Vectra DA Blood Test for Rheumatoid Arthritis

Policy Number: AHS – G2127 – Vectra DA Blood Test for Rheumatoid Arthritis	Prior Policy Name and Number, as applicable:
Effective Date: 11/01/2022-11/30/2023	

I.Policy Description

Rheumatoid arthritis (RA) is a chronic, systemic, inflammatory disorder which results from a complex interaction between genes and the environment, leading to a breakdown of immune tolerance and synovial inflammation in a characteristic symmetric pattern. RA usually leads to the destruction of joints due to erosion of cartilage and bone, causing joint deformities (Firestein, 2021).

Vectra DA is a multi-biomarker disease activity (MBDA) blood test which combines the levels of 12 serum biomarkers into a single score from 1 to 100 to provide an objective measure of RA disease activity. It is intended for use with existing symptom-based disease activity measures to improve long-term outcomes for RA patients (van der Helm-van Mil, Knevel, Cavet, Huizinga, & Haney, 2013).

This policy does not pertain to general inflammation; for guidance on general inflammation testing, including erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), please see policy AHS-G2155 General Inflammation Testing and policy AHS-G2022 ANA/ENA Testing.

II. Indications and/or Limitations of Coverage

Application of coverage criteria is dependent upon an individual's benefit coverage at the time of the request. Medical Policy Statements do not ensure an authorization or payment of services. Please refer to the plan contract (often referred to as the Evidence of Coverage) for the service(s) referenced in the Medical Policy Statement. If there is a conflict between the Medical Policy Statement and the plan contract (i.e., Evidence of Coverage), then the plan contract (i.e., Evidence of Coverage) will be the controlling document used to make the determination.

Application of coverage criteria is dependent upon an individual's benefit coverage at the time of the request. If there is a conflict between this Policy and any relevant, applicable government policy [e.g. National Coverage Determinations (NCDs) for Medicare] for a particular member,

then the government policy will be used to make the determination. For the most up-to-date Medicare policies and coverage, please visit their search website http://www.cms.gov/medicare-coverage-database/overview-and-quicksearch.aspx?from2=search1.asp& or the manual website.

Specifications pertaining to Medicare and Medicaid can be found in Section VII of this policy document

1. The use of a multi-biomarker disease activity score for rheumatoid arthritis (e.g., Vectra DA score) **DOES NOT MEET COVERAGE CRITERIA**.

III. Table of Terminology

Term	Definition
ACR	American College of Rheumatology
ANA	Antinuclear antibody
BMI	Body mass index
CDAI	Clinical disease activity index
CLIA '88	Clinical Laboratory Improvement Amendments of 1988
CMS	Centres for Medicare and Medicaid
CRP	C-reactive protein
DA	Disease activity
DAS	Disease activity score
DAS28-CRP	Disease activity score the 28-joint based on CRP
DMARDs	Disease-modifying antirheumatic drugs
EGF	Epidermal growth factor
ELISA	Enzyme-linked immunosorbent assay
ENA	Extractable nuclear antigen
ESR	Erythrocyte sedimentation rate
EULAR	European League Against Rheumatism
FDA	Food and Drug Administration
HCPs	health care providers
IgG	Immunoglobulin G
IL-6	Interleukin-6
LDAS	Low disease activity state
LDTs	Laboratory-developed tests
MBDA	Multi-biomarker disease activity
MMP-1	Matrix metalloproteinase 1
NICE	National Institute for Care and Excellence
PAS	Patient activity scale

PDA	Persistent disease activity
PROs	Patient-reported outcomes
RA	Rheumatoid arthritis
RAPID-3	Routine assessment of patient index data-3
SAA	Serum amyloid A
SJC	Swollen joint count
TNF	Tumour necrosis factor
TNFRI	Tumour necrosis factor receptor type I
VCAM-1	Vascular cell adhesion molecule 1
VEGF-A	*Vascular endothelial growth factor A*
WG	Working group
YKL-40	Chitinase 3-like 1

IV. Scientific Background

Rheumatoid arthritis (RA) affects over 1.3 million people in the U.S. and over 4 million worldwide. Despite the availability of potent biologic treatments, substantial disease activity persists in many patients, with accompanying progressive bone and soft tissue damage, extra-articular consequences, disability, and increased mortality (Centola et al., 2013). The condition usually involves stiff and swollen joints throughout the body, pain, and eventually the destruction of the affected joints. This typically leads to significant motor disability in patients who do not respond to treatment (Venables, 2019).

