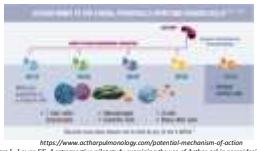
Acthar gel

Mechanism of action:

- Corticosteroid secretion by the adrenal glands
- Endocrine and immune effects outside the adrenal axis
- Stimulation of alternative melanocorticoreceptors (MCRs)



https://www.actharpulmonology.com/potential-mechanism-of-action

Baughman RP, Barney JB, O'hare L, Lower EE. A retrospective pilot study examining the use of Acthar gel in sarcoidosis patients. Respir Med. 2016;110:66-72.

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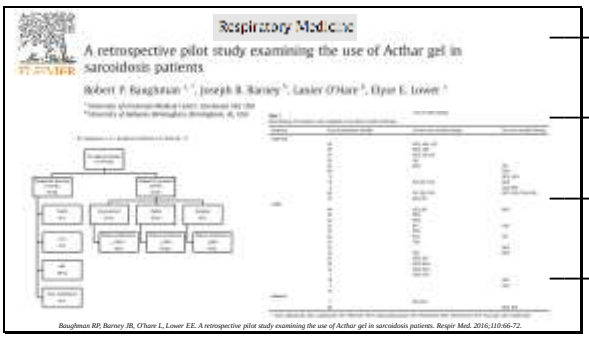

Respiratory Medicine

A retrospective pilot study examining the use of Acthar gel in sarcoidosis patients

Robert P. Baughman, Joseph B. Barney, Lanier O'Hare, Elyse E. Lower

Baughman RP, Barney JB, O'hare L, Lower EE. A retrospective pilot study examining the use of Acthar gel in sarcoidosis patients. Respir Med. 2016;110:66-72.

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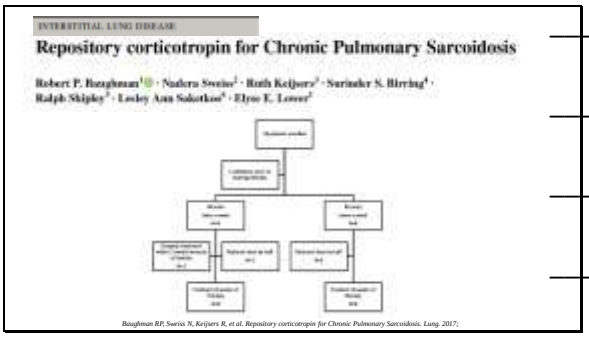

INTERSTITIAL LUNG DISEASE

Repository corticotropin for Chronic Pulmonary Sarcoidosis

Robert P. Baughman · Nadera Sweiss · Ruth Keijsers · Surinder S. Birring · Ralph Shipley · Lesley Ann Saketkoo · Elyse E. Lower

Baughman RP, Sweiss N, Keijsers R, et al. Repository corticotropin for Chronic Pulmonary Sarcoidosis. Lung. 2017;

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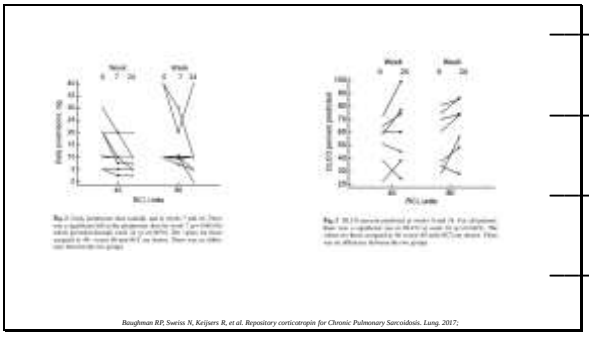

Baughman RP, Sweiss N, Keijsers R, et al. Repository corticotropin for Chronic Pulmonary Sarcoidosis. Lung. 2017;

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Acthar Gel

- **Conclusion:**
- Regardless of dose that the patient received:
  - Significant reduction in the dosage of prednisone
  - Significant improvement in their DLCO (Despite withdrawal of prednisone)
  - Significant improvement in the health-related quality of life

Baughman RP, Sweiss N, Keijsers R, et al. Repository corticotropin for Chronic Pulmonary Sarcoidosis. Lung. 2017;

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Acthar Gel

- **No placebo group:**
  - Can't be sure that reduction in prednisone dose due to effect of repeat study visits and effort to reduce prednisone.
  - The reduction of prednisone dose may have also been due to stimulation of glucocorticoid release

Baughman RP, Sweiss N, Keijsers R, et al. Repository corticotropin for Chronic Pulmonary Sarcoidosis. Lung. 2017;

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Thank you

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Acthar Gel

- We were unable to demonstrate
- that the reduction in prednisone dosage during the short
- course of this study was associated with lessening of the
- toxicities associated with high-dose prednisone such as
- weight gain and diabetes. However, patients reported an
- improved quality of life while receiving RCI.
- A change in FVC percent predicted is a

Baughman RP, Sweiss N, Keijsers R, et al. Repository corticotropin for Chronic Pulmonary Sarcoidosis. Lung. 2017;

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- there was no
- significant change in weight during the course of the study.
- There was also no change in hemoglobin A1c levels or
- treatment for diabetes or hypertension. Eight patients complained
- of anxiety and fluid retention on the day of drug
- administration

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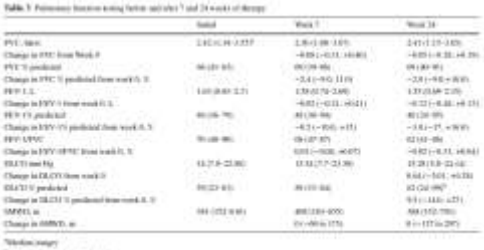

Baughman RP, Sweiss N, Keijsers R, et al. Repository corticotropin for Chronic Pulmonary Sarcoidosis. Lung. 2017;

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Iannuzzi MC, Fontana JR. Sarcoidosis: clinical presentation, immunopathogenesis, and therapeutics. JAMA. 2011;305(4):391-9

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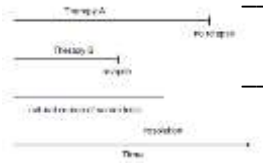
Who to treat?

- Duration of an anti-sarcoidosis regimen exceeds the presence of the antigen in the host, the therapy will be "effective."
- If the regimen is discontinued while the antigen is still present, the patient will "relapse"



Judson MA. The treatment of pulmonary sarcoidosis. Respir Med. 2012;106(10):1351-61.

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Judson MA Curr Opin Pulm Med. 2019 Jun 11.

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Judson MA Curr Opin Pulm Med. 2019 Jun 11.

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Judson MA Curr Opin Pulm Med. 2019 Jun 11.