Measuring disease activity has become important for the management of patients with RA (J. R. Curtis et al., 2012). As RA is a chronic illness, earlier and more aggressive treatment may provide significant benefits, especially for patients with more severe forms of the illness (Taylor & Maini, 2020). Tighter control, such as more frequent monitoring and actively striving to meet a disease activity level, has been advantageous in several studies (Bakker, Jacobs, Verstappen, & Bijlsma, 2007; Mease, 2010). However, there is no gold standard for disease activity assessment in RA. Multiple measures are used, and no single measure of disease activity has been recommended in U.S. or international RA guidelines (Centola et al., 2013). Disease activity indices are based on clinical, laboratory, and physical measures. Most of these indices, such as the Disease Activity Score (DAS) and the Routine Assessment of Patient Index Data-3 (RAPID-3), rely on either clinical evaluation of joints, patient-reported outcomes (PROs), or both in disease activity assessment. However, high intra- and inter-observer variability occurs. Furthermore, prior damage to joints or other conditions may influence these measurements (J. R. Curtis et al., 2012). Other commonly used tools for diagnosing RA have significant weaknesses; for example, blood tests may be used but are completely normal for many RA patients. MRI may be used due to its ability to identify early signs, but it is expensive and time consuming (Li, Sasso, van der Helm-van Mil, & Huizinga, 2016).

Biologic markers or "biomarkers" can provide objective measurements that reflect underlying pathophysiological processes, pathogenic processes, or responses to treatment. Most measures of monitoring disease and treatment progress rely on subjective measurements, such as joint

evaluation, so biomarkers may be a useful complement in patient management (Taylor & Maini, 2020). Joint damage at the molecular level may be occurring before any clinical signs appear so identifying any indications of disease activity could allow clinical interventions to be taken earlier (Mc Ardle, Flatley, Pennington, & FitzGerald, 2015). Markers such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are part of clinical measures such as the DAS. However, these two biomarkers are nonspecific; abnormal amounts of these markers may be due to other reasons apart from RA and may be completely normal in patients with RA (Centola et al., 2013; J. R. Curtis et al., 2012). This non-specificity is not limited to ESR and CRP. For example, antibodies (usually called rheumatoid factors or RF) produced against immunoglobulin G (IgG) are often tested to diagnose RA, but these antibodies may be produced in response to another rheumatic condition or a separate chronic infection (Shmerling, 2021). Autoantibodies to citrullinated protein epitopes, such anti-cyclic citrullinated peptide (anti-CCP2), has also been a focus of biomarker research in RA. Both RF and anti-CCP2 have similar sensitivities for the diagnosis of RA, but anti-CCP2 is positive in 20%-30% of RA patients who are negative for RF (Shapiro, 2021). RA is a heterogenous condition, and no single biomarker is a reliable predictor of RA disease activity (Mc Ardle et al., 2015). However, the combined assessment of multiple biomarkers, such as through multi-biomarker disease activity (MBDA), may be useful for predicting disease activity and progression (Taylor & Maini, 2020).

Clinical Validity and Utility

According to J. R. Curtis et al. (2012), the MBDA algorithm (Vectra DA) was developed by screening 396 candidate biomarkers. An algorithm was then created to generate a composite score based on the 12 biomarkers most correlated to RA clinical disease activity which are as follows:

- Interleukin-6 [IL-6]
- Tumor necrosis factor receptor type I [TNFRI]
- Vascular cell adhesion molecule 1 [VCAM-1]
- Epidermal growth factor [EGF]
- Vascular endothelial growth factor A [VEGF-A]
- YKL-40
- Matrix metalloproteinase 1 [MMP-1]
- MMP-3
- CRP
- Serum amyloid A [SAA]
- Leptin
- Resistin

These biomarkers represent several processes related to RA, such as cartilage remodeling and cytokine signaling pathways. A score of ≤29 is considered “low” activity, between 29 and 44 is “moderate” activity, and >44 is “high” activity. The MBDA is intended to provide separate information from a clinical evaluation of joints and should be used as a complement, not as a replacement (J. R. Curtis et al., 2012).

This MBDA has been shown to correlate significantly (r=0.72; p<0.001) with a disease activity score based on the 28-joint Disease Activity Score based on CRP (DAS28-CRP) and has been validated for clinical use as a disease activity marker in RA (J. R. Curtis et al., 2012). Both Hirata et al. (2013) and Bakker et al. (2012) found the MBDA score to correlate well with disease activity and could complement other existing measures of RA assessment. Remission based on the MBDA score was a significant predictor of radiographic non-progression, whereas both remission-defined DAS28-CRP and American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) criteria was not. The MBDA test was also useful in assessing the risk of radiographic progression among patients who met clinical remission criteria. MBDA results may provide an important addition to clinical assessment, however, further studies are needed to confirm its clinical utility in the management of RA (van der Helm-van Mil et al., 2013).

Li, Sasso, Emerling, Cavet, and Ford (2013) evaluated the impact of an MBDA blood test for rheumatoid arthritis (RA) on treatment decisions made by six health care providers (HCPs) in 101 patients. HCPs completed surveys before and after viewing the MBDA test result, recording dosage and frequency for all RA medications and assessment of disease activity. Frequency and changes in treatment plan that resulted from viewing the MBDA test result were determined. The MBDA test results were found to have changed 38% of patients' treatment plans. Furthermore, treatment plans were changed 63% of the time the MBDA test results were found to be "not consistent" or "somewhat consistent" with the clinical assessment of disease activity. However, any improvement in clinical outcomes caused was not reported, and the overall amount of drug use was not affected (Li et al., 2013).

Another study by Li et al. (2016) assessed the correlation between MBDA score and disease progression in 163 RA patients. The study found that low radiographic progression was associated with low MBDA scores, and higher scores were associated with more frequent and severe progression. Notably, MBDA scores correlated with progression even when a conventional measure such as the DAS28 indicated otherwise. For example, low risk of progression was associated with a low MBDA score, even when a concurrent DAS28 score was high. The authors concluded that MBDA may be a good complement for conventional measures, as well as provide information on changing treatment plans (Li et al., 2016).

J. R. Curtis, Greenberg, Harrold, Kremer, and Palmer (2018) initially studied the influence of age, obesity and other comorbidities on the MBDA test. A cross-sectional analysis of RA patients who have participated in an MBDA test was used (n=357). "Of 357 eligible patients, 76% (n = 273) had normal CRP (<10mg/L) with high (33%), moderate (45%), and low (22%) disease activity by MBDA. The MBDA score was significantly associated with BMI, age, CDAI [clinical disease activity index], and SJC [swollen joint count] (J. R. Curtis et al., 2018)." Almost one third of participants had normal CRP scores but high MBDA scores. "In this real-world analysis, the MBDA score was associated with RA disease activity, obesity, and age, and was negligibly affected by common comorbidities (J.R. Curtis et al., 2018)."The authors conclude by suggesting that an adjusted MBDA score may require development to account for BMI and age. Such a study was then published the following year. J. R. Curtis et al. (2019) developed an MBDA test that will include additional factors such as sex, age and obesity in RA patients. Obesity, or adiposity,

was measured using either BMI or serum leptin concentration. Two cohorts were studied, totaling 1736 patients. Overall, the authors have developed "a leptin-adjusted MBDA score that has significantly improved [the] ability to predict clinical disease activity and radiographic progression (J. R. Curtis et al., 2019)." It was suggested that this leptin-adjusted MBDA score "significantly adds information to DAS28-CRP and the original MBDA score in predicting radiographic progression. It may offer improved clinical utility for personalized management of RA (J. R. Curtis et al., 2019)."

A recent study analyzed the measurement of serum biomarkers at early RA disease onset in hopes to better predict disease progression (Brahe et al., 2019). MBDA score and changes in this score were evaluated to predict DAS28-CRP remission. A total of 180 patients participated in this study and were treated with either methotrexate and adalimumab (n = 89) or methotrexate and placebo (n = 91) in addition to a glucocorticoid injection into swollen joints; results showed that "Early changes in MBDA score were associated with clinical remission based on DAS28-CRP at 6 months (Brahe et al., 2019)."

In a study by Ma et al. (2020), the MBDA test was used to explore the role of biomarkers in predicting remission of RA. Serum samples for 148 patients were assessed for MBDA score at three months, six months, and at one year. RA patients on greater than six months stable therapy in stable low disease activity were assessed every three months for one year. Patients not fulfilling any remission criteria at baseline were classified as 'low disease activity state' (LDAS). Patients not fulfilling any remission criteria over 1 year were classified as 'persistent disease activity' (PDA). Of the 148 patients, 27% were in the LDAS group and over 1 year and 9% of patients were classified as PDA. Baseline MBDA score and concentrations of IL-6, leptin, SAA and CRP were significantly lower in all baseline remission criteria groups in comparison to LDAS groups. The individual MBDA biomarkers (IL-6, leptin, SAA, CRP) and initial MBDA score was able to differentiate between remission at baseline and LDAS. The authors state that these findings highlight the potential value of repeated measurements of MBDA score to evaluate the stability of clinical disease activity over time (Ma et al., 2020).

In a combined analysis of the OPERA, SWEFOT, and BRASS studies in which a newer version of the MBDA score was validated, Curtis analyzed the prognostic value of the adjusted MBDA score for radiographic progression in RA. The new MBDA score, used in these three studies, adjusts for age, sex, and adiposity. Curtis evaluated associations of radiographic progression (ΔTSS) per year with the adjusted MBDA score, seropositivity, and clinical measures using linear and logistic regression. The adjusted MBDA score was validated in SWEFOT, compared with the other two cohorts, and used to generate curves for predicting risk of radiographic progression. The adjusted MBDA score was found to be the "strongest, independent predicator of radiographic progression (ΔTSS > 5) compared with seropositivity (rheumatoid factor and/or anti-CCP), baseline TSS, DAS28-CRP, CRP SJC, or CDAI. Its prognostic ability is not significantly improved by the addition of DAS28-CRP, CRP, SJC, or CDAI" (Jeffrey R. Curtis et al., 2021).

V. Guidelines and Recommendations

American College of Rheumatology (ACR)

The ACR convened a Working Group (WG) to evaluate the validity, feasibility, and acceptability of available RA disease activity measures.

The WG recommended the following measures:

- Clinical Disease Activity Index
- Disease Activity Score with 28-joint counts (erythrocyte sedimentation rate or C-reactive protein
- Patient Activity Scale (PAS) and PAS-II
- Routine Assessment of Patient Index Data (3 measures)
- Simplified Disease Activity Index

According to the WG, these measures were recommended because "they are accurate reflections of disease activity; are sensitive to change; discriminate well between low, moderate, and high disease activity states; have remission criteria; and are feasible to perform in clinical settings (Anderson et al., 2012)."

The WG also recognized "there is no ideal measure of disease activity" and acknowledged that some measures excluded in their review may be superior to the six recommended measures. However, they believed they identified the best measures of disease activity in RA (Anderson et al., 2012).

In 2015, the ACR published guidelines for the treatment of RA. While these guidelines focus mainly on methods of treatment rather than types of testing, "The team also discussed the following topics and recommended that they be targeted for future research: use of biologics and DMARDs during the period of conception, pregnancy, and breastfeeding; treatment of RA with interstitial lung disease; laboratory monitoring for biologics/tofacitinib; and biomarker testing (Singh et al., 2015)."

European League Against Rheumatism (EULAR)

EULAR recommends clinical examination as the method of detecting arthritis, but if a definite diagnosis cannot be reached, other risk factors such as rheumatoid factor or swollen joints should be considered.

EULAR states that the main goal of disease-modifying antirheumatic drugs (DMARDs) is clinical remission and regular monitoring of adverse events, disease activity and comorbidities should occur. Monitoring should include joint counts, patient and physician global assessment, and ESR and CRP measurements. Other measures such as radiographic can complement the main measures.

EULAR notes that several combinations of biomarkers have been evaluated, but not validated. Additionally, EULAR states that current data is not convincing and further study is required (Combe et al., 2017).

A 2019 EULAR update focused on management of RA with DMARDs stated that "The major weakness of our current treatment approaches is the lack of biomarkers for immediate stratification of an individual patient to the most appropriate drug. Importantly, these considerations emphasize the need to search for predictive markers; however, since a considerable number of patients (about 20%–30%) are refractory to all current treatment options, new therapies also need to be developed" (Smolen et al., 2020).

Another 2019 EULAR update focused on use of disease activity measures for RA. In it, the guideline identified 11 measures of RA disease activity that met the authors' "minimum standards for regular use", which was defined to include the following four characteristics:

"1) providing a numerical value,

2) categorizing to ≥3 disease states which separate low, moderate, and high disease activity,

3) being feasible for regular measurement in clinic and

4) possessing adequate psychometric properties".

The guideline identified Vectra DA as one of the 11 disease activity measures fulfilling these four minimum standards. However, the guideline recommended five other measures of disease activity, while giving Vectra an "Inconclusive" rating (England et al., 2019).

National Institute for Care and Excellence (NICE), Quality Standard, Rheumatoid arthritis in over 16s

NICE recommends monthly monitoring of CRP and disease activity until remission or low disease activity. Remission is defined as a DAS28 score of under 2.6, and low is defined as a DAS28 score of under 3.2. NICE does not mention biomarkers in its recommendations for research (NICE, 2020).

The NICE recently published recommendations regarding laboratory testing for rheumatoid arthritis. These guidelines state that "Enzyme-linked immunosorbent assay (ELISA) tests for therapeutic monitoring of tumor necrosis factor (TNF)-alpha inhibitors (drug serum levels and antidrug antibodies) show promise but there is currently insufficient evidence to recommend their routine adoption in rheumatoid arthritis. The ELISA tests covered by this guidance are Promonitor, IDKmonitor, LISA-TRACKER, RIDASCREEN, MabTrack, and tests used by Sanquin Diagnostic Services (NICE, 2019)."

Treat to Target Task Force (2014 Update to 2010 Guidelines)

The task force states that remission or low disease activity is the goal of treatment. Remission is defined as absence of clinical signs and symptoms of disease activity. The task force was reconvened to update their previously issued guidelines from 2010. The task force recommended regular monitoring and documentation of disease activity. The frequency may depend on activity; for higher disease activity, the frequency may be as high as monthly whereas a lower activity patient may only need be re-evaluated every six months (Smolen et al., 2016).

VI. Applicable State and Federal Regulations

DISCLAIMER: If there is a conflict between this Policy and any relevant, applicable government policy for a particular member [e.g., Local Coverage Determinations (LCDs) or National Coverage Determinations (NCDs) for Medicare and/or state coverage for Medicaid], then the government policy will be used to make the determination. For the most up-to-date Medicare policies and coverage, please visit the Medicare search website: http://www.cms.gov/medicare-coverage-database/overview-and-quick-search.aspx. For the most up-to-date Medicaid policies and coverage, visit the applicable state Medicaid website.

Food and Drug Administration (FDA)

Many labs have developed specific tests that they must validate and perform in house. These laboratory-developed tests (LDTs) are regulated by the Centers for Medicare and Medicaid (CMS) as high-complexity tests under the Clinical Laboratory Improvement Amendments of 1988 (CLIA '88). LDTs are not approved or cleared by the U. S. Food and Drug Administration; however, FDA clearance or approval is not currently required for clinical use.

VII. Applicable CPT/HCPCS Procedure Codes

Procedure codes appearing in medical policy documents are only included as a general reference. This list may not be all inclusive and is subject to updates. In addition, codes listed are not a guarantee of payment.

Code Number	Code Description
81490	Autoimmune (rheumatoid arthritis) analysis of 12 biomarkers using immunoassays, utilizing serum, prognostic algorithm reported as a disease activity score

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VIII. Evidence-based Scientific References

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IX. Revision History

Revision	Summary of Changes

Date	
07/01/2021	Initial Effective Date
07/19/2022	Updated background, guidelines, and evidence-based scientific references. Literature review did not necessitate any modifications to the coverage criteria. Revised code disclaimer statement
09/07/2023	Policy Archived Background information, guidelines and coverage criteria moved to G2022 Biomarker Testing for Autoimmune Rheumatic Disease Committee approved 09/18/2023 ODM approval 09/07/2